

**UNIVERSITY OF PUERTO RICO
RIO PIEDRAS CAMPUS
DEPARTMENT OF MATHEMATICS**

**TOPOLOGY
PH.D. QUALIFYING EXAM
SYLLABUS**

The Ph.D. qualifying exam is based on the material of the graduate course in Topology, which includes the topics covered in Chapter 2 – Chapter 5 of J. Munkres' book, *Topology, A First Course*.

I. Topological Spaces and Continuous Functions

Topological Spaces. Basis for a Topology. The Order Topology. The Product Topology on $X \times Y$. The Subspace Topology. Closed sets and Limit Points. Continuous Functions. The Product Topology. The Metric Topology. The Quotient Topology.

II. Connectedness and Compactness

Connected Spaces. Connected Sets in the Real Line. Components and Path Components. Local Connectedness. Compact Spaces. Compact Sets in the Real Line. Limit Point Compactness. Local Compactness.

III. Countability and Separation Axioms

The Countability Axioms. The Separation Axioms. The Urysohn Lemma. The Urysohn Metrization Theorem. Partitions of Unity.

IV. The Tychonoff Theorem

Tychonoff Theorem. Completely Regular Spaces. The Stone-Ćech Compactification.

The students are also expected to know various techniques involving subspaces and maps of Euclidean Space \mathbb{R}^n , techniques often introduced in an undergraduate Advanced Calculus course.

Exam format:

There will normally be six problems in the exam. Each problem is worth 20 points. Only the best five solutions of each student will be counted. The passing score is 60 points or more. There may be more than 6 problems in the exam, but only the best 5 solutions will be counted.

References:

1. J. Munkres, *Topology, A First Course*, Prentice-Hall, 1975.
2. J. Munkres, *Topology*, 2nd Edition, Prentice-Hall, 2000.