GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of Electrical Engineering and Electronics 1, PG_00042021		
Field of study	Power Engineering		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study 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	1	Language of instruction	English
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Faculty Of Electrical And Control Engineering -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jacek Horiszny	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	0.0	0.0	0.0	45

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	45	7.0	23.0	75

Subject objectives

Providing the definition of basic concepts in electrical engineering on the basis of the theory of electromagnetic field. Presentation of methods of calculating capacitance, inductance, resistance, induced voltage. Acquainting with the methods of analysis of electric circuits and the phenomena occurring in them.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W05] has structured knowledge in the field of electrical engineering and electronics, necessary to understand the basics of operation and selection of electrical machines, electricity transmission systems and power electronic devices	defines potential, voltage, electric current, electric capacity, self and mutual inductance, resistance; calculates the capacity of flat and cylindrical capacitors, mutual inductance of circuits, resistance of conductors and earth electrodes, voltages induced by magnetic flux; solves simple linear DC circuits; solves simple linear 1-phase and 3-phase sinusoidal current circuits; explains the phenomenon of electrical resonance.	[SW3] Assessment of knowledge contained in written work and projects
[K6_W03] knows the basics of automation and automatic regulation, knows the principles of the selection of electrical devices, drive systems and their control	calculates parameters of equivalent circuits for elements of the power system	[SW3] Assessment of knowledge contained in written work and projects
[K6_K02] is able to work in a group taking different roles in it, can think and act in an entrepreneurial way, is aware of responsibility for their own work and responsibility for teamwork	recognizes the potential exposures and hazards occurring in electrical systems	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	Elements of the electromagnetic field theory: electrostatic field, Coulombs law, electric field intensity and electric potential, electric capacity. Electric field of DC currents: resistance of a conductor, earthing. Magnetic field: magnetic field intensity and magnetic induction, self and mutual inductance, electromagnetic induction. Linear DC circuits: electric circuit components, energy and power of electric current, Kirchhoffs laws, superposition, Thevenins theorem. Nonlinear DC circuits: linearity and nonlinearity of components and circuits. Method of characteristics intersection, iterative methods, linearization. AC circuits: ideal R, L, C components in the AC circuit, phasor solution, complex impedance, complex Kirchhoffs laws, phasor diagrams, active, reactive and complex power, complex Thevenin theorem, circuits with magnetic coupling, transformer. The characteristics of three-phase systems, the introduction to the methods of analysis of three-phase symmetrical and asymmetrical circuits.	
Prerequisites and co-requisites	Basic knowledge of vector calculus, differential and integral calculus, basic knowledge of complex numbers; knowledge of physics at the high school level.	
Assessment methods and criteria	Subject passing criteria	Passing threshold / Percentage of the final grade
	Written exam	55.0% / 70.0%
	Midterm colloquium	55.0% / 30.0%
Recommended reading	Basic literature	Bolkowski S.: Elektrotechnika teoretyczna. Tom 1. Teoria obwodów elektrycznych. WNT, Warszawa 2001 Krakowski M.: Elektrotechnika teoretyczna. Tom 1 i 2. PWN, Warszawa 1999 Matusiak R.: Elektrotechnika teoretyczna. Tom 2. Teoria pola elektromagnetycznego. WNT, Warszawa 1976
	Supplementary literature	Cholewicki T.: Elektrotechnika teoretyczna. Vol 1 i 2. WNT, Warszawa 1972
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Three electric charges Q1, Q2, Q3 are given at the vertices of an equilateral triangle with a side length d. Calculate: a) the force acting on the charge Q1 and b) the electric field at that point. 2. Calculate the resistance of the coil containing n turns wound on the rectangular carcass axb with wire of diameter D. 3. The concentrated cylindrical winding of diameter D, containing n turns, is placed in the homogeneous magnetic field of induction B(t) = Bsin (wt). The winding is lying in the plane angled to the direction of the field vector at angle a. Calculate the maximum value of the voltage induced in the coil. 4. Calculate currents in the given circuit. 5. Define the electric capacitance. 6. Calculate the capacitance of flat and cylindrical condenser. 7. Calculate the currents in DC circuit. 8. Calculate the currents in AC circuit. 9. Calculate the resonant frequency of the circuit. 10. Calculate current and power in given symmetrical three-phase circuit with star-connected load. 11. Calculate current and power in given symmetrical three-phase circuit with delta-connected load. 12. Calculate current and power in given three-phase four-wire circuit with asymmetrical star-connected load. 13. Calculate current and power in given three-phase three-wire circuit with asymmetrical star-connected load. 14. Calculate current and power in given three-phase three-wire circuit with asymmetrical delta-connected load.
Work placement	Not applicable

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