GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electronics, PG_00033424
Field of study	Mechatronics, Mechatronics

Date of commencement of studies	October 2020	Academic year of realisation of subject	2021/2022
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	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 hab. inż. Leszek Jarzębowicz

Lesson types and methods of instruction

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

E-learning hours included: 0.0

Adresy na platformie eNauczanie:
Elektronika dla kier. Mechatronika sem.3 - 2021/22 - Moodle ID: 16543
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=16543

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	5.0	50.0	100

Subject objectives	Teach students about the basic elements and electronic components, the basics of digital technology and microprocessor components, selection rules of electronic components in simple electronic circuits. Introduct to the design and operation of electronic devices and control equipment in the industry. Get to know about the modern microelectronic systems in general machinery.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U04	Student records time waveforms using an oscilloscope and advanced measurement and control devices. Interprets the measurement results. It uses modern electronic and measuring equipment. Measures voltage, current, power, frequency with meters.	[SU4] Assessment of ability to use methods and tools
K6_W09	Student explains principles of operation of basic elements and electronic systems used in industry. Student calculates the values of currents, voltages in simple electronic circuits	[SW1] Assessment of factual knowledge

Subject contents	Lecture: Elements of passive electronics. Types and principle of operation of semiconductor devices. Semiconductor diode - the types and qualities. Bipolar Field- effect and IGBT Transistor. Optoelectronics: photodiode, photovoltaics, light emitting diode, photoresistor, phototransistor, optocoupler, optical fibers. Application of semiconductor devices in power electronics - controlled and non-controlled rectifiers, inverters, pulsed DC converters. Operational amplifier and its applications - generators, active filters, regulators. Unstabilized and stabilized power supplies. Fundamentals of digital technology - integrated circuits digital TTL and CMOS. Combinational and sequential-mode integrated logic circuits. The basic types of logic gates and latches. Digital LSI devices: multiplexers, demultiplexers, decoders, adders, registers, counters. Input-output systems. Digital-to-analog and analog-to-digital converters. Examples of applications of microprocessors. Tutorials: Electronic passive components: resistors, capacitors, inductive coils, transformers - rated parameters, rules for the selection of elements to the circuit. The basic semiconductor devices: diodes, transistors (bipolar, field-effect, IGBTs), opto-electronic components (photodiode, photovoltaics, light emitting diode, photoresistor, phototransistor, optocoupler, fiber optics) - setting the bias point in the circuit, the choice of element type, the protective elements in the transient. Application of semiconductor devices in power electronics: controlled rectifiers, inverters, pulsed DC converters - selection of items, calculation of the currents and voltages values in various states of system operation. Operational amplifier - the simple determination of the characteristics of utility systems. Fundamentals of digital technology - the design of systems performing the desired function logic. The principles of mutual co-operation of digital circuits at the level of inputs-outputs and connecting of actuators - selection of items. Laboratory: Electronic equipment - terms of use, protection against interference. 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 - gyro sensor, incremental encoder, distance and displacement - laser rangefinder and displacement sensor.
Prerequisites and co-requisites	Basic knowledge in mathematics and physics at secondary level. Knowledge from the course of Electrotechnics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written test on the content of lectures	50.0%	20.0%
Practical exercise	50.0%	30.0%
Midterm colloquium	50.0%	50.0%

Recommended reading

Basic literature	1. Pr. zb.: Elektrotechnika i elektronika dla nieelektryków. Podręcznik akademicki – Mechanika. WNT, Warszawa 2005; 2. Tietze U. Schenk Ch.: Układy półprzewodnikowe. WNT, Warszawa 1996; 3. Horowitz P., Hill W.: Sztuka elektroniki. T.1+2. WKŁ, Warszawa 1996; 4. Instrukcje laboratoryjne
Supplementary literature	1. Pr. zb. pod red. A. Opolskiego: Elektronika dla elektryków. Laboratorium. Wyd. PG, Gdańsk 2004; 2. Filipkowski A.: Układy elektroniczne analogowe i cyfrowe. WNT, Warszawa 2006; 3. Rusek M., Pasierbiński J.: Elementy i układy elektroniczne w pytaniach i odpowiedziach. WNT, Warszawa 2006
eResources addresses	Elektronika dla kier. Mechatronika sem.3 - 2021/22 - Moodle ID: 16543 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=16543

Example issues/ example questions/ tasks being completed	Selection of parameter of elements items in a simple electronic circuits such as voltage divider. Calculation of currents and voltages in the rectifier circuits. Selection of components parameters in the voltage stabilizer. Analysis of the operational amplifier circuit - calculation the output voltage and transfer function of the system. Analysis of simple combinational logic circuits.
Work placement	Not applicable