

Oral Qualifying Exam Syllabus

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Algebraic and Differential Topology

Smooth Manifolds
Tangent /Cotangent Spaces
Differential Forms
Contractions, Lie Derivatives, and Exterior Differentials
De Rham Cohomology

Fundamental Group
Seifert-Van Kampen Theorem
Covering Spaces
Deck Transformation Group

Singular and Cellular Homology
Relative Homology
Mayer-Vietoris Sequence
Exact Sequences and Excision

Cohomology Ring
Kunneth Formula
Cup/Cap Products
Poincare Duality

References:
Introduction to Smooth Manifolds, by John Lee
Algebraic Topology, by Allen Hatcher

Gauge Theory

Principal and Vector Bundles
Connections
Curvature
Chern Classes

References:
An Introduction to Gauge Theory, by John Morgan

Symplectic Geometry

Symplectic Manifolds
Symplectomorphisms
Local Forms
Hamiltonian Mechanics
Moment Maps

References:
Lectures on Symplectic Geometry, by Ana Cannas da Silva