

Condensed Matter Physics

Module No.: MN-P-SP-CondMat, MN-P-PN-CondMat, MN-P-WaMa

Course: Spintronics: from Basics to Applications

Lecturers: Daniel E. Bürgler
Email: d.buergler@fz-juelich.de

Category	Type	Language	Teaching Hours	CP	Semester
Specialized Course	Lecture	English	2	3	SuSe

Requirements for participation:

Basic knowledge of condensed matter physics

Type of module examinations:

One oral examination at the end of the module

Duration of the course:

1 semester

Aims of the course:

Understanding of the fundamental ideas, phenomena, experimental techniques, and applications of spintronics.

Contents of the course:

The lecture gives an overview of the fundamentals, major phenomena, historical development, experimental techniques, and applications of spintronics, i.e. magnetism and spin transport in thin films and magnetic nanostructures. Novel phenomena occurring in magnetic multilayers and nanostructures ranging from the giant magnetoresistance effect (GMR) honored by the 2007 Nobel Prize in Physics to most recent developments e.g. in molecular spintronics will be discussed.

Topics covered are:

- Magnetism of thin films
- Interlayer exchange coupling
- Giant and tunneling magnetoresistance (GMR, TMR)
- Current-driven magnetization dynamics
- Magnetic memories (MRAM)
- Molecular spintronics
- Pure spin currents
- Spin Hall effects

Recommended literature:

- Hand-outs (electronically available during the course)
- Proceedings 30. IFF-Spring School "Magnetische Schichtsysteme", Forschungszentrum Jülich GmbH (1999)
- Proceedings 36. IFF-Spring School "Magnetism goes Nano", Forschungszentrum Jülich GmbH (2005)
- Proceedings 40. IFF-Spring School "Spintronics", Forschungszentrum Jülich GmbH (2009)
- Proceedings 47. IFF-Spring School "Memristive Phenomena", Forschungszentrum Jülich GmbH (2016)