GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Materials Science and Equipment Design, PG_00047588						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2022		Academic year of realisation of subject	2022/2023			
Education level	first-cycle studies		Subject group	Obligatory subject group in the field of study			
Mode of study	Full-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	2.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marcin Gnyba					
	Teachers	dr inż. Paweł Jakóbczyk dr hab. inż. Marcin Gnyba dr hab. inż. Paweł Wierzba dr inż. Michał Sobaszek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Inżynieria Materiałowa i Konstrukcja Urządzeń 2023 - Moodle ID: 29425 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29425						
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		2.0		18.0	50
Subject objectives	Subject necessary for proper formation of the graduate profile. The student acquires knowledge of the construction materials used in electronics and construction of basic electronic components. Together he acquires skills of the selection of materials and components as well as measuring their parameters.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	1. The student is able to perform a measurement task on the basis of workplace training. 2. The student is able to use the signal generator, multimeter, RLC meter, oscilloscope and thermostat in a basic degree 3. Student analyses correlation between molecular composition of materials and their macroscopic properties.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K6_W02] Knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	1. Student describes selected interactions between EM radiation and materials. 2. Student describes properties and parameters of dielectrics, magnetics, conductors and resistive materials.	[SW1] Assessment of factual knowledge
[K6_W03] Knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	1. Student classifies dielectrics, magnetics, conductors and resistive materials. 2. Student describes construction and properties of RLC components. 3. The student describes the influence of the temperature and frequency of the signal on electronic materials and RLC elements.	[SW1] Assessment of factual knowledge

Subject contents

1. Macroscopic and microscopic approach to solid state materials; crystalline and amorphous materials. 2. Thin films and bulk materials. Alloys, ceramics, polymers and composite materials. 3. Electromagnetic spectrum and conventional designations. Magnetization of matter; electrical conductivity; matter polarization. 4. Magnetic material classifications: ferromagnetism, ferrimagnetism, paramagnetism. Soft and hard magnetic materials. 5. Magnetic alloys and magnetic ceramics (ferrites) - selected mattters of manufacturing technology 6. Magnetic components and their equivalent circuits. 7. Examples of magnetic materials and their applications: magnetic recording materials, cores of the coils and transformers, sensors, high energy magnets; trends of development. 8. Dielectric materials and insulation; electronic polarization; dielectric loss. 9. Linear and nonlinear dielectrics: ferroelectricity, piezoelectricity and pyroelectricity. 11. Dielectric materials examples and aplications.

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	50.0%	60.0%
Practical exercise	50.0%	40.0%

Recommended reading

Basic literature	M.Blicharski, "Wstęp do inżynierii materiałowej", WNT, Warszawa 1998 Z. Celiński, "Materiałoznawstwo elektrotechniczne", Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1998 H. Rawa, "Podstawy Elektromegnetyzmu", Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1996 Michel K., Sapiński T., "Rysunek techniczny elektryczny", WNT, Warszawa 1987 S.O. Kasap, "Principles of Electronic Materials and Devices", McGraw-Hill, Second Edition 1996. Dokumentacja laboratoryjna oprogramowania, pliki pomocnicze w formacie *.pdf User Manuals, Tutorials, data sheets Oleksiuk W., Paprocki K., "Konstrukcja mechanicznych zespołów sprzętu elektronicznego", WKiŁ, Warszawa 1997 Burcan J., "Podstawy rysunku technicznego". WNT, Warszawa 2006 Instrukcja laboratoryjna użytkowania pakietu programów PADS. Katedra Aparatury Pomiarowej, 2001 i 2005 Spiralski L., Konczakowska A., "Podstawy technologii i konstrukcji urządzeń i systemów elektronicznych", Skrypt WSM, Gdynia 1997. K. Radecki, "Materiały i elementy elektroniczne bierne", Wydawnictwa Politechniki Warszawskiej, Warszawa 1991
Supplementary literature	No requirements
eResources addresses	

Example issues/ example questions/ tasks being completed

1 Measurement of nominal and residual parameters of the electronic components.

2 Determination of temperature parameters of materials and components.

3 Determine the relationship between the composition of the material and its electrical and magnetic parameters.

Work placement

Not applicable