COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electrical engineering [S1Mech1>Elekt]

Course

Field of study
Mechatronics

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

5,00

Coordinators

Lecturers

Prerequisites

Basic knowledge of mathematics and physics in the field of electricity and magnetism. The ability to use a mathematical apparatus to analyze simple electrical and electronic circuits.

Course objective

Getting to know the theoretical and practical issues related to the use of laws in electrical and magnetic circuits. Acquiring practical skills in the field of measurements of electrical quantities with their mathematical development and interpretation. Getting to know the basics of operation and safe use of electrical devices and electronic systems.

Course-related learning outcomes

Knowledge:
1. Knows theoretical and practical basics of AC and DC electric circuits as well as electric and electronic elements and devices.
2. Knows theoretical and practical basics of electrical and electronic measuring instruments.
3. Knows issues related to the quality of electricity in electrical installations.

Skills:
1. Solving simple electric circuits of direct and alternating current.

2. Connecting and servicing electric and electronic systems as well as measuring electric quantities in these systems.
3. Selecting electrical and/or electronic equipment to the needs resulting from the functions of the designed installation.

Social competences:
1. Awareness of the social consequences of the practical application of the acquired knowledge, skills and related responsibility.
2. Can cooperate in a group.
3. Can define priorities related to the use of technical devices and take into account non-technical aspects.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
The knowledge acquired during the lecture is verified during an exam consisting of 40-50 single- or multiple-choice test questions. Passing with at least of 50% points required. The topics, on the basis of which questions are developed, are posted after each lecture on the eKursy platform. Additionally it is possibility to earn bonus points by activity in classes or beyond them (homework).

Tutorials:
The skills acquired during the classes are verified on the basis of a final test consisting of 3-4 tasks (with equal marks), as well as on the basis of activity in class and outside of them (homework). Credit for at least 50% of points is required.

Laboratory classes:
Assessment of knowledge and skills related to the preparation for classes and the implementation of the exercise task. Assessment of the reports from the exercises performed. Colloquium on the knowledge and skills acquired during the laboratory exercises. Practical test in the field of the ability to correctly connect electrical circuits and perform measurements of electrical quantities. The final grade is determined as the weighted average of the partial grades obtained.

Programme content

Laws, theorems and principles applicable in electrical engineering, methods of analysis and synthesis of electric circuits in the field of steady states for direct and sinusoidally alternating current circuits, issues related to electrical machines, transformers, basic electronic components and systems.

Course topics

Lecture:
Basic quantities and phenomena concerning electric and magnetic fields, electric signals and their classification, problems in the field of electric circuits with concentrated and distributed parameters (elements, rules and laws occurring in circuits), methods of analyzing direct and sinusoidal current circuits (Kirchhoff"s law method, loop currents, nodal potentials), circuit theorems (including Thevenin and Norton), active, reactive and apparent power, power factor, reactive power compensation, energy in electric circuits, matching the receiver to the source for maximum power, voltage and current resonance, measurements power and energy in electric circuits, problems of electric energy quality, electric semiconductor light sources.

Tutorials:
Determination of equivalent resistance/impedance, method of Kirchhoff"s laws, principle/method of superposition, method of loop currents and nodal potentials, Thevenin and Norton theorem/method, determination of active, reactive and apparent power, reactive power compensation, calculation of electricity consumption, resonance of voltages and currents.

Laboratory classes:
Getting acquainted with measuring equipment and methods of making measurements, learning the correct connection of electrical circuits and proper connection of measuring devices to the circuits, practical

verification of Thevenin and Norton theorem, checking the principles of superposition, proportionality and reciprocity, testing linear and nonlinear elements in DC circuits, testing elements RLC in sinusoidal alternating current circuits, measurements of power and electricity, testing of semiconductor rectifying and filtering systems.

Teaching methods

Lecture:
A multimedia presentation extended with examples presented on the board, initiating discussions and engaging students in solving simple accounting tasks, additional materials posted on the eKursy platform.

Tutorials:
Solving tasks on the basics of electrical engineering and electronics on the board with student involvement, discussions and comments on other ways of solving tasks. Analysis of problem tasks. Students carrying out tasks independently in the eKursy system.

Laboratory classes:
Practical exercises in connecting electrical and electronic circuits, performing experiments, working in teams, discussion, additional materials posted on the eKursy platform.

Bibliography

Basic:
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2. Bolkowski S., Brociek W., Rawa M.: "Teoria obwodów elektrycznych. Zadania", WNT, Warszawa 2015.
3. Chwaleba A., Moeschke B., Płoszajski G.: "Elektronika", WSiP, Warszawa 2014.
4. Czarnywojtek P., Kozłowski J., Machczyński W.: "Zbiór zadań z podstaw elektrotechniki. Obwody liniowe prądu stałego i sinusoidalnego", Wydawnictwo Państwowej Wyższej Szkoły Zawodowej im. Prezydenta Stanisława Wojciechowskiego, Kalisz 2007.
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7. Opydo W.: "Elektrotechnika i elektronika dla studentów wydziałów nieelektrycznych", Wyd. Politechniki Poznańskiej, Poznań 2012.
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9. Pilawski M., Winek T.: "Pracownia elektryczna", WSiP, Warszawa 2020.

Additional:
1. Bolkowski S.: "Teoria obwodów elektrycznych", WNT, Warszawa 2017.
2. Cieślicki K., Syrzycki A.: "Zbiór zadań z elektrotechniki ogólnej", OWPW, Warszawa 2007.
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4. Horowitz P., Hill W.: "Sztuka elektroniki", WKiŁ, Warszawa 2018.
5. Orlik W.: "Egzamin kwalifikacyjny elektryka w pytaniach i odpowiedziach", Wyd. KaBe, Krosno 2018.
6. Praca zbiorowa (red. Strojny J.): "Vademecum elektryka", SEP COSiW, Warszawa 2016.
7. Szabatin J., Śliwa E.: "Zbiór zadań z teorii obwodów", OWPW, Warszawa 2008.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
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)	50	2,00