COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mobile and cloud technologies

Course

Field of study
automatic control and robotics

Year/Semester
1/1

Area of study (specialization)
intelligent control systems

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	30	
Tutorials	Projects/seminars	

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Knowledge: Students starting this subject should have knowledge of automation and robotics corresponding to level 6 of the Polish Qualifications Framework, in particular knowledge of programming and data structures.

Skills: The student should have the ability to solve and implement programming problems in the field of automation and robotics, as well as the ability to obtain information from specified sources. Student should also understand the need to expand his competences and be ready to cooperate in a team.

Social competences: In addition, in the area of social competences, the student must exhibit such qualities as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, respect for other people.

Course objective

1. Providing students with knowledge of remote systems, distributed real-time systems and network techniques using mobile and cloud technologies.

2. Developing students' skills to develop a control and measurement system as well as its implementation and launching in a programming environment using mobile and cloud technologies.

3. Developing in students the importance of knowledge of technology and recommendations related to the construction and programming of a remote control and measurement system using mobile and cloud technologies.

Course-related learning outcomes

Knowledge

1. Student has specialist knowledge in the field of remote and distributed systems, real time systems and network techniques; [K2_W3]

2. has knowledge of development trends and the most important new achievements in the field of automation and robotics and related scientific disciplines [K2_W12]

Skills

1. Student is able to use information and communication techniques; [K2_U8]

2. is able to critically assess and select the appropriate methods and tools to solve the task in the field of automation and robotics; is able to use innovative and unconventional tools in the field of automation and robotics; [K2_U22]

3. is able to construct an algorithm for solving a complex and unusual engineering task and a simple research problem as well as implement, test and run it in a selected programming environment for selected operating systems; [K2_U25]

4. is able to construct an algorithm for the solution of a complex measuring and computing-control task as well as implement, test and run it in a selected programming environment on a microprocessor platform; [K2_U26]

Social competences

1. The student is aware of the need for a professional approach to technical issues, meticulous familiarization with the documentation and environmental conditions in which devices and their components can function; [K2_K4]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
Formative assessment:

a) in the scope of lectures:

based on homework assignments and answers to questions about the material discussed in previous lectures,

b) in the scope of the laboratory:

based on assessment of knowledge and understanding of current issues presented in the course of the subject.

Summative rating:

a) in the scope of lectures, verification of assumed learning outcomes is carried out by:

i. assessment of knowledge and skills demonstrated during the written exam in the form of a test

ii. discussion of exam results.

b) in the scope of laboratory, verification of assumed learning outcomes is carried out by:

i. assessment of student's preparation for individual classes,

ii. continuous assessment, during each class (oral answers) - rewarding the increase in the ability to use known principles and methods,

iii. assessment of tasks prepared partly during classes and also after their completion.

Obtaining additional points for activity during classes, in particular for:

i. independent construction of a distributed system consisting of a more than10 of electronic modules with microprocessors cooperating with the database control and measurement system developed during the classes, and preparation of documentation,

ii. effectiveness of applying the acquired knowledge while solving a given problem

iii. comments related to the improvement of teaching materials.

Programme content

The lecture program includes the following topics:

1. Types of cloud computing models and their application. Communication protocols used in remote systems including real-time communication. Types of data exchange formats. JSON data description format.

2. (SQL) Database design for control and measurement systems (SQL, NoSQL). Discussion of the relations: one to one, one to many, many to many. Types of MySQL, SQLite and PostgreSQL databases.

3. (SQL) Operations performed on databases - CRUD. Collecting and searching data from measuring systems.

4. (SQL / Yii) Object-relational mapping taking into account the model-view-controller approach. Preparation of data from the control and measurement system for model, view and management.

5. (Yii) Controllers describing the behavior of mobile applications. Overview of creating controllers in the Yii PHP Framework.

6. (Yii) Models mapping database tables. Overview of creating models in the Yii PHP Framework.

7. (Yii) Views presenting data from models describing the control and measurement system. Overview of creating views in the Yii PHP Framework.

8. (Yii) Forms and filters used to parameterize the control and measurement system. Overview of creating forms and filters in the Yii PHP Framework.

9. (Android) Use of mobile device sensors (e.g. accelerometer and vision sensor).

10. (Android) Communication of the mobile application with the database in real time. Performing CRUD operations on the database.

11. (Android) The use of a mobile device (smartphone) as a measuring platform. Transferring data from sensors to the database. Visualization of collected data.

12. (Android) The use of a mobile device (smartphone) as a control and measurement platform. The use of a mobile device in upcycling (forms of recycling of waste). Processing of sensor data and a database on a mobile device - processing on the edge of the cloud.

13. Distributed control and measurement system.

14. Security of cloud systems. Overview of the TSL protocol.

15. Werable systems.

The program of laboratory classes includes:

1. Describing various data structures using JSON. Validation of obtained results in the parser.

2. (SQL) Computer-designed SQL database for the control and measurement system consisting of several different microprocessor devices and mobile devices.

3. (SQL) Performing CRUD operations on the sample database. Performing complex operations with combining query results.

4. (SQL / Yii) Generations of the application skeleton based on a database. Gii generator. Yii configuration.

5. (Yii) Controllers describing the behavior of the application. Implementation using Yii.

6. (Yii) Models mapping database tables. Implementation using Yii.

7. (Yii) Views describing the appearance of the application. Implementation using Yii.

8. (Yii) Forms and data filtration in models and controllers. The correctness of the data entered in the forms.

9. (Android) Support for available sensors of the mobile device. Sampling and processing of digital data including the sampling period.

10. (Android) Data acquisition from available sensors of a mobile device. Data sampling and database upload. Development of a measuring system.

11. (Android) Communication with the database. Searching, removing, adding, modifying system devices with the use of codes. Creation of measurement series.

12. (Android) Analysis of data from available sensors and data from a database on a mobile device. Development of the control and measurement system.

13. (Android) Real-time user behavior analysis based on data from available sensors and archive data from a database on a mobile device.

14. Security analysis of the developed distributed system using network analyzers.

15. Analysis of the efficiency of the distributed control and measurement system.

Teaching methods

1. Lecture: presentation of creating a control and measurement system based on mobile and cloud technologies, multimedia presentation illustrated with literature data and sample projects

2. Laboratory classes: the use of a database system, framework for Internet applications, environments for mobile and cloud applications

Bibliography

Basic

1. Tworzenie aplikacji z Yii : receptury, Makarov, 2014

2. PHP i MySQL : dynamiczne strony WWW, Larry Ullman, 2019

3. PHP, MySQL i JavaScript : wprowadzenie, Robin Nixon, 2019

4. Programowanie w języku Kotlin : the Big Nerd Ranch guide, Josh Skeen, David Greenhalgh, 2019

5. Android Studio : tworzenie aplikacji mobilnych, Marcin Płonkowski, 2018

6. Przewodnik po Yii 2.0 (online) https://www.yiiframework.com/doc/guide/2.0/pl [stan na 2020-04]

Additional

1. Embedded programming with Android : bringing up an Android system from scratch, Roger Ye, 2016

2. Documentation Oracle MySQL (online) https://docs.oracle.com/cd/E17952_01/index.html [stan na 2020-04]

3. Documentation MySQL (online) https://dev.mysql.com/doc/ [stan na 2020-04]

4. Documentation PHP (online) https://www.php.net/docs.php [stan na 2020-04]

5. Documentation Android (online) https://developer.android.com/docs [stan na 2020-04]

6. Wearable System for Monitoring of Oxygen Concentration in Breath Based on Optical Sensor, 2015, https://doi.org/10.1109/JSEN.2015.2410789

7. Sensors in Mobile Devices Knowledge Base, 2020, https://doi.org/10.1109/LSENS.2020.2975161

8. An Automatic Site Survey Approach for Indoor Localization Using a Smartphone, 2020, https://doi.org/10.1109/TASE.2019.2918030

9. Łuczak D., „Remote laboratory with WEB interface", Computer Applications in Electrical Engineering, Vol. 9, str. 257-268, Poznań, 2011, ISSN 1508-4248

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4,0
Classes requiring direct contact with the teacher	60	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for exam, task preparation) [1]	60	2,0

[1] delete or add other activities as appropriate