

UMCS
Topology in Condensed Matter
Summer 2019/2020

Instructor Information:

Instructor: Dr Nicholas Sedlmayr

Office: 306

Email: sedlmayr@umcs.pl

Course Web Page: See [this](#) page.

Course Content: The (potential) topics of this course include:

- Topology: Mathematical Background
- Beyond Landau: Topology and Order
- Types of Topology in Condensed Matter: Long Range Entanglement and Symmetry Protected Topology
- Topological Insulators and Superconductors in 1D, 2D, and 3D
- The Ten-Fold Way
- Topology of what exactly?
- Topological invariants
- Bulk-boundary correspondence - Majoranas!
- Long range entanglement and quantum order
- Integer and fractional quantum Hall effects
- Berry phase, Aharonov-Bohm effect
- Topology of Fermi surfaces

Grading: The course grade will be based on participation in the classes and a final exam.

Objectives: To have an overview of the different applications of topology in understanding condensed matter systems, and just enough of the mathematical background.

Prerequisites: Condensed Matter Physics, Quantum Mechanics, Linear Algebra.