STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Distributed nets		**1010331271010335158**
Field of study: **Automatic Control and Robotics**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **4 / 7**
Elective path/specialty: **Robotics**	Subject offered in: **Polish**	Course (compulsory, elective): **elective**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **30** Classes: **-** Laboratory: **30** Project/seminars: **-**		No. of credits: **5**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art		ECTS distribution (number and %**)**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	K_W17: He knows the basic criteria and methods of synthesis tuning regulators and identification of control objects. K_W18: They know and understand the construction and operation of programmable industrial controllers; He knows and understands the basic principle of the communication interfaces used in industrial control systems. K_W22: He has an elementary knowledge of the life cycle of the equipment and selected security systems used in automation and robotics.
2	**Skills**	K_U10: Can construct algorithm for solving a simple engineering task. K_U14: Can design a simple control systems for processes with one entrance and one exit. K_U18: Can choose parameters and settings of the basic industrial controller and configure and program an industrial PLC.
3	**Social competencies**	K_K03: He has a sense of responsibility for own work and a willingness to comply with the principles of teamwork and responsibility for jointly implemented tasks; able to manage a small team, set goals and define priorities leading up to the task.

Assumptions and objectives of the course:

The aim of the course is to learn the basics of theoretical principles and typical applications of communication networks and distributed control systems. Student after completion of education should be able to: select and configure the appropriate network communication technology to a particular object, select the modules of a distributed system, write a high-level language application that supports selected interfaces, to develop a microprocessor-based communication module for the selected protocols.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Know and understand the construction and operation of programmable industrial controllers as well as their analog and digital peripherals; He knows and understands the basic principle of the communication interfaces used in industrial control systems - [K_W18]

2. He is focuses on the current status and recent trends in the area of development of automation and robotics. - [K_W21]

3. He ordered knowledge of computer architectures, systems, and computer networks and operating systems including real time operating systems. - [K_W13]

Skills:

1. Able to design and implement a local telecommunication network (including industrial) for the selection and configuration of components and communication devices (wired and wireless). - [K_U13]

2. Can choose parameters and settings of the basic industrial controller and configure and program an industrial PLC. - [K_U18]

3. He can choose the type and parameters of the executive, the measuring system, control unit and peripheral modules and communication for the selected application and make their integration in the form of output measurement and control system. - [K_U17]

4. He can construct a simple task solution algorithm engineering, and implement, test, and run it in your chosen development environment on a PC for selected operating systems. - [K_U10]

Social competencies:

1. He has awareness of the importance and understand the non-technical aspects and effects of engineering activities including ts impact on the environment and the related responsibility for the decisions taken. - [K_K02]

Assessment methods of study outcomes

Lecture: assessment of knowledge and skills shown on completing the final test.

Laboratories: current control of knowledge necessary for the accomplishment of the problems in the area of tasks in the laboratory, rewarding gain skills they met the principles and methods, assessment of ability to use the acquired knowledge and skills to solve complex problems.

Course description

Implementation of the typical structures of automation. Systems PLC communication. Analysis of local networks in a layered diagram of the ISO-OSI. Examples of the construction, operation and use of selected local networks: Modbus, CAN, Profibus, HART, Ethernet Powerlink, Profinet, KNX. Description of operation and use of the structure of industrial communication through an extensive network. Functional Description Ethernet. Discussion of protocols: IP, TCP, UDP. Static and dynamic addressing devices on the WAN. The use of selected protocols (DNS, SMTP, SFTP, HTTP, SSH) for remote management operation of the control system. Distributed control systems (DCS) in a continuous process control systems. The structure of DCS system: Object equipment, wiring, actuators, process stations, operator stations and engineering. Control algorithms of continuous processes - modification of an elementary PID algorithm, the specifics of distributed control. Additional features of the DCS: tuning regulators through self-tuning, diagnostics system. Laboratory illustrate selected topics discussed in the lectures.

Basic bibliography:

1. Justin Hutchens, Kali Linux Network Scanning Cookbook, 2014

2. Raimond Pigan, Mark Metter, Automating with PROFINET: Industrial Communication Based on Industrial Ethernet, 2nd Edition, 2015

3. Ilya Grigorik, High Performance Browser Networking, 2013

Additional bibliography:

1. Technical documentation of manufacturers of PLCs and industrial controls

2. Data communication of digital measurement and control - Part 1: The set of profiles for the production of continuous and discrete associated with the local bus used in industrial control systems PN-EN 61784-1, Polish Committee for Standardization, 2005

3. Bruce Hartpence, Packet Guide to Routing and Switching, 2011

Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Laboratory exercises	30
3. Consultations and examination	5
4. Preparation to laboratory exercises and elaboration of reports	40
5. Preparation to tests and examination	20

Student's workload

Source of workload	hours	ECTS
Total workload	125	5
Contact hours	65	2
Practical activities	60	2