COURSE DESCRIPTION CARD - SYLLABUS

Course name
Microelectronics [S1Inf1>MIKRO]

Course

Field of study
Computing

Year/Semester
2/3

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
24

Laboratory classes
20

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr inż. Michał Melosik
michal.melosik@put.poznan.pl

Lecturers

Prerequisites

Student beginning this course should have basic knowledge of electronic circuit analysis and mathematical analysis, algebra and discrete mathematics. The student should have the ability to solve algebraic equations and simple differential equations, and the ability to obtain information from indicated sources. In the area of social competences, the student understands the necessity of broadening his competences in the field of advanced technologies. Moreover, in the area of social competences the student must present such attitudes as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, respect for other people.

Course objective

1. to share the basic knowledge of microelectronics in new technologies and the importance of computer engineering in computer science. 2. to develop students" ability to solve simple problems occurring during the use of digital equipment and popular hardware platforms. 3. developing students" skills of team work in designing microelectronic systems.

Course-related learning outcomes

Knowledge:

The student has a detailed knowledge of selected electronics branches, has the knowledge necessary to assess the proper functioning of the designed devices; he or she has knowledge of development trends and new achievements on the borderline of electronics and computer science; he or she has the knowledge necessary to solve engineering problems on the borderline of electronics and computer science.

Skills:
The student is able to plan and conduct computer simulations of microelectronic macrocells with the use of SPICE software and is able to interpret the results obtained; he is able to use appropriate hardware platforms for formulating and solving tasks and to propose experimental methods of testing them in a microelectronic laboratory; he is able to select and use a hardware platform in accordance with the assumptions of the designed system/device.

Social competences:
The student understands that knowledge and skills on the boundary of electronics and computer science are rapidly becoming obsolete; he or she is aware of the importance of computer engineering and microelectronics knowledge in solving engineering problems and understands the causes of faulty electronic devices.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Formulation evaluation:
a) in terms of lectures:
on the basis of answers given on the final credit or preparation of a written analysis on a given topic
(b) as regards laboratories:
based on the evaluation of the current progress of the tasks,
Summary evaluation:
The verification of the assumed educational results is carried out by the student:
- evaluation of skills related to the realization of laboratory exercises,
- Continuous assessment, during each class (oral answers) - rewarding the increase in the ability to use the learned principles and methods,
- evaluation of the report or source code prepared partly during and partly after the class; this evaluation also includes teamwork skills,
- assessment of the correctness and the way the student explains the source code used for the task with a specific microelectronic system,
- assessment of the knowledge and skills shown on the written credit of the lectures or preparation of a written analysis of the given issue.
Obtaining additional points for activity during classes, especially for:
- discussing additional aspects of the issue,
- effectiveness of applying the acquired knowledge while solving a given problem,
- the ability to cooperate within a team practically carrying out a specific task in the laboratory,
- comments related to the improvement of teaching materials

Programme content

Lectures:
-The role of computer engineering and microelectronics in modern computer science,
-CMOS technology, MOS transistor models,
-Selected microelectronic circuits in CMOS technology
- ASICs
-Microelectronic systems in the context of IoT development,
- Analysis of the possibility of using selected hardware platforms in terms of using open hardware solutions and open source software,
-Analysis of selected microelectronic systems described in the latest scientific literature,
-Development trends in microelectronics - hardware layer security.
-The lecture invited representatives of microelectronic/IT companies of international range.
Laboratories:
-Symulation of basic CMOS macrocells in SPICE,

-Service and application of single-board compute platforms

Teaching methods

wykład: prezentacja multimedialna, pokaz multimedialny, demonstracja, dyskusja
ćwiczenia laboratoryjne: ćwiczenia praktyczne, praca w zespole, studium przypadków

Bibliography

Basic
1. A. Handkiwicz, "Mixed-signal systems : a guide to CMOS circuit design", Wiley 2002
2. U. Tietze, Ch. Schenk, "Układy półprzewodnikowe", WNT 1997
3. B. Wilkinson, "Układy cyfrowe", WKŁ 2003
4. A. Robinson, "Raspberry Pi : najlepsze projekty", Helion 2014
5. S. Monk "Raspberry Pi : przewodnik dla programistów Pythona", Helion 2014
6. J. Majewski, Piotr Zbysiński, "Układy FPGA w przykładach", BTC 2007
Additional
1. W. Jendernalik, G. Blakiewicz, A. Handkiewicz, M. Melosik "Analogue CMOS ASICS in image processing systems", Metrology and Measurement Systems 20 (4), 613-622
2. A. Handkiewicz, S. Szczesny, M. Naumowicz, P. Katarzyński, M. Melosik, "SI-Studio, a layout generator of current mode circuits" Expert Systems with Applications 42 (6), 3205-3218

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	44	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	31	1,00