MA3H6 Algebraic Topology, Spring 2015 **Module contents and calendar**

The text is *Hatcher, Algebraic Topology*, available free online at

`http://www.cornell.edu/~hatcher`

and in paper copy for about £20. Page numbers below refer to this book, and everyone following the course should try to keep up with the reading. If you think you might end up buying the book, buy it now rather than later. It is nice to have a paper copy to write marginal notes on.

We will cover most of Chapter 2, *Homology*. This means assuming a lot of the material of Chapter 1. A lot of this of this you will have been covered in the *Topology* module in Term 1, but we, or pehaps just you, will probably have to supplement this with occasional forays into Chapter 1. A particularly important notion is that of *CW Complex*, and underlying this is the notion of the *quotient of a topological space by an equivalence relation*, which is the mathematical version of "gluing things together".

There will be assessed exercises each week, posted on the module homepage, though only a small number will be marked. The book has lots of exercises at the end of each section, which you should get to work on as soon as they appear accessible. Many of the assessed exercises are taken from these. I will supplement them with extra exercises; in particular, on the module homepage there are already some *Exercises on Abelian Groups and Quotients*, which revise some of the basic material that you need in order to follow the module.

Approximate Calendar Week by Week

1. Definition of Delta-complex and simplicial homology. *Pages 97-107*
2. Singular homology; functoriality, relative homology, exact sequences, the long exact sequence of the homology of a pair. Homotopy invariance of singular homology. Relation between π_1 and H_1. *Pages 108-117 and 166-167.*
3. Excision (proof only sketched) and applications. *Pages 118-127*
4. Equivalence of simplicial and singular homology. *Pages 127-131*
5. Computations and Applications: The degree of a map between spheres, the hairy ball theorem. *Pages 128-131*
6. Cellular homology. *Pages 137-142*
7. Examples and computations. *Pages 142-149*
8. The Euler characteristic. The Mayer-Vietoris sequence. *Pages 149-155*
9. Axioms for homology; categories and functors. *Pages 160-165*
10. Overspill and revision.