Topology Qualifying Exam
Topics

Point set topology
- Topological spaces:
  - axioms of a topology, open and closed sets, basis for a topology, continuous maps, homeomorphisms
- Examples of topological spaces:
  - subspaces, products, quotients, CW complexes, metric spaces
- Topological properties:
  - connectedness, compactness, path-connectedness (and their local variants), Hausdorff, separation axioms
- Classification of surfaces:
  - 2-dimensional manifolds, orientability, examples, construction, the classification theorem

Algebraic topology
- Fundamental group:
  - the fundamental group, induced homomorphisms, simple connectedness, the fundamental group of the circle, applications
- Seifert-van Kampen:
  - group presentations, Seifert-van Kampen theorem, computations of the fundamental group for many examples, applications
- Covering spaces:
  - covering spaces, examples, covering transformations, equivalence of covering spaces, the universal covering space, classification of covering spaces, applications
- Homology theory:
  - (singular, simplicial, and cellular), homology of spaces, homology of pairs, exact sequences, chain complexes, excision, Mayer-Vietoris theorem, homology with coefficients, degree, computations, applications

Main References
- J.R. Munkres, *Topology, Second Edition*, Chapters 2-4, 9-14
- T. Lawson, *Topology: A Geometric Approach*, Chapters 1-3, 5
- A. Hatcher, *Algebraic Topology*, Chapters 0-2

Additional References
- W.S. Massey, *Algebraic Topology: An Introduction*, Chapters 2-7
- J.J. Rotman, *An Introduction to Algebraic Topology*, Chapters 3-6, 8-10