Oral Exam Syllabus

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November 16, 2008

1. Low Dimensional Topology

   References:
   4-Manifolds and Kirby Calculus: Gompf and Stipsicz
   Knots, Links, Braids and 3-Manifolds: Prasolov, Sossinsky

   (a) Knot Theory
      i. The Knot Group (Wirtinger presentation)
      ii. Seifert Surfaces
      iii. Alexander Polynomial
      iv. Signature
   (b) Handlebody Theory
      i. Morse Theory
      ii. Heegaard and Kirby Diagrams
      iii. Surgery
      iv. Kirby Calculus

2. Morse-Floer Homology

   References:
   Lectures Notes on Morse Homology: Michael Hutchings

   (a) Morse-Smale Functions
   (b) Moduli spaces of Flow Lines and Compactifications
   (c) Morse Homology Construction and Invariance
   (d) The Morse Inequalities

3. Heegaard-Floer Homology

   References:
   Holomorphic Discs and Topological Invariants for Closed 3-Manifolds: Ozsváth and Szabó
   Holomorphic Discs and 3-Manifold Invariants: Properties and Applications: Ozsváth and Szabó
   Lectures on Heegaard Floer Homology: Ozsváth and Szabó
   Holomorphic Discs and Knot Invariants: Ozsváth and Szabó

   (a) Construction and Invariance for 3-Manifolds
   (b) The Surgery Exact Sequence and Applications
   (c) Construction of Heegaard-Floer Knot Homology
   (d) The Skein Exact Sequence
   (e) $\chi(\mathit{HFK})$ = Alexander Polynomial