COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electronic circuits and systems [S1MNT1>C-UiSE]

Course

Field of study
Mathematics of Modern Technologies

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematical analysis, basics of electrical engineering and metrology. Using the laws of electrical engineering to analyze AC and DC circuits. In addition, he should be able to obtain information from selected sources on electrical and electronic issues.

Course objective

To provide students with knowledge about the structure, properties, principles of operation of basic circuits and electronic components in practice. Getting to know by students of the ability to design, build and test electronic circuits and systems.

Course-related learning outcomes

Knowledge:
• has structured knowledge about classification of basic electronic and optoelectronic ich roli w zasto-sowanych, wybranych układach i systemach elektronicznych [K_W03(P6S_WG), K_W04(P6S_WG)];

• hasknowledgeabouttechnologyofdesigningandmanufacturingprintedcircuitboards[K_W05(P6S_WG)];
• hasknowledgeofcheckingandtestingelectronicsystemsinthephaseofitsconstructionandoperation [K_W09(P6S_WG)];
• knows principles of design, construction, operation of electronic circuits and systems basis on general standards and principles taking into account their reliability, safety, operation [K_W05(P6S_WG), K_W09(P6S_WG)].

Skills:
• is able to find and read the technical documentation of selected electronic components and find relevant electrical parameters and interpret them accordingly [K_U08(P6S_UW), K_U15(P6S_UK)];
• can build and test simple electronic circuits using appropriate methods and tools [K_U05(P6S_UW), K_U12(P6S_UW)];
• can design a simple electronic circuit with a printed circuit, taking into account selected accepted standards and principles [K_U11(P6S_UW), K_U13(P6S_UW)];
• can make a critical analysis of operation of the designed built electronic systems based on the tests and studies, taking into account the aspects of its operation in accordance with the requirements of the relevant technical standards [K_U06(P6S_UW), K_U08(P6S_UW)].

Social competences:
• is aware and understands the aspects of the impact of electronic systems on humans and the environment [K_K03(P6S_KO)];
• knows and adheres to the principles of professional ethics in the area of designing the production of electronic systems and its responsibility for decisions [K_K03(P6S_KO)];
• is aware of the scope of his knowledge and electronic systems as well as its limitations, is able to formulate correct cognitive conclusions and the role of its transmission [K_K03(P6S_KO)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: evaluation of knowledge and skills demonstrated on a written test and calculus nature (the written test sheet contains the information necessary to perform calculus tasks); threshold for passing the test 50%; rewarding grades from laboratory classes as well as presence and activity during the lecture;
Laboratory classes: entry tests and rewarding knowledge necessary to implement problems posed in the area of laboratory tasks; assessment of skills related to implementation of measurement task; assessment of reports on the exercises performed; assessment of knowledge demonstrated on the written test in laboratory classes (test questions and calculation tasks).

Programme content

The topics covered in this course include wide aspects of electronic circuit design built using basic passive and active components. Methods of synthesis of these circuits and practical construction, assembly and verification will be presented.

Course topics

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Lectures:
• introduction: structure and construction of electronic circuits and systems;
• principle of operation, properties and applications of basic passive electronic components;
• semiconductors and basic semiconductor elements, ie diodes, transistors used in practical solutions of electronic circuits;
• operational amplifiers - properties, parameters, configurations and circuits; the role of negative and positive feedback, linear and non-linear applications;
• constructions of power supplies and stabilizers;
• basic optoelectronic elements - properties and their application in electronic systems;
• digital circuits - basic concepts of logic circuits and systems, manufacturing technologies and parameters of digital circuits; analysis and synthesis of combinational and sequential circuits;
• designing electronic circuits; the use of EDA software in the design process; technologies of manufacturing and assembly of electronic systems.
Laboratory classes: laboratory classes are carried out over fifteen 90-minute meetings, in 4-8 subgroups;

the subject of the laboratory classes is divided into four parts
• the subject of first part is: getting to know the instruments and measurement techniques used during laboratory classes; paying attention to the analysis of measurement data and way they are presented on the charts;
• in the second part, laboratory exercises are performed on basic passive and active electronic components, electronic circuits, paying attention to their practical application; in addition to testing elements and systems, their simulations are performed using available software;
• the subject of the third part is an introduction to the design of printed circuit boards using EDA software, presentation of the equipment of workstations for assembling electronic components and the assembly of a simple prepared printed circuit board;
• during the last class, laboratory exercises are performed on the properties of digital electronic circuits: combinational and sequential; methods of synthesis of simple circuits containing logic gates, multiplexers and flip-flops are presented.

Teaching methods

Lectures: lectures are carried out using multimedia presentations illustrated with examples of simulations and the necessary mathematical calculations on the blackboard;
Laboratory classes: laboratoryexercisesareconductedinlaboratorygroups;duringtheclasses,connection of the measurement system is performed, the indicated measurements are carried out, the measurement results are processed and the report is prepared; additionally, individual design and assembly of simple printed circuit boards is performed; the applied teaching methods are student-oriented and motivate them to actively participate in the teaching process through discussions and presetation.

Bibliography

Basic:
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• Z. Kulka, M. Nadachowski, Wzmacniacze operacyjne i ich zastosowania cz. 1 i 2 WNT 1983;
• U. Tietze, Ch. Schenk, Układy półprzewodnikowe, WNT, Warszawa 2007;
• J. Zakrzewski, Czujniki i przetworniki pomiarowe, Wyd. Politechniki Śląskiej, Gliwice 2004;
• J. Rydzewski, Pomiary oscyloskopowe, WNT, Warszawa, 2007;
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Additional:
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• Denton J. Dailey, Electronic Devices and Circuits, copyright 2001 by Prentice-Hall, Inc., Upper Sadle River, New Jersey 07548, USA. Warszawa 2002;
• Bibliografia wyszukana przez studenta ze źródeł drukowanych i elektronicznych;
• S. Tumański, Technika pomiarowa, WNT 2007;
• W. Kester, Przetworniki A/C i C/A: teoria i praktyka, BTC, 2012;
• W.E. Ciążyński, Rzeczywiste wzmacniacze operacyjne w zastosowaniach, Wyd. PŚ, Gliwice, 2012;
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• Z. Nawrocki, Wzmacniacze operacyjne i przetworniki pomiarowe, Wyd. PWr, Wrocław, 2008;
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• L. Hasse, Zakłócenia w aparaturze elektronicznej, Radioelektronik, Warszawa,1995;
• Aviation Electronics Technician - Basic, NAVEDTRA 14028, 2003;
• www.electropedia.org.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	63	2,50