GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electrical technology and electronics, PG_00055052		
Field of study	Management and Production Engineering		
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	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Control Systems Engineering -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mirosław Mizan, doc. PG	
	Teachers	dr inż. Mirosław Mizan, doc. PG dr inż. Sławomir Judek dr hab. inż. Leszek Jarzębowicz dr inż. Łukasz Sienkiewicz	

Lesson types and methods of instruction							
	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60	4.0	36.0	100

Subject objectives	The aim is to explain the fundamental laws of the electrical phenomena and to instruct students about the basic principle of operation of electrical and electronic equipment used in production systems and processes.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K01] feels the need for self-realization by learning throughout life, is looking for modern and innovative solutions in their actions, is able to think creatively and act in an entrepreneurial way	Student knows new technical solutions used in electric drive systems and control and supervision systems of electrical devices. Operates modern electronic and measuring equipment. Recognizes the importance of self-expanding knowledge and skills in the field of study and related areas. Combines knowledge from various fields to understand the principles of operation of modern production devices and systems.	[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice
[K6_W04] has basic knowledge in the field of automation, robotics and control of production processes, has elementary knowledge of electrical and electronic applications in the production system, has basic knowledge of thermodynamics and fluid mechanics as well as the selection and design of hydraulic and pneumatic systems	Student defines the basic physical quantities in electric circuits. Explains the law describing the relationship between physical quantities in electric circuits. Explains the basic principles of operation of electrical machines and electrical equipment. Student explains principles of operation of basic elements and electronic systems used in industry.	[SW1] Assessment of factual knowledge
[K6_U02] has the ability of self-learning and expanding knowledge in a specialized field of engineering production	Student operates basic electrical equipment used in industry. Connects simple electrical circuits. Performs basic measurements of electrical quantities. Interprets the results of the measurements. Uses a modern electric drive systems.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

Subject contents

Lecture: The basic physical quantities in electrical engineering. Electrical circuit elements and their characteristics. Kirchhoff"s laws. DC and AC circuits. Three-phase AC symertical circuits. Electric and magnetic field, forces in the electromagnetic field. The Faraday"s law of electromagnetic induction. Transformer - the physical phenomena and principles of operation. Electric DC and AC motors and generators - principles of operation, velocity control. Elements of passive electronics. Types and principle of operation of semiconductor devices. Semiconductor electronics components: diodes, transistors, thyristors. Optoelectronics. Power electronic converters in the drive system: rectifier, chopper, inverter. Operational amplifier and its applications - generators, filters, regulators. Elements of digital technology - logic gates, memory and microprocessors. Protection against electric shock. Laboratory: Linear and nonlinear DC circuits - the supply and load elements, measurements of electrical quantities, voltage-current characteristics of the elements. AC circuits - basic elements, measurements of power, current and voltage, setting the parameters. Transients in electrical circuits. The drive system of DC motor - methods of speed and torque control. The drive system with asynchron motor - start-up, speed control. Servodrive with permanent magnet synchronous motor - position, velocity and torque control. Microprocessor controllers in drive systems. Electronic measurement equipment - terms of use, protection against interference, oscilloscope recording of signals. Semiconductor diodes and their application - rectifiers. Optoelectronics and its applications - encoders, optical links. Operational amplifier and its application - basic systems based on operational amplifiers, active filters. Basic LSI logic gates of combinatoric and sequential type - principle of operation, electrical characteristics. Transducers for measurement of mechanical quantities: acceleration (accelerometer), angular velocity (gyroscopic sensor, incremental encoder), distance and displacement (laser rangefinder and displacement sensor).

Prerequisites and co-requisites

Basic knowledge in mathematics and physics at secondary level.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Practical exercise (laboratory)	50.0%	50.0%
Tests on the content of lectures	50.0%	50.0%

Recommended reading

Basic literature	1. Pr. zb. : Elektrotechnika i elektronika dla nieelektryków. Podręcznik akademicki Mechanika. WNT, Warszawa 2004; 2. Kurdziel R.: Podstawy Elektrotechniki. WNT, Warszawa 1972; 3. Tietze U., Schenk C.: Układy półprzewodnikowe. WNT,Warszawa 1996; 4. Laboratory instructions.
Supplementary literature	1. Pr. zb.: Poradnik Inżyniera Elektryka. T.1-3. WNT, Warszawa 1996; 2. Matulewicz W.: Maszyny elektryczne podstawy. Wyd. PG, Gdańsk 2005; 3. Horowitz P., Hill W.: Sztuka elektroniki. T.1+2. WKŁ, Warszawa 1996; 4. Filipkowski A.: Układy elektroniczne analogowe i cyfrowe. WNT, Warszawa 2006.
eResources addresses	Adresy na platformie eNauczanie: Elektrotechnika i elektronika dla kier. ZiIP st. I stopnia 2022/23 sem.2 - Moodle ID: 27941 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27941

Example issues/ example questions/ tasks being completed	The calculation of the currents in the DC circuit. Calculation of the power of circuit components. The adjustment of the circuit parameters to achieve a specific desired value of the given output parameter of the circuit. The calculation of currents and voltages in a circuit with a transformer. Calculating the current in the symmetrical 3-phase circuit. The connecting of the simple electrical circuit and measuring of basic electrical quantities. The operating of propulsion system with an electric motor. Performing measurements and determining voltage-current or frequency characteristics in simple electronic systems.
Work placement	Not applicable

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