COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electronics Computer Aided Design

Course

Field of study
Electronics and Telecommunications

Year/Semester
2/3

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	30	
Tutorials	Projects/seminars	

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
dr inż. Sławomir Michalak (PhD Eng.)

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Responsible for the course/lecturer:

Prerequisites

The student has knowledge of the operation of basic electronic components and their characteristics, the basics of circuit theory and electrical metrology. Knows the basic symbols of electronic components and shows knowledge of basic electronic circuits. He knows the principles of operation and can design basic electronic circuits. Can use the catalog data of electronic components and systems. Uses the computer to perform the assumed tasks. Demonstrates the ability to obtain information (catalog data) on the Internet. Capable of independent learning (textbooks, computer programs). Behaves actively in class, puts questions, consciously uses contacts with the teacher (e.g. as part of consultations).

Course objective

Providing students with knowledge of the basics and tools for computer analysis of electronic systems using CAD programs, knowledge about the next stages of design and analysis of electronic devices. Developing students' skills in creating schematic diagrams using CAD tools (e.g. LTSPICE, MULTISIM and APLAC), performing basic analyzes (DC, AC, time) and extended analyzes (temperature, parametric, FFT,

noise, Worst Case, Monte Carlo). Acquainting with models of elements, issues of simulation of analog, digital and analog-digital systems, optimization of the parameters of the designed system.

Course-related learning outcomes

Knowledge

Knows the theoretical foundations and principles of designing analog and digital circuits, the operation of electronic circuits and the design and analysis of electronic circuits, computer aided design. Has ordered and broad knowledge in the field of properties and characteristics of electronic components, in the field of building models of electronic components, design and analysis of electronic systems.

Skills

Is able to analyze and design circuits and systems using CAD tools. Can use models, catalog cards and application notes for electronic components. Has the ability to analyze, design and simulate the operation of analog and digital circuits taking into account the given criteria, using the appropriate engineering methods and tools. Is able to obtain information from literature and databases as well as other sources in English; is able to integrate obtained information, interpret it, give conclusions. Is able to communicate in English language in a professional environment. He wants to educate himself.

Social competences

Has a sense of responsibility for the designed electronic and telecommunications systems and is aware of the potential dangers to other people or society in the event of improper use.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired as part of the lecture, supplemented with practical skills acquired during laboratory classes, is verified by self-completion and passing a semester work (simulation of the operation of a given electronic system). Individual topics of final essays are given on one of the last lectures. Students bring their semester work (report in paper form and files with simulations - sent by e-mail using the university e-mail system), receive note in accordance with the date of the final session.

The ability to use the knowledge acquired during lectures, correctness of simulation performance, correctness of selection and scope of analyzes according to the nature of the system, ability to modify the used element models are assessed. The scope of tasks of the semester work (degree of difficulty and labor intensity) is graded (satisfactory, good and very good). After issuing the grade, until it is approved in the e-proto system, students also have the possibility of individual consultation and verification of the grade (oral answer).

Laboratory classes are awarded on the basis of the student's reports (in writing). The report is made after each laboratory unit (performing the assigned exercise). The semester grade from the laboratory is determined on the basis of all reports (arithmetic mean value). The correctness and scope of the simulation are assessed (mandatory and additional tasks). Students have the option of individual consultation, verification of the grade (oral answer or additional tasks) and obtaining a higher grade.

Programme content

- CAD programs and basic analyzes used in simulation programs.
- Basic analysis (DC, frequency AC, time).
- Parametric, FFT, temperature analysis.
- Statistical analysis (Worst Case, Monte Carlo).
- Models of voltage and current sources (DC, AC, SIN, PULSE, EXP).
- Models of basic passive electronic components (resistor, capacitor, coil) used in simulation programs.
- Models of active elements (diode, Zener diode, bipolar and unipolar transistors).
- Models and macromodels of operational amplifiers.
- Comparison of element models used in CAD programs.

Teaching methods

1. Lecture: traditional lecture; multimedia presentation, illustrated with examples of simulation programs.

2. Laboratory exercises: practical exercises at computer stations, performing simulation tasks given by the teacher, supported by examples of solutions (multimedia presentations).

Bibliography

Basic

1. Sandler M.S., "SPICE Circuit Handbook", McGraw-Hill Education - Europe, 2006.

2. El Emam K., Drouin J., Melo W., Dorling A. "SPICE : the theory and practice of software process improvement and capability determination" , IEEE Computer Society, 1998.

3. Vladimirescu A., "The SPICE Book", Willey, 1994.

4. Massabrio G., Antognetti P., "Semiconductor Device Modeling with Spice", McGraw Hill Professional, 1998.

Additional

1. MicroSim Corporation. "PSPICE reference manuał Version 8.0". 1997.

2. Kielkowski R., "Inside Spice", McGraw-Hill Inc., 1994.

3. El Emam K., Drouin J-N., Melo W., "SPICE: the theory and practice of software process improvement and capability determination", IEEE Computer Society, 1998.

4. Moscovici A., "High speed A/D converters: understanding data converters through SPICE", Kluwer Academic Publischers, 2001.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes, project preparation)[1]	55	2,0

[1] delete or add other activities as appropriate