COURSE DESCRIPTION CARD - SYLLABUS

Course name
Circuit theory [S1AiR1E>TO1]

Course

Field of study
Automatic Control and Robotics

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
45

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

7,00

Coordinators

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Lecturers

Prerequisites

High school level mathematics and physics news. Knowledge of the basic quantities describing electrical circuits. The ability to understand and interpret the messages communicated and effective self-education in the field related to the selected field of study.

Course objective

Getting to know the theoretical and practical problems of electrical engineering. Acquiring the ability to analyze selected electrical circuits of direct and alternating current.

Course-related learning outcomes

Knowledge:
The graduates has an advanced knowledge and understanding of selected facts, objects and phenomena and the methods and theories relating to them that explain the complex relationships between them; he has a basic general knowledge of mathematics including algebra, geometry, analysis, probabilistic and elements of discrete mathematics and logic, including mathematical methods and numerical methods necessary to:
▪ describe and analyse the properties of linear and basic non-linear dynamic and static systems,

▪ the description and analysis of complex numbers,
▪ the description of random processes and uncertain quantities,
▪ the description and analysis of combinatorial and sequential logic systems,
▪ description of control algorithms and stability analysis of dynamic systems,
▪ the description, analysis and methods of signal processing in the time and frequency domain,
▪ numerical simulation of dynamic systems in the continuous and discrete time domain [K1_W1 (P6S_WG)].
Has well-ordered, theoretically grounded general knowledge in the field of electric circuit theory and DC and AC (including three-phase) electrical engineering [K1_W6 (P6S_WG)].
Skills:
Be able to use appropriately selected methods and measuring instruments and measure relevant signals and, on the basis of these, determine the static and dynamic characteristics of automation components and obtain information on their basic properties [K1_U14 (P6S_UW)].
Is able to build, commission and test a simple electronic and electromechanical system [K1_U15 (P6S_UW)].
Social competences:
The graduate is aware of the need for a professional approach to technical issues, meticulous familiarization with the documentation and environmental conditions in which the equipment and its components can operate. The graduate is ready to observe the rules of professional ethics and to demand it from others, to respect the diversity of opinions and cultures [K1_K5 (P6S_KR)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture:
- assessment of the knowledge and skills demonstrated in the problem-based written exam (it is allowed to conduct the test in an electronic form on the university's educational platform eKursy).
Auditorium exercises:
- tests and 2 written tests (tests: 7th and 14th week of classes),
- rewarding ongoing bonuses for activity and creativity in solving set tasks.
Assessment rules (for credit for the lecture and auditorium exercises):
5.0 - over 90% of points
4.5 - 80% -90% points
4.0 - 70% -80% points
3.5 - 60% -70% points
3.0 - 50% -60% points
2.0 - less than 50% of points

Programme content

The module program covers the following topics:
1) Basic laws, phenomena and theorems in direct and alternating current electrical circuits,
2) Circuits with non-sinusoidal signals,
3) Transient states in electrical circuits,
4) Three-phase systems,
5) Electrical crossovers and filters.

Course topics

Lecture.
Basic concepts of an electric circuit, mathematical models of circuit elements, basic laws of electromagnetic field, rules of voltage and current arrows, laws of electric circuits, solving DC circuits - methods: mesh and nodal potentials, Thevenin and Norton theorems, work and power of electric current, instantaneous value , average and effective current and voltage. Sinusoidal alternating current circuits - complex number method, vector plots, active, reactive and apparent power, RLC circuit analysis, power factor improvement, voltage and current resonance, transients in electrical circuits, three-phase circuits, non-sinusoidal periodic circuits, quadrants and filters.
Tutorials
Solving basic tasks in DC circuits using the laws, theorems and circuit methods, calculating power in a circuit, power balance, calculating meter indications. Solving tasks in RLC circuits with sinusoidal

excitations - symbolic method, calculation of active, reactive and apparent power, solving electrical circuits in the state of voltage and current resonance. Solving electrical circuits in transient states - classical method. Solving three-phase circuits, calculating power - Aron circuit.

Teaching methods

Lecture: multimedia presentation, illustrated with examples given on the board and with the use of simulation software, initiating discussions during the lecture. Additional materials are placed in the eCourses system.
Auditorium exercises: solving problems related to the basics of electrical engineering on the blackboard, discussions and comments on the methods of solving the tasks and performing tasks independently in the e-courses.

Bibliography

Basic
1. Robert L. Boylestad, Introductory Circuit Analysis, Pearson.
2. John O'Malley, Theory and problems of Basic circuit analysis, McGraw-Hill.
3. John Bird, Electrical circuit theory and technology, Newnes.
4. Czarnywojtek P., Kozłowski J., Machczyński W.: Zbiór zadań z podstaw elektrotechniki, Wydawnictwo PWSZ, Kalisz, 2007.
Additional
1. J.W. Nilsson & S.A. Riedel, Electric Circuits, 8th edition, Prentice Hall, 2008.
2. Bolkowski S., Brociek W., Rawa H.: Teoria obwodów elektrycznych. Zadania, WNT, Warszawa 1995.

Breakdown of average student's workload

	Hours	ECTS
Total workload	175	7,00
Classes requiring direct contact with the teacher	75	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	100	4,00