COURSE DESCRIPTION CARD - SYLLABUS

Course name
Application of microcontrollers and PLC controllers in measurements

Course

Field of study
Electrical Engineering

Year/Semester
2/4

Area of study (specialization)
Systemy pomiarowe w przemyśle i inżynierii biomedycznej

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
0	20	0
Tutorials	**Projects/seminars**	
0	20	

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

Basic knowledge in the scope of electrotechnics, metrology and computer science. Basic knowledge in the scope of electronics, including knowledge of electronic analog and digital systems. Basis of programming languages Ability of the efficient self-education in the area of programming of microcontrollers and PLC controllers Awareness of the necessity of competence broadening and ability to show readiness to work as a team.

Course objective

Knowledge of programming bases of the selected PLC controlles and possibilities of the modern 8-bit microcontrollers for measurement techniques. Knowledge of interdisiplinary achievements in the area of industrial applications of ARM microcontrollers and PLC controllers

Course-related learning outcomes

Knowledge

1. Ability to describe the application range and potential of the modern measuring systems.

2. Ability to explain the principles and techniques of the acquisition and processing measuring signals in the present industrial applications.

Skills

1. Ability to design creatively the modern measurement systems, using possibilities offered by available techniques, taking into account the limitations of the present status of knowledge and technique.

2. Ability to work independently and as a team in the design and construction companies, research laboratories and industrial centers.

Social competences

1. Understanding a need of the broad popularization of the knowledge in the area of simple and complex measurement systems used in industry and biomedical engineering.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory exercises:

Initial tests and awarding the knowledge needed to solve problems given in the scope of laboratory tasks, continuous evaluation, at all classes,and awarding the skill increase in the use of the known principles and methods, evaluation of the knowledge and skills related to a given measuring the report prepared.

Projects:

Continuous evaluation, at all classes,and awarding the skill increase in the use of the known principles and methods, evaluation of the knowledge and skills related to a given group or independent project and evaluation of the prepared report.

Programme content

Laboratory:

1. Application of microcontrollers in measurement systems.

2. Internal architecture of ARM microcontrollers.

3. Internal I/O devices of microcontrollers.

4. Configuration of a microprocressor system.

5. Measurement applications with the use of internal I/O sources.

6. Cooperation between a microcontrller with external devices.

7. Languages of microcontroller programming: ASEMBLER and "C".

8. Presentation of starting means, programming means for cooperation with microcontrollers,and network sources concerning the problems with microcontrollers.

Project:

1. Construction of measuring systems with the use of PLC controllers.

2. Languages of PLC controllers programming.

3. Bases of programming, operations on data, signal processing, controllers communications.

4. Examples of measurement systems configurations with a PLC controller.

Teaching methods

Laboratory: Multimedia presentations expanded by examples shown on a board and realization of experiments

Project:Multimedia presentations expanded by examples shown on a board and realization of project.

Bibliography

Basic

1. R. Sałat, K. Korpysz, P. Obstawski, Wstęp do programowania sterowników PLC, WKŁ, Warszawa 2010.

2. J. Kasprzyk, Programowanie sterowników przemysłowych, WNT, Warszawa 2006.

3. A. Król, J. Moczko-Król, S5/S7 Windows Programowanie i symulacja sterowników PLC firmy Siemens, Nakom, Poznań 2002.

4. R. Baranowski, Mikrokontrolery AVR ATmega w praktyce, Wyd. BTC, Warszawa 2005

5. T. Zieliński, Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, WKŁ, Warszawa 2007

6. Hulewicz A., Sterowniki PLC w systemach zarządzania inteligentnym budynkiem, Przegląd Elektrotechniczny, nr 1a/2013, s. 108-110

7. Hulewicz A., Krawiecki Z., Sterownik PLC i panel operatorski w układzie automatyki inteligentnego budynku, , Poznan University of Technology Academic Journals, Electrical Engineering, No 92, Poznań 2017, s. 345-3541. A. Hulewicz, Z. Krawiecki, Sterownik PLC i panel operatorski w układzie automatyki inteligentnego budynku, , Poznan University of Technology Academic Journals, Electrical Engineering, No 92, Poznań 2017, s. 345-354.

8. T. Gilewski., Podstawy programowania sterowników SIMATIC S7 1200 w języku LAD, BTC, Warszawa 2017.

Additional

1. U. Tietze, Ch. Schenck, Układy półprzewodnikowe, WNT, Warszawa 1993.

2. J. Bogusz, Lokalne interfejsy szeregowe w systemach cyfrowych, Wyd. BTC, Warszawa 2004.

3. J. Szabatin, Podstawy teorii sygnałów, wyd. 3, WKŁ, Warszawa 2000

Breakdown of average student's workload

	Hours	ECTS
Total workload	130	5,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes~~/tutorials~~, preparation for tests~~/exam~~, project preparation) [1]	85	3,0

[1] delete or add other activities as appropriate