A First Course in
Algebraic Topology

B.K. Lahiri

Alpha Science International Ltd.
## Contents

**Preface**  
 SYMBOLS AND NOTATIONS  
 vii  
 viii  

1. **Basic Concepts**  
   2. **Category and Functors**  
   - Category  
   - Functors  
   9  
2. **Homotopy**  
   - Introduction and Definitions  
   - Properties of Homotopic Mappings  
   - Relative Homotopy  
   - Exercises  
   12  
3. **Homotopy Type and Retractions**  
   - Contractible Spaces  
   - Homotopy Type  
   - Retractions  
   - Exercises  
   19  
4. **Paths**  
   - Definitions  
   - Path Connected Spaces  
   - Equivalent Paths  
   - Exercises  
   23  
5. **The Fundamental Group**  
   - Formation of a Group  
   - Isomorphism of Fundamental Groups  
   - Homomorphism of Fundamental Groups  
   - Induced Homomorphism  
   - The Homotopy Groups  
   - Exercises  
   33  
6. **Fundamental Group of the Circles**  
   - Introduction  
   - Lemmas  
   - Main Theorem  
   - Torus  
   - Applications  
   - Exercises  
   43  
