

**DEPARTMENT OF MATHEMATICS**

**ORAL EXAMINATION**

**Minor area: TOPICS IN ALGEBRAIC TOPOLOGY**

There is a general emphasis on examples!

- 1) Classification of surfaces
- 2) Fundamental group & Van Kampen's theorem & Calculations in many examples
- 3) Basic Homology theory
  - Singular & simplicial homology
  - Constructive versus axiomatic approach
  - Long exact homology sequences
  - Mayer-Vietoris sequence
  - Coefficient sequences
  - Künneth formula for products
  - Calculations in many examples
- 4) Cohomology ring
  - Examples
  - Cup & Cap products
  - De Rham cohomology & differential forms
- 5) Duality
  - Poincaré & Alexander duality theorems
- 6) Fixed point theorems
  - Brouwer & Lefschetz theorems
- 7) Higher homotopy groups
  - Definitions
  - Examples
  - Hurewicz homomorphism
- 8) Fibre bundles
  - Homotopy sequence & examples