Homotopy Theory (L24)

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This will be an advanced course in Algebraic Topology, first describing higher homotopy groups and their associated theory and then introducing two of the most important computational tools in this subject: spectral sequences and cohomology operations. After developing the basic theory we will focus on calculations and applications of these tools.

Topics that might be covered are

1. Higher homotopy groups; CW complexes and Whitehead's theorem; homotopy excision; the Hurewicz theorem; fibre bundles and fibrations; Eilenberg–MacLane spaces;
2. the spectral sequence of a filtered space; the Serre spectral sequence; example calculations; applications to computing homotopy groups;
3. Steenrod squares and the Steenrod algebra; example calculations; applications to Stiefel–Whitney classes, and vector fields on spheres.

Pre-requisites

Part III Algebraic Topology.

Literature

1. A. Hatcher *Algebraic Topology*. Cambridge University Press, 2002. Available at

   http://pi.math.cornell.edu/~hatcher/AT/AT.pdf

   as well as an online-only Chapter 5 at

   http://pi.math.cornell.edu/~hatcher/AT/ATch5.pdf
2. J. Strom *Modern Classical Homotopy Theory*. Graduate Studies in Mathematics, 127.
3. R. E. Mosher and M. C. Tangora *Cohomology operations and applications in homotopy theory*. Dover.

Additional support

Four examples sheets will be provided and four associated examples classes will be given. There will be a revision class in the Easter Term.