

**Algebraic Topology**  
Michaelmas Term 2017

Christopher Douglas  
Course time: T12 & W12

Email: [cdouglas@maths](mailto:cdouglas@maths)  
Website: [www.christopherleedouglas.com/teaching/classes/at/](http://www.christopherleedouglas.com/teaching/classes/at/)

Office: N2.27

Course Outline

|       |        |  |
|-------|--------|--|
| Tues. | 10 Oct | Homotopy and homology.                     |
| Wed.  | 11 Oct | Delta complexes and simplicial homology.   |
| Tues. | 17 Oct | Singular homology and homotopy invariance. |
| Wed.  | 18 Oct | Homology long exact sequence.              |
| Tues. | 24 Oct | Excision and the Mayer–Vietoris sequence.  |
| Wed.  | 25 Oct | Simplicial equals singular.                |
| Tues. | 31 Oct | Cellular homology.                         |
| Wed.  | 1 Nov  | Axioms for homology.                       |
| Tues. | 7 Nov  | Cohomology and products.                   |
| Wed.  | 8 Nov  | Properties of cohomology.                  |
| Tues. | 14 Nov | Universal coefficient theorems.            |
| Wed.  | 15 Nov | Cross and cup products.                    |
| Tues. | 21 Nov | Künneth theorem.                           |
| Wed.  | 22 Nov | Manifolds and duality.                     |
| Tues. | 28 Nov | Poincaré duality.                          |
| Wed.  | 29 Nov | Lefschetz and Alexander duality.           |

## References and resources

Hatcher, *Algebraic topology*, chapters 2 and 3.  
math.stackexchange.com

## Background references

Hatcher, *Algebraic topology*, chapter 1.  
Massey, *Algebraic topology: an introduction*.  
Stillwell, *Classical topology and combinatorial group theory*.  
B3.1a Topology and Groups, course notes.  
  
Sutherland, *Introduction to metric and topological spaces*.  
Munkres, *Topology*.  
Part A Topology, course notes.  
  
Artin, *Algebra*.  
Part A Algebra 2 – Rings and Modules, course notes.  
  
Dummit and Foote, *Abstract algebra*.  
Part A Algebra 3 – Group Theory, course notes.

## Problem Sheets

There will be six problem sheets, due at noon on Tuesday of weeks 2, 3, 4, 6, 7, and 8.  
There is also a preliminary ‘problem sheet 0’ (not for submission), which students are advised to do during weeks 0 & 1 to revise their background knowledge.

## Classes

R12:30, C. Douglas; TA: J. Steinebrunner, jan.steinebrunner@maths  
F2, R. Wade, wade@maths; TA: S. Kang, kangs@maths