COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electronics and electrical engineering [S1MiTPM1>EiE]

Course

Field of study
Materials and technologies for automotive industry

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
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge at the academic level in the field of mathematics and physics. The ability to use acquired knowledge to analyze electrical and magnetic phenomena and the ability to use mathematical apparatus to analyze simple electric and electronic circuits.

Course objective

Understanding theoretical and practical issues related to the use of laws in electric and magnetic circuits. Acquiring practical skills in the measurement of electrical quantities along with their mathematical development and interpretation. Learning the basics of operation and safe use of electrical devices and electronic systems.

Course-related learning outcomes

Knowledge:
1. Has knowledge of electrical and electronic systems. Knows the laws and methods of analyzing direct and alternating current electrical circuits. Knows methods of testing electrical and electronic circuits.

Skills:

1. Can obtain information from literature and the Internet, work individually, independently solve basic problems in the field of electrical engineering and electronics.
2. Is able to connect and operate simple electrical and electronic systems and measure electrical quantities in these systems.
3. Is able to apply knowledge in the field of electrical engineering and electronics necessary to determine the parameters and signals of electrical circuits such as voltages, currents, impedances, powers, energies, etc.

Social competences:
1. Is able to determine priorities related to the use of technical devices and take into account non-technical aspects, is aware of the impact of electrical and electronic devices on the environment.
2. Is able to think and act in an enterprising way, is able to cooperate in a group, understands various aspects and effects of an engineer's activity.

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 a final colloquium consisting of 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 completing homework assignments.
Laboratory:
Assessment of knowledge and skills related to preparation for classes and implementation of the exercise task. Assessment of reports on completed exercises. A colloquium on knowledge and skills acquired while performing laboratory exercises. Practical test on the ability to properly connect electrical circuits and measure electrical quantities. The final grade is determined as a weighted average of the obtained partial grades.

Programme content

Laws and methods relating to the theory of electric circuits in the field of steady states for direct and alternating current circuits, issues relating to electrical machines, basic electronic components and systems.

Course topics

Lecture:
Basic quantities and laws relating to the electric and magnetic field (Lorentz force, flow law, Biot-Savart law, Faraday's phenomenon of electromagnetic induction, Maxwell's equations), electric signals and their classification, basic concepts of electric circuits with concentrated and distributed parameters, elements and laws of electric circuits, methods of analysis of direct and sinusoidally alternating current circuits (Kirchhoff's law method, mesh currents, nodal potentials), active, reactive and apparent power, reactive power compensation, energy in electric circuits, resonance of voltages and currents, power and energy measurements in electrical circuits. Methods of analyzing electric circuits of direct current and sinusoidally alternating current. Basic information about the construction, principle of operation and application of transformers and AC motors. Basic electronic components and circuits, including: diodes, thyristors, diacs, triacs, transistors, logic gates and rectifier systems, filtering systems.
Laboratory:
Getting acquainted with measuring equipment and methods of making measurements, learning how to properly connect electrical circuits and properly connect measuring devices to circuits, practical testing of the laws, theorems and principles applicable in electrical circuits (e.g. Ohm's law, Kircchoff's laws, Theeven's theorem, superposition principle, principle reciprocity, etc.), testing of linear and non-linear elements in direct current circuits, testing of R L C elements in sinusoidally alternating current circuits, power and electricity measurements, testing of semiconductor rectifying and filtering systems, testing of a transformer, testing of a photovoltaic module.

Teaching methods

Lecture:
Multimedia presentation extended by examples presented on the board, initiating discussions and

engaging students in solving simple accounting tasks during the lecture, additional materials posted on the eKursy platform.
Laboratory:
Practical exercises in connecting electric and electronic circuits, performing experiments, working in teams, discussion, additional materials posted on the eKursy platform.

Bibliography

Basic:
1.Opydo W.: Elektrotechnika i elektronika dla studentów wydziałów nieelektrycznych, Wydawnictwo Politechniki Poznańskiej, Poznań 2012.
2. Opydo W., Kulesza K., Twardosz G.: Urządzenia elektryczne i elektroniczne, Wydawnictwo Politechniki Poznańskiej, Poznań 2015.
3. Horowitz P., Hill W.: Sztuka elektroniki, Wydawnictwo Komunikacji i Łączności, Warszawa 2015.
4. Cysewska-Sobusiak A.: Podstawy metrologii i inżynierii pomiarowej, Wydawnictwo Politechniki Poznańskiej, Poznań 2010.
5. Bolkowski S.: Elektrotechnika, Wydawnictwa Szkolne i Pedagogiczne, Warszawa 2019.
6. Frąckowiak J., Nawrowski R., Zielińska M.: Teoria obwodów. Laboratorium, Wydawnictwo Politechniki Poznańskiej, Poznań 2017.
7. Pilawski M., Winek T.: Pracownia elektryczna, Wydawnictwa Szkolne i Pedagogiczne, Warszawa 2020.

Additional:
1. Bolkowski S.: Teoria obwodów elektrycznych, Wydawnictwo Naukowo Techniczne, Warszawa 2017.
2. Frąckowiak J., Nawrowski R., Zielińska M.: Podstawy elektrotechniki. Laboratorium, Wydawnictwo Politechniki Poznańskiej, Poznań 2011.
3. Cieślicki K., Syrzycki A.: Zbiór zadań z elektrotechniki ogólnej, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2007.
4. Markiewicz A.: Zbiór zadań z elektrotechniki, Wydawnictwa Szkolne i Pedagogiczne, Warszawa 2018.
5. Putz Ł.: Badania i analiza wpływu wybranych układów sterująco-zasilających systemów lektroluminescencyjnych na parametry energii elektrycznej, Rozprawa Doktorska, Politechnika Poznańska, Poznań 2018.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00