GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Nanomagnetism (C004105)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	English	Gent	lecture seminar independent work
B (semester 2)	English	Gent	lecture independent work seminar

Lecturers in academic year 2024-2025

Van Waeyenberge, Bartel	WE04	lecturer-in-charge
Leliaert, Jonathan	WE04	co-lecturer

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Master of Science in Teaching in Science and Technology(main subject Physics and Astronomy)	6	A, B
Master of Science in Physics and Astronomy	6	A, B
Exchange Programme in Physics and Astronomy (Master's Level)	6	A, B

Teaching languages

English

Keywords

Magnetism, ferromagnetic and antiferromagnetic materials, spin transport, magnetization dynamics, nano magnets

Position of the course

Advanced course in solid state physics. This course aims at giving the students the basic ingredients to understand the contempory research going on in the field of magnetism and magnetic nanostrures. Emphasis is laid on research related to activities in Gent.

Contents

1 Introduction: Modern magnetism: what, why and how
2 Basic concepts of magnetism: magnetic ordering and phase transitions – exchange interaction – magnetic anisotropies - magnetostatics – magnetic microstructure: domains and domainwalls – magnetization dynamics: Landau-Lifshitz-Gilbert equation
3 Experimental and computational techniques: Interaction with Light - X-rays – Neutrons, Micromagnetic simulations
4 Magnetism on the nanoscale: magnetostatics – magnetic inferfaces: exchange bias and magnetic multilayers - magnetization dynamics: spin wave modes – spin dependent transport (GMR, TMR) - spin transfer torque
5 Discussion of research papers

Initial competences

Basic knowledge of quantum mechanics, material science, solid state physics.

Final competences

1 Acquiring a fundamental knowledge on magnetism and be able to apply it to the field of nano magnetism.
2 Understanding the principles of the experimental and computation mehtods used to study

magnetic systems.
3 Having an overview of the new concepts and challenges in the contemporary magnetism research.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture, Independent work

Extra information on the teaching methods

The lectures and excersissessions will be organized in an interactive way. Some session will be used to get in touch with experimental and computational methods.
Because of COVID19, possible different teaching methode will be deployed if necessary.

Course content-related study coaching

The students can consult the lectures personally and electronically

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment, Written assessment with open-ended questions, Written assessment open-book

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Written assessment with open-ended questions, Written assessment open-book

Examination methods in case of permanent assessment

Presentation

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

Oral examination with written preparation for the theory part (Periodic Evaluation).
Oral presentation of a research paper in front of the peers (Permanent Evaluation)

Calculation of the examination mark

3/4 Periodic Evaluaton + 1/4 Permanent evaluation

Study material

None