COURSE DESCRIPTION CARD - SYLLABUS

Course name
Power electronics and microprocessor technique [N1Energ2>EiTM2]

Course

Field of study
Power Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
10

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Knowledge - Knowledge in mathematics, computer science and electronics at the level of the second year of first-cycle studies. Skills - The ability to effectively self-study in a field related to the chosen field of study; ability to make the right decisions when solving simple tasks and formulating problems in the field of widely understood electrical engineering. Competences - The student is aware of expanding their competences, shows readiness to work in a team, the ability to comply with the rules in force during lecture and laboratory classes.

Course objective

Familiarizing with the architecture and programming principles of microprocessor systems and the principles of their cooperation with external devices - at the basic level.

Course-related learning outcomes

Knowledge:
1. Has advanced knowledge in mathematics, including knowledge of algebra, analysis, probability and elements of analytical geometry, including mathematical methods and numerical methods necessary to:
1) describe and analyze the operation of electrical, mechanical, analog and digital components and

systems, and also basic physical phenomena occurring in them; 2) description and analysis of energy systems operation; 3) mathematical description of physical and chemical processes, including continuous and discrete energy processes.
2. Has knowledge of the basics of telecommunications, analog and digital data transmission in wired and wireless channels; knows the areas of their application in the field of energy.
3. Has ordered knowledge of the theory of electrical, electronic and power electronic circuits, as well as the theory of signals and methods of their processing; knows and understands the connections between theoretical issues and real objects.

Skills:
1. Potrafi pozyskiwać informacje z literatury, baz danych i innych źródeł; potrafi integrować uzyskane informacje, dokonywać ich interpretacji, a także wnioskować oraz formułować i uzasadniać opinie.
2. Potrafi pracować indywidualnie i w zespole; umie oszacować czas potrzebny na realizację zleconego zadania; potrafi opracować i zrealizować harmonogram prac zapewniający dotrzymanie terminów.
3. Potrafi wykorzystać poznane metody analityczne, symulacyjne i eksperymentalne oraz modele matematyczne, a także symulacje komputerowe do analizy i oceny działania elementów i układów energetycznych.
4. Potrafi planować i przeprowadzać eksperymenty w tym pomiary i symulacje komputerowe oraz skonstruować algorytm i posłużyć się właściwie dobranymi środowiskami programistycznymi, symulatorami oraz narzędziami komputerowo wspomaganego projektowania do symulacji, projektowania i weryfikacji elementów i układów energetycznych oraz prostych systemów elektronicznych i automatyki.
5. Potrafi projektować proste układy i systemy energetyczne do różnych zastosowań i dokonać wstępnej oceny ekonomicznej proponowanych rozwiązań i podejmowanych działań inżynierskich.

Social competences:
1. Is ready to think and act in an entrepreneurial manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
Assessment of knowledge and skills demonstrated during the written test-problem exam - based on the number of points obtained.
Laboratory
1. Continuous assessment, rewarding the increase in the ability to use known principles and methods,
2. Assessment of knowledge and skills related to the exercise, evaluation of the exercise report.
Getting extra points for activity during classes, especially for:
- proposing to discuss additional aspects of the issue,
- effectiveness of applying the acquired knowledge while solving a given problem,
- ability to work within a team that practically performs a specific task in a laboratory,
- comments related to the improvement of teaching materials,
- continuous assessment, rewarding activity and substantive content of the statement.

Programme content

The module program covers the following topics:
1/ basics of digital technology,
2/ microprocessor (uP) and microcontroller (uC),
3/ MCS51(R) family microcontrollers from INTEL,
4/ microcontrollers derived from the MCS51 family,
5/ microcontrollers with ARM core,
6/ digital signal processors (DSP),
7/ evaluation tools.

Course topics

The lecture program covers the following topics:
1/ arithmetic and logical operations,
2/ logic gates and digital functional blocks,

3/ von Neumann architecture of microprocessor systems,
4/ architecture and list of uC commands of the MCS51(R) family,
5/ architecture and list of uC instructions of the ADuC7000 family from Analog Devices,
6/ uC architecture of the SAB80C500 family by INFINEON,
7/ HARVARD architecture of microprocessor systems,
8/ architecture and instruction list of the ADSP-21000 family of signal processors from Analog Devices.

The laboratory program covers the following topics:
1/ functions and rules of use of hardware and software development tools,
2/ basic principles of uP and uC programming - in ASSEMBLER and C/C++ language,
3/ real-time data processing - basic rules,
4/ digital filtering algorithms.

Teaching methods

1. Lecture with multimedia presentation (diagrams, formulas, definitions, etc.) supplemented by the content of the board.
2. Laboratory exercises: multimedia presentation, presentation illustrated with examples given on a blackboard, and performance of tasks given by the teacher - practical exercises.

Bibliography

Basic:
1. T. Starecki, Mikrokontrolery 8051 w praktyce, Wydawnictwo BTC, W-wa, 2002.
2. P. Hadam, Projektowanie systemów mikroprocesorowych, Wydawnictwo BTC, W-wa, 2004.
3. J. Doliński, Mikrokontrolery AVR w praktyce", Wyd. BTC, W-wa 2003.
4. R. G. Lyons, Wprowadzenie do cyfrowego przetwarzania sygnałów, Wyd. II, WKŁ, W-wa, 2010.
5. A. Dąbrowski, Przetwarzanie sygnałów przy użyciu procesorów sygnałowych, Wydawnictwo Politechniki Poznańskiej, Poznań, 2000.

Additional:
1. T.P. Zieliński, Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, Wyd. II, WKŁ, W-wa, 2014.
2. Technical documentation of microprocessors/microcontrollers and their application notes as well as educational materials - available on selected company websites.

Breakdown of average student's workload

	Hours	ECTS
Total workload	107	4,00
Classes requiring direct contact with the teacher	32	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	2,50