COURSE DESCRIPTION CARD - SYLLABUS

Course name
Computer aided design of electronic circuits [S2Elmob1-SSP>KWPUE2]

Course

Field of study
Electromobility

Year/Semester
2/3

Area of study (specialization)
Car Onboard 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
0

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematical analysis, electrical engineering and metrology. Using the laws of electrical engineering to analyze DC and AC circuits. He knows the basic electronic components, their properties and characteristics. Can use technical documentation, including standards, catalog notes, instructions and scientific and technical magazines also in English. He is aware of the need to expand his competences and is ready to cooperate within the team.

Course objective

Familiarizing students with basics of processes supporting the design of electronic circuits using computer tools (CAD). Presentation of implementation of the design process, manufacturing technology and testing of electronic circuits. Developing the ability to draw and develop schematic diagrams, printed circuit boards and technical documentation of the project. Computer simulations of electronic components and systems using various available tools, performing DC, frequency, time and extended analyses, e.g. thermal, parametric, FFT. Familiarizing students with the theoretical and practical aspects of designing electronic circuits. Practical implementation of the design process of a selected electronic system.

Course-related learning outcomes

Knowledge:
1. Has a structured knowledge of modeling, analysis, synthesis and manufacturing technology of typical electronic systems, including those used in vehicles by use of computer tools.
2. Has knowledge of computer techniques and ways of analyzing electronic circuits, determining their characteristics, and assessing their properties.

Skills:
1. Can use knowledge, modern CAD software and appropriate technical documentation to design unusual electronic systems in the field of electromobility.
2. Can perform computer simulations, select and set appropriate methods of analysis to check the operation and properties of the designed electronic circuit.
3. He can choose an adequate set of computer tools for the design, analysis and development of production files of the electronic system, taking into account their advantages and limitations depending on the specificity of the developed application.
4. Can use CAD software to design and perform simple electronic systems used in electromobility
5. He can choose a set of tests and studies for developed and designed electronic systems.
6. Works individually and in a team on the technical aspects of electronic circuit solutions implemented by use of computer tools.

Social competences:
1. He can critically look at and evaluate the properties of simple electronic circuit solutions, noticing his own cognitive limitations motivating him to constantly improve his qualifications.
2. Is aware of his social role, fulfills the obligations of formulating and transferring reliable scientific and technical knowledge.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory classes
Entrance tests and bonuses for the knowledge necessary to implement the problems in the area of laboratory tasks. Evaluation of skills related to the implementation of the task. Evaluation of reports on exercises performed. Evaluation of the knowledge demonstrated in the written test in the field of the content of laboratory classes (test questions and calculation tasks).

Programme content

The subjects of the class include practical aspects of electronic circuit design using available and commonly used software. Individual projects, developed using EDA software and simulation programs, will be verified in a practical manner after their assembly, commissioning and testing.

Course topics

Laboratory classes
The topics of the classes include issues related to:
a.) Simulation and analysis of electronic components and systems
b.) Designing printed circuit boards using CAD software
c.) Practical implementation of the selected project, including its launch and selection of the functional range tests.

Teaching methods

Laboratory exercises carried out individually or in small laboratory groups. Depending on the subject of the exercise, the following tasks are performed, indicated by the teacher: drawing circuit diagrams, simulations and analyzing the operation of the circuits, drawing a printed circuit board design, preparing technical documentation, connecting the measurement system, carrying out the indicated measurements, developing the measurement results and preparing the report. In addition, an individual design, assembly and testing of simple printed circuit boards is carried out.
The teaching methods used are student-oriented and motivate them to actively participate in teaching process through discussions and papers.

Bibliography

Basic:
1. A. Filipkowski, Układy elektroniczne analogowe i cyfrowe , WNT 1993
2. Z. Kulka , M. Nadachowski, Wzmacniacze operacyjne i ich zastosowania cz. 1 i 2 WNT 1983
3. U. Tietze, Ch. Schenk, Układy półprzewodnikowe, WNT, Warszawa 2007
4. J. Porębski, P. Korohoda, SPICE program analizy nieliniowych układów elektronicznych, WNT, Warszawa, 1996.
5. Zachara Z., Wojtuszkiewicz K., PSpice: symulacje wzmacniaczy dyskretnych, MIKOM, Warszawa, 2001.
6. T. Sidor, Komputerowa analiza elektronicznych układów pomiarowych, Kraków, Wydawnictwo AGH, 2006.
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8. R.A.Pease, Projektowanie Układów Analogowych. Poradnik praktyczny , BTC, 2005
9. R. Kisiel, Podstawy technologii montażu dla elektroników. Wydanie II, BTC, 2012

Additional:
10. W.E. Ciążyński, Rzeczywiste wzmacniacze operacyjne w zastosowaniach, Wyd. PŚ, Gliwice, 2012.
11. B. Carter, R. Mancini, Wzmacniacze operacyjne: teoria i praktyka, BTC, 2011.
12. Ch. Kitchin, L. Counts, Wzmacniacze operacyjne i pomiarowe: przewodnik projektanta, BTC, 2009

Breakdown of average student's workload

	Hours	ECTS
Total workload	56	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	26	1,00