GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electronics and electrotechnics, PG_00060844		
Field of study	Chemical Technology		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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 Physical Chemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jarosław Wawer	
	Teachers		

Lesson types

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

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

The purpose of the course is to prepare non-electronic engineers to work with specialists in the field. This need arises from the increasing unification of science and technology. Apparatus used in chemical technology, in addition to the use of physical and chemical phenomena, requires basic knowledge of the operation of electronic systems. The combination of all the above-mentioned disciplines will allow conscious planning of work and analysis of chemical samples. The content of the course also addresses practical issues regarding the use of electricity.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U08] Is able to select elements of automatic control systems for simple technological processes and use computer programs to control and optimize chemical processes.	is able to select basic electronic and electrical components for the implementation of simple measurement and control systems. They can use computer software to analyze circuit operation as well as to control and optimize simple processes.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_W05] Has knowledge of electrical engineering, automation and computer science, including the operation of measurement and control systems	possesses knowledge of electronics and electrical engineering, enabling understanding of the principles of circuit operation. They understand the relationships between the elements of electrical circuits and are able to interpret their functioning.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation

<table>
<tr><td>Subject contents</td><td>Course content – lecture

The course content has been designed to help students make better use of their knowledge from other fields upon completing this course. Particular emphasis is placed on the practical aspect, enabling future work not only in biological and chemical laboratories but also in positions closely related to industrial production. The primary teaching method will involve using fundamental mathematical and physics concepts to analyze measurement results.

Course Outline:

• Basic concepts hydraulic analogy of an electrical circuit
• Ohms law, internal resistance of a power source
• How to read and draw electrical schematics?
• Mains voltage, three-phase current
• Work, power, effective power
• Basic electronic components resistors, symbols, and key parameters
• Kirchhoffs first and second laws
• Capacitors technical parameters
• Use of capacitors in integrating and differentiating circuits
• Diodes semiconductor circuit design
• Types of diodes (rectifier diodes, Zener diodes, LEDs, RGB)
• Half-wave and full-wave rectifiers, Graetz bridge
• Voltage regulators (circuits with capacitors, Zener diodes, transistors, and monolithic regulators)
• Bipolar transistors (structure, characteristics, operating states, circuits)
• Operational amplifiers (example applications)
• Microcontrollers basic concepts
• Temperature measurement and control
• DC motors and generators, AC motors
• Power regulators
• Electrical energy transmission

Course content – laboratory

During the laboratory classes, students work with Raspberry Pi Pico microcontrollers. They connect them to computers, program in MicroPython, and build simple circuits. The lab sessions include five meetings covering:

1. Basic principles of electronic circuit design
2. Working with an analog-to-digital converter and power regulation using PWM
3. Connecting circuits to a microcontroller and handling data exchange interfaces
4. Bluetooth protocol management with MCU
5. Stepper motor control</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of mathematics and physics.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td></td><td>50.0%</td><td>40.0%</td></tr><tr><td></td><td>50.0%</td><td>60.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>1) Paul Horowitz, Winfield Hill, Sztuka elektroniki cz. 1-2, Wydawnictwo WKŁ, Warszawa 2013

2) Paweł Hempowicz, "Elektrotechnika i elektronika dla nieelektryków", Wydawnictwo WNT, Warszawa, 1999</td></tr><tr><td>Supplementary literature</td><td>3) Miesięcznik Elektronika dla Wszystkich, Wydawnictwo AVT</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>How much is the voltage drop across a conducting junction diode?
Under which polarity will the junction diode conduct current?
What will happen if a transformer is connected to a direct current (DC) voltage?
State Kirchhoffs first law.
Draw the diode characteristic I=f(U).
Describe the principle of operation of a three-phase asynchronous motor.
Question about microcontrollers: What is the purpose of the PWM signal, and what can it be used for?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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