COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of magnetism [S1FT2>PMag]

Course

Field of study
Technical Physics

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

Prerequisites

A prerequisite to participation in the course is knowledge in experimental physics and atomic physics. The student should also have a basic knowledge of quantum mechanics.

Course objective

1. Presentation of the basic knowledge in magnetism 2. Familiarize students with issues related to the methods of preparation and structurization of magnetic materials as well as characterization of their magnetic properties. 3. To familiarise students with applications of magnetic materials in computer science, electronics, and medicine.

Course-related learning outcomes

Knowledge:
As an effect of the course, a student has:
1. a detailed knowledge of magnetic materials, in particular, he or she understands the mechanisms responsible for magnetic properties of matter and the role of magnetic interactions in the creation of magnetic structures
2. necessary skills to characterize physical properties of magnetic materials

3. an overview of state of the art in applied magnetic materials in computer science and medicine and the newest trends in spin-based electronics.

Skills:
A student can:
1. analyze problems in the physics of magnetism and solve them using his or her knowledge.
2. compare and choose the most appropriate tool for the characterization of magnetic materials.
3. understand and use given sources of knowledge and gain knowledge from other resources, including the internet

Social competences:
The student will gain competence allowing for:
1. Engaging in basic task solving and independent building of their skills.
2. Understanding the importance of modern magnetic nanostructures for computer science, electronics, medicine, and the broadly understood civilization progress.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

written/oral exam 3: 50.1%-70.0%
4: 70.1%-90.0%
5: od 90.1%

Programme content

1) Basic concepts of the physics of magnetism - magnetic anisotropy, magnetic domains, magnetic interactions and ordering, domain walls, the magnetization reversal process.
2)Magnetoresistance effects
3) Measurements of magnetic properties
5) Magnetic thin films and their patterning
6) Magnetic materials and their applications.

Course topics

none

Teaching methods

Lecture: presentation illustrated with examples

Bibliography

Basic:
C. Kittel, Wstęp do fizyki ciała stałego, PWN, Warszawa (2011)
A. Szewczyk, A. Wiśniewski, R. Puźniak, H. Szymczak, Magnetyzm i nadprzewodnictwo, PWN, Warszawa 2021
A. H. Morrish, Fizyczne podstawy magnetyzmu, PWN, Warszawa 1970.
Artykuły naukowe w zakresie wytwarzania i charakteryzacji magnetycznych nanostruktur

Additional:
A.Oleś, „Metody doświadczalne fizyki cała stałego”, Wydawnictwo Naukowo Techniczne, Warszawa 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	10	0,50