GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electrical engineering and electronics, PG_00064268		
Field of study	Elektrotechnika i elektronika		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Electrified Transportation -> Faculty of Electrical and Control Engineering -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Sławomir Judek	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	15.0	0.0	0.0	60

E-learning hours included: 0.0

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Moodle ID: 1478 Elektrotechnika i elektronika
https://enauczanie.pg.edu.pl/2025/course/view.php?id=1478

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 student demonstrates the ability to solve basic DC and AC circuits, encompassing single-phase and three-phase configurations. They possess the skill to interpret electrical equipment parameters. They can characterize electrical devices and installations and understand the operational principles of electrical drives. The student is competent in conducting simple measurements of voltage, current, and power in DC and AC circuits, and can interpret the resulting data. They can differentiate between analog and digital electronic devices.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U01] able to use technical documentation and literature, databases and other sources of transport related information; able to interpret information, make logical links and formulate opinions and conclusions based on the above	Students can use the technical documentation of electrical engineering. The student can identify and interpret new developments in the technical literature.	[SU2] Ocena umiejętności analizy informacji
[K6_W02] has knowledge of physics, mechanics, electrical engineering, hydromechanics, thermodynamics, materials science, and measurement techniques necessary to understand the phenomena occurring in transportation, as well as the principles of construction and operation of infrastructure and means of transport	The student has basic knowledge of electrical engineering. A student can characterize selected electrical equipment. Students can characterize electronic equipment. Students can plan and perform simple measurements of electrical quantities.	[SW1] Ocena wiedzy faktograficznej

Subject contents	Course content – lecture Classification of electric signals and elements of electric circuits. Direct current linear electric circuits. Ohms, and Kirchhoffs law. Electric power and energy. The methods of electric circuits solutions: similarity method, node method and Thevenin method. DC non-linear electric circuits. Linearized circuit in the bias point. Alternating current (AC) linear electric circuits. Method of determining of voltage and current waveforms on the resistance, inductance, and capacitance. Complex numbers method. Phasor diagrams. Power in an AC circuit. Method of solution of AC circuits: similarity method, node method. Phenomena of resonance - the resonant frequency. Three-phase electric circuits. Compensation of reactive power and voltage in electrical power systems. Electric and magnetic field. Sources of electricity. Magnetic coupling circuits. Transformers. Basic concepts of rotating machines. DC and induction machines. Motor speed control. Power electronics in modern electrical engineering. Power switching devices. Review of standard power electronic circuits converters and inverters. Electric installations. Low-voltage distribution circuit diagrams. Electrical safety. Protection in low voltage installations. Elements of electronics. Constructions and characteristics of semiconductor devices. Diodes. Transistors. Optoelectronics elements. Active circuits with an operational amplifier. Amplifiers. Generators. Power supplies. Introduction to logic circuits. Introduction to microprocessors. Representation of numbers. Selected applications of microprocessors. Course content – exercises DC circuits. Power in a DC circuit, matching the source to the load. Kirchhoff method. AC circuits. Representation of the waveforms using complex numbers. The concept of impedance, reactance, equivalent circuit method. The concept of power in AC circuits. Active power, reactive and apparent power, power factor of the system. Calculation of the current drawn from the mains supply mixed group of receivers. Symmetrical three-phase circuits, basic concepts: line and phase voltage, line and phase currents for the receivers connected in a wye or delta. The concept of a three-phase power system. Simplified one-wire diagrams: SEE, transformer, receiver. Operational amplifier (op-amp) circuits. Binary system and arithmetic. Course content – laboratory Resonant circuits. Transformer. Multi-pulse rectifiers. AC and DC electric drive. Operational amplifier circuits. Optoelectronics. Electrical installations. Electrical devices: overcurrent circuit breaker and differential circuit breaker.
Prerequisites and co-requisites	Basic knowledge of mathematics and physics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Report from laboratory exercises	60.0%	20.0%
Tests	60.0%	20.0%
Exam	60.0%	60.0%

Recommended reading

Basic literature	Charles K. Alexander, Matthew N. O. Sadiku: Fundamentals of electric circuits. 5th ed. McGraw-Hill Science Engineering, 2012
Supplementary literature	Karris S. T.: Circuit Analysis I with MATLAB Applications. Orchard Publications 2004 Karris S. T.: Circuit Analysis II with MATLAB Applications. Orchard Publications 2003
eResources addresses	

Example issues/ example questions/ tasks being completed	1. Draw simple examples of electrical DC and AC circuits, and discuss ways to determine their parameters. 2. Discuss the construction of DC and AC motors and show the ways to adjust the angular velocity. 3. Characterize the electrical supply installations. 4. Characterize electronic and power electronics components. 5. Discuss methods of serial communications of signals.
Practical activites within the subject	Not applicable

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