

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Elektronika**

Name in English: **Electronics**

Main field of study (if applicable): **Mechanical Engineering and Machine Building**

Level and form of studies: **I level, full-time**

Kind of subject: **obligatory**

Subject code: **MMD031001 (MMD031301)**

Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	60				
Form of crediting	Crediting with grade				
Group of courses					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.2		1.4		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of physics, electrical engineering and chemistry at the high school level.
2. Ability to measure the basic electrical quantities.

SUBJECT OBJECTIVES

- C1. Understanding the physical phenomena occurring in semiconductors.
- C2. Understanding the construction's principles and applications of selected semiconductor devices and integrated circuits (analog and digital).
- C3. Understanding the construction's principles and applications of basic electronic devices (power supplies, amplifiers, analog to digital converter, digital to analog converter, digital oscilloscope).
- C4. Acquiring the ability to choose the active and passive electronic elements for specified applications (for construction of sensors used in mechanics).
- C5. Usage of the acquired knowledge, presented during the lecture, for solving technical issues.
- C6. Learning how to study the technical literature and to prepare the student for self-education.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The student has expertise in the field of physics, including mechanics, thermodynamics, optics, electricity and magnetism, nuclear physics and solid state physics, including the knowledge necessary to understand the basic physical phenomena occurring in electronic components and circuits and in their environment/surrounding.

PEK_W02 - The student understands the physical basis of the operation of semiconductor devices and the importance of their parameters.

PEK_W03 - The student has knowledge of the digital logic systems.

II. Relating to skills:

III. Relating to social competences:

PEK_K01 - The student understands the need for the use of new techniques and technologies in engineering activities and is able to identify goals and anticipate the effects of undertaken experimental work.

PEK_K02 - The student can work independently and in a team.

PEK_K03 - The student is able to select the priorities for fulfillment of the given task.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction. Development trends in electronics.	2
Lec2	Signals applied in electronics: analog and digital (description of the fundamentals of the signals).	2
Lec3	Description of the electronic components. Resistors, capacitors, semiconductor sensors (thermistors and photo-resistors).	2
Lec4	Physical principles of semiconductor electronic components.	2
Lec5	Outline of the technology of semiconductor devices.	2
Lec6	P-N junction: the mechanism of the formation of the junction, the direct current I-V characteristics of the diode.	2
Lec7	The temperature's and light's effect on the parameters of the p-n junction. Semiconductor sources and detectors of optical radiation: LED, laser diode, semiconductor lasers, photodiode, optocoupler).	2
Lec8	Bipolar transistors: design, operation principles, configurations, static characteristics, small-signal parameters.	2
Lec9	Electronic amplifiers: classification, one-stage low frequency amplifier in common emitter topology, operational amplifier.	2
Lec10	Thyristor - the semiconductor switching device: construction, operation principles, switching methods, static I-V characteristics, dynamic operation of the thyristor.	2
Lec11	Unipolar transistor: Field Effect Transistor, Junction Transistor - PNFET: the principle of operation, I-V characteristics, parameters.	2
Lec12	Unipolar transistor, Field Effect Transistor with Insulated Gate - MOSFET: principles of operation, I-V characteristics, parameters. Semiconductor DRAM memory.	2

Lec13	Digital Circuits: Basic logic functions, parameters. Logic gates of TTL and CMOS family: construction and parameters.	2
Lec14	Selected electronic devices: power supply systems, generators, oscilloscope, analog to digital and digital to analog converters.	2
Lec15	Final test	2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1		3
Lab2		3
Lab3		3
Lab4		3
Lab5		3
		Total hours: 15

TEACHING TOOLS USED

- N1. Traditional lecture (Power Point presentation)
- N2. Self-study
- N3. Consultations
- N4. Repetition of the presented material as a preparation for the laboratory classes
- N5. Assessment of the laboratory classes: test regarding the knowledge about the topic of the exercise, report from the realized work during the classes

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end))	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01 - PEK_W03, PEK_K01-PEK_K03	Test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)

Evaluation (F – forming (during semester), P – concluding (at semester end))	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

P. Hempowicz, R. Kielsznia, A. Piłatowicz, J. Szymczyk i inni, Elektrotechnika i elektronika dla nieelektryków, WNT, 2004

A. Świt, J. Pułtorak, Przyrządy półprzewodnikowe, WNT, 1984

W. Marciniak, Przyrządy półprzewodnikowe i układy scalone, WNT, 1984

M. Polowczyk, A. Jurewicz, Elektronika dla mechaników, Wyd. Politechniki Gdańskiej, 2002

SECONDARY LITERATURE

M. Rusek, J. Pasierbiński, Elementy i układy elektroniczne w pytaniach i odpowiedziach, WNT, 1991

G. Rizzoni, Fundamentals of Electrical Engineering, McGraw-Hill, 2010

Ch. A. Schuler, Electronics. Principles & Applications, 2008

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Electronics
 AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Mechanical Engineering and Machine Building

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01 - PEK_W03, PEK_K01-PEK_K03	K1MBM_K04, K1MBM_W33	C1 - C4	Lec1 - Lec15	N1 - N3

SUBJECT SUPERVISOR

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