STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Basic Electronics		**1010511321010500191**

Field of study	Profile of study (general academic, practical)	Year /Semester
Computing	**general academic**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**elective**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours					No. of credits
Lecture: **30**	Classes: **-**	Laboratory: **30**	Project/seminars: **-**		**5**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
basic	**from field**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**5 100%**
Technical sciences	**5 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Prerequisites: basic knowledge of mathematics and physics in the range required to understand basics of electronics (understanding concepts of current, voltage, Ohm etc.).
2	**Skills**	Students should be able to solve basic mathematics and physics problems and should be able to search for new information.
3	**Social competencies**	Students should have the following features: truthfulness, sincerity, cognitive curiosity, creativity and respect for people.

Assumptions and objectives of the course:

1. The aim of the course to give students the basic knowledge of electronics, which covers analysis, simulation and design of simply electronic circuits ? both analog and digital. Some information about measurements and signals will be also presented.
2. Practice and develop among students abilities to solve simple problems related to analog and digital circuits and systems maintenance.
3. Practice and develop among students team work skills through the team projects and usage of CAD systems.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. . - [K1st_W3]
2. . - [K1st_W7]
3. . - [K1st_W5]

Skills:

1. . - [K1st_U3]
2. . - [K1st_U13]

Social competencies:

1. . - [K1st_K1]
2. . - [K1st_K2]

Assessment methods of study outcomes

Formative assessment:

a) lectures:

- based on answers to question asked and open problems posed during the lectures,

b) labs:

- evaluation of student?s knowledge necessary to prepare, and carry out the lab tasks,

Total assessment:

a) lectures:

- based on written exams results,

b) labs:

- monitoring students activities during classes,
- evaluation of reports on the method and results of lab experiments
- evaluation of possible short quize to evaluate student preparation to the labs.

Course description

Lectures cover the following topics:

Basics: current and voltage, resistance and Ohm?s law, series and parallel resistances, power supplies (power line, batteries), power and Joule?s law,ground and load;

DC and AC current: batteries and power supplies, voltage and current dividers, Thevenin?s and Norton?s theorems: statement, application to the voltage and current dividers. Superposition.

Transforming voltages, capacitance as a reaction to voltage variations and the RC circuit, inductance as a reaction to current variations;

Electrical resonans RLC. Frequency characteristics.

Basic of semiconductors: Diodes, Transistors (BJT, JFT, MOSFET).

Non linear circuital devices: diodes, use as rectifiers, LED; transistors: use as switches, use as amplifiers; operational amplifiers (op-amp): basic features, basic, negative-feedback, linear configuration; negative-feedback application examples: inverting amplifier, non-inverting amplifier, follower, inverting adder, differential amplifier, differentiator, integrator; positive-feedback application examples: oscillator.

Introduction to digital electronics: CMOS logic, NOT, AND, OR, NOR, NAND, XOR; Gates parameters: switch time, fan-out, transient characteristic, noise margin.

Basics of A/D and D/A converters. New trends in electronics: Microprocessors, microcontrollers, FPGA, ASIC, SoC.

Labs:

Practical information about safety rules, connections of electrical circuits. Basic measurements.

Next the lab is divided into 3 parts, each includes 4 experiments.

First part: basic rules and laws of electronics: Thevenina theory(DC circuit), R, L, C elements in circuits with sinusoid source. Power consumption. Operational apmplifiers and its configurations. Diodes and their applications.

Second part: Construction and operation of PMOS and NMOS transistors, inverter NMOS, flip-flop built on TTL transistors.

Third part: Implementation of basic digital circuits on FPGA platform.

Basic bibliography:

1. Horowitz P., Hill W., ?The Art of Electronics? (3th ed., 2015), Cambridge University Press
2. Labs manual, A. Handkiewicz (redaktor), http://ccs.put.poznan.pl, Poznań, 2006

Additional bibliography:

1. CMOS Current Mode Sigma-Delta Modulators, Śniatała P., PUT PSNC. Wydawnictwo NAKOM, Poznań 2016

Result of average student's workload

Activity	Time (working hours)
1. Participating in labs	30
2. Labs preparing	15
3. Labs reports finishing (at home)	15
4. consulting with a teacher	1
5. Preparing to exams/quizes	5
6. Participating in lectures	30
7. Literature study	10
8. Preparing to the final exam and participating in final exam (8h+2h)	10

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	116	5
Contact hours	63	3
Practical activities	37	2