

UMCS  
Topology in Condensed Matter  
Summer 2019/2020

**Instructor Information:**

*Instructor:* Dr Nicholas Sedlmayr

*Office:* 306

*Email:* [sedlmayr@umcs.pl](mailto: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.