COURSE DESCRIPTION CARD - SYLLABUS

Course name
Programming of mechatronic systems [S1Eltech2>PO1-PSM]

Course

Field of study
Electrical Engineering

Year/Semester
3/5

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
0

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of procedural and object-oriented programming. Basic knowledge of electronics and digital circuits. Programming in a high-level language, e.g. C++, C#, Java. He/she is aware of the necessity to broaden his/her competences, willingness to cooperate within a team.

Course objective

Introduction to modern methods of developing software for microcontrollers using the ESP32 platform as an example. Learning about the principle of operation of the mechatronic devices in question. Designing the user interface of microcontroller software. Creating applications using the Internet, cooperating with electromechanical devices, wired and wireless communication, collecting and processing information from sensors.

Course-related learning outcomes

Knowledge:
He/she knows and understands, to an advanced level, selected issues of mathematics, numerical methods and physics indispensable for describing and analysing the operation of electrical components, systems and systems and the phenomena occurring in them.

He/she knows and understands basic mechanics, including graphical description of structures; he/she has a structured knowledge of mechatronics and its importance in industry.
Has advanced knowledge of tools for computer-aided analysis and design of electrical equipment, systems and installations.

Skills:
Be able, using appropriately selected methods and tools, to critically analyse and evaluate the performance of existing electrical equipment, circuits and systems.
Be able to use known analytical, simulation and experimental methods to design, analyse and evaluate the performance of electrical components and systems.
Be able to apply appropriate methods and tools, including advanced information and communication techniques and computer-aided systems, to solve complex and non-routine electrical engineering problems.

Social competences:
He/she is ready to improve professional, personal and social competences; is aware that knowledge and skills in the field of electrical engineering evolve rapidly.
He/she is ready to make use of scientific achievements and to consult experts in the field of electrical engineering in order to effectively solve engineering tasks beyond his/her own competence.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory exercises:
- testing and bonus of knowledge necessary to carry out the problems set in a given laboratory task area,
- in-class assessment - rewarding the increment of skills in using the learned principles and methods,
- evaluation of knowledge and skills connected with the realisation of the exercise task, evaluation of the report from the performed exercise.

Obtaining additional points for activity during classes, especially for:
- proposing to discuss additional aspects of the issue,
- effectiveness of the application of the acquired knowledge in solving a given problem,
- the ability to cooperate within a team practically realising a detailed task in the laboratory,
- comments related to the improvement of the didactic process,
- aesthetic care of the reports and assignments prepared - as part of self-study.

Programme content

The aim of the course is to acquire skills in programming mechtronic systems using the ESP32 microcontroller. The laboratory exercises carried out will use basic sensors and actuators of mechatronics. The result will be the development of a mechtronic system and the presentation of measurement results from the sensors.

Course topics

Platform construction: Arduino and compatible, STM, ESP32, etc. Construction of peripheral devices. Arduino IDE development environment, Processing programming language (conditional instructions, loops, object-oriented programming, custom modules). Wired (Onewire, I2C) and wireless (bluetooth, Wi-Fi) communication with devices. Extension of functionality using modules (Shields). Collection and processing of information from sensors (distance, position, acceleration, inclination, humidity and temperature, magnetic field). Interaction of the mechatronic system with the device using the Internet. Design of mechatronic systems and their software.

Teaching methods

Laboratory exercises: multimedia presentation illustrated with examples given on the blackboard and performance of tasks given by the instructor - practical exercises.

Bibliography

Basic:

1. S. Monk, Arduino dla początkujących. Kolejny krok. Helion 2015.
2. E. Williams, Programowanie układów AVR dla praktyków. Helion 2014.
3. S. Monk, Arduino i Android. Niesamowite projekty. Szalony geniusz. Helion 2014.
4. E. Burnettte, Hello, Android. Programowanie na platformę Google dla urządzeń mobilnych. Helion, 2011.

Additional:
1. R. Anderson, D. Cervo, Arduino dla zaawansowanych, Helion 2014.
2. M. Riley, Inteligentny dom. Automatyzacja mieszkania za pomocą platformy Arduino, systemu Android i zwykłego komputera. Helion 2013.
3. M. P. Clark, Wireless Access Networks: Fixed Wireless Access and WLL Networks Design and Operation, Wiley, 2000.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	30	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,50