GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Magnetic Materials Science, PG_00039760		
Field of study	Materials Engineering, Materials Engineering, Materials Engineering, Materials Engineering		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	6	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Instytut Nanotechnologii i Inżynierii Materiałowej -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marek Augustyniak	
	Teachers	dr inż. Marek Augustyniak	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	15.0	30
E-learning hours included: 0.0						

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	30	5.0	15.0	50

Subject objectives

The aim of the course is practical introduction to the magnetic materials science. Emphasis is put on the the distinction between broad applications (electrotechnical steels, hard magnets), and special applications (superconductors, amorphous and nanocrystalline materials). Computer-assisted learning and design are strongly supported (proper mastership of the Internet-derived data, computer modeling techniques of magnetic materials).

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U09	The student is able to identify the most useful elements of knowledge about magnetic materials in the context of the current market demand. He'she aims to accumulate strong points in the CV, a.o. related to virtual prototyping of magnetic materials and devices (CAE).	[SU4] Assessment of ability to use methods and tools
K6_U07	The student is able to obtain information from literature, databases and other properly selected sources, also in English, in the field of materials engineering	[SU2] Assessment of ability to analyse information
K6_W04	The student is able to self-sufficiently acquire, confront and critically verify the material parameters related to magnetic materials science. He/she is able to properly use the unit conversion (American - European).	[SW1] Assessment of factual knowledge
K6_K01	The student is able to describe the principle of operation of devices and systems for measuring the magnetic properties of materials.	[SK5] Assessment of ability to solve problems that arise in practice
K6_W06	The student is able to solve the equation systems describing the closed and almost-closed circuits in which the magnetic flux circulates (yoke electromagnets, fragments of electric machines)	[SW2] Assessment of knowledge contained in presentation

Subject contents	1. Scope of applications of magnetic devices and phenomena. 2. Magnetostatics and magnetodynamics - features particular to different frequency ranges. 3. Electrotechnical materials, magnetic circuits. 4. Permanent magnets and types of hysteresis loops. 5. Numerical approach to magnetic materials science (FEM models inspired by industrial practice) 6. Special materials: amorphous and nanocrystalline alloys, superconductors. 7. Measurement of magnetic properties of materials.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Presentations	60.0%	40.0%
Activity during the courses, and homeworks	60.0%	60.0%

Recommended reading

Basic literature	Scientific and technical publications (e.g. from Elsevier / Springer) concerning magnetic materials science.
Supplementary literature	--
eResources addresses	Adresy na platformie eNauczanie: Materiałoznawstwo magnetyczne, Sem. 6 Inż.Mat. 2023 - Moodle ID: 29607 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29607

Example issues/ example questions/ tasks being completed	1. Scope of applications of magnetic devices and phenomena. 2. Magnetostatics and magnetodynamics - features particular to different frequency ranges. 3. Electrotechnical materials, magnetic circuits. 4. Permanent magnets and types of hysteresis loops. 5. Numerical approach to magnetic materials science (FEM models inspired by industrial practice) 6. Special materials: amorphous and nanocrystalline alloys, superconductors. 7. Measurement of magnetic properties of materials.
Work placement	The teacher proposes optional consultations, aiming at recognition of job opportunities related to the magnetism of materials.