COURSE DESCRIPTION CARD - SYLLABUS

Course name
Embedded systems [S2EiT2E-TIT>SW]

Course

Field of study
Electronics and Telecommunications

Year/Semester
2/3

Area of study (specialization)
Information and Communication Technologies

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

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

Has programming knowledge in C/C++ languages. Has basic knowledge of microcontroller programming. Has basic knowledge of regulators and control algorithms. Can obtain information from literature and databases and other sources in Polish or English. Can use high level programming languages C/C++. Can analyze code in low-level languages. Can understand the limitations of knowledge and skills and the need for further training. Can participate in team projects.

Course objective

Get to know the design and basic features of embedded systems. Getting to know three basic realizations of embedded systems (e.g. SoC systems, PLCs, programmable systems). Introduction to the group of communication interfaces created for embedded systems. Familiarization with wireless identification technology (e.g. RFID).

Course-related learning outcomes

Knowledge:
Has knowledge about the construction and programming of microcontrollers.
Has knowledge about the operation of embedded systems.

Has knowledge about the construction and parameters of the communication network designed to operate sensors and detectors.
Has knowledge about wireless identification standards.

Skills:
Has the ability to analyze and design an embedded system using a SoC system (e.g. ARM) taking into account the imposed requirements. Is able to run a microprocessor-based SoC system (e.g. ARM) using compilation tools and supplied software libraries.
Can determine the requirements for the communication link depending on the type and importance of the data transmitted between the sensors/detectors and the management system.

Social competences:
Is open to continuous learning opportunities and understands the need to improve professional competence.
Has basic knowledge necessary to understand non-technical conditions of engineering activity; he knows the basic principles of occupational safety and health.
Has a sense of responsibility for designed electronic and telecommunication systems.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture: written exam
The written exam is a set of 6-10 problematic questions, for which desciptory answer is expected.
Each answer is ranked from 0 to 1 points (fractinal points also possible).
The exam is passed if the number of attained points is greater than 50%. More than 50% indicates the knowledge above of satisfactory level.
The course issues of which the questions are prepared, are sent to students by e-mail using the university"s e-mail system.
Laboratories:
Activity during classes, reports from particular activities. Laboratory project realized individually/in small groups.

Programme content

Embedded systems - introduction to the subject matter, historical background, definitions of basic concepts.
Microcntrollers - construction, functionality, requirements related to the construction of microcontrollers.
Ways of programming microcontrollers (ladder logic, function block diagram, structural text, instruction list, sequential sequence of blocks. Systems supporting programming and visualization.
Embedded systems using ARM microcontrollers. CPU specification, SoC systems.
Sensors, detectors and complex measrement systems.
FPGA programmable systems in embedded systems - application areas, automotive industry, aerospace medical industry (radiation resistance), hardware data encryption, radar applications, software processors for SoC systems in FPGA systems. Wired communication standards in embedded systems - SPI, I2C, 1Wire, CAN, Bluetooth, WiFi. Wireless identification.

Course topics

none

Teaching methods

Lecture: multimedia presentation with examples presented on the blackboard.
Laboratories: implementation of projects on computers (individual or in groups of few people).
Examples illustrated on screen/blackboard.

Bibliography

Basic

Urbaniak A., Podstawy automatyki, Wydawnictwo PP, Poznań 2004 (wydanie II)
Additional
Kasprzyk J. Programowanie Sterowników PLC, Warszawa 2007, WNT.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	70	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00