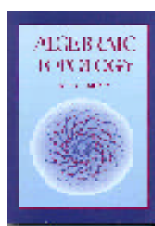


Algebraic Topology

Siddhartha Gadgil



Algebraic Topology
Allen Hatcher
 Cambridge University Press
 2002.

Algebraic topology is a subject central to mathematics and which, at the level taught in a first course, can be considered as fully mature. Thus, one expects, at least from a given viewpoint, a book to be written that can be regarded as the definitive text and reference of the subject. In my view, Allen Hatcher's *Algebraic topology* is such a book. Furthermore, the book contains a wealth of additional topics, examples and exercises that make it an inspiring book for the motivated student.

The point of view from which this book is written is that of a geometer who is algebraically sophisticated. Thus, while the aim of the book is geometric understanding and applications, the treatment does make use of a fair amount of algebraic sophistication wherever this leads to a more transparent and efficient exposition. The examples have been chosen to be geometrically interesting, for example torus knots and linear groups, rather than merely those illustrating pathologies.

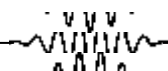
The book begins with a preliminary chapter on homotopy and cell complexes, which

includes the basic constructions like mapping cylinders. This sets the stage for a geometric treatment throughout the book. The four main chapters are on fundamental groups, homology, cohomology and cup products.

The chapter on fundamental groups begins with the basic example of the circle, giving the crucial ideas behind the relation with covering spaces without getting into formalisms. This is followed by a section on the Van Kampen theorem and then one on the relation between fundamental groups and covering spaces.

Homology is initially developed in the setting of what the author calls Δ -complexes. These are generalisations of simplicial complexes for which simplicial homology can be defined, but with the advantage that the number of simplices required is not too many. Singular homology and its basic properties are then developed. The second half of the chapter is devoted to computations and a wealth of applications, including the Lefschetz fixed point theorem and the Borsuk-Ulam theorem (using the transfer homomorphism).

In the chapter on cohomology, after some motivating remarks and definitions, the Universal coefficients theorem is introduced and proved. This is followed by a section on the cup product, which includes the computation for projective spaces. The next section treats orientations, fundamental classes and Poincaré duality for topological manifolds. This is followed by a treatment of Alexander and Lefschetz dualities.



The chapter on homotopy theory begins with the basic results and then goes on to Whitehead's theory of homotopy for CW-complexes. Then some methods for computation, including Hurewicz theorem and exact sequences for fibrations, are introduced. The final section treats Serre fibrations, Postnikov towers and obstruction theory.

Each chapter is followed by a large selection of additional topics, which range from

topological methods in group theory to Loop spaces and Steenrod squares.

To conclude, I strongly recommend Hatcher's *Algebraic Topology* to any serious student of mathematics with the only caveat being that the book requires a certain level of mathematical sophistication.

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Information and Announcements

Story of the Oceans

Story of the Oceans is a book primarily intended for educating school children on different aspects of ocean studies. This is brought out by Geological Society of India at the instance of the Department of Ocean Development, Government of India.

This book, also available in Hindi, Kannada, Telugu, Tamil, Marathi, Malayalam and Oriya, will be given free on request to interested school children.

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