Syllabus for Topology Preliminary Exam Updated Fall 2022

(Based on MATH 631, Topology)

Topological Spaces and Continuous functions: Topological spaces, open sets, closed sets, basis, sub- basis, subspaces, product topology, limit points, sequences, convergence, continuous functions, homeomorphisms, metric spaces. Examples include: Euclidean spaces, subspaces, and quotient spaces.

[M, Ch. 2, Sections 12-22] or [B, Ch. 1, Sections 1-3, 6, 8, 13]

Connectedness and Compactness: Definitions of connected, path connected, local connected, compact and locally compact; examples and counterexamples of subsets in R and R^n with these properties. Preservation of properties under continuous mappings, equivalence of sequential and limit point compactness for metric spaces, one-point compactification, compactness of arbitrary products of compact spaces.

[M, Ch. 3, Sections 23-29, Chapter 5, 37] or [B, Ch. 1, Sections 4, 7, 9, 11].

Countability and separation axioms: Countability axioms, separation axioms including T_1, Hausdorff, regular and normal spaces. Examples of Hausdorff spaces and non-Hausdorff spaces.

[M, Ch. 4, Sections 30-31] or [B, Ch. 1, Section 5]

Fundamental Groups: Homotopy, path homotopy, fundamental group, induced homomorphisms, fundamental group of a product, fundamental group of the circle, covering spaces, covering maps, and lifting.

[H, Ch. 1, Sections 1, 3] or [M, Ch 9, Sections 51-54, 60]

Suggested Texts for Material:
[M] Munkres, Topology, Second Edition, Prentice Hall 2000 (ISBN 0-13-181629-2)

[B] Bredon, Topology and Geometry, Springer 2010 (ISBN 978-1-4419-3103-0)

[H] Hatcher, Algebraic Topology, Cambridge 2001 (ISBN 978-0-521-79540-1)