Bialystok University of Technology
Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Programming of autonomous robots**							Course code	**CP1S05001**
								Course type	**elective**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15		**30**					No. of ECTS credits	**4**
Entry requirements	Fundamentals of robotics, Python programming 1, Python programming 2								
Course objectives	Introduction to issues related to programming mobile robots. Acquainting with software systems used to implement basic tasks of mobile robots. Introduction to IT tools used in the control of mobile robots. Acquainting with the practical aspects of programming mobile robots.								
Course content	Lecture: Modeling of the kinematics of wheeled mobile robots. Control of mobile robots. Communication with sensors and actuators of mobile robots. Introduction to the ROS navigation stack. Visualization and programming of mobile robots in industrial tasks. Laboratory classes: Modeling of mobile robots using the URDF language. Visualization of a mobile robot in the RVIZ environment. Introduction to the basics of the ROS system: packages, nodes, topics, services, actions. Implementation of the ROS system node controlling a mobile robot in Python and C ++. Getting to know the configuration of the navigation stack of the ROS system for a mobile robot: move_base packages, local and global planners, AMCL package and gmapping.								
Teaching methods	Informative-problem lecture; Laboratory classes;								
Assessment method	Lecture: exam Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	
LO1	kinematics of wheel-driven mobile robots	CP1_W01 CP1_W02
LO2	principle of operation of mobile robot	CP1_W01 CP1_W02 CP1_W03 CP1_W07
LO3	software systems basics of programming and configuration of mobile robot navigation systems	CP1_W07 CP1_W08
	Skills: the graduate is able to	
LO4	develop a visualization model of a mobile robot	CP1_U01 CP1_U02 CP1_U06 CP1_U09
LO5	set up a navigation stack for a real mobile robot	CP1_U01 CP1_U02 CP1_U07 CP1_U08

LO6	apply the principles of occupational health and safety in laboratory classes	CP1_U13	
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed	
LO1	Lecture: exam;	W	
LO2	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W	L
LO3	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W	L
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
Student workload (in hours)		No. of hours	
Calculation	Lecture attendance	15	
	Laboratory classes attendance	30	
	Preparation for the lecture exam; participation in the exam	25	
	Preparation for laboratory classes	19	
	Preparation for laboratory classes completion	6	
	Participation in teacher-student sessions related to the module subject	5	
	TOTAL	100	
Quantitative indicators		Hours	ECTS
Student workload - activities that require direct teacher participation		52	2,1
Student workload - practical activities		60	2,4
Basic references	1. Hughes C., Hughes T., Programowanie robotów: sterowanie pracą robotów autonomicznych. Helion, Gliwice, 2017. 2. Gupta S., Autonomous robots and agents. Springer, 2007. 3. Fahimi F., Autonomous robots modeling, path planning, and control. Springer, 2009. 4. Klancar G., Zdesar A., Blazic S., Skrjanc I., Wheeled mobile robotics: from fundamentals towards autonomous systems. Butterworth-Heinemann 2017.		
Supplementary references	1. Valavanis K. P., Vachtsevanos G. J., Handbook of robotics. Springer-Verlag Gmbh, 2008. 2. Kaczmarek W., Panasiuk J., Borys S., Środowiska programowanie robotów. PWN, Warszawa, 2017. 3. Choset H. i inni, Principles of Robot Motion, The MIT Press, Londyn, 2005		
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme	
Author of the programme	dr inż. Adam Wolniakowski	2022-06-07	

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Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Applications of autonomous robots**							Course code	**CP1S05002**
								Course type	**elective**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15		**30**					No. of ECTS credits	**4**
Entry requirements	Fundamentals of robotics, Python programming 1, Python programming 2								
Course objectives	Introduction to issues related to the autonomy of mobile robots. Acquainting with the methods of autonomous location, mapping and navigation of mobile robots. Introduction to IT tools supporting autonomous solutions. Acquainting with practical methods of implementing autonomous systems. Introduction to the issues of cooperation of autonomous robots.								
Course content	Lecture: Modeling of wheeled mobile robots with the use of URDF and SDF languages. Introduction to modeling the kinematics and dynamics of mobile robots. Discussion of methods for determining the position and estimating parameters of the movement of mobile robots. AMCL algorithm. Methods of building a map of the environment (SLAM). Planning the trajectory of the movement of mobile robots with the use of global (nav_planner) and local (base_local_planner, Dwa_local_planner, teb_local_planner) planners. Modeling, visualization, simulation and programming of mobile robots in industrial tasks. Introduction to the issues of cooperation of autonomous robots. Laboratory classes: Modeling and simulation of wheeled autonomous mobile robots with the use of URDF and SDF languages as well as RViz and Gazebo tools. Introduction to the basics of ROS: packages, nodes, topics, services and actions. Introduction to the ros_control framework and Gazebo plugins in the simulation of mobile robots. Introduction to the Gazebo simulator API. The use of positioning systems to locate the robot in space on the example of the UWB system. Configuration of an autonomous navigation system for a real mobile robot with the use of move_base, amcl, gmapping packages. Work cell calibration. Implementation of the task of cooperation between robots.								
Teaching methods	Informative-problem lecture; Laboratory classes;								
Assessment method	Lecture: exam Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes								
Symbol of learning outcome	Learning outcomes							Reference to the learning outcomes for the field of study	

	Knowledge: the graduate knows and understands	
LO1	kinematics of wheeled mobile robots	CP1_W01 CP1_W02
LO2	principle of operation of location and navigation systems for mobile robots	CP1_W01 CP1_W02 CP1_W03 CP1_W07
LO3	basics of programming and configuration of autonomous control systems for mobile robots	CP1_W07 CP1_W08
	Skills: the graduate is able to	
LO4	develop a simulation model of an autonomous mobile robot	CP1_U01 CP1_U02 CP1_U06 CP1_U09
LO5	configure software for an autonomous mobile robot	CP1_U01 CP1_U02 CP1_U07 CP1_U08
LO6	apply principles of occupational health and safety in laboratory classes	CP1_U13

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L
LO2	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L
LO3	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L

Student workload (in hours)		No. of hours
Calculation	Lecture attendance	15
	Laboratory classes attendance	30
	Preparation for the lecture exam; participation in the exam	25
	Preparation for laboratory classes	19
	Preparation for laboratory classes completion	6
	Participation in teacher-student sessions related to the module subject	5
	TOTAL	100

Quantitative indicators	Hours	ECTS
Student workload - activities that require direct teacher participation	52	2,1
Student workload - practical activities	60	2,4

Basic references	1. Hughes C., Hughes T., Programowanie robotów: sterowanie pracą robotów autonomicznych. Helion, Gliwice, 2017. 2. Gupta S., Autonomous robots and agents. Springer, 2007. 3. Fahimi F., Autonomous robots modeling, path planning, and control. Springer, 2009.

	4. Klancar G., Zdesar A., Blazic S., Skrjanc I., Wheeled mobile robotics: from fundamentals towards autonomous systems. Butterworth-Heinemann 2017.	
Supplementary references	1. Bovik A., Handbook of image and video processing. Academic Press 1st edition (June 14, 2000), lub Academic Press 2 edition (June 21, 2005). 2. Szeliski R., Computer vision: algorithms and applications. Springer 2010. 3. Gupta S., Autonomous robots and agents. Springer, 2007. 4. Pedram A., Visual perception for manipulation and imitation in humanoid robots. Springer, 2009.	
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme
Author of the programme	dr inż. Adam Wolniakowski	2022-06-07

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Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Programming of industrial robots**							Course code	**CP1S05003**
								Course type	**elective**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15		**30**					No. of ECTS credits	**4**
Entry requirements	Fundamentals of robotics, Python programming 1, Python programming 2								
Course objectives	Modeling of kinematics and dynamics of manipulators. Familiarization with the methods and programming languages of robots. Learning environments for on-line and off-line robot programming. Programming the movement of manipulators.								
Course content	Lecture: Introduction to modeling the kinematics and dynamics of manipulators. Basics of programming manipulators with the use of scripting languages. Introduction to the ROS system. Acquainting with robot programming environments. Laboratory classes: Modeling of industrial manipulators in RWXML and URDF languages. Visualization of manipulators in the RobWork and RViz environment. Getting to know the basics of the ROS system. Getting to know the libraries of the RobWork environment. Acquainting with libraries enabling solving the tasks of simple and inverse kinematics. Acquainting with selected scripting languages of manipulator programming. Practical programming of selected manipulators.								
Teaching methods	Informative-problem lecture; Laboratory classes;								
Assessment method	Lecture: exam Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	
LO1	modeling methods of manipulators kinematics	CP1_W01 CP1_W02 CP1_W07
LO2	methods of robots programming	CP1_W07
LO3	basics of ROS operation	CP1_W07 CP1_W12
	Skills: the graduate is able to	
LO4	develop a kinematic model of an industrial robot	CP1_U04 CP1_U06 CP1_U07 CP1_U09
LO5	program a sequence of movements for an industrial robot	CP1_U02 CP1_U06 CP1_U07
LO6	apply principles of occupational health and safety in laboratory	CP1_U13

LO6	classes		
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed	
LO1	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L	
LO2	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L	
LO3	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L	
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
Student workload (in hours)		No. of hours	
Calculation	Lecture attendance	15	
	Laboratory classes attendance	30	
	Preparation for the lecture exam; participation in the exam	25	
	Preparation for laboratory classes	19	
	Preparation for laboratory classes completion	6	
	Participation in teacher-student sessions related to the module subject	5	
	TOTAL	100	
Quantitative indicators		Hours	ECTS
Student workload - activities that require direct teacher participation		52	2,1
Student workload - practical activities		60	2,4
Basic references	1. Kaczmarek W., Panasiuk J., Programowanie robotów przemysłowych. PWN, Warszawa, 2017. 2. Kaczmarek W., Panasiuk J., Borys S., Środowiska programowanie robotów. PWN, Warszawa, 2017. 3. Hughes C., Hughes T., Programowanie robotów: sterowanie pracą robotów autonomicznych. Helion, Gliwice, 2017.		
Supplementary references	1. Honczarenko J., Roboty przemysłowe: budowa i zastosowanie. WNT, Warszawa, 2011. 2. Choset H. i inni, Principles of Robot Motion, The MIT Press, Londyn, 2005		
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme	
Author of the programme	dr inż. Adam Wolniakowski	2022-06-07	

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Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Applications of industrial robots**							Course code	**CP1S05004**
								Course type	**elective**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15		**30**					No. of ECTS credits	**4**
Entry requirements	Fundamentals of robotics, Python programming 1, Python programming 2								
Course objectives	Acquainting with the basic types of tasks performed by robots. Designing a work cell with industrial manipulators. Modeling and simulation of industrial manipulators. Planning the movement of manipulators.								
Course content	Lecture: Scheduling tasks. Planning the trajectory in the junction and Cartesian space. Introduction to the ROS system. Issues related to the simulation and control of industrial robots using the ROS system. Laboratory classes: Modeling of industrial robot stations with the use of URDF and RWXML languages. Simulation of industrial robots in the RobWork and Gazebo environments. Getting to know the basics of the ROS system. Acquainting with programming tools for solving simple and inverse kinematics tasks, planning and collision detection tasks and robot control. Practical implementation of an industrial task with the use of a selected industrial robot.								
Teaching methods	Informative-problem lecture; Laboratory classes;								
Assessment method	Lecture: exam Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	
LO1	methods of planning the trajectory of motion	CP1_W01 CP1_W02 CP1_W07
LO2	methods of designing and simulating robotic cells	CP1_W07
LO3	basics of the ROS operation	CP1_W07 CP1_W12
	Skills: the graduate is able to	
LO4	develop a simulation model of an industrial robot station, solve the task of planning the trajectory of an industrial robot	CP1_U04 CP1_U06 CP1_U07 CP1_U09
LO5	implement an industrial task using a manipulator	CP1_U02 CP1_U06 CP1_U07
LO6	apply the principles of occupational health and safety in laboratory	CP1_U13

LO6	classes		
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed	
LO1	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L	
LO2	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L	
LO3	Lecture: exam; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L	
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
Student workload (in hours)		No. of hours	
Calculation	Lecture attendance	15	
	Laboratory classes attendance	30	
	Preparation for the lecture exam; participation in the exam	25	
	Preparation for laboratory classes	19	
	Preparation for laboratory classes completion	6	
	Participation in teacher-student sessions related to the module subject	5	
	TOTAL	100	
Quantitative indicators		Hours	ECTS
Student workload - activities that require direct teacher participation		52	2,1
Student workload - practical activities		60	2,4
Basic references	1. Kaczmarek W., Panasiuk J., Programowanie robotów przemysłowych. PWN, Warszawa, 2017. 2. Kaczmarek W., Panasiuk J., Borys S., Środowiska programowanie robotów. PWN, Warszawa, 2017. 3. Hughes C., Hughes T., Programowanie robotów: sterowanie pracą robotów autonomicznych. Helion, Gliwice, 2017.		
Supplementary references	1. Honczarenko J., Roboty przemysłowe: budowa i zastosowanie. WNT, Warszawa, 2011. 2. Choset H. i inni, Principles of Robot Motion, The MIT Press, Londyn, 2005		
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme	
Author of the programme	dr inż. Adam Wolniakowski	2022-06-07	

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Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Programming of embedded systems**							Course code	**CP1S05005**
								Course type	**obligatory**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15		**30**					No. of ECTS credits	**3**
Entry requirements	C programming, Electronic components and subsystems								
Course objectives	Getting to know components of an embedded system and their functions. Acquainting with structure standards of industrial embedded systems. Teaching the basics of programming selected microcontrollers dedicated to systems embedded in a high-level language. Teaching how to create and run embedded applications.								
Course content	Lecture: Basic terms used in embedded systems. Principles of designing embedded systems. Structure and functions of a system using a microcontroller. Architecture of selected microcontrollers for embedded applications. Programming environments for creating and testing applications on a selected microcontroller. Communication interfaces used in embedded systems. Laboratory classes: Basics of creating an application in a selected tool program (preparation and compilation of a project). Development of an application that uses specific internal resources of the microcontroller and electronic components connected to the microcontroller. Example applications on the ZL27ARM set. Sample real-time control applications with FreeRTOS. Development and implementation of a simple control system based on FreeRTOS.								
Teaching methods	Informative-problem lecture; Laboratory classes;								
Assessment method	Lecture: one test Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	
LO1	definition of the embedded system and the principles of designing embedded systems	CP1_W07
LO2	design standards for embedded system components	CP1_W04 CP1_W06 CP1_W10
LO3	communication interfaces and protocols used in embedded systems	CP1_W06 CP1_W10

LO3	communication interfaces and protocols used in embedded systems	
	Skills: the graduate is able to	
LO4	use electronic components and the architecture of the selected microcontroller to create an embedded system	CP1_U07
LO5	create and test an application for an embedded system based on a selected microcontroller in selected programming techniques	CP1_U01
LO6	use technical documentation to select the components used in an embedded system	CP1_U01
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	Lecture: one test;	W
LO2	Lecture: one test;	W
LO3	Lecture: one test;	W
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
Student workload (in hours)		No. of hours
Calculation	Lecture attendance	15
	Laboratory classes attendance	30
	Preparation for lecture test(s)	10
	Preparation for laboratory classes	9
	Preparation for laboratory classes completion	6
	Participation in teacher-student sessions related to the module subject	5
	TOTAL	75
Quantitative indicators		Hours / ECTS
Student workload - activities that require direct teacher participation		50 / 2
Student workload - practical activities		50 / 2
Basic references	1. Ashford L. E., Introduction to embedded systems: a cyberphysical system approach. Cambridge, London MIT Press 2017. 2. Ganssle J., Embedded hardware, Elsevier/Newnes 2008. 3. Galewski M., STM32. Aplikacje i ćwiczenia w języku C z biblioteka HAL. Wyd. BTC, Legionowo 2019. 4. Peckol J. K., Embedded systems: a contemporary design tool. John Wiley and Sons 2008. 5. Szumski M., Mikrokontrolery STM32 w systemach sterowania i regulacji. Wyd. BTC, Legionowo 2018.	
Supplementary	1. Kurczyk A., Mikrokontrolery STM32 dla początkujących. Wyd. BTC, Legionowo 2019. 2. Lewis D. W., Między asemblerem a językiem C. Podstawy oprogramowania wbudowanego. Oficyna Wyd. READ ME, Łódź 2004. 3. Paprocki K., Mikrokontrolery STM32 w praktyce. Wyd. BTC, Legionowo 2011.	

references	4. Rzecki K. (red.), Zagadnienia programowania aplikacji mobilnych i systemów wbudowanych. Wyd. Politechniki Krakowskiej, Kraków 2016. 5. Vahid F., Givargis T., Embedded system design: a unified hardware/software introduction, Wiley J., New York 2002.	
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme
Author of the programme	dr inż. Rafał Kociszewski	2022-06-07

Bialystok University of Technology
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Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Databases**							Course code	**CP1S05006**
								Course type	**obligatory**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15				**30**			No. of ECTS credits	**3**
Entry requirements	Operating systems								
Course objectives	Acquainting with the process of creating a relational database. Teaching of queries in SQL language. Teaching the basics of creating tables, views, procedures, triggers.								
Course content	Lecture: Relational data model. Basic SQL queries. Join, group queries. MS SQL Server and T-SQL data manipulation language. Retrieving information from tables. Entering and editing data. Creating and modifying the structure of databases. Create views, procedures, and functions. Triggers. Transactions. Specialistic workshop: Creation of a relational database consisting of tables, views, functions, procedures and triggers that enable manipulation and management of the database content.								
Teaching methods	Informative-problem lecture; Specialization workshop;								
Assessment method	Lecture: one test Specialistic workshop: evaluation of reports, individual progress, discussion and activity at workshop								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	
LO1	basic concepts of databases	CP1_W08
LO2	basic assumptions of the relational data model	CP1_W08
LO3	T-SQL data manipulation language	CP1_W08
	Skills: the graduate is able to	
LO4	design a simple database based on a relational model	CP1_U09 CP1_U01
LO5	manipulate data with SQL language	CP1_U09 CP1_U01

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	Lecture: one test;	W
LO2	Lecture: one test;	W

LO3	Lecture: one test;	W	
LO4	Specialistic workshop: evaluation of reports, individual progress, discussion and activity at workshop;	Ps	
LO5	Specialistic workshop: evaluation of reports, individual progress, discussion and activity at workshop;	Ps	
Student workload (in hours)		No. of hours	
Calculation	Lecture attendance	15	
	Workshop attendance	30	
	Preparation for lecture test(s)	9	
	Preparation for specialistic workshop	12	
	Preparation for workshop completion	4	
	Participation in teacher-student sessions related to the module subject	5	
	TOTAL	75	
Quantitative indicators		Hours	ECTS
Student workload - activities that require direct teacher participation		50	2
Student workload - practical activities		51	2
Basic references	1. Dudek W. Bazy danych SQL. Teoria i praktyka, Helion, 2005. 2. Ben-Gan I., Microsoft SQL Server 2012. Podstawy języka T-SQL, Promise, 2016. 3. Szeliga M., Mendrala D., Praktyczny kurs SQL. Wydanie III, Helion, 2015.		
Supplementary references	1. Garcia-Molina H., Ullman J. D. Widom J., Systemy baz danych. Pełny wykład, WNT, 2006.		
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme	
Author of the programme	dr Maciej Ciężkowski	2022-06-07	

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Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Cybersecurity**							Course code	**CP1S05007**
								Course type	**elective**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15		**15**					No. of ECTS credits	**2**
Entry requirements	Computer networks and wireless systems								
Course objectives	Acquainting with current types of cyber threats as well as technical and organizational measures of protection against these threats. Acquiring the ability to analyze selected types of cyber threats and to analyze the functionality of the corresponding methods and tools for counteracting them.								
Course content	Lecture: An overview of the types of cyber threats in industrial, computer and telecommunication systems as well as technical and organizational measures to protect against these threats. Basics of cryptographic information protection, digital signatures. Secure authentication and authorization in computer systems. Operation of SSL and TLS security techniques. Security issues in local and mobile wireless networks. VPN networks. Concept of buffer overflow attacks and denial of service attacks. Threats specific to web applications. Laboratory classes: Analysis of the operation and efficiency of selected cryptographic algorithms. Testing attacks on hash functions, also in the context of password security effectiveness in the event of disclosure of the user base of the ICT system. Configuration and testing of selected technologies used in protection against cyber threats. Practical use of passive and active recognition methods, including the OSINT approach, also in relation to the Internet of Things systems.								
Teaching methods	Informative-problem lecture; Laboratory classes;								
Assessment method	Lecture: one test Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	
LO1	basic concepts of cybersecurity in the context of threats and protection measures for applications, transmission systems and users	CP1_W10

LO2	features and applications of algorithms and cryptographic systems	CP1_W10
LO3	methods and systems of protection against cyber threats	CP1_W10
	Skills: the graduate is able to	
LO4	analyze the operation and effectiveness of classical and modern cryptographic techniques	CP1_U06
LO5	configure and test the operation of selected systems of protection against cyber threats	CP1_U06 CP1_U08
LO6	perform simple exploratory analysis with OSINT elements	CP1_U06
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	Lecture: one test;	W
LO2	Lecture: one test;	W
LO3	Lecture: one test;	W
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
Student workload (in hours)		No. of hours
Calculation	Lecture attendance	15
	Laboratory classes attendance	15
	Preparation for lecture test(s)	7
	Preparation for laboratory classes	5
	Preparation for laboratory classes completion	3
	Participation in teacher-student sessions related to the module subject	5
	TOTAL	50
Quantitative indicators		Hours / ECTS
Student workload - activities that require direct teacher participation		35 / 1,4
Student workload - practical activities		28 / 1,1
Basic references	1. Stallings W., Brown L., Bezpieczeństwo systemów informatycznych. Zasady i praktyka. Tom 1 i 2. Wydanie IV, Helion, Gliwice 2019. 2. Brotherston L., Berlin A., Bezpieczeństwo defensywne. Podstawy i najlepsze praktyki. Helion, Gliwice 2018. 3. Ortega J. M., Bezpieczeństwo sieci w Pythonie. Rozwiązywanie problemów za pomocą skryptów i bibliotek. Wydanie II, Helion, Gliwice 2021.	
Supplementary	1. Białas A., Bezpieczeństwo informacji i usług w nowoczesnej instytucji i firmie. WNT, Warszawa 2007. 2. Józefiok A., Security CCNA 210-260. Zostań administratorem sieci komputerowych Cisco. Helion, Gliwice 2016.	

Supplementary references	3. Sankar K., Sundaralingam S., Balinsky A., Miller D., Bezpieczeństwo sieci bezprzewodowych. MIKOM, Warszawa 2005. 4. Witryny internetowe poświęcone zagadnieniom cyberbezpieczeństwa (np. niebezpiecznik.pl, sekurak.pl, zaufanatrzeciastrona.pl, cert.pl).	
Organisational unit conducting the course	Department of Photonics, Electronics and Light Technology	Date of issuing the programme
Author of the programme	dr inż. Andrzej Zankiewicz	2022-06-07

Bialystok University of Technology
Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Security and reliability of computer systems**							Course code	**CP1S05008**
								Course type	**elective**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15		**15**					No. of ECTS credits	**2**
Entry requirements	Operating systems, Computer networks and wireless systems								
Course objectives	Acquainting with the basic concepts as well as theoretical and mathematical foundations of security and reliability of information systems, as well as with selected technical solutions based on them. Acquiring practical skills related to the computational analysis of IT systems security methods and the analysis of the operation of selected technical solutions using these methods.								
Course content	Lecture: The essence and components of information security. Elements of the theory of numbers and information theory and their application in the construction of selected methods of securing communication and transactions in information systems. The basics of reliability analysis and the principles of creating solutions that enable high reliability of IT systems. A comprehensive approach to defining an information security policy. Security audits and penetration tests of IT systems. Laboratory classes: Performing basic computational analysis of selected methods of securing communication and transactions in IT systems. Configuration and analysis of the operation of selected solutions to ensure the security and high reliability of IT systems.								
Teaching methods	Informative-problem lecture; Laboratory classes;								
Assessment method	Lecture: one test Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	
LO1	main concepts as well as theoretical and mathematical foundations of security and reliability of information systems	CP1_W10
LO2	operation and scope of applications of selected measures to ensure the security of information systems	CP1_W10
LO3	operation and scope of functionality of selected methods of ensuring	CP1_W10

LO3	high reliability of information systems	
	Skills: the graduate is able to	
LO4	perform a basic computational analysis of selected methods of security of communication and transactions in information systems	CP1_U06
LO5	configure and analyze the operation of selected IT system security systems	CP1_U06 CP1_U08
LO6	analyze the operation of selected methods of ensuring high reliability of IT systems	CP1_U06 CP1_U08

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	Lecture: one test;	W
LO2	Lecture: one test;	W
LO3	Lecture: one test;	W
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L

Student workload (in hours)		No. of hours
Calculation	Lecture attendance	15
	Laboratory classes attendance	15
	Preparation for lecture test(s)	7
	Preparation for laboratory classes	5
	Preparation for laboratory classes completion	3
	Participation in teacher-student sessions related to the module subject	5
	TOTAL	50

Quantitative indicators	Hours	ECTS
Student workload - activities that require direct teacher participation	35	1,4
Student workload - practical activities	28	1,1

Basic references	1. Pieprzyk J., Hardjono T., Seberry J., Teoria bezpieczeństwa systemów komputerowych. Helion, Gliwice 2005. 2. Stallings W., Brown L., Bezpieczeństwo systemów informatycznych. Zasady i praktyka. Tom 1 i 2. Wydanie IV, Helion, Gliwice 2019. 3. Ortega J. M., Bezpieczeństwo sieci w Pythonie. Rozwiązywanie problemów za pomocą skryptów i bibliotek. Wydanie II, Helion, Gliwice 2021.
Supplementary references	1. Brotherston L., Berlin A., Bezpieczeństwo defensywne. Podstawy i najlepsze praktyki. Helion, Gliwice 2018. 2. Józefiok A., Security CCNA 210-260. Zostań administratorem sieci komputerowych Cisco. Helion, Gliwice 2016.

Organisational unit conducting the course	Department of Photonics, Electronics and Light Technology	Date of issuing the programme
Author of the programme	dr inż. Andrzej Zankiewicz	2022-06-07

Bialystok University of Technology
Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Processes visualization**							Course code	**CP1S05009**
								Course type	**obligatory**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15				**30**			No. of ECTS credits	**3**
Entry requirements	Programming of PLC controllers								
Course objectives	Acquainting with visualization systems and reporting systems used in industrial conditions.								
Course content	Lecture: Basic concepts and tasks of the industrial process visualization system. Examples of applications, requirements and structure of the visualization system of industrial processes. User interface, kinds of variables, kinds of scripts. Structural and object-oriented programming in visualization systems. Alarms, trends and system protection. Types of reports and methods of their creation. Communication and data exchange with a PLC controller. Recipes. Reporting of measurement data with the use of SQL database. Specialistic workshop: Getting to know the environment of the industrial process visualization system: elements of the graphic editor, creating windows, declaring internal variables and I/O type, assigning animation links, creating scripts, displaying alarms, reports, trends; establishing communication with other applications and with the PLC. Implementation of a visualization and reporting project for a selected industrial process.								
Teaching methods	Informative-problem lecture; Specialization workshop;								
Assessment method	Lecture: one test Specialistic workshop: evaluation of reports, individual progress, discussion and activity at workshop								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	
LO1	basic concepts in the field of visualization of industrial processes	CP1_W07
LO2	the structure of industrial process visualization systems and the methods of communication between them	CP1_W07
LO3	types of data and rules of their use in visualization systems of industrial processes	CP1_W07
	Skills: the graduate is able to	

LO4	program and configure graphic objects in visualization systems of industrial processes	CP1_U07
LO5	implement scripts in industrial process visualization systems	CP1_U07
LO6	create a system for the visualization of the selected industrial process	CP1_U09
	Social competences: the graduate is ready to	
LO7	use of the knowledge and experience of recognized experts in the development of an industrial process visualization project	CP1_K01
LO8	timely implementation of the various stages of the project	CP1_K03
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	Lecture: one test;	W
LO2	Lecture: one test;	W
LO3	Lecture: one test;	W
LO4	Specialistic workshop: evaluation of reports, individual progress, discussion and activity at workshop;	Ps
LO5	Specialistic workshop: evaluation of reports, individual progress, discussion and activity at workshop;	Ps
LO6	Specialistic workshop: evaluation of reports, individual progress, discussion and activity at workshop;	Ps
LO7	Specialistic workshop: evaluation of reports, individual progress, discussion and activity at workshop;	Ps
LO8	Specialistic workshop: evaluation of reports, individual progress, discussion and activity at workshop;	Ps
Student workload (in hours)		No. of hours
Calculation	Lecture attendance	15
	Workshop attendance	30
	Preparation for lecture test(s)	9
	Preparation for specialistic workshop	12
	Preparation for workshop completion	4
	Participation in teacher-student sessions related to the module subject	5
	TOTAL	75
Quantitative indicators		Hours / ECTS
Student workload - activities that require direct teacher participation		50 / 2
Student workload - practical activities		51 / 2
Basic references	1. Podręczniki szkoleniowe. In Touch cz. 1. Tworzenie i serwisowanie aplikacji. Astor Kraków 2010. 2. Podręczniki szkoleniowe. In Touch cz. 2. Zagadnienia zaawansowane. Astor Kraków 2011. 3. Dzierżek K., Programowanie sterowników PLC GE-Fanuc. Wydawnictwo PB, Białystok 2007.	
	1. Tworzenie i zarządzanie symbolami ArchestrA - podręcznik użytkownika. Astor, Kraków 2009.	

Supplementary references	2. In Touch 9.5. Podręcznik użytkownika. Tłumaczenie z angielskiego. Astor Kraków 2006. 3. In Touch – Opis funkcji, pól i zmiennych systemowych. Tłum. z angielskiego. Astor Kraków 2006. 4. InTouch HMI Application Management and Extension Guide. Wonderware 2013. 5. InTouch HMI Visualization Guide. Wonderware 2013.	
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme
Author of the programme	dr inż. Michał Ostaszewski	2022-06-07

COURSE DESCRIPTION CARD

BIALYSTOK UNIVERSITY OF TECHNOLOGY		**Faculty of Electrical Engineering**	
Field of study	Industry Digitization	**Level and form of study**	Full-time first-cycle (BSc) studies
A group of modules /specialty	Common subject	**Education profile**	General
Course name	Industrial Networks 1	**Course code**	CP1S05010
		Course type	Mandatory

Course form(s)	**L**	**C**	**LC**	**P**	**SW**	**FW**	**S**	**Semester**	**5**
and number of hours	15		45					**ECTS credits**	**6**

The programme is valid from	2025/2026
Introductory courses	CP1S04005
Course objectives	Familiarization with the architecture of field industrial networks used in industrial automation applications. Developing principles of operation, design, programming and maintenance of industrial networks for process data exchange such as PROFIBUS DP and MODBUS RTU.
Framework programme content	Layered model of decentralized control systems. Master–Slave model. Real-time decentralized PID control systems. Network topology. Transmission media. Layered model of the PROFIBUS DP network. Protocols: PROFIBUS DP, RS485, MODBUS RTU. Cabling and network parameters. Communication functions for PROFIBUS DP and MODBUS RTU. Data frames and protocol structure. Programming cyclic and acyclic process-data exchange in PLC-based networked systems. Real-time handling in PROFIBUS DP. Network and device diagnostics in PROFIBUS DP. Design of distributed control systems based on PLC/PAC, HMI and peripheral devices, illustrated with selected industrial applications. Fundamentals of configuring PLC networks and peripheral measurement/actuating devices.
Other information about the course	content of the course refers to the principles of sustainable development the course is related to the scientific activity conducted at the University

Calculation:

Student workload related to:	**Total number of hours**	**including contact**	**including practical**
participation in lectures	15	15	
participation in other forms of activities	45	45	45
participation in an examination	3	3	2,3
completion of professional training	0	0	0
preparation for passing a lecture/an examination	5		
preparation for practical classes	82		82
			0
			0
			0
			0
			0
			0
Total number of hours:	**150**	**63**	**129**
Total number of ECTS credits:	**6**	**2,5**	**5,2**

Expected discipline learning outcomes	Knowledge	Skills	Social competence

Objectives and framework content prepared by	Arkadiusz Mystkowski, DSc. PhD Eng. Assoc. Prof.	Date:	3.09.2025

Implementation in the academic year **2025/2026**

Programme content

	Lecture
1	OSI model of a decentralized control system. Master–Slave model.
2	Decentralized real-time PID control systems.
3	Network topology. Transmission media. Layered model of the PROFIBUS DP network.
4	Protocols: PROFIBUS DP, RS-485, MODBUS RTU.
5	Cabling and network parameters. Communication functions for PROFIBUS DP and MODBUS RTU.
6	Data frames and protocol structure.
7	Programming cyclic and acyclic process-data exchange in a PLC-based networked system.
8	Real-time handling in PROFIBUS DP.
9	Network and device diagnostics in PROFIBUS DP.
10	Distributed control systems based on PLC/PAC, HMI systems and peripheral devices, illustrated with selected industrial applications.
11	
12	
13	
	Laboratory
1	Safety rules. TIA Portal engineering software for S7-series controllers.
2	PROFIBUS DP industrial network: configuration fundamentals.
3	PROFIBUS DP network: data exchange between controllers within a common network.
4	Communication with a SIPART DR22 industrial controller via PROFIBUS DP
5	Communication with a SIMATIC VS vision system via PROFIBUS DP
6	PROFIBUS DP network diagnostics – Profitrace (Proficore)
7	Modbus RTU industrial network: configuration fundamentals.
8	Modbus: data exchange between controllers within a common network
9	Modbus: using the industrial network to carry out practical tasks – communication with a peripheral device (WaveShare)
10	
L	Informative/problem-based lecture, discussion.

Teaching methods	LC	laboratory exercises
	-	
Teaching methods (online classes)		
	-	
Forms of crediting	L	Written exam, two midterm tests, and an extra optional homeworks to increase the mark.
	LC	Evaluation of entry quizzes, reports, discussions and in-class activity
Conditions of crediting	L	Written exam pass/grade scale: (≤49%) 2.0 (fail); (50%–60%) 3.0; (61%–70%) 3.5; (71%–80%) 4.0; (81%–90%) 4.5; (91%–100%) 5.0.
	LC	The final assessment depends on the completeness of the individual lab tasks, homework tasks, report preparation and its presentation.

Outcome symbols -

Knowledge: the student knows and understands	**Expected learning outcomes**	**Expected learning outcomes defined for the field of study**		
		Knowledge	Skills	Social competence
E1	models of decentralized control systems, RT and IRT modes, including drive control systems, and the operating principle of the PROFIBUS DP and MODBUS network protocols	CP1_W06, CP1_W10		
E2	functions used for communication and device control in the PROFIBUS DP and MODBUS networks	CP1_W10		
E3	methods for diagnosing industrial networks and peripheral devices	CP1_W10		
Skills: the student can				
E4	configure, commission and test distributed control systems using PROFIBUS DP and MODBUS networks.		CP1_U07	
E5	program functions for real-time process-data exchange in PROFIBUS DP and MODBUS networks.		CP1_U07	
E6	apply methods and perform diagnostics of PROFIBUS DP and MODBUS industrial networks and peripheral devices.		CP1_U07	
Social competence: the student is ready to				
E7	critical self-assessment of one's knowledge in the field of distributed control systems.			CP1_K01

Outcome symbols

	Methods of verification of learning outcomes	**Course form subject to verification**
E1	Written exam; completion of laboratory reports	W, LC
E2	Written exam; completion of laboratory reports	W, LC
E3	Written exam; completion of laboratory reports	W, LC
E4	Written exam; completion of laboratory reports	LC
E5	Written exam; completion of laboratory reports	LC
E6	Written exam; completion of laboratory reports	LC
E7	Written exam; completion of laboratory reports	W, LC

Basic references	1	EN 50170-2 PROFIBUS, EN 50254-3 PROFIBUS-DP, ICS 61158.
	2	Sen, Sunit Kumar. Fieldbus and Networking in Process Automation. 2nd ed., CRC Press, 2021.
	3	www.profibus.com
Supplementary references	1	Teacher's materials, projects and instructions.
	2	https://support.industry.siemens.com/
Course coordinator	Arkadiusz Mystkowski, DSc. PhD Eng. Assoc. Prof.	**Date:** 3.09.2025

Bialystok University of Technology
Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Internet of Things**							Course code	**CP1S05011**
								Course type	**obligatory**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
	15		**30**					No. of ECTS credits	**3**
Entry requirements	Computer networks and wireless systems, Sensors and measurement systems								
Course objectives	Acquainting with modern technologies used in Internet of Things (IoT) systems and areas of application of such systems. Acquisition of practical skills related to the creation of Internet of Things applications using selected sensor, transmission, server and cloud platforms technologies.								
Course content	Lecture: The concept of the Internet of Things (IoT). Typical components and architecture of Internet of Things systems. Local range wireless low energy transmission technologies used in IoT, e.g. Bluetooth Low Energy, Zigler, Thread, WM-Bus. Transmission technologies for wide area IoT networks, e.g. LTE Cat M1, NB-IoT, LoRaWAN, Sigfox. Modern network layer protocols used in IoT systems: IPv6, 6LoWPAN. Selected server technologies used in the Internet of Things systems. The use of cloud platforms in the Internet of Things systems. Characteristics of typical applications of IoT systems (smart cities, Smart Metering, intelligent buildings and others). Laboratory classes: Programmatic handling and processing of data from selected types of sensors (including MEMS sensors). Configuration and testing of the IoT system with local wireless communication (e.g. in the Bluetooth Low Energy standard in advertising and connection modes and in other selected standards). Configuration and testing of the data transmission system in the LoRaWAN network. Creation of server applications that use databases and cooperate with physical devices. Development and testing of Internet of Things applications for selected IoT hardware platforms. The use of cloud-based data acquisition and visualization services from IoT systems.								
Teaching methods	Informative-problem lecture; Laboratory classes;								
Assessment method	Lecture: one test Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Knowledge: the graduate knows and understands	

LO1	basic concepts, structure and applications of the Internet of Things systems	CP1_W10	
LO2	general operating principles and application scopes of selected transmission standards used in the Internet of Things systems	CP1_W10	
LO3	functions of selected server and cloud technologies used in the Internet of Things systems	CP1_W07	
	Skills: the graduate is able to		
LO4	implement server applications cooperating with databases and sensors of physical devices	CP1_U08	
LO5	configure and analyze the work of transmission systems used in IoT systems	CP1_U08	
LO6	use cloud-based data acquisition and visualization services of IoT systems	CP1_U09	
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed	
LO1	Lecture: one test;	W	
LO2	Lecture: one test; Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	W L	
LO3	Lecture: one test;	W	
LO4	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
LO5	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
LO6	Laboratory: evaluation of introductory tests, reports, discussion and activity during the classes;	L	
Student workload (in hours)		No. of hours	
Calculation	Lecture attendance	15	
	Laboratory classes attendance	30	
	Preparation for lecture test(s)	10	
	Preparation for laboratory classes	9	
	Preparation for laboratory classes completion	6	
	Participation in teacher-student sessions related to the module subject	5	
	TOTAL	75	
Quantitative indicators		Hours	ECTS
Student workload - activities that require direct teacher participation		50	2
Student workload - practical activities		50	2
Basic references	1. Guinard D., Trifa V., Internet Rzeczy. Budowa sieci z wykorzystaniem technologii webowych i Raspberry Pi. Helion, Gliwice 2017. 2. Wytrębowicz J., Radziszewski P., Cabaj K., Inżynieria systemów Internetu Rzeczy. Zagadnienia bezpieczeństwa i komunikacji. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2021.		

	3. Dokumentacja technologii transmisyjnych wykorzystywanych w systemach IoT (dostępna na stronach internetowych). 4. Dokumentacja wykorzystywanych w laboratorium platform i usług IoT.	
Supplementary references	1. Culic I., Radovici A., Rusu C., Komercyjne i przemysłowe aplikacje Internetu Rzeczy na Raspberry Pi. Prototypowanie rozwiązań IoT. APN Promise, Warszawa 2020. 2. Sikorski M., Internet Rzeczy. PWN, Warszawa 2020.	
Organisational unit conducting the course	Department of Photonics, Electronics and Light Technology	Date of issuing the programme
Author of the programme	dr inż. Andrzej Zankiewicz	2022-06-07

Bialystok University of Technology
Faculty of Electrical Engineering

Field of study	**Industry Digitization**							Degree level and programme type	**full-time Bachelor's degree**
Specjalization / diploma path	**common subject**							Study profile	**general academic**
Course name	**Foreign language 4**							Course code	**CP1S05012**
								Course type	**elective**
Forms and number of hours of educational ectivities	L	C	LC	P	SW	FW	S	Semester	**5**
		30						No. of ECTS credits	**2**
Entry requirements	Foreign language 3								
Course objectives	Continue to improve language proficiency (listening, reading, interaction, production, writing) at level B2 in line with the Common European Framework of Reference for Languages. Stimulating curiosity about fundamental dilemmas of modern civilization and issues of the field of study. Revision of basic terminology from the field of study. Getting acquainted and practicing the form of a summary/abstract.								
Course content	Classes: Topics related to academic life, current problems of social life and dilemmas of modern civilization and problems of the studied field. Language and grammar issues in the discussed texts. Basic terminology of the field of study (part 3). The form of the summary (abstract) of the selected type of text (e.g. diploma thesis).								
Teaching methods	Classes;								
Assessment method	Evaluation of inter-semester tests; mofular tests, written and oral statements								

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
	Skills: the graduate is able to	
LO4	use a foreign language in accordance with the requirements of the B2 level of the Common European Framework of Reference for Languages	CP1_U01 CP1_U05
LO5	understand and formulate texts on various issues of the contemporary world, including those containing the basic terminology of the field of study; write a summary of the selected text (e.g. a BA thesis)	CP1_U01 CP1_U05
LO6	understand and formulate oral statements on various issues of the modern world, also those containing the basic terminology of the field of study	CP1_U01 CP1_U05
	Social competences: the graduate is ready to	

LO7	take an active part in the discussion respecting the diversity of expressed opinions, views, cultural references	CP1_K02
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO4	Evaluation of inter-semester tests; mofular tests, written and oral statements;	C
LO5	Evaluation of inter-semester tests; mofular tests, written and oral statements;	C
LO6	Evaluation of inter-semester tests; mofular tests, written and oral statements;	C
LO7	Evaluation of inter-semester tests; mofular tests, written and oral statements;	C

Student workload (in hours)		No. of hours
Calculation	Classes attendance	30
	Preparation for classes	9
	Preparation for classes completion	6
	Participation in teacher-student sessions related to the module subject	5
	TOTAL	50

Quantitative indicators	Hours	ECTS
Student workload - activities that require direct teacher participation	35	1,4
Student workload - practical activities	50	2

Basic references	1. Murphy R., English Grammar in Use, Cambridge: Cambridge University Press 2010. 2. Cieplicka M., Torzewska W., Русский язык. Kompendium tematyczno-leksykalne 2, Wagros 2008. 3. Długokęcka J., Chadaj S., Język niemiecki zawodowy w branży elektronicznej, informatycznej i elektrycznej, WSIP 2013. 4. McCarthy M., Academic Vocabulary in Use, Cambridge: Cambridge University Press 2010. 5. Chwatow S., Hajczuk R., Русский язык в бизнесе, WSiP 2000. 6. Kuhn Ch., Niemann R. M., Winzer-Kiontke B., Studio d - Die Mittelstufe B2, Cornelsen Verlag 2010. 7. Foley M., My Grammar Lab, Pearson 2012. 8. Granatowska H., Danecka I., Как дела? 2. Wyd. Szkolne PWN 2003. 9. Koithan U., Schmitz H., Sieber T., Sonntag R., Aspekte Mittelstufe Deutsch, Langenscheidt 2007. 10. Milczarek W., Język rosyjski od A do Z. Repetytorium, Kram. 2007.
Supplementary references	1. Longman Dictionary of Contemporary English. Harlow: Pearson Education 2011. 2. Kowalska N., Samek D., Praktyczna gramatyka języka rosyjskiego, REA 2004. 3. Nietrzebka M., Ostalak S., Alles klar Grammatik, WSIP 2004. 4. Kuca Z., Język rosyjski w biznesie dla średniozaawansowanych, WSiP 2007. 5. Kostka G., Elektroniker fuer Energie- und Gebaeudetechnik, Fundacja VCC. 6. Samek D., Rozmówki polsko-rosyjskie, REA 2009. 7. Słownik naukowo-techniczny polsko-niemiecki, niemiecko-polski. WNT 2006, 2007.

	8. Słownik naukowo-techniczny rosyjsko-polski. WNT 2009. 9. Corbeil J-C., Archambault A., Wielojęzyczny słownik wizualny, leksykon tematyczny, Wydawnictwo Wilga 1996.	
Organisational unit conducting the course	School of Foreign Languages	Date of issuing the programme
Author of the programme	mgr Dorota Ostrowska	2022-06-07