COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electronic circuits [S2Elmob1>UE]

Course

Field of study
Electromobility

Year/Semester
1/2

Area of study (specialization)
Energy Processing Systems

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 (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

5,00

Coordinators

mgr inż. Adam Gulczyński
adam.gulczynski@put.poznan.pl

dr hab. inż. Michał Gwóźdź prof. PP
michal.gwozdz@put.poznan.pl

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

Properties of specialized microelectronic circuits - signal amplifiers. Analog switches - construction, parameters and operating systems. Analog signal processors - construction, parameters and applications. Reference voltage generators - construction, parameters and operating systems. Power supply systems - linear and impulse converters - properties and work systems. Introduction to digital-to-analog and analog-to-digital convertion. Construction and parameters of analog-to-digital and digital-to-analog converters and digital potentiometers. Construction and principles of designing the path of signal intake from a physical quantity converter into an electrical signal. Analog-to-digital and digital-to-analog converters in a microprocessor system - principles of cooperation. Current, voltage, temperature and acceleration measuring transducers - construction and parameters. Coupling microcircuits for galvanically isolated electronic systems - construction, parameters and applications. Micromachine acceleration sensors and gyroscopes. Digital integrated circuits of small and medium scale integration - overview of parameters. Basic principles of designing analog-digital electronic systems.

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