STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Electrical engineering		**1010334121010325179**

Field of study	Profile of study (general academic, practical)	Year /Semester
Control Engineering and Robotics	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**part-time**

No. of hours				No. of credits
Lecture: **48**	Classes: **22**	Laboratory: **22**	Project/seminars: **-**	**9**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**9 100%**
Technical sciences	**9 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of mathematics and physics.
2	**Skills**	Ability to use literature, solving linear equations, ability to operate on complex numbers, ability to observe and draw conclusions.
3	**Social competencies**	Ability to work in a team, attention to improving their own competence.

Assumptions and objectives of the course:

Theoretical and practical knowledge of electrical problems. Acquire the skills to analyze selected electrical circuits for AC and DC.

Practical test circuit theory of rights and the most important observation of electrical phenomena.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. He has ordered knowledge of the theory of electrical circuits and electrical DC and AC circuits, including the three-phase. - [K_W08 +++]

2. It has a basic knowledge of the theory of signals and information processing methods in the field of time and frequency. - [K_W05 +]

3. It has a basic knowledge of the principles of measurement of electrical quantities, knows and understands the methods of measurement of electrical, familiar with computational methods and tools necessary to analyze the results of the experiment. - [K_W11 +++]

Skills:

1. He can use the basic methods of signal processing and analysis in the time domain and frequency and extract information in the analyzed signals. - [K_U19 +++]

2. Able to work independently and in a team, is able to estimate the time needed to carry out the tasks commissioned. - [K_U02 ++]

3. . It can be used properly chosen methods and measuring instruments and measure the relevant signals and based on them to designate the characteristics of electrical and information about their essential properties. - [K_U15 +++]

4. Able to develop the documentation and give a presentation on the results of a laboratory task. - [K_U03 ++]

Social competencies:

1. Understand the effects of non-technical aspects and engineering activities including its impact on the environment and the associated responsibility for decisions. - [K_K02 ++]

Assessment methods of study outcomes

Lecture:

- assess the knowledge and skills listed on the written exam of a problematic.

Exercises auditorium:

- tests and final exam in writing,
- keep rewarding activity and creativity in solving the set tasks.

Laboratory:

- test and favoring knowledge necessary for the accomplishment of problems in the area of laboratory tasks,
- continuous evaluation for each course - rewarding gain skills they met the principles and methods
- assessment of knowledge and skills related to the implementation of the tasks your practice, the assessment report performed exercise
- rewarding ability to work in a team practice performing the task detailed in the laboratory,
- developed aesthetic rewarding diligence reports and tasks within their own learning.

Course description

Lecture:

Basic concepts of electric circuit, mathematical models of electric circuit components, basic laws of the electromagnetic field, rules for determining the voltage and current, circuitry law, solving DC circuits. The method of loop currents and of nodal, Thevenin and Norton's theorems, energy and electrical power, instantaneous value, average and RMS current and voltage. Sinusoidal alternating current circuits. The method of complex numbers, Vector charts, active, reactive and apparent power, RLC circuit analysis, correction the power factor, resonance voltages and currents, transients in electrical circuits, three-phase circuits, circuits with non-sinusoidal periodic waveforms, networks and filters.

Exercises auditorium:

Solving the basic tasks of the current circuits using laws, theorems and methods of peripheral, power calculation circuit, balance of power, calculation of meter indications. Solving the RLC circuit with sinusoidal excitations - symbolic method, calculate active, reactive and apparent power, calculation circuitry capable of resonance voltages and currents. Solving circuits in transient states - classical method. Solving three-phase circuits, power calculation - Aron measuring system.

Laboratory:

The principles of superposition, proportional and mutual in electrical circuits. The theorems of Thevenin and Norton. The actual source of electrical energy, matching of receiver to source of electrical energy to maximum of power. RLC elements in sinusoidal alternating current circuits. The resonance in the serial circuits. The correction of load factor. The analysis of transient state in linear circuits. The symmetrical three-phase circuits. The analysis AC circuits with LC elements. Linear electric ciruits with periodic non-sinusoidal currents in steady state. The filters. The equivalent networks.

Basic bibliography:

1. Bolkowski S., Elektrotechnika teoretyczna, Wyd. 6, WNT, Warszawa 2001.
2. Kurdziel R.: Podstawy elektrotechniki, WNT, Warszawa 1973.
3. Czarnywojtek P., Kozłowski J., Machczyński W.: Zbiór zadań z podstaw elektrotechniki, Wydawnictwo PWSZ, Kalisz, 2007.
4. Frąckowiak J., Nawrowski R., Zielińska M.: Laboratorium Elektrotechniki Teoretycznej, Wydawnictwo Politechniki Poznańskiej 2011.

Additional bibliography:

1. Krakowski M.: Elektrotechnika teoretyczna. Tom 1. Obwody liniowe i nieliniowe?, PWN, Warszawa 1995.
2. Bolkowski S., Brociek W., Rawa H.: Teoria obwodów elektrycznych. Zadania, WNT, Warszawa 1995.
3. Skrypt Laboratorium Elektrotechniki teoretycznej, Wydawnictwo Politechniki Poznańskiej, Poznań 1998 wydanie VII.
4. Bolkowski S.: Teoria Obwodów Elektrycznych, WNT, Warszawa 1998.

Result of average student's workload

Activity	Time (working hours)

1. participation in class lectures	48
2. participated in exercises auditorium	22
3. participation in laboratory classes	22
4. participate in the consultations	16
5. exam preparation	32
6. preparation for colloquia	32
7. preparation and development of laboratory reports	50
8. participation in the exam	4

Student's workload

Source of workload	hours	ECTS
Total workload	226	9
Contact hours	112	4
Practical activities	72	3