

TOPOLOGY QUALIFYING EXAM SYLLABUS

Mathematics 205A. Text: J. Munkres, *Topology*. Supplementary texts W. Sutherland, *Introduction to Metric and Topological Spaces*. A. Hatcher *Algebraic Topology*.

Part 1: Point Set Topology

Topologies, bases, closed sets, limit points, various concepts of connectedness and compactness, countability and separation properties, subspace, product and quotient topologies.

Part 2: Fundamental groups and covering spaces. Homotopy, Fundamental group, retractions, deformation retractions, homotopy type, covering spaces, the fundamental group of the circle, Seifert-Van Kampen Theorem.

Mathematics 205B. Texts: J. Munkres, *Topology*. A. Hatcher *Algebraic Topology*.

Part 1: Fundamental groups and covering spaces.

Seifert-Van Kampen Theorem (continued), Classification of Covering Spaces.

Part 2: Homology

Simplicial and chain complexes, simplicial and singular homology, and applications: homotopy invariance, relative homology, excision, long exact sequence of a pair, Mayer-Vietoris sequences, Brouwer's Fixed Point Theorem, Invariance of domain, Jordan-Brouwer Separation Theorem.

Mathematics 205C. Text: J. Lee, *Introduction to Smooth Manifolds*. Supplementary text: J. Milnor, *Topology from the Differentiable Viewpoint*.

Topological manifolds, smooth structures, smooth maps and their differentials, the tangent bundle, Lie groups and their Lie algebras, partitions of unity, vector fields, Lie brackets, submersions, immersions, embeddings, submanifolds, embedding and approximation theorems, Lie group actions, Sard's theorem, flows, degree theory.