COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basic Electronics

Course

Field of study
Computing

Year/Semester
1/2

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
English

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
12

Laboratory classes
12

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
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60-965 Poznań, Piotrowo 3A

Responsible for the course/lecturer:

Prerequisites

The student starting this course should have basic knowledge of selected mathematics areas (needed to understand the basics of electrical engineering, the basics of electronics and measuring electrical quantities)
He should have the ability to solve basic problems in the field of information technology and the ability to obtain information from the indicated sources. They should also understand the need to expand their competences / be ready to cooperate within the team.
In terms of social competences, the student must present attitudes such as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, respect for other people.

Course objective

1.To provide students with basic knowledge of the construction, analysis, computer simulation and design of electrical and electronic systems in the field of analog and digital systems and measurement methods occurring in these electrical signal systems.

2. Developing students' skills to solve simple problems related to the operation of devices and elements of analog and digital electronics.

3. Shaping students' teamwork skills by showing the necessity and possibilities of team development of complex projects of analog and digital electronic circuits using CAD techniques.

Course-related learning outcomes

Knowledge

The student has an ordered, theoretically founded general knowledge in the field of electronics (K1st_W3).
The student knows the basic techniques used in the process of solving problems in the field of electronics, mainly of an engineering nature (K1st_W7).
The student has knowledge about important directions of development and the most important achievements of electronics (K1st_W5).

Skills

The student is able to properly plan and perform experiments, including measurements in the field of electronics (K1st_U3).
The student is able to design electronic circuits as well as construct and program simple microprocessor systems (K1st_U13)

Social competences

Student rozumie, że w informatyce (a więc i w ściśle z nią związanej elektronice) wiedza i umiejętności bardzo szybko stają się przestarzałe (K1st_K1).
Student ma świadomość znaczenia wiedzy w rozwiązywaniu problemów inżynierskich z zakresu elektroniki (K1st_K2)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
The knowledge acquired during the lecture is verified on the basis of a written test (possible on-line mode). The examination topics on the basis of which the questions are developed are available to students in the moodle system (or other electronic communication system).
The lecture pass threshold is 51% of points.
The skills acquired during the laboratory classes are verified on an ongoing basis. At each laboratory class, the correctness of the exercises is assessed on a scale from 2 to 5. The final grade is the average of the marks obtained from each laboratory session.

Programme content

Lecture topics:
- Introduction to electronics - a variety of techniques and technologies. Hardware vs. software.
- Simulations of electronic systems - tools, types of analyzes.
- Principles of DC circuits analysis - review of Kirchhoff's laws, basic elements, circuit theorems - Thevenin, Norton theorem, superposition principle, compensation theorem, analysis methods.
- IoT systems - sensors and hardware platforms (illustration of circuit analysis theory).

- Introduction to the analysis of sinusoidal alternating current circuits - description of the R, L, C elements in the time domain and on the complex plane - the relationship between these descriptions. Symbolic method - procedure algorithm. Series and parallel connection of RLC components. Phasor and vector diagrams of electrical circuits.
- The phenomenon of frequency resonance explanation of the concept of spectral analysis of a system, amplitude and phase characteristics.
- Basic materials used in electronics - properties, conduction mechanism in n-type semiconductors, p-type semiconductors, p-n junction and MOS structure.
- The principle of operation and characteristics of CMOS transistors.
- Electronic components as components of logic circuits: combinational and sequential electronic logic circuits, NMOS inverter, dynamic inverter, construction of logic circuits based on NMOS inverters, CMOS inverter, advantages and disadvantages of CMOS circuits, construction of CMOS logic gates, transmission gate (TG),
- IoT systems - sensors and hardware platforms (sample projects).

Lab topics:
- Getting to know the measuring apparatus - operating the oscilloscope, multimeter, DC power supply and waveform generator.
- Basics of simulating electronic circuits using the LTSpice simulator (DC analysis, transient, determining the time parameters of circuits).
- Studies of linear systems using Thevenin's theorem.
- Study of nonlinear systems on the example of R, L, C elements. Analytical determination of current flow in AC circuits using the complex number method.
- Investigation of the resonance phenomenon in RLC systems.
- Study of semiconductor systems on the example of rectifier diodes and light emitting diodes.
- NMOS and PMOS field effect transistors. Determination of current characteristics and testing of simple control systems based on MOS transistors.
- The operational amplifier and its basic applications.
- Introduction to digital circuits on the example of FPGA matrices.

Teaching methods

Lecture: multimedia presentation, illustrated with examples given on the board.

Laboratory: carrying out practical laboratory exercises on the prepared sets of electronic circuits.

Bibliography

Basic

1. Korzec zdzisław: Podstawy współczesnej elektroniki. Podręcznik dla studentów informatyki Wydawnictwo: Wyższa Szkoła Humanistyczno-Ekonomiczna w łodzi. ISBN: 8374051957
2. Paul Horowitz , Winfield Hill: Sztuka elektroniki, WKiŁ, Warszawa, 2011. ISBN 978-83-2061-992-8

3. Jerzy Zalewicz: Laboratorium podstaw elektroniki i miernictwa elektrycznego, AHE, 2004. ISBN 83-7405-163-9

Additional

1. https://www.electronics-tutorials.ws/
2. Skrypt do laboratorium, A. Handkiewicz (redaktor), http://ccs.put.poznan.pl, Poznań, 2006

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	24	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests, project preparation) [1]	51	2,0

[1] delete or add other activities as appropriate