Syllabus for Geometry/Topology Qualifying Exam

Topics in Topology

1. Basic properties of a topology, open sets, closed sets, covers, continuous maps
2. Connectedness, Hausdorff property, local compactness, compactness, paracompactness
3. Products, quotient topology and spaces, identification topology and spaces, metric spaces, homeomorphisms
4. Basic properties of a topological manifold, embeddings and immersions of topological manifolds
5. Elementary homotopy theory, homotopy equivalence, fundamental group, covering spaces

Topics in Geometry

1. Fundamentals of smooth manifolds, immersions, embeddings, submersions, submanifolds, manifolds with boundary, smooth maps, diffeomorphisms, partition of unity
2. Basic propeties of vector bundles, the tangent and cotangent bundles
3. Vector fields and flows of vectors fields, integral curves, singular points
4. Elementary properties of Lie groups, group actions, quotient spaces, homogeneous spaces
5. Tensors and tensor bundles, differential forms and Stokes theorem, elementary de Rham cohomology theory

Suggested References

1. J.R. Munkres, Topology
2. T.W. Gamelin and R.E. Greene, Introduction to Topology
3. M.A. Armstrong, Basic Topology
4. J.M. Lee, Introduction to Topological Manifolds
5. Th. Bröcker and K. Jänich, Introduction to Differential Topology

6. J.M. Lee, Introduction to Smooth Manifolds

7. Th. Aubin, A Course in Differential Geometry

8. W.M. Boothby, An Introduction to Differentiable Manifolds and Riemannian Geometry (Chapters I-VI)

9. L. Conlon, Differentiable Manifolds, A First Course