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Algebraic L-theory and Topological Manifolds - A. A. Ranicki 1992-12-10

Assuming no previous acquaintance with surgery theory and justifying all the algebraic concepts used by their relevance to topology, Dr Ranicki explains the applications of quadratic forms to the classification of topological manifolds, in a unified algebraic framework.

Topology and Geometry - Glen E. Bredon 2013-03-09

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

Counterexamples in Topology - Lynn Arthur Steen 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.

Three-Dimensional Geometry and Topology, Volume 1 - William P. Thurston 2014-10-31

This book develops some of the extraordinary richness, beauty, and power of geometry in two and three dimensions, and the strong connection of geometry with

topology. Hyperbolic geometry is the star. A strong effort has been made to convey not just denatured formal reasoning (definitions, theorems, and proofs), but a living feeling for the subject. There are many figures, examples, and exercises of varying difficulty. This book was the origin of a grand scheme developed by Thurston that is now coming to fruition. In the 1920s and 1930s the mathematics of two-dimensional spaces was formalized. It was Thurston's goal to do the same for three-dimensional spaces. To do this, he had to establish the strong connection of geometry to topology--the study of qualitative questions about geometrical structures. The author created a new set of concepts, and the expression "Thurston-type geometry" has become a commonplace. Three-Dimensional Geometry and Topology had its origins in the form of notes for a graduate course the author taught at Princeton University between 1978 and 1980. Thurston shared his notes, duplicating and sending them to whoever requested them. Eventually, the mailing list grew to more than one thousand names. The book is the culmination of two decades of research and has become the most important and influential text in the field. Its content also provided the methods needed to solve one of mathematics' oldest unsolved problems--the Poincaré Conjecture. In 2005 Thurston won the first AMS Book Prize, for Three-dimensional Geometry and Topology. The prize recognizes an outstanding research book that makes a seminal contribution to the

research literature. Thurston received the Fields Medal, the mathematical equivalent of the Nobel Prize, in 1982 for the depth and originality of his contributions to mathematics. In 1979 he was awarded the Alan T. Waterman Award, which recognizes an outstanding young researcher in any field of science or engineering supported by the National Science Foundation.

Computational Topology - Herbert Edelsbrunner 2010

Combining concepts from topology and algorithms, this book delivers what its title promises: an introduction to the field of computational topology. Starting with motivating problems in both mathematics and computer science and building up from classic topics in geometric and algebraic topology, the third part of the text advances to persistent homology. This point of view is critically important in turning a mostly theoretical field of mathematics into one that is relevant to a multitude of disciplines in the sciences and engineering. The main approach is the discovery of topology through algorithms. The book is ideal for teaching a graduate or advanced undergraduate course in computational topology, as it develops all the background of both the mathematical and algorithmic aspects of the subject from first principles. Thus the text could serve equally well in a course taught in a mathematics department or computer science department.

Understanding Topology - Shaun V. Ault 2018-01-30

"Topology can present significant challenges for undergraduate students of mathematics and the sciences. 'Understanding topology' aims to change that. The perfect introductory topology textbook, 'Understanding topology' requires only a knowledge of calculus and a general familiarity with set theory and logic. Equally approachable and rigorous, the book's clear organization, worked examples, and concise writing style support a thorough understanding of basic topological principles. Professor Shaun V. Ault's unique emphasis on fascinating applications, from chemical dynamics to determining the

shape of the universe, will engage students in a way traditional topology textbooks do not"--Back cover.

Topology for Analysis - Albert Wilansky 2008-10-17

Starting with the first principles of topology, this volume advances to general analysis. Three levels of examples and problems make it appropriate for students and professionals. Abundant exercises, ordered and numbered by degree of difficulty, illustrate important concepts, and a 40-page appendix includes tables of theorems and counterexamples. 1970 edition.

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.

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 or beginning graduate level. There are over 500 exercises, 114 figures, numerous diagrams. The general direction of the book is toward homotopy theory with a geometric point of view. This book would provide a more than adequate background for a standard algebraic topology course that begins with homology theory. For more information

see www.bangor.ac.uk/r.brown/topgpds.html
This version dated April 19, 2006, has a number of corrections made.

Lecture Notes in Algebraic Topology - James Frederic Davis 2001

The amount of algebraic topology a graduate student specializing in topology must learn can be intimidating. Moreover, by their second year of graduate studies,

students must make the transition from understanding simple proofs line-by-line to understanding the overall structure of proofs of difficult theorems. To help students make this transition, the material in this book is presented in an increasingly sophisticated manner. It is intended to bridge the gap between algebraic and geometric topology, both by providing the algebraic tools that a geometric topologist needs and by concentrating on those areas of algebraic topology that are geometrically motivated. Prerequisites for using this book include basic set-theoretic topology, the definition of CW-complexes, some knowledge of the fundamental group/covering space theory, and the construction of singular homology. Most of this material is briefly reviewed at the beginning of the book. The topics discussed by the authors include typical material for first- and second-year graduate courses. The core of the exposition consists of chapters on homotopy groups and on spectral sequences. There is also material that would interest students of geometric topology (homology with local coefficients and obstruction theory) and algebraic topology (spectra and generalized homology), as well as preparation for more advanced topics such as algebraic K-theory and the s-cobordism theorem. A unique feature of the book is the inclusion, at the end of each chapter, of several projects that require students to present proofs of substantial theorems and to write notes accompanying their explanations. Working on these projects allows students to grapple with the "big picture", teaches them how to give mathematical lectures, and prepares them for participating in research seminars. The book is designed as a textbook for graduate students studying algebraic and geometric topology and homotopy theory. It will also be useful for students from other fields such as differential geometry, algebraic geometry, and homological algebra. The exposition in the text is clear; special cases are presented over complex general statements.

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.

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.

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, Satō 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.

MemComputing - Massimiliano Di Ventra
2022-02-21

MemComputing is a new computing paradigm that employs time non-locality (memory) to both process and store information. This book, written by the originator of this paradigm, explains the main ideas behind MemComputing, explores its theoretical foundations, and shows its applicability to a wide variety of combinatorial optimization problems, machine learning, and quantum mechanics. The book is ideal for graduate students in Physics, Computer Science, Electrical Engineering, and Mathematics, as well as researchers in both academia and industry interested in unconventional computing. The author relies on extensive margin notes, important remarks, and many illustrations to better explain the main concepts and clarify jargon, making the book as self-contained as possible. The reader will be guided from the basic notions to the more advanced ones with an always clear and engaging writing style. Along the way, the reader will appreciate the advantages of this computing paradigm and the major differences that set it apart from the prevailing Turing model of computation, and even quantum computing.

K-Theory - Max Karoubi 2009-11-27

From the Preface: K-theory was introduced by A. Grothendieck in his formulation of the

Riemann- Roch theorem. For each projective algebraic variety, Grothendieck constructed a group from the category of coherent algebraic sheaves, and showed that it had many nice properties. Atiyah and Hirzebruch considered a topological analog defined for any compact space X , a group $K\{X\}$ constructed from the category of vector bundles on X . It is this "topological K-theory" that this book will study. Topological K-theory has become an important tool in topology. Using K-theory, Adams and Atiyah were able to give a simple proof that the only spheres which can be provided with H-space structures are S^1 , S^3 and S^7 .

Moreover, it is possible to derive a substantial part of stable homotopy theory from K-theory. The purpose of this book is to provide advanced students and mathematicians in other fields with the fundamental material in this subject. In addition, several applications of the type described above are included. In general we have tried to make this book self-contained, beginning with elementary concepts wherever possible; however, we assume that the reader is familiar with the basic definitions of homotopy theory: homotopy classes of maps and homotopy groups. Thus this book might be regarded as a fairly self-contained introduction to a "generalized cohomology theory".

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 Königsberg, 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 not understand the simplest topological facts, such as the reason 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 visualization of problems from other parts of mathematics—complex analysis (Riemann), mechanics (Poincaré), and group theory (Dehn). It is these connections to other parts of mathematics which make topology an important as well as a beautiful subject.

Algebra: Chapter 0 - Paolo Aluffi 2009

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.

Differential Forms in Algebraic Topology - Raoul Bott 2013-04-17

Developed from a first-year graduate course in algebraic topology, this text is an informal introduction to some of the main ideas of contemporary homotopy and cohomology theory. The materials are structured around four core areas: de Rham theory, the Čech-de Rham complex, spectral sequences, and characteristic classes. By using the de Rham theory of differential forms as a prototype of cohomology, the machineries of algebraic topology are made easier to assimilate. With its stress on concreteness, motivation, and readability, this book is equally suitable for self-study and as a one-semester course in topology.

Lectures on the Topology of 3-manifolds - Nikolai Saveliev 1999

Notes on Lie Algebras - Hans Samelson 2012-12-06

(Cartan sub Lie algebra, roots, Weyl group, Dynkin diagram, . . .) and the classification, as found by Killing and Cartan (the list of all semisimple Lie algebras consists of (1) the special-linear ones, i. e. all matrices (of any fixed dimension) with trace 0, (2) the orthogonal ones, i. e. all skewsymmetric matrices (of any fixed dimension), (3) the symplectic ones, i. e. all matrices M (of any fixed even dimension) that satisfy $MJ = -JM^T$ with a certain non-degenerate skewsymmetric matrix J , and (4) five special Lie algebras G_2, F_4, E_6, E_7, E_8 , of dimensions 14, 52, 78, 133, 248, the "exceptional Lie algebras", that just somehow appear in the process). There is also a discussion of the compact form and other real forms of a (complex) semisimple Lie algebra, and a section on automorphisms. The third chapter brings the theory of the finite dimensional representations of a semisimple Lie algebra, with the highest or extreme weight as central notion. The proof for the existence of representations is an ad hoc version of the present standard proof, but avoids explicit use of the Poincaré-Birkhoff-Witt theorem. Complete reducibility is proved, as usual, with J. H. C. Whitehead's proof (the first proof, by H. Weyl, was analytical-topological and used the existence of a compact form of the group in

question). Then come H.

Topology Illustrated - Peter Saveliev
2016-02-02

This book follows a two-semester first course in topology with emphasis on algebraic topology. Some of the applications are: the shape of the universe, configuration spaces, digital image analysis, data analysis, social choice, exchange economy. An overview of discrete calculus is also included. The book contains over 1000 color illustrations and over 1000 exercises.

Introduction to Topology - Theodore W. Gamelin 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.

Computational Topology for Data Analysis - Tamal Krishna Dey 2022-03-10

This book provides a computational and algorithmic foundation for techniques in topological data analysis, with examples and exercises.

The \$K\$-book - Charles A. Weibel
2013-06-13

Informally, K -theory is a tool for probing the structure of a mathematical object such as a ring or a topological space in terms of suitably parameterized vector spaces and producing important intrinsic invariants which are useful in the study of 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.

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 relations of these ideas with other areas of mathematics. Rather than choosing one point of view of modern topology (homotopy theory, simplicial complexes, singular theory, axiomatic homology, differential topology, etc.), we concentrate our attention on concrete problems in low dimensions, introducing only as much algebraic machinery 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 topologists-without, we hope, discouraging budding topologists. We also feel that this approach is in better harmony with the historical development of the subject. What would we like a student to know after a first course in topology (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: understanding the relation between homology and integration, first on plane domains, later on Riemann surfaces and in higher dimensions; winding numbers and degrees of mappings, fixed-point theorems; applications such as the Jordan curve

theorem, invariance of domain; in dices of vector fields and Euler characteristics; fundamental groups

Algebraic Topology - Marvin J. Greenberg
2018-03-05

Great first book on algebraic topology. Introduces (co)homology through singular theory.

More Concise Algebraic Topology - J. P. May
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.

A Combinatorial Introduction to Topology - Michael Henle
1994-01-01

Excellent text covers vector fields, plane homology and the Jordan Curve Theorem, surfaces, homology of complexes, more. Problems and exercises. Some knowledge of differential equations and multivariate

calculus required. Bibliography. 1979 edition.
Elements of Topology - Tej Bahadur Singh
2013-05-20

Topology is a large subject with many branches broadly categorized as algebraic topology, point-set topology, and geometric topology. Point-set topology is the main language for a broad variety of mathematical disciplines. Algebraic topology serves as a powerful tool for studying the problems in geometry and numerous other areas of mathematics. Ele

Lectures on Algebraic Topology - Sergei 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.

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.

Complex Cobordism and Stable Homotopy Groups of Spheres - Douglas C. Ravenel
2003-11-25

Since the publication of its first edition, this book has served as one of the few available on the classical Adams spectral sequence, and is the best account on the Adams-Novikov spectral sequence. This new edition has been updated in many places, especially the final chapter, which has been completely rewritten with an eye toward future research in the field. It remains the definitive reference on the stable homotopy groups of spheres. The first three chapters introduce the homotopy groups of spheres and take the reader from the classical results in the field through the computational aspects of the classical Adams spectral sequence and its modifications, which are the main tools topologists have to investigate the homotopy groups of spheres. Nowadays, the most efficient tools are the Brown-Peterson theory, the Adams-Novikov spectral sequence, and the chromatic spectral sequence, a device for analyzing the global structure of the stable homotopy groups of spheres and relating them to the cohomology of the Morava stabilizer groups. These topics are described in detail in Chapters 4 to 6. The revamped Chapter 7 is the computational payoff of the book, yielding a lot of information about the stable homotopy group of spheres. Appendices follow, giving self-contained accounts of the theory of formal group laws and the

homological algebra associated with Hopf algebras and Hopf algebroids. The book is intended for anyone wishing to study computational stable homotopy theory. It is accessible to graduate students with a knowledge of algebraic topology and recommended to anyone wishing to venture into the frontiers of the subject.

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.

Algorithms and Theory of Computation Handbook, Second Edition, Volume 2 - Mikhail J. Atallah
2009-11-20
Algorithms and Theory of Computation

Handbook, Second Edition: Special Topics and Techniques provides an up-to-date compendium of fundamental computer science topics and techniques. It also illustrates how the topics and techniques come together to deliver efficient solutions to important practical problems. Along with updating and revising many of the existing chapters, this second edition contains more than 15 new chapters. This edition now covers self-stabilizing and pricing algorithms as well as the theories of privacy and anonymity, databases, computational games, and communication networks. It also discusses computational topology, natural language processing, and grid computing and explores applications in intensity-modulated radiation therapy, voting, DNA research, systems biology, and financial derivatives. This best-selling handbook continues to help computer professionals and engineers find significant information on various algorithmic topics. The expert contributors clearly define the terminology, present basic results and techniques, and offer a number of current references to the in-depth literature. They also provide a glimpse of the major research issues concerning the relevant topics.

Algebraic Topology - Allen Hatcher 2002
 In most mathematics departments at major universities one of the three or four basic first-year graduate courses is in the subject of algebraic topology. This introductory textbook in algebraic topology is 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. The four main chapters present the basic material of the subject: fundamental group and covering spaces, homology and cohomology, higher homotopy groups, and homotopy theory generally. The author emphasizes the geometric aspects of the subject, which helps students gain intuition. A unique feature of the book is the inclusion of many optional topics which are not usually part of a first course due to time constraints, and for which elementary expositions are sometimes hard to find. Among these are:

Bockstein and transfer homomorphisms, direct and inverse limits, H-spaces and Hopf algebras, the Brown representability theorem, the James reduced product, the Dold-Thom theorem, and a full exposition of Steenrod squares and powers. Researchers will also welcome this aspect of the book.
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 abstract 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 introduction 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.

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.

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

Homotopy theory, including basic facts about homotopy groups and applications to obstruction theory.

Introduction to 3-Manifolds - Jennifer Schultens
2014-05-21

This book grew out of a graduate course on 3-manifolds and is intended for a mathematically experienced audience that is new to low-dimensional topology. The exposition begins with the definition of a manifold, explores possible additional structures on manifolds, discusses the classification of surfaces, introduces key foundational results for 3-manifolds, and provides an overview of knot theory. It then continues with more specialized topics by briefly considering triangulations of 3-manifolds, normal surface theory, and Heegaard splittings. The book finishes with a discussion of topics relevant to viewing 3-manifolds via the curve complex. With about 250 figures and more than 200 exercises, this book can serve as an excellent overview and starting point for the study of 3-manifolds.