COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electronic circuits [S2Elmob1>UE]

Course

Field of study
Electromobility

Year/Semester
1/2

Area of study (specialization)
Alternative Fuels and Energy Storage

Profile of study
general academic

Level of study
second-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
15

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Knowledge in the field of analog and digital electronics at the undergraduate level. Ability to understand the content of technical documentation regarding electronic systems and its analysis.

Course objective

Getting acquainted with the principles of operation of complex analog and analog-digital electronic circuits. Acquisition of the ability to design analog and analog-digital electronic circuits at a basic level.

Course-related learning outcomes

Knowledge:
1. Has extended and in-depth knowledge of selected areas of mathematics, necessary to describe the elements, systems and systems used in electromobility
2. Has extended and deepened knowledge in the field of modelling, analysis and synthesis of elements and systems characteristic of hybrid and electric vehicles, including traction ones
3. Has extensive knowledge in the field of measurements of electrical quantities and selected non-electrical quantities also with the use of remotely controlled systems; has in-depth knowledge of the development of experimental results

Skills:
1. Is able to use the knowledge of the latest technical and technological achievements in the design of unusual devices and systems in the field of electromobility
2. Is able to design, manufacture and integrate into ICT, electronic, power electronic and drive systems and systems for hybrid and electric vehicles, including traction vehicles
3. Has language skills in English at B2+ level; reads professional literature and technical documentation with understanding, including devices and systems used in electric and hybrid vehicles

Social competences:
1. Understands that in the field of technology, knowledge and skills are rapidly devaluing, which requires their constant supplementation
2. Is aware of the importance of the latest scientific and technical achievements in solving research and practical problems and, if necessary, supporting expert opinions

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
Evaluation of knowledge and skills demonstrated in a written exam of a test-problem nature, based on the number of points obtained
Project
1. Continuous assessment, rewarding the increase in the ability to use the learned principles and methods
2. Assessment of knowledge and skills related to the implementation of the project
Laboratory
1. Continuous assessment, rewarding the increase in the ability to use the learned principles and methods
2. Assessment of knowledge and skills related to the execution of the exercise, assessment of the exercise report
Methods common to projects and laboratory
Obtaining additional points for activity during classes, in particular for:
- proposing to discuss additional aspects of the issue,
- the effectiveness of applying the acquired knowledge when solving a given problem,
- the ability to work as part of a team, practically implementing a detailed task in the laboratory,
- comments related to the improvement of didactic materials.

Programme content

The module program covers the following issues:
1/ special purpose signal amplifiers,
2/ analog switches,
3/ reference voltage generators,
4/ digital-to-analog converters and digital potentiometers,
5/ analog-to-digital converters,
6/ systems for galvanic separation of electronic systems
7/ stabilizers of voltages supplying electronic circuits,
8/ temperature transducers and measuring systems,
9/ current and voltage transducers and measuring systems,
10/ analogue signal processors,
10/ principles of designing analog-digital systems.

Course topics

The lecture program covers the following topics:
1/ structures and principles of use of special-purpose signal amplifiers,
2/ basics of digital-analog and analog-to-digital signal processing,
3/ architecture of digital-to-analog and analog-to-digital converters,
4/ principles of powering electronic systems,
5/ basics of measurement of basic physical quantities in industrial systems,

6/ basics of designing electronic systems.

The design class program includes:
1/ discussion of the structure and principles of designing the analog forefield of an analog-to-digital converter,
2/ presenting the principles of selecting analog-to-digital converters,
3/ individual implementation of an electronic system project by the student,
4/ discussion of completed projects.

The laboratory program includes research:
1/ differential and instrument amplifiers,
2/ reference voltage generators - series and parallel,
3/ supply voltage stabilizers - linear and pulse,
4/ digital-to-analog and analog-to-digital converters.

Teaching methods

1. Lecture with a multimedia presentation (diagrams, formulas, definitions, etc.) supplemented with content given on the board
2. Projects and laboratory exercises: multimedia presentation, presentation illustrated with examples given on the board and performance of tasks given by the teacher - in the form of practical exercises

Bibliography

Basic:
1. Z. Kulka, M. Nadachowski, Analogowe układy scalone, WKŁ, W-wa, 1980
2. J. Szabatin, Podstawy teorii sygnałów, WKŁ, W-wa, 2000
3. P. Górecki, Wzmacniacze operacyjne, Wydawnictwo BTC, W-wa, 2004
4. F. Maloberti, Przetworniki danych, WKŁ, W-wa, 2010
5. P. Horowitz, W. Hill, Sztuka elektroniki. Część 1 i 2, WKŁ, W-wa, 2014

Additional:
1. W. Kester, The Data Conversion Handbook, Elsevier, 2005
2. Technical documentation of electronic components and their application notes and educational materials - available on the websites of Analog Devices (https://www.analog.com/en/index.html) and Texas Instruments (https://www.ti.com /)

Breakdown of average student's workload

	Hours	ECTS
Total workload	122	5,00
Classes requiring direct contact with the teacher	62	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,00