



Department of Mathematics
Johns Hopkins University

110.413 Introduction to Topology Course Syllabus

The following list of topics is considered the core content for the course 110.413 Introduction to Topology. The current text for the course is:

Text: [Topology](#), 2nd Ed., Munkres, J., New Jersey: Prentice Hall, January, 2000, ISBN-10: 0131816292, ISBN-13: 978-0131816299.

Course Topics

- **General Topology**

- **Set Theory and Logic (1+ weeks)**

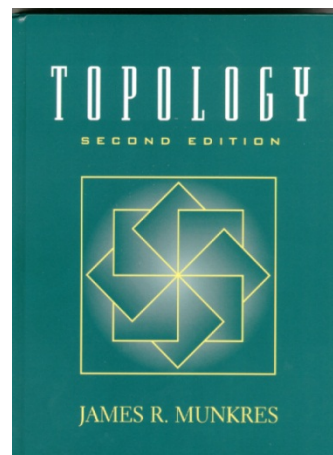
- 1 Fundamental Concepts
- 2 Functions
- 3 Relations
- 4 The Integers and the Real Numbers
- 5 Cartesian Products
- 6 Finite Sets
- 7 Countable and Uncountable Sets
- 8 The Principle of Recursive Definition
- 9 Infinite Sets and the Axiom of Choice
- 10 Well-Ordered Sets
- 11 The Maximum Principle

- **Topological Spaces and Continuous Functions (3 weeks)**

- 12 Topological Spaces
- 13 Basis for a Topology
- 14 The Order Topology
- 15 The Product Topology on $X \times Y$
- 16 The Subspace Topology
- 17 Closed Sets and Limit Points
- 18 Continuous Functions
- 19 The Product Topology
- 20-1 The Metric Topology
- 22 The Quotient Topology

- **Connectedness and Compactness (2 weeks)**

- 23 Connected Spaces
- 24 Connected Subspaces of the Real Line
- 25 Components and Local Connectedness
- 26 Compact Spaces
- 27 Compact Subspaces of the Real Line
- 28 Limit Point Compactness
- 29 Local Compactness





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- **Countability and Separation Axioms (2 weeks)**
 - 30 The Countability Axioms
 - 31 The Separation Axioms
 - 32 Normal Spaces
 - 33 The Urysohn Lemma
 - 34 The Urysohn Metrization Theorem
 - 35 The Tietze Extension Theorem
 - 36 Imbeddings of Manifolds

- **Algebraic Topology**
 - **The Fundamental Group (3 weeks)**
 - 51 Homotopy of Paths
 - 52 The Fundamental Group
 - 53 Covering Spaces
 - 54 Fundamental Group of a Circle
 - 55 Retractions and Fixed Points
 - 56 (optional) The Fundamental Theorem of Algebra
 - 57 The Borsuk-Ulam Theorem
 - 58 Deformation Retracts and Homotopy Type
 - 59 The Fundamental Group of S^n
 - 60 The Fundamental Group of Some Surfaces

 - **(optional) Classification of Surfaces (1 week)**
 - 74 Fundamental Groups of Surfaces
 - 75 Homology of Surfaces
 - 76 Cutting and Pasting
 - 77 The Classification Theorem
 - 78 Constructing Compact Surfaces

 - **Classification of Covering Spaces (1 week)**
 - 79 Equivalence of Covering Spaces
 - 80 The Universal Covering Space
 - 81 Covering Transformations
 - 82 Existence of Covering Spaces