COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electrical and computer systems in mechatronics

Course

Field of study
Electrical Engineering
Area of study (specialization)
Energy conversion and control systems in mechatronics
Level of study
First-cycle studies
Form of study
full-time

Year/Semester
4/7
Profile of study
general academic
Course offered in
polish
Requirements
elective

Number of hours

Lecture
30
Laboratory classes
15
Other (e.g. online)
Tutorials
Projects/seminars
15

Number of credit points

5

Lecturers

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

Knowledge - Student has basic knowledge of object-oriented programming, relational databases. Algorithms and data structures. Programming in a high-level language, e.g. C ++, Java. Basic knowledge of electronics and digital circuits.

Student knows the structure and operation of the frequency converter. He knows the types, basic characteristics and control algorithms of electrical machines.

Skills - The skill of effective self-education in a field related to the chosen major of studies, skill to make the right decisions when solving simple tasks and formulating problems in the field of widely understood electrical engineering.

Competences - Student is aware of the widening his competence, demonstrate a willingness to work in a team, posse a skill to comply with the rules in force on the lecture and laboratory, have a skill to comply with the rules in force during lecture, project and laboratory classes

Course objective

Introduction to the basic information about the platform of the advanced .NET visual programming environment. Acquiring the skills to design and implement window applications in C #. Testing created applications.

Acquainting with contemporary methods of creating software for mobile devices working under the control of the Android operating system. Understanding the operation principles of the devices and program algorithms.

Gaining knowledge about the principle of operation, construction and parameterization of converter drive systems and practical skills related to the selection, configuration and commissioning of drive applications used in industrial automation systems.

Course-related learning outcomes

Knowledge

1. The student has structured knowledge in the field of metrology and the properties and operation of modern measuring equipment.

2. The student has ordered and theoretically founded general knowledge of key computer science topics necessary for an electrical engineer.

3. The student has ordered and theoretically founded knowledge of construction, principles of operation and operation of transformers, electrical machines and technical systems, knows the processes occurring in their life cycle.

4. Has knowledge of the construction, operating principles, configuration and programming standards of modern drive systems used in industrial applications..

Skills

1. The student is able to design and implement, in accordance with the given specification and using the right methods, techniques, tools and materials, typical electrical systems for various applications.

2. The student is able to formulate an algorithm, uses programming languages and IT tools used in electrical engineering.

3. Student is skiled to use properly selected IT tools to perform simulations, design and analysis of electrical systems and drive systems.

4. The student is able to correctly configure the frequency converter to implement a given drive application. Is able to create and implement control algorithms using PLC controllers.

Social competences

1. The student understands the importance of knowledge in solving problems and raising professional,

personal and social competences.
2. The student is aware that in technology knowledge and skills quickly become obsolete.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
Lecture:

-assessment of knowledge and skills by the completion of a written test (solving problem),
-continuous evaluation for each lecture (rewarding activity and quality of the expression).

Laboratory:
- end test and rewarding of knowledge necessary to carry out subsequent tasks in class,

- continuous assessment of the student's activity and the increase of his knowledge and skills, as well as social competences related to team work,
- assessment of knowledge and skills related to the implementation of tasks, assessment of reports on the completed task.

Programme content

Introduction to the .NET platform. Presentation of the .NET platform structure. Types of the .NET Framework. Overview of programming languages for the .NET platform. Characteristics of the Microsoft Visual Studio Suite. Presentation of the programming environment. Editing forms. Starting the application. Creating a sample application for Windows. CLR (Common Language Runtime) environment. Basic CLR functions and services. Memory and resource management. Basics of programming in C #. Overview of language syntax: instructions, variables, operators and data types. Access and file operations. Rules for creating classes, methods, constructors and objects of these classes. The use of tables. Review of the basic tools contained in the SDK (Software Development Kit). Advanced C # elements. Preprocessor directives. Event handling. Error handling with exceptions. String operations. Using Windows interface components. Windows Forms Library. Usage of namespace, initial form and its properties. Adding controls, specifying their properties and defining event handling functions. Mouse and keyboard support, menu, status bar, toolbar. Basic controls: buttons, text boxes, drop-down lists, etc. Creating charts. Dialogs: standard and custom dialogs. Bookmarks. GDI + graphical environment. Acquiring graphics object. Graphic tools: fonts, brush pens. Drawing and filling functions. Image processing. Pixel processing, image processing.

Creating a mobile application in J2ME. User interface design. Two-dimensional graphics and multimedia. Reading data and monitoring the COM port. Storage of data on mobile devices, including GIS geographic data. Parsing data from a GPS receiver. Download and presentation of data from the SQL database. Three-dimensional OpenGL graphics. Creating an application adapted to various devices.

PLC structure, programming languages and programming environments. The structure and operation of the frequency converter. Methods and algorithms for controlling basic types of electric machines

implemented in modern frequency converters. Group work of converter drives on a common DC bus. Servo drives - history, current status, block structure, control methods, PLCopen Motion Control function blocks.

Teaching methods

Lectures - presentation of issues using multimedia, illustrated with examples given on a board, discussion of problem issues.

Laboratory and project exercises: multimedia presentation, illustrated with examples given on the board, and implementation of tasks given by the teacher - practical exercises. Laboratory exercises on the parameterization and programming of industrial propulsion systems.

Bibliography

Basic

11. Chappell D.: Zrozumieć platformę .NET, Helion, 2007

2. Duffy J.: .NET Framework 2.0, Zaawansowane programowanie, Helion, 2007

3. Michelsen K.: Język C#. Szkoła programowania, Helion, 2007

4. Griffiths Ian, Adams Matthew, Liberty Jesse, C#. Programowanie, Helion, 2012

5. Andrew Troelsen, Język C# 2010 i platforma .NET 4.0, Wydawnictwo Naukowe PWN, 2011

6. Jacek Matulewski, Dawid Borycki, Grzegorz Krause, Maciej Grabek, Maciej Pakulski, Mateusz Warczak, Jacek Lewan-dowski, Sławomir Orłowski, Visual Studio 2010 dla programistów C#, Helion, 2011

7. Dokumentacja elektroniczna systemu programowania Visual Studio.NET

8. Hello, Andriod. Programowanie na platformę Google dla urządzeń mobilnych.Helion, 2011.

9. T. Imieliński, H. F. Korth, Mobile Computing. KLUWER, 1996.

10. J. Januszewski, Systemy satelitarne GPS, Galileo i inne, PWN, 2010.

11. S. Shekhar, S. Chawla, Spatial database: A Tour. Prentice Hall, 2003.

Additional

1. Burton K.: .NET CLR. Ksieka eksperta, Helion, 2002

2. Liberty J.: C# 2005. Wprowadzenie, O'Reilly, 2007

3. Hejlsberg Anders, Torgersen Mads, Wiltamuth Scott, Golde Peter, Język C#. Programowanie, Helion, 2010

4. Mike Snell, Lars Powers, Microsoft Visual Studio 2010. Księga eksperta, Helion 2011

5. M. P. Clark, Wireless Access Networks: Fixed Wireless Access and WLL Networks Design and Operation, Wiley, 2000.

6. W. Hołubowicz, P. Płóciennik, Cyfrowe Systemy Telefonii Komórkowej GSM 900, GSM 1800, UMTS, 1998.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	5,0
Classes requiring direct contact with the teacher	100	4,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	50	2,0

[1] delete or add other activities as appropriate