

**DESCRIPTION OF THE PROGRAM FOR THE FIELD OF STUDY****IT SCIENCE - academic year 2025/2026****1st degree  
practical profile**

<b>1. GENERAL CHARACTERISTICS OF THE STUDY PROGRAM</b>	
<b>Faculty conducting studies:</b>	<b>Faculty of Transport and Information Technology</b>
1.1 Name of the program/field of study/specialization	Computer Science, specializations to choose from: 1. Software Engineering and Mobile Technologies, 2. Cybersecurity and network technologies 3. Implementation of IT systems
1.2 Level of study	First-cycle studies
1.3 Polish Qualifications Framework Level	Level 6 of the Polish Qualifications Framework
1.4 Study profile	Practical
1.5 Form(s) of study	Full-time and part-time studies
1.6 Professional title awarded to graduates, ISCED CODE. Synthetic description of professional characteristics and the graduate's job position after graduation	<p>Engineer; ISCED code: Information and communication technologies subgroup 061; A person with the above qualification has general and practical knowledge in the field of computer science, telecommunications and electrical engineering necessary to develop specialist competences in the field of various IT systems, both in terms of the theory of operation of these systems, their design, as well as their practical use in the economy, business and administration. This person is able to use acquired competences to formulate and solve complex and non-standard problems of a practical nature in the field of computer science, and in particular is able to perform tasks including:</p> <ul style="list-style-type: none"> <li>• software engineering, as well as the selection of programming environments and tools for designing, implementing, testing and deploying IT systems, including web applications,</li> <li>• design, implementation and management of modern multimedia applications, including those operating in various areas of providing ICT services;</li> <li>• designing, implementing and maintaining computer networks and computer/IT systems with particular emphasis on their security;</li> <li>• analysis of how computer and network systems function and diagnostics and monitoring of these systems using available software and hardware tools,</li> <li>• design and management of complex ICT projects.</li> </ul> <p>A person with the above qualifications is prepared to work in enterprises/entities with various profiles of activity, and in particular in:</p> <ul style="list-style-type: none"> <li>• IT companies and telecommunications network operators</li> <li>• state administration,</li> <li>• financial and insurance institutions, especially where BI analytical systems are used</li> <li>• companies involved in the creation and implementation of application software</li> <li>• companies that deal with the use of modern information technologies in practice,</li> </ul> <p>in positions:</p> <ul style="list-style-type: none"> <li>• programmer of IT systems and web applications;</li> <li>• computer systems designer;</li> <li>• IT systems tester;</li> <li>• IT specialist;</li> <li>• IT department manager</li> <li>• computer equipment sales and diagnostics specialist;</li> <li>• administrator of computer networks and information systems;</li> <li>• specialist in the field of security of computer systems and networks;</li> <li>• designer, programmer and database administrator ;</li> <li>• IT systems implementation consultant – supporting organizations in the implementation process;</li> </ul>

	<ul style="list-style-type: none"> <li>• Systems Integration Specialist – dealing with connecting various components and applications;</li> <li>• business analyst – analyzing and transforming customer needs into technical requirements;</li> <li>• Process optimization consultant – improving the functioning of the organization through the effective use of IT systems</li> <li>• an independent entrepreneur running his own IT company.</li> </ul>
1.7 Number of semesters and ECTS points required to complete studies	VII semesters, 210 ECTS
1.8 Total number of teaching hours for full-time/part-time studies	2660 - hours of teaching in full-time studies; 1850 - hours of teaching in part-time studies; including 6-month professional internships during full-time and part-time studies.
1.9. Total number of ECTS points obtained in classes conducted with the direct participation of academic teachers or other persons conducting classes	106 ECTS points out of 210 ECTS points in the full-time study programme, 74 ECTS points out of 210 ECTS points in the part-time programme
1.10 Number of ECTS points for courses in the humanities or social sciences	12 ECTS points

## 2. LEARNING OUTCOMES STATED IN THE STUDY PROGRAM AND ASSIGNMENT OF SCIENTIFIC DISCIPLINES

### 2.1 Assignment of disciplines

**Scientific field: field of engineering and technical sciences**

No.	Name of the discipline	Number of ECTS points	%
1.	Technical information technology and telecommunications	210	100
Total number of ECTS and percentage of ECTS in the study programme		210	100

### 2.2 Directional learning outcomes in relation to the PRK

<b>Name of course:</b>	<b>Information technology</b>		
<b>Level of education:</b>	<b>LEVEL 6 PRK - First-cycle studies</b>		
<b>Education profile:</b>	<b>Practical</b>	Reference to:	
<b>Symbol of learning outcomes for a study program</b>	<b>Learning outcomes after completing first-cycle studies in Computer Science</b>	universal characteristics for a given PRK level	second-level characteristics of learning outcomes for qualifications at levels 6–7 of the Polish Qualifications Framework
			Level 6      Engineering competences

#### KNOWLEDGE

##### The graduate knows and understands:

Symbol	Description	PRK level	Competences
<b>K_W01</b>	advanced knowledge of key concepts in the field of scientific discipline Technical information technology and telecommunications necessary for: <ul style="list-style-type: none"> <li>• description and analysis of algorithms and data structures,</li> <li>• description and analysis of the operation, implementation and security of IT systems,</li> <li>• description and analysis of the operation of analog and digital systems,</li> </ul> and the practical application of this knowledge in professional activities related to the field of study: Computer Science, first cycle degree.	P6U_W	P6S_WG
<b>K_W02</b>	advanced knowledge of electrical engineering, electronics and measurement, necessary to understand the basics of computer and telecommunications systems and methods of recording, processing and secure data transmission.	P6U_W	P6S_WG
<b>K_W03</b>	at an advanced level selected issues relating to the technical and mathematical foundations of computer science, and is able to use this knowledge in professional activities related to the field of study.	P6U_W	P6S_WG
<b>K_W04</b>	at an advanced level, issues and terminology in the field of computer architecture, peripherals and network devices used in professional activities.	P6U_W	P6S_WG
<b>K_W05</b>	at an advanced level and uses software design methodology and information system description languages in practice.	P6U_W	P6S_WG
<b>K_W06</b>	at an advanced level, issues in the field of computer systems software.	P6U_W	P6S_WG
<b>K_W07</b>	advanced issues in the field of computer architecture and networks as well as operating systems, necessary for the installation, configuration, operation, maintenance and security of these systems.	P6U_W	P6S_WG

<b>K_W08</b>	advanced level of electrical engineering issues for operating devices included in telecommunications networks and configuring and securing these devices in local and wide area networks .	P6U_W	P6S_WG
<b>K_W09</b>	at an advanced level, issues related to the design and operation of database systems used in professional activities related to the field of study.	P6U_W	P6S_WG
<b>K_W10</b>	at an advanced level, issues related to software engineering, including the process of implementing IT systems	P6U_W	P6S_WG
<b>K_W11</b>	at an advanced level, issues related to the security of computer systems and networks.	P6U_W	P6S_WG
<b>K_W12</b>	advanced issues in the field of data structures and information processing algorithms, data analysis, machine learning.	P6U_W	P6S_WG
<b>K_W13</b>	at an advanced level and uses digital information processing in practice.	P6U_W	P6S_WG
<b>K_W14</b>	at an advanced level and uses in practice the processes of selecting the appropriate hardware components of computer and network systems.	P6U_W	P6S_WG
<b>K_W15</b>	at an advanced level, issues in the field of technical standards and norms concerning computer science and electrical engineering; knows English/Russian terminology in the field of computer science at the B2 level of the Common European Framework of Reference for Languages - and practical application of this knowledge in professional activities related to the field of study.	P6U_W	P6S_WG
<b>K_W16</b>	at an advanced level, issues related to the life cycle of computer and network devices and software components; has knowledge of an active and healthy lifestyle necessary to practice as an IT specialist.	P6U_W	P6S_WG
<b>K_W17</b>	issues necessary to understand the non-technical conditions of engineering activities; basic occupational health and safety principles applicable to the work of an IT specialist and knowledge of physical culture.	P6U_W	P6S_WK
<b>K_W18</b>	issues related to the protection of industrial and intellectual property, patent and copyright law, as well as issues related to professional ethics.	P6U_W	P6S_WK
<b>K_W19</b>	issues related to management and running a business, including specialist IT companies	P6U_W	P6S_WK
<b>K_W20</b>	general principles of creating and developing forms of individual entrepreneurship.	P6U_W	P6S_WK
<b>SKILLS</b> <b>The graduate is able to:</b>			
<b>K_U01</b>	obtain information from literature, databases and other sources; is able to integrate obtained information, interpret it, draw conclusions and formulate and justify opinions.	P6U_U	P6S_UU
<b>K_U02</b>	work individually and in a team; is able to estimate the time needed to complete an assigned task; is able to develop and implement a work schedule that ensures meeting deadlines and takes care of health and physical fitness.	P6U_U	P6S_UO
<b>K_U03</b>	prepare documentation relating to the implementation of the engineering task.	P6U_U	P6S_UW
<b>K_U04</b>	prepare, present and discuss a short presentation on the results of the engineering task and participate in the debate.	P6U_U	P6S_UW; P6S_UK
<b>K_U05</b>	communicate in a foreign language at B2 level, including reading technical documentation used in professional activities.	P6U_U	P6S_UK
<b>K_U06</b>	determine directions for further learning and implement the process of self-education.	P6U_U	P6S_UU
<b>K_U07</b>	use the mathematical methods learned, as well as computer simulations, to analyze and evaluate the performance of computer systems.	P6U_U	P6S_UW
<b>K_U08</b>	critically analyze the functioning of computer and network systems and perform diagnostics of these systems using available software and hardware tools.	P6U_U	P6S_UW
<b>K_U09</b>	compare the elements of computer systems and networks according to given utility and economic criteria (security, reliability, speed of operation, cost, etc.).	P6U_U	P6S_UW
<b>K_U10</b>	use appropriately selected programming environments and tools to design, create, test and implement IT systems, including mobile applications.	P6U_U	P6S_UW
<b>K_U11</b>	plan and perform simulation and measurement of characteristics of devices included in computer and teleinformatic network systems.	P6U_U	P6S_UW
<b>K_U12</b>	formulate specifications for information systems using UML.	P6U_U	P6S_UW
<b>K_U13</b>	design individual software components through the proper selection of methods and tools.	P6U_U	P6S_UW

<b>K_U14</b>	design computer networks by properly selecting methods and tools.	P6U_U	P6S_UW
<b>K_U15</b>	use catalog cards and application notes to select appropriate hardware components and software for the designed computer networks.	P6U_U	P6S_UW
<b>K_U16</b>	design websites and services through the correct selection of methods and tools.	P6U_U	P6S_UW
<b>K_U17</b>	plan the process of implementing application software, including its implementation; is able to initially estimate its costs.	P6U_U	P6S_UW
<b>K_U18</b>	build, configure, run, test and properly secure the designed computer network.	P6U_U	P6S_UW
<b>K_U19</b>	configure computer and communication devices in local (wired and radio) telecommunications networks; is able to administer hardware and software in local networks, as well as monitor the network security level and detect possible incidents.	P6U_U	P6S_UW
<b>K_U20</b>	formulate an information processing algorithm, use high-level programming languages by using appropriate IT tools.	P6U_U	P6S_UW
<b>K_U21</b>	when formulating and solving tasks involving the design, production and implementation of IT systems, notice their non-technical aspects, including environmental, economic and legal ones.	P6U_U	P6S_UW
<b>K_U22</b>	take up work in an industrial environment, especially in the IT industry, and is able to safely perform tasks at work by applying occupational health and safety rules.	P6U_U	P6S_UW
<b>K_U23</b>	assess the usefulness of typical methods and tools for solving computer engineering tasks and select and use appropriate methods and tools.	P6U_U	P6S_UW
<b>K_U24</b>	use available software to process multimedia data, including for advertising and promotion on the Internet.	P6U_U	P6S_UW
<b>K_U25</b>	design databases; formulate database queries using appropriate tools.	P6U_U	P6S_UW
<b>K_U26</b>	use standards for design, implementation, testing and use applicable in computer science and electrical engineering.	P6U_U	P6S_UW
<b>K_U27</b>	use technical standards and adapt its operations to applicable regulations, as well as process and archive data, including measurement data.	P6U_U	P6S_UW
<b>SOCIAL COMPETENCES</b> <b>The graduate is ready to:</b>			
<b>K_K01</b>	continuous training (second and third cycle studies, postgraduate studies, courses) - improving professional, personal and social competences.	P6U_K	P6S_KK
<b>K_K02</b>	critical respect for non-technical aspects and consequences of an engineer's activities, including their impact on the environment.	P6U_K	P6S_KK P6S_KO
<b>K_K03</b>	behaving in a professional manner, observing professional ethics and respecting the diversity of opinions and cultures, promotes the social and cultural importance of sport.	P6U_K	P6S_KR
<b>K_K04</b>	taking responsibility for one's own work and subordinating oneself to the principles of teamwork and taking responsibility for decisions made and tasks carried out jointly.	P6U_K	P6S_KO
<b>K_K05</b>	thinking and acting in an entrepreneurial way.	P6U_K	P6S_KO
<b>K_K06</b>	critically formulate and convey to the public - including through the mass media - information and opinions on the achievements of computer science, electrical engineering and other aspects of the engineering profession; is ready to convey such information and opinions in a generally understandable manner, including in a foreign language.	P6U_K	P6S_KK

### 3. DIMENSION, RULES AND FORM OF PROFESSIONAL INTERNSHIP, NUMBER OF ECTS FOR THE FIELD OF STUDY

The internships last 6 months (38 ECTS points), and the detailed the learning outcomes of professional internships are specified in the Professional Internship Programme and the Professional Internship Diary as well as the syllabus for the Computer Science major, first-cycle practical profile. The conditions for WSEI students to recognize the learning outcomes of their professional internships are specified in the Resolution of the Senate of WSEI in Lublin, according to which the professional internship is divided into two parts:

- I. Professional practice carried out at the University,
- II. Professional practice carried out at an employer's

The first part of the internship takes place according to the following scheme:

- Introduction to professional practice - 25 teaching hours in the first semester of studies (1 ECTS)
- Project related to the field of study - 50 teaching hours in the fourth semester of studies (2 ECTS)

- Project related to the field of study and a report on professional practice – 75 hours in the 6th semester of studies (3 ECTS)

The second part of the internship includes 810 teaching hours and takes place from June 1 to September 30 of a given year, respectively in semesters II, IV and VI after completing classes. The student receives 32 ECTS for completing this part. The approval of individual parts of the internship carried out at the employer by the internship supervisor and the dean takes place no later than September 30 of each year.

#### **4. STUDENTS' CHOICE OF CLASS MODULES INCLUDED IN THE STUDY PROGRAM**

The number of ECTS points that a student receives by completing elective courses: 74 ECTS points, which is 35 % of the total number of ECTS points in the program. The elective modules include:

- foreign language (English, Russian) – 7 ECTS points,
- optional module: 4 ECTS points
- specialization modules (9 modules) – 57 ECTS points,
- seminar and diploma examination – 6 ECTS points,

#### **5. NUMBER OF ECTS POINTS FOR SHAPING PRACTICAL SKILLS IN THE PRACTICAL PROFILE STUDIES PROGRAM**

In the practical profile study program in the field of Computer Science, the number of ECTS points is set at 143, which develop practical skills, which constitutes 68% of the total number of ECTS points in the program

**6. CLASSES OR GROUPS OF CLASSES WITH THE ASSIGNMENT OF LEARNING OUTCOMES AND THE PROGRAM CONTENT THAT ENSURE THE ACHIEVEMENT OF THESE OUTCOMES**

No.	Module/Subject:	Learning outcomes in:			Program content:	Form of crediting (ZAO, EGZ)	Method of verification and evaluation of learning outcomes
		knowledge	skills	social competence s			
1.	General module	K_W15, K_W17, K_W18,	K_U01, K_U21, K_U22	K_K02 - K_K04	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Presentation of the IT systems of the Lublin Academy of WSEI. Presentation of the e-learning platform, virtual dean's office, mobile student.</li> <li>2. Occupational health and safety – the essence of OSH, legal aspects of OSH, labour law, obligations of employers, rights and obligations of employees, National Labour Inspectorate.</li> <li>3. Occupational health and safety – hazards at the workplace and methods to eliminate or limit them, ergonomics, accidents at work, occupational diseases, respect for the natural environment and compliance with ecological principles in professional work.</li> <li>4. The concept and sources of intellectual property law. Intangible assets as a subject of protection.</li> <li>5. Copyright and related rights. Subject of copyright protection - the concept of a work, types of works (adaptations of other people's works, inspired works), conditions for protection.</li> <li>6. Use of source materials in compliance with copyright principles. Sanctions for infringement of intellectual property protected by law.</li> <li>7. Intellectual property in the IT industry. Licenses and types of licensing for IT products.</li> <li>8. Basic ICT issues (domains, ssl certificates , basic computer networks, operating systems)</li> <li>9. IT security (rules for safe use of the Internet, password rules, safe processing of personal data, incident handling)</li> </ol>	ZAO	Test, practical task

2 a.	Foreign language (English)	K_W15	K_U05	K_K01	<p>Exercises: Semester III</p> <ol style="list-style-type: none"> <li>1. Use of grammatical tenses – repetition and expansion of selected material with new applications,</li> <li>2. Creating questions about the subject and object,</li> <li>3. Using the correct language register in correspondence: formal and informal letter, email,</li> <li>4. Using vocabulary related to family and interpersonal relationships – lexical exercises and typical collocations,</li> <li>5. Weak and strong forms of auxiliary verbs,</li> <li>6. Intonation patterns in interrogative forms,</li> <li>7. How to write and speak more fluently – sentence connectors,</li> <li>8. Rules for writing short press articles,</li> <li>9. The use of formal and informal courtesy phrases in a telephone conversation,</li> <li>10. Describing a job position – vocabulary exercises,</li> <li>11. Use of specialized, directional language.</li> </ol> <p>Semester IV</p> <ol style="list-style-type: none"> <li>1. Use of grammatical tenses – repetition and expansion of selected material with new applications,</li> <li>2. How to say the same thing but different - paraphrasing.</li> <li>3. Using a variety of adjective forms in statements about attitudes and stereotypes – comparative structures, regular and irregular superposition of adjectives, strong adjectives.</li> <li>4. Talking about habits and preferences - constructions: used to, get used to, would rather and wish .</li> <li>5. Expressing skills, abilities and necessities using modal verbs.</li> <li>6. Expressing a request using pseudo questions.</li> <li>7. Talking about travel and means of transport – thematic vocabulary.</li> <li>8. Using the language of suggestion, methods of commenting and giving opinions.</li> <li>9. Writing an application letter and CV – form and rules of its creation,</li> <li>10. Ambiguous nouns as exemplified by personal characteristics.</li> <li>11. Writing short advertising articles.</li> </ol>	EGZ	Semester tests, homework (oral and written), activity during classes, Final written exam
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					<p>12. Characteristics of Written Statements in "For and Against" Essays</p> <p>13. Use of specialized and directional language</p> <p>Semester V</p> <ol style="list-style-type: none"> <li>1. Use of grammatical tenses – repetition and expansion of selected material with new applications,</li> <li>2. Talking about hypothetical situations using conditionals,</li> <li>3. Cognitive use of the verb " have " and " get "</li> <li>4. Hypothetical situations – emotions and giving advice – lexical and grammatical tasks,</li> <li>5. phrasal verbs ,</li> <li>6. Prepositions and prepositional phrases,</li> <li>7. Expressing quantity using quantifiers,</li> <li>8. Passive voice.</li> <li>9. Formulation of complex sentences with subordinate and superordinate clauses,</li> <li>10. Review of a book, film, favorite website – complex sentences and rules for creating paragraphs,</li> <li>11. Use of specialized, directional language.</li> </ol>		
2b.	Foreign language (Russian)	K_W15	K_U05	K_K01	<p>Exercises:</p> <p>Semester III</p> <ol style="list-style-type: none"> <li>1. Use of grammatical tenses – repetition and expansion of selected material with new applications,</li> <li>2. Creating questions about the subject and object,</li> <li>3. Using the correct language register in correspondence: formal and informal letter, email,</li> <li>4. Using vocabulary related to family and interpersonal relationships – lexical exercises and typical collocations,</li> <li>5. Weak and strong forms of auxiliary verbs,</li> <li>6. Intonation patterns in interrogative forms,</li> <li>7. How to write and speak more fluently – sentence connectors,</li> <li>8. Rules for writing short press articles,</li> <li>9. The use of formal and informal courtesy phrases in a telephone conversation,</li> <li>10. Describing a job position – vocabulary exercises,</li> <li>11. Use of specialized, directional language.</li> </ol>	EGZ	Semester tests, homework (oral and written), activity during classes, Final written exam

				<p>Semester IV</p> <ol style="list-style-type: none"> <li>1. Use of grammatical tenses – repetition and expansion of selected material with new applications,</li> <li>2. How to say the same thing but different - paraphrasing.</li> <li>3. Using a variety of adjective forms in statements about attitudes and stereotypes – comparative structures, regular and irregular superposition of adjectives.</li> <li>4. Talking about habits and preferences.</li> <li>5. Expressing skills, abilities and necessities using modal verbs.</li> <li>6. Expressing a request using spurious questions.</li> <li>7. Talking about travel and means of transport – thematic vocabulary.</li> <li>8. Using the language of suggestion, methods of commenting and giving opinions.</li> <li>9. Writing an application letter and CV – form and rules of its creation,</li> <li>10. Ambiguous nouns as exemplified by personal characteristics.</li> <li>11. Writing short advertising articles.</li> <li>12. Characteristics of Written Statements in "For and Against" Essays</li> <li>13. Use of specialized and directional language</li> </ol> <p>Semester V</p> <ol style="list-style-type: none"> <li>1. Use of grammatical tenses – repetition and expansion of selected material with new applications,</li> <li>2. Talking about hypothetical situations using conditionals,</li> <li>3. Hypothetical situations – emotions and giving advice – lexical and grammatical tasks,</li> <li>4. Prepositions and prepositional phrases,</li> <li>5. Expressing quantity using quantifiers,</li> <li>6. Passive voice.</li> <li>7. Formulation of complex sentences with subordinate and superordinate clauses,</li> <li>8. Review of a book, film, favorite website – complex sentences and rules for creating paragraphs,</li> <li>9. Use of specialized, directional language.</li> </ol>	
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3 .	Social and humanistic module	K_W17, K_W18	K_U01, K_U21	K_K03, K_K06	<p>Lectures: Psychological aspects of human functioning</p> <p>1. Psychology as a science and psychological concepts of man</p> <ul style="list-style-type: none"> <li>- Fields of psychology</li> <li>- Goals of psychology as a science (description, explanation, prediction, control)</li> <li>- Selected methods of psychological research</li> <li>- Common assumptions of psychological concepts of man</li> <li>- Selected concepts (psychoanalytic concept of man, behaviorist concept of man, concept of human nature in humanistic psychology, cognitive concept of man)</li> </ul> <p>2. Perception and social perception</p> <ul style="list-style-type: none"> <li>- The concept of perception – how we receive information</li> <li>- Perception as interpretation of impressions</li> <li>- Organization of perception processes (background figure, proximity, similarity, closure)</li> <li>- The constancy of perceptual processes and illusions</li> <li>- Knowledge and judgments about other people</li> <li>- F. Heider's Classical Attribution Theory</li> <li>- Deformations of the attribution process</li> <li>- Hall effect phenomenon and its types</li> </ul> <p>3. Basic Cognitive Processes: Memory, Thinking and Problem Solving</p> <ul style="list-style-type: none"> <li>- The concept and nature of memory</li> <li>- Phases of the memory process</li> <li>- Features and types of memory</li> <li>- Block model of memory (sensory, short-term, long-term memory)</li> <li>- Theories on forgetting (loss of memory traces, interference, loss of access, repression)</li> <li>- Mnemonics</li> <li>- Definitions and Nature of the Thinking Process</li> <li>- Components of the thought process</li> <li>- The role of thinking in solving problems</li> <li>- Irrationality in thinking and cognitive distortions</li> </ul> <p>Philosophical and ethical aspects of human functioning</p> <p>1. The Foundations of Philosophy as the Love of Wisdom</p> <ul style="list-style-type: none"> <li>- The origin, subject and concept of philosophy</li> <li>- Basic philosophical problems and philosophical positions in antiquity (Arche and the problem of change and its epistemological references)</li> <li>- Socrates: Views and the Birth of Ethics as a Science</li> </ul>	ZAO	<p>Final test, student activity during classes, discussion during classes on a specific Case study</p>
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					<ul style="list-style-type: none"> <li>- Idealistic and rationalistic conception of reality and its influence on the subsequent perception of the world</li> </ul> <p>2. Basics of ethics</p> <ul style="list-style-type: none"> <li>- Pre-Socratic Codes of Ethics</li> <li>- Ethics as a science</li> <li>- Basic ethical concepts</li> <li>- The concept of human action and factors influencing the assessment of human conduct</li> </ul> <p>3. Selected issues of professional ethics</p> <ul style="list-style-type: none"> <li>- Work ethic: responsibilities to yourself and your employer</li> <li>- Basic values of professional ethics: (truth, lies, reliability, honesty, secrecy)</li> <li>- Codes of Ethics: PTI Code of Ethics (Ethical Standards)</li> </ul>		
4.	Physical education	K_W17	K_U02	K_K03	<p>Exercises:</p> <ol style="list-style-type: none"> <li>1. Discussing the principles of safety and hygiene during physical education classes. Familiarization with the teaching material and principles of passing classes. Familiarization with the regulations and rules of conduct in the gym and weight room.</li> <li>2. Physical exercises in maintaining human health.</li> <li>3. Learning the individual elements related to soccer, volleyball and basketball – elements of technique and tactics, rules of refereeing.</li> <li>4. Discussion of forms of body shaping in aerobic exercises using various equipment, such as skipping ropes, bands, dumbbells, balls, body shapers , and gymnastic benches.</li> <li>5. Learning the principles of stretching and callanetics as an effective method of gradual stretching and shaping of muscles.</li> <li>6. The use of specific forms of exercise to shape one’s own body.</li> <li>7. The importance of micro and macro elements in the proper functioning of the body during aerobic work and rest.</li> <li>8. Presentation and familiarization with various forms of stationary and circuit training.</li> <li>9. Discussion of physical activity at particular stages of human development, the essence of movement and the aging process.</li> <li>10. Presentation of various forms of physical activity with and without music: Fitness, Aerobics, Pilates , Body Shape , Aeroboxing - impact on the shaping of individual muscle groups.</li> <li>11. Technique for performing exercises at different tempos, selection of appropriate loads for individual muscle groups, discussion of active rest and physical fitness for the quality of everyday life and professional work.</li> </ol>	REGRET	Credit based on active participation in discussions on culture and physical fitness, health and hygiene

					<p>12. Exercises for the shoulder and hip girdles, abdominal and back muscles as a form of strengthening the postural muscles.</p> <p>13. Discussion of the importance of concentration and breathing in physical exercises for the cardiovascular and respiratory systems.</p> <p>14. Medicine ball in various forms of strengthening the shoulder girdle, abdominal and back muscles, squats and half-squats with a jump, assuming the "WZ" and "S" positions.</p> <p>15. Summary, discussion and evaluation of physical fitness.</p>		
5.	Operating systems	K_W07, K_W11			<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Computer system and operating system – definitions.</li> <li>2. Basic functionalities of the operating system.</li> <li>3. Operating systems in a historical perspective.</li> <li>4. Characteristics of MS Windows family systems</li> <li>5. Characteristics of Linux and Android class systems</li> <li>6. The most important files and directories in the system.</li> <li>7. Basic console commands.</li> <li>8. Permissions and users management.</li> <li>9. Managing and monitoring Linux processes</li> </ol>	ZAO	Written test
			K_U08, K_U19	K_K03	<p>Laboratories:.</p> <ol style="list-style-type: none"> <li>1. Basics of Windows administration: user management, directory structure.</li> <li>2. Linux system administration: account management, directory structure.</li> <li>3. Windows user management commands, file and directory permissions, ACLs, permission policies.</li> <li>4. Access rights in Linux, creating groups, detailed permissions - ACL lists</li> <li>5. Windows boot – boot modes, reading configuration, monitoring system and processes.</li> <li>6. Linux basic file and directory operations: creating, deleting, moving, deleting, renaming, mounting file systems</li> <li>7. Windows environment variables, defining variables, building command line scripts.</li> <li>8. Linux environment variables, defining variables, building bash scripts .</li> <li>9. Windows system logs, resource sharing, task scheduling.</li> <li>10. Booting a Linux system – run levels, reading configuration, managing processes in the system and monitoring its operation.</li> <li>11. Linux task schedulers, defining tasks.</li> </ol>		Written colloquium, practical test of Linux commands

6.	Programming Basics	K_W03, K_W05, K_W12, K_W15			<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Basic information about programming and programming languages</li> <li>2. Compiling and running programs in the Windows environment.</li> <li>3. C++ Language – A Brief Overview.</li> <li>4. Variables, constants, operators, expressions, preprocessor directives.</li> <li>5. Structuring instructions.</li> <li>6. Arrays and strings.</li> <li>7. Indicators.</li> <li>8. Functions.</li> <li>9. Data access and complex data types.</li> <li>10. Standard input/output and file operations.</li> <li>11. Complex operators, memory management, date and time.</li> <li>12. Preprocessor.</li> <li>13. Standard C99.</li> </ol>	EGZ	Written exam
			K_U01, K_U03, K_U09, K_U13, KU20	K_K02, K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Installing and configuring the developer environment.</li> <li>2. A program that performs basic mathematical calculations, e.g. calculating the areas of figures and the volumes of solids.</li> <li>3. Solving a quadratic equation in the full range of parameters A, B, C.</li> <li>4. A program that calculates the distances between cities from a set stored in a two-dimensional array.</li> <li>5. Arithmetic sequence, geometric sequence, Fibonacci sequence.</li> <li>6. Programming in the second decade of the 21st century.</li> <li>7. Other programming problems illustrating basic structural constructs of the C language.</li> </ol>		Activity during classes and own work evaluated
7.	Computer systems architecture	K_W01, K_W02, K_W04, K_W14		K_K01,	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Computer system - introduction. Evolution of computers - performance aspect. Computers of the future. Classification of computer architectures. Computer functions and its basic structure</li> <li>2. Number systems. Binary arithmetic. Boolean algebra. Logical gates. Combination and sequential circuits. Programmable logic devices - PLD</li> <li>3. The structure of the central processing unit. The basic principle of the CPU operation – instruction cycle, pipeline processing. Instruction lists. CISC and RISC architecture. Parallel organization</li> <li>4. I/O Modules. Input-Output Operations. Communication Buses. Motherboard Architecture.</li> </ol>	EGZ	Written exam

					<p>5. Memory – basic concepts. Memory hierarchy. Cache memory concept. Internal memory – RAM, ROM. Mass storage. Disk arrays.</p> <p>6. Graphics and audio subsystem. Graphics card - architecture. GPU vs. CPU. Graphics card interfaces. Sound digitization, structure and functions of the sound card. Audio connectors</p> <p>7. Computer cases. Switching power supplies, UPS. Cooling systems.</p> <p>8. Types of data transmission. Peripheral device interfaces. Characteristics of selected input-output devices.</p> <p>9. Computer modifications and diagnostics</p>		
			K_U01, K_U03, K_U07 - K_U10,	K_K01, K_K06	<p>Laboratories:</p> <p>1. Conversion of number systems, arithmetic operations on binary numbers</p> <p>2. Fundamentals of designing and simulating digital logic circuits – combinational circuits (adder, comparator) and sequential circuits (register, counter, ROM)</p> <p>3. Computer component diagnostics - BIOS, UEFI, POST - system diagnostic tools - non-system diagnostic tools</p> <p>4. Design and implementation of a presentation on a topic related to computer systems architecture (optional)</p> <p>5. Design of a computer station according to the established criteria. Selection of computer system components along with justification</p>		Presentation, lab report
8.	Electrical engineering and electronics	K_W02, K_W03, K_W08			<p>Lectures:</p> <p>1. Electric field – quantities characterizing the electric field. Capacitance, capacitors. Electric field energy.</p> <p>2. Magnetic field – quantities characterizing the magnetic field. Inductance, induction coil. Magnetic field energy.</p> <p>3. Semiconductors – band structure of a solid, valence band, conduction band, energy gap. Intrinsic and doped semiconductor.</p> <p>4. Junctionless (volumetric) semiconductor elements - Hall effect sensor, thermistor, varistor, photoresistor (definition, symbols, principle of operation, characteristics, materials, application).</p> <p>5. PN junction: concepts of dynamic equilibrium, depletion layer, potential barrier; voltage-current characteristics of the junction, breakdown).</p> <p>6. Semiconductor diodes - structure, principle of operation, types, characteristics, selected operating systems (e.g. rectifiers, stabilizers).</p>	ZAO	Written colloquium

					<p>7. Bipolar transistors - structure, parameters, principle of operation, operating circuits and their properties.</p> <p>8. Unipolar transistors - structure, types, principle of operation, operating circuits. Transistor amplifiers - circuits, operating classes.</p>		
			K_U11, K_U26	K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Occupational health and safety training, Rules for making up exercises, Rules of conduct in the workshop, Familiarization with equipment</li> <li>2. Measurements in DC circuits</li> <li>3. Single-phase AC circuits</li> <li>4. Passive filters</li> <li>5. Bipolar Transistor Testing</li> <li>6. Study of the unipolar transistor</li> </ol>		Grades for laboratory reports and attitude and activity during classes
9.	Mathematical analysis with linear algebra	K_W03		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. The concept of a number sequence and its basic properties, the limit of a number sequence and basic methods for determining the limits of sequences, including Euler sequences. Exponential and logarithmic functions with a natural base.</li> <li>2. The concepts of limit and continuity of functions of one variable and the properties of such functions.</li> <li>3. The concept of the derivative of a function, its properties and applications, including l'Hopital 's theorem . The concept of an extremum of a function of one variable, necessary and sufficient conditions for the existence of a local extremum. The smallest and largest values of a function on a closed interval. Local and global extrema. Convex and concave functions and their applications.</li> <li>4. The concept of an antiderivative and methods of determining antiderivatives. Definite integral and methods of its determination and applications of the definite integral.</li> <li>5. Matrix algebra. Determinant of a square matrix. Properties of determinants. Inverse matrix. Applications of matrices and determinants in computer science.</li> </ol>	ZAO	Written test
							K_U07

					<p>4. Determining indefinite and definite integrals of functions of one variable. Applications of integral calculus.</p> <p>5. Performing operations on matrices, calculating the determinant of a matrix and its inverse.</p>		
10.	Algorithms and data structures	K_W01, K_W02, K_W10, K_W12		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Computer representation of floating-point numbers. Rounding errors in numerical processes.</li> <li>2. Numerical interpolation ( Lagrange's formula and Newton's formula).</li> <li>3. Numerical integration (interpolation quadratures).</li> <li>4. Solving systems of linear equations and Gaussian elimination.</li> <li>5. Numerical solution of nonlinear equations (Newton and secant methods).</li> <li>6. Algorithms and their complexity. Linear lists (unidirectional and bidirectional). Queues and stacks and their applications.</li> <li>7. Tree structures, binary search trees, red-black trees. Using B-trees to create indexes.</li> <li>8. Heaps and their application to sorting. Quick sort algorithm. Merge sort.</li> <li>9. Graphs and basic graph algorithms</li> </ol>	EGZ	Written exam
			K_U07, K_U17	K_K03, K_K06,	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Practical numerical problem solving using GNU Octave .</li> <li>2. Implementation of selected algorithms and data structures in the GNU OCTAVE language</li> <li>3. Application of algorithms and data structures to solving practical problems.</li> <li>4. Application of numerical methods in solving technical problems.</li> <li>5. Practical use of non-numerical processing algorithms. It is assumed that a representative of the business environment will present selected algorithms and their practical application in the form of presentations and case studies</li> </ol>		Grades for group work in the laboratory assignment. Attendance
11.	Fundamentals of Structured Programming in C++	K_W06, K_W12, K_W15			<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Introduction to the module. Assessment rules. Literature and IDE environment suggestions. Expanding knowledge on project structure and syntax of basic C/C++ instructions.</li> <li>2. Characteristics of fundamental types, logical and arithmetic operators - additional information. Explicit and implicit type conversion. Using the ' debugger ' tool to find ' runtime ' errors.</li> <li>3. Increment and decrement operators. Relational and logical operators. Protective expressions. Enumerated types and defining alternative type names.</li> </ol>	EGZ	Written exam. Attendance

				<ol style="list-style-type: none"> <li>4. Conditional and iterative statements in a complex context, taking into account usage patterns and potential errors.</li> <li>5. Definition, declaration and function call - supplementary issues. Modularization - including your own and third-party code in the project.</li> <li>6. Pointers and references. Dynamic array allocation, passing arguments to functions.</li> <li>7. Example of including a third-party library in a project. Passing arrays to functions. Pointers to functions. Smart pointers for dynamic memory allocation.</li> <li>8. Data structures, defining aggregated data types and functions defined in structures.</li> <li>9. Defining access to class members. Class inheritance, issues of calling constructors of base and derived classes.</li> <li>10. Multiple inheritance. Virtual functions and polymorphism using pointers or references. Application of polymorphism in interface programming. Function templates and class templates. Lecture course credit exam - zero term.</li> </ol>		
			<p>K_U01, K_U03, K_U10, K_U13, K_U20</p> <p>K_K02, K_K04, K_K05</p>	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Working with functions - summary of material from the Basics of Programming module. Assessment program - 'Active calculator'. References to variables and pointers - introduction.</li> <li>2. Pointers and references in passing arguments to functions by address. Program for evaluation - Function calculating the volume and area of a selected solid.</li> <li>3. Passing arrays to functions by reference or pointer. Dynamic allocation of arrays using a pointer. Program for evaluation - A function that writes values to an array created dynamically and passed as an argument.</li> <li>4. Introduction to object-oriented programming. Example of the 'kuferek' class. Private and public class components, member functions, implicit constructor.</li> <li>5. A test on structured programming using pointers, consisting of a program on a given topic and four questions on single statements.</li> <li>6. Extension of the 'truck' class with a name field and access password. Construction of a user menu for handling the trunk.</li> <li>7. Program for evaluation - definition of the 'cash register' class. Program simulating store cash register operations from the user menu.</li> <li>8. Defining functions working on class objects, passed as arguments by reference. The 'canister' class and functions for</li> </ol>		<p>10 lab assignments. Attendance</p>

					<p>refueling canisters. Division of code into definition, header and main files.</p> <p>9. Functions working on class objects. Program for evaluation - 'Balloon' and global function for inflating balloons.</p> <p>10. Example of solving the task 'Class Balloon' with a user interface using an array and a pointer to class objects.</p> <p>11. Functions controlling keyboard input. Stream formatting flags and manipulators. Handling output and input streams to disk files.</p> <p>12. Program for evaluation - Calculator that displays a formatted table of temperatures in various units and saves the results to a text file.</p> <p>13. The relation of containing class objects by other classes. Constructor initialization list, pointers to class objects, dynamic definition of class member objects.</p> <p>14. Program for evaluation - class 'Battery' containing objects of class 'Pokretlo' or class 'Paczkomat' containing objects of class 'Skrzynka'.</p> <p>15. Example of inheritance and polymorphism. Test of the presented example. Summary of the laboratory course, assigning a formative assessment, possibility of improving one task.</p>		
12.	Designing websites with computer graphics elements.	K_W05, K_W06, K_W10, K_W13, K_W15, K_W16		K_K01	<p>Lectures:</p> <p>1. Information architecture in websites. General principles of website design. Examples of "good" and "bad" designs. The process of planning and designing a website. Site plan.</p> <p>2. HTML – Introduction. Language Syntax. HTML Document Structure. Description of Selected Tags. Source Code Editors</p> <p>3. Cascading Style Sheets - Introduction. Style Structure. Connecting Style Declarations to Documents. CSS Properties (Cascading, Inheritance, Classes, Pseudo-Elements ). Selected Text Formatting Commands</p> <p>4. Colors and background of the page. Sass metalanguage . The idea of a container. Units of measurement in CSS</p> <p>5. Graphics on the Internet - introduction. Important parameters of graphic files. Optimization and general rules for placing graphics on websites. Canvas element . Basics of SVG language. Animations and multimedia on the website. The role of color in website design. Elements of visual identification.</p> <p>6. Scripts on web pages (JS, PHP). Introduction to JavaScript. Adding script to a page. Functions and arrays. Event handling.</p> <p>7. DOM model and its objects. Accessing DOM nodes. Form validation. jQuery library . Practical examples of JS usage.</p>	ZAO	Written test

					<p>8. Web development standards. Site elements – parts of a site and a web page. Introduction to web typography. Page layouts. Flexbox model . RWD technique – mobile sites. Site accessibility (WCAG standard)</p> <p>9. Responsiveness of websites. Introduction to Bootstrap . The idea of the Bootstrap grid . Examples of multi-column structures. Navigation components. Displaying content, images, lists. Other useful components</p> <p>10. Testing the website. Optimization - site loading speed. Positioning. Maintaining the website. Legal and ethical issues.</p>		
			K_U10, K_U13, K_U16, K_U23, K_U24	K_K01, K_K03	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Document structure - text tags</li> <li>2. Lists, tables, hyperlinks</li> <li>3. Forms</li> <li>4. Images and multimedia</li> <li>5. CSS - structure, properties, text formatting</li> <li>6. CSS - Colors and Page Background</li> <li>7. Container Model and Page Layouts</li> <li>8. Graphic elements - canvas tag , SVG language</li> <li>9. JQuery library in web page implementation</li> <li>10. Own website design</li> <li>11. Service implementation</li> </ol>		Exercise report, service project
13.	IT Project Management	K_W17, K_W19			<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. General concept of the project and its characteristics,</li> <li>2. Characteristics of selected types of projects, including the scheme of project phases functioning,</li> <li>3. Features of IT projects,</li> <li>4. Thematic areas of IT projects and characteristics of a project manager,</li> <li>5. Knowledge and skills of a project manager,</li> <li>6. Principles of teamwork in project implementation,</li> <li>7. Selected issues of the principles of negotiation with internal and external stakeholders during project implementation,</li> <li>8. Basics of implementation project management.</li> <li>9. Structure of implementation work.</li> <li>10. IT project work methodologies</li> <li>11. Inquiry, offers, functional specifications</li> <li>12. Pre-implementation analysis</li> <li>13. Preparing a pre-implementation analysis document</li> <li>14. Configuration, implementation and training reports</li> <li>15. Starting the system.</li> <li>16. Post-implementation assistance</li> </ol>	ZAO	Written test

			K_U02, K_U03, K_U23	K_K01, K_K04	Exercises: 1. Request for quotation 2. Functional specification 3. Offering 4. Project schedule 5. Analytical questions 6. Configuration analysis 7. Design documentation		Task evaluation
14.	Introduction to Computer Networks	K_W04, K_W07, K_W11, K_W14, K_W15		K_K01	Lectures: 1. Discovering the web. 2. Configuring the network operating system. 3. Network protocols and communications. 4. Network access layer. 5. Ethernet. 6. Network layer. 7. Transport layer. 8. IP addressing. 9. Subnets in IP networks. 10. Application layer. 11. Computer network.	EGZ	Written exam
			K_U05, K_U08, K_U09, K_U14, K_U18, K_U19	K_K01, K_K04	Laboratories: 1. Initializing and Reloading a Router and Switch. Installing IPv6 Configuration on Windows 10/11. Examining Network Interoperability Tools. Examining Converged Network Services. Mapping the Internet. 2. Establishing a console session using Tera Term. Building a simple network. Configuring the switch management address. 3. Web Standards Research. 4. Monitoring network traffic. 5. Observing the three-stage TCP connection establishment. 6. Using Wireshark to examine and capture DNS UDP frames. 7. Using Wireshark to examine and capture FTP and HTTP frames. 8. IPv4 address conversion to binary. IPv4 address resolution. IPv6 address resolution. IPv6 address configuration on network devices. 9. Design and implement an addressing scheme based on IPv4 subnets. 10. Design and implementation of VLSM addressing schemes. 11. Tracking MAC addresses of network devices. 12. Using Wireshark to examine Ethernet frames. Observing ARP using Windows CLI, IOS CLI, and Wireshark . 13. Using IOS CLI to Examine Switch MAC Address Tables		Grades for work within individual laboratory tasks

15.	Software Engineering	K_W05, K_W10, K_W15, K_W16		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Introduction to Software Engineering</li> <li>2. Software design</li> <li>3. Software design and development tools (MS Visio, SQL Server, Visual Studio)</li> <li>4. Entities</li> <li>5. DPD Diagrams.</li> <li>6. UML language and modeling of information systems.</li> <li>7. Organization of a programming project, gathering and analysis of requirements.</li> <li>8. System design. IT project management and its changes.</li> </ol>	EGZ	Written exam
			K_U04, K_U12, K_U17	K_K01, K_K03, K_K04, K_K06	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Practical exercises in entities, DPD diagrams, UML.</li> <li>2. Practical knowledge of modeling tools and code repositories.</li> </ol>		Grade for independent work within the laboratory task
16.	Teleinformatics and multimedia systems	K_W02, K_W04, K_W13, K_W14		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Communication process. Definition and tasks of a telecommunications and teleinformatic system. Development of telecommunications networks - technological progress. Types of telecommunications networks. Multiple access techniques to the transmission medium. Transfer modes in networks. Digital telecommunications networks - from ISDN to xDSL .</li> <li>2. IP networks. Types of computer networks. Network topologies - structure, advantages and disadvantages of individual solutions. OSI and TCP/IP network model. Basics of network infrastructure design on the example of LAN</li> <li>3. Types of wired connections. Components of structured cabling. Selected active and passive network devices. Fiber optic networks. Optical access networks FTTx</li> <li>4. Basics of wireless technology. Advantages and disadvantages of wireless networks. Wireless LAN 802.11 standards. Other standards (Bluetooth, WiMax ). Wireless network devices.</li> <li>5. Mobile telephone networks (GSM - 5G). Satellite teleinformatic networks, basic issues, satellite constellations, LBRDS networks and for providing telephone services, broadband networks. Other communication systems (DECT, TETRA)</li> <li>6. Security of teleinformatic systems. Elements and attributes of security. Security measures and their selection. Security of human resources</li> <li>7. Introduction to multimedia systems. Structure and principles of designing audiovisual presentation systems (principles of room</li> </ol>	ZAO	Written colloquium

					<p>sound reinforcement (basics of acoustics), selection of projection system). Projectors and projection screens. Microphones. Loudspeakers</p> <p>8. Image in multimedia systems. Perception of visual information. Definition and classification of images. Information systems in image technology. Principles of creating a digital image - image as a mathematical function. Discretization - image sampling and quantization</p> <p>9. Image recording systems. Photography and cameras. Video monitoring systems. Guidelines for the CCTV system designer</p> <p>10. Convolutional networks .</p> <p>11. Image creation methods in computer systems - projection techniques. Monitors. Printing process (digital, offset printing)</p>		
			K_U01, K_U03, K_U09, K_U10, K_U14, K_U15	K_K01, K_K06	<p>Laboratories:</p> <p>1. Laboratory program and module crediting requirements. Project task 1 criteria.</p> <p>2. Defining the applications of the designed network. Numerical estimation of the network. Selection of the architecture along with justification.</p> <p>3. Analysis and selection of network topology. Logical and physical diagram of the topology of the designed network.</p> <p>4. Cable selection. Network equipment specification. Cost estimate.</p> <p>5. Criteria for design task 2. Acoustic analysis of a room using the acoustic application calculator</p> <p>6. Calculations and selection of sound system</p> <p>7. Calculations and selection of projection system</p> <p>8. Cost estimate and situation drawing</p> <p>9. Design documentation.</p>		Laboratory Report - Design Documentation
17.	Discrete mathematics	K_W03		K_K01	<p>Lectures:</p> <p>1. Relations and functions and their types. Factorial and its generalizations. Binomial coefficients.</p> <p>2. Permutations, variations and combinations and their types. Properties of permutations without repetitions – fixed points and disorders.</p> <p>3. Interpretations of combinatorial objects.</p> <p>4. The main methods of counting sets: the sum law, the product law, the bijection law, the inclusion law and the Dirichlet pigeonhole law.</p> <p>5. Mathematical induction and its applications to defining new concepts. Newton's binomial, its generalizations and binomial coefficients.</p>	ZAO	Written test

					<p>6. Elements of number theory (divisibility, Euclidean algorithm). Examples of recursion.</p> <p>7. Undirected graphs and their types. Matrix representation of a graph and its applications. Special cases of graphs: Euler and Hamilton graphs</p>		
			K_U07	K_K01, K_K05	<p>Exercises:</p> <ol style="list-style-type: none"> <li>1. Functions used in discrete mathematics (e.g. floor and ceiling), modulo operation, binary relation, equivalence relation, congruence relation, relation graph.</li> <li>2. Designating abstraction classes.</li> <li>3. Applying mathematical induction to proofs of equality, inequality, and divisibility.</li> <li>4. Creating mathematical models using permutations, variations and combinations, permutations without repetitions and disorders.</li> <li>5. Composition of permutations, decomposition of permutations into disjoint cycles, type of permutation, inversion, decomposition into transpositions.</li> <li>6. Methods of construction and analysis of special numbers and their interpretations (Bell, Bernoulli, Stirling, Catalan numbers).</li> <li>7. Using graph methods in practical problems</li> </ol>		Written test (6 tasks). Activity during classes
18.	Database systems	K_W09			<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. The concept of a database management system (DBMS) and a database, DBMS functions, basic methods of data organization (hierarchical, network, relational and object models).</li> <li>2. Relational data model: relationships, primary keys and foreign keys, domains, " null " values, elements of relational algebra.</li> <li>3. Data integrity in the relational model: entity, referential and domain integrity, methods for maintaining referential integrity.</li> <li>4. Database modeling: normalization, normal forms, entity-relationship diagrams.</li> <li>5. Introduction to SQL. Basic SQL statements.</li> <li>6. Structured and correlated subqueries</li> </ol>	ZAO	Written test
			K_U01, K_U25	K_K03	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. DDL commands: create, modify, and delete tables, indexes, and views.</li> <li>2. INSERT, UPDATE, DELETE, TRUNCATE commands.</li> <li>3. Simple queries using predicates and sorting.</li> <li>4. Internal, external and bilateral joins.</li> <li>5. Queries using aggregate functions.</li> <li>6. Structured and correlated subqueries.</li> </ol>		Laboratory tasks

19.	Fundamentals of object-oriented programming in Java	K_W06, K_W12, K_W15		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Structure of Java programs; simple data types; expressions and operators;</li> <li>2. Simple and structured statements: loops, conditionals, selection statements;</li> <li>3. Boards, collections.</li> <li>4. Object-oriented programming concepts: class, object, encapsulation, fields and methods; inheritance and polymorphism; access specifiers;</li> <li>5. Designing methods; packages; abstract classes, interfaces.</li> <li>6. Input/output programming; streams; exception handling.</li> <li>7. Creating Windowed Applications Using the JavaFX Library</li> </ol>	EGZ	Written exam
			K_U01, K_U05, K_U10, K_U20	K_K01, K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Writing, compiling, and running Java programs in the IntelliJ environment .</li> <li>2. Basic input/output operations.</li> <li>3. Programs illustrating the use of flow control instructions.</li> <li>4. Boards, use of collections.</li> <li>5. Creating simple classes and objects. Inheritance, creating derived classes, constructors.</li> <li>6. Design of a program requiring the creation of a class hierarchy.</li> <li>7. Creating GUI applications using the JavaFX library .</li> <li>8. Exception handling. File I/O operations.</li> </ol>		Lab assignment. Project assignment. Class activity
20	Fundamentals of artificial intelligence	K_W03, K_W12, K_W13			<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Introduction to Machine Learning - Definitions</li> <li>2. Linear Regression and Decision Trees</li> <li>3. Methods of interpreting models</li> <li>4. Logistic regression</li> <li>5. Interpreting and analyzing machine learning models</li> <li>6. Shapely Values and the SHAP method</li> <li>7. Learning and Interpreting Neural Networks</li> <li>8. Selected Machine Learning Frameworks</li> <li>9. Learning and Interpreting with scikit-learn</li> <li>10. Pytorch and Linear Models</li> <li>11. Deep learning</li> <li>12. Using advanced libraries for machine learning</li> </ol>	EGZ	Written exam
			K_U02, K_U04, K_U20, K_U23	K_K02, K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Elements of artificial intelligence</li> <li>2. Basic structure of neural networks</li> <li>3. Loss functions for regression and classification</li> <li>4. Types of Activation Functions</li> <li>5. Python libraries used in artificial intelligence.</li> </ol>		Laboratory assignment

					6. Introduction to Machine Learning Algorithms Using Python 7. Introduction to Deep Learning with Python		
21.	Advanced databases	K_W09			Lectures: 1. Database structure. Concepts of block, extension and segment. 2. Tablespaces and data files. 3. Concurrent data access: transactions, locks and sessions. 4. Administering database objects. 5. Monitoring user work, user administration. 6. Database security mechanisms: redo log, rollback segment, control files. 7. Database archiving: physical and logical. Data recovery mechanisms. 8. Data types in SQL and PL/SQL. Constants, simple variables, record variables. 9. SQL statements in PL/SQL	ZAO	Written test
			K_U25	K_K03	Laboratories: 1. SQL commands from the DML, DDL, DCL and TCL groups. 2. Joins. 3. Aggregation functions. Anonymous blocks. 4. Procedures and functions. 5. Exceptions: predefined exceptions, handling exceptions, defining your own exceptions, exception propagation. 6. Cursors. Packages. Procedure and function overloading. Package initialization section. 7. Triggers: object triggers, row triggers, predicates in triggers, INSTEAD-OF triggers		Relational Data Base Project
22.	Communication security and cryptography	K_W11, K_W17		K_K01- K_K03	Lectures: 1. History of Cryptography 2. Symmetric and asymmetric cryptography 3. Web Application Security 4. Operating system security 5. Cloud Security 6. Cryptography and application security 7. Providing confidentiality and authentication in cryptographic systems 8. Cybersecurity and Cloud Solutions 9. Blockchain and cryptocurrencies 10. Electronic Signature 11. Quantum cryptography 12. Spyware 13. CVE- Common Vulnerabilities and Exposures	ZAO	Written colloquium, Activity during classes. Development of selected issues

			K_U01, K_07- K_U09, K_U23, K_U26	K_K04	Laboratories: 1. Encryption algorithms and operating system security 2. Encryption algorithms and their implementation in Python 3. Database and password security 4. Securing web applications		Laboratory tasks. Activity during classes
23a	Enterprise	KW_18- K_W20			Lectures: 1. Industry 1.0-4.0, understanding the concept of entrepreneurship and types of entrepreneurship and their characteristics 2. I form of entrepreneurship – entrepreneurship in the functional sense, the importance of the SME sector in the Polish and global economy. The impact and importance of innovation and Research and Development on entrepreneurship, selected support programs in various areas of activity of SME companies 3. Form II of entrepreneurship – the entrepreneur as an entity “practicing” entrepreneurship, features and components of the entrepreneur’s profile 4. III form of entrepreneurship – entrepreneurship as an approach to management, selected economic aspects of the functioning of an SME sector enterprise, identification and assessment of opportunities, threats and risks. Barriers to the creation and functioning of SME sector companies, innovation as the basis for entrepreneurial activities, sources of support for entrepreneurs in their activities	ZAO	Students develop a project in the form of a multimedia presentation on a selected topic from the list, relating to the broadly understood concept of entrepreneurship
			K_U21,		Exercises: 1. Legal basis and principles of undertaking and conducting business activity in Poland. A concise presentation of legal regulations governing undertaking and conducting business activity based on the provisions of the Act of 6 March 2018 - Entrepreneurs' Law. 2. Organizational and legal forms of economic activity: Presentation of organizational and legal forms of economic activity and basic conditions necessary to start the activity, 3. Procedure for registering business activity by individuals - Central Register and Information on Business Activity a. Principles of operation of CEiDG b. Registration procedure in traditional and electronic form c. Registration of a company in the National Court Register - d. Principles of operation of the KRS and registration procedure e. Registration forms - filling in selected forms - exercises 4. Public law obligations of an entrepreneur towards public administration bodies – Forms of taxation .		Implementation of tasks related to the establishment and operation of the company

				K_U22, K_U27	Laboratories: Industry Business Simulations - Business Planning. The student's task is to establish a sole proprietorship of choice in various industries and plan the development of the company. The game evaluates the participant at each stage of the game in terms of the decisions made, checks their correctness, consistency, logic and compliance with the law		Participating in and completing the game with the requirement to obtain a minimum of 50% of points in each round of the simulation game.
23b	Company management	K_W19, K_W20			Lectures: 1. The process of creating enterprises 2. Legal forms of enterprises 3. Levels of enterprise management 4. Resources and management systems 5. The specificity of service and production companies 6. Process and design companies 7. Sources of financing 8. Business plan	ZAO	Written test
			K_U01	K_K02	Exercises: 1. Marketing orientation of the company and its determinants 2. Marketing information system 3. Market segmentation and target market selection 4. Product strategy: 5. Pricing strategy 6. Promotion strategy 7. Distribution strategy 8. Varieties of modern marketing - Permanent Relationship Marketing - Internet Marketing - Guerrilla Marketing 9. Logistics processes in the enterprise - Supply and distribution logistics processes - Internal logistics processes		Correctness of answers given during the discussion
			K_U02, KU04, KU22	K_K02	Laboratories: 1. Introduction to the game concept 2. Familiarize yourself with the game documentation 3. Creating a virtual company 4. Preliminary games 5. Games in teams of 4		Game results

					6. Self-assessment of gameplay		
24.	Information Technology and Design Patterns	K_W05, K_W06, K_W10		K_K01	Lectures: 1. The general idea of using design patterns. 2. Description and analysis of selected patterns (idea, UML, application, implementation): creative, structural and behavioral. 3. Analysis of practical use cases.	ZAO	Development of a selected topic
			K_KU10, K_U20, K_U23, K_U26	K_K03, K_K06	Laboratories: Exercises in practical programming problem solving using design patterns .		Laboratory task. Activity during classes
25.	Parallel programming	K_W04, K_W06, K_W15		K_K01	Lectures: 1. Survey of modern multiprocessor computer architectures, Flynn's taxonomy, Amdahl's law . 2. Basic concepts of parallel programming: nondeterminism , races, critical sections, protection mechanisms, private and shared variables. 3. Creating multithreaded software for shared memory systems: Thread Class, ThreadPool Class , Parallel Class , Asynchronous Delegates , Task Parallel Library. 4. Using synchronization mechanisms – Interlocked , Monitor, ResetEventy , lock, mutex , semaphore, parallel access collections classes. 5. Sending and receiving messages, broadcasts, reduction operations, distributed computation in the Scatter / Gather scheme . 6. Methodology for creating parallel program algorithms; evaluation of their effectiveness.	ZAO	Test. Activity during classes
			K_U05, K_U10, K_U20	K_K01, K_K04	Laboratories: 1. Writing and analyzing multithreaded programs using the Thread Class , ThreadPool Class, Parallel Class , Asynchronous Delegates , Task Parallel Library. 2. Examples illustrating the occurrence of races. Examples of using synchronization objects to eliminate races and pass signals. 3. Examples of embarrassingly parallel problems and data interdependency problems. 4. Writing programs that use parallel loops using the Parallel class . 5. Performance analysis of parallel programs. 6. Debugging parallel programs		Design task
26.	Mobile Device Programming	K_W05- K_W07			Lectures: 1. Android architecture and core development tools like Android Studio and Gradle .	EGZ	Exam - test

					<ol style="list-style-type: none"> <li>2. Techniques for creating user interfaces using layouts such as LinearLayout and ConstraintLayout ,</li> <li>3. Principles of dynamic view manipulation in Java code.</li> <li>4. Integrating applications with the Internet, supporting JSON format and creating lists using RecyclerView .</li> <li>5. Mobile app navigation, activity and fragment lifecycle management</li> <li>6. Applying the MVVM pattern using ViewModel and LiveData .</li> <li>7. The basics of animation in Android, including implementing advanced effects using MotionLayout .</li> </ol>		
			K_U08, K_U10, K_U13	K_K01, K_K02, K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Installing and configuring the development environment</li> <li>2. Designing user interfaces using XML files and dynamically manipulating views in Java code.</li> <li>3. Implementing lists using RecyclerView and navigating applications using Intent and NavigationController .</li> <li>4. Working with APIs, connecting applications to the Internet, and integrating data in JSON format.</li> <li>5. Application lifecycle management and MVVM architecture implementation using ViewModel and LiveData .</li> <li>6. Creating animations with MotionLayout .</li> </ol>		Laboratory tasks. Activity during classes
27.	Design of IT systems	K_W05, K_W10		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Key concepts related to the design of information systems. Phases of information system construction.</li> <li>2. Software development methodologies - review of design models and paradigms, including classical and agile approaches. Features of good IT system design.</li> <li>3. Division and organizational models of project teams. Tools for computer-aided software design.</li> <li>4. UML language and UML modeling tools.</li> <li>5. Designing system architecture. Designing user interfaces. Designing modules and procedures.</li> <li>6. Formal methods of software engineering and their use in creating specifications of information systems. Review of methods for designing specific information systems (client-server, web applications, mobile systems).</li> <li>7. Software project management, key project parameters. Risk management in an IT project, risk assessment methods.</li> <li>8. Software quality assurance techniques – integration and acceptance unit testing.</li> </ol>	EGZ	Exam - test

			K_U03, K_U10, K_U12, K_U17	K_K04, K_K06	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Practical implementation of subsequent stages of an IT system project using an example project.</li> <li>2. Analysis and description of functional and non-functional requirements of the system.</li> <li>3. Using UML to create an IT system design, creating use case, activity, class, sequence diagrams, and an ERD entity diagram to illustrate the structure and behavior of the designed system.</li> <li>4. Familiarization with the ORM (Object- Relational Mapping ) for mapping objects in code to records in a relational database using the Entity Framework example in the Visual Studio environment.</li> <li>5. Organization of project teams to implement the assigned IT system project</li> </ol>		Laboratory tasks. Activity during classes
28.	Cyberattacks on infrastructure – techniques and combating	K_W07, K_W11, K_W13		K_K01	<p>Lectures:</p> <p>Part I:</p> <ol style="list-style-type: none"> <li>1. Cybersecurity – history of cyberspace, definition of cyber threats, problems of identifying cyber attacks. Security in the era of Big Data.</li> <li>2. Consequences of Massive Cloud Computing Usage. Cyber Warfare – Attack Phases.</li> <li>3. Cyberspace as a dimension of competition between states and organizations – intelligence, economic competition,</li> <li>4. The Internet as a tool for spreading true and false information.</li> </ol> <p>Part II:</p> <ol style="list-style-type: none"> <li>1. Stages of an attack and their detection.</li> <li>2. Tools for increasing the level of security. Automation of response to detection of anomalies.</li> <li>3. Systematic approach to building security in the ISO, SOC, NOC, CSIRT organization. Securing evidence of an attack for analysis purposes</li> </ol>	EGZ	Exam - test
			K_U11, K_U18, K_U19	K_K04	<p>Laboratories:</p> <p>Part I:</p> <ol style="list-style-type: none"> <li>1. Methodology and recognition of cyber attacks: <ul style="list-style-type: none"> <li>– reconnaissance (passive and active ),</li> <li>– collecting information,</li> <li>– enumeration,</li> <li>– supply,</li> <li>– exploitation .</li> </ul> </li> <li>2. Limiting the spread of the attack. Collecting evidence for analysis.</li> </ol> <p>Part II:</p>		Lab report

					<ol style="list-style-type: none"> <li>1. Group project: <ul style="list-style-type: none"> <li>– Installation of IDS/IPS mechanisms in the internal network.</li> <li>– Implementation of SIEM mechanisms based on the WAZUH application. System configuration and implementation on the indicated OS .</li> </ul> </li> <li>2. Repelling an attack using the above-mentioned application.</li> </ol>		
29.	Application testing	K_W01, K_W05, K_W10, K_W15		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. What is testing, its goals and why it is necessary. Distinguishing debugging from testing.</li> <li>2. Testing activities, testware , and test roles.</li> <li>3. Testing in the software development cycle: its impact, models, and best practices. Shift left as a way to reduce costs. Basic activities in the testing process.</li> <li>4. Distinguish between levels and types of testing, confirmation testing and regression testing. Applications and benefits of dynamic and static testing.</li> <li>5. Equivalence partitioning, boundary value analysis, testing: based on decision tables, state transitions.</li> <li>6. Experience-based and collaborative testing techniques.</li> <li>7. Test planning (purpose and content, entry/exit criteria, estimation techniques)</li> </ol>	ZAO	Colloquium - test. Elaboration of selected issues. Activity during classes
			K_U03, K_U08, K_U10, K_U12	K_K03, K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Test environment installation and configuration. Basic annotations Junit .</li> <li>2. Creating and executing unit tests. Verifying code correctness using assertions.</li> <li>3. Exception and edge case testing.</li> <li>4. Test parameterization: multiple tests with different data.</li> <li>5. Mocking in Unit Testing Introduction to mocking – principles and benefits. Mocking tools ( Mockito ).</li> <li>6. Test case design in black-box testing: equivalence partitioning, boundary value analysis, cause-effect relationships, and error guessing.</li> <li>7. Test Case Design in White-Box Testing: Coverage of Statements, Decisions, and Conditions .</li> </ol>		Laboratory tasks. Activity during classes
30.	Web Application Programming	K_W01, K_W05, K_W10		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Web applications - terminology, technologies. Architecture of a web application that works with a database. HTTP protocol methods. HTTP request and response headers.</li> </ol>	ZAO	Written colloquium

					<ol style="list-style-type: none"> <li>2. PHP as an example of a server-side scripting language. Basic elements of the language.</li> <li>3. Methods for retrieving data from HTML forms. PHP functions and templates. Web application interaction with the file system on the web server.</li> <li>4. Web application collaboration with databases. SQL queries. MySQL server and PHPMyAdmin database administration tool .</li> <li>5. PHP and MySQL - MySQL and PDO interface</li> <li>6. Presentation layer of a web application – using the JS language and the React library .</li> <li>7. Application implementation, performance, optimization</li> <li>8. Web Application Security</li> </ol>		
			K_U01, K_U10, K_U13, K_U17, K_U26	K_K01, K_K06	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Web application development environment – Apache server, MySQL and PHP.</li> <li>2. PHP Application Development Basics</li> <li>3. Working with data in PHP and MySQL. Implementation of a class for handling a database based on the mysqli or PDO extension.</li> <li>4. User registration and login support</li> <li>5. Building the presentation layer of a web application based on the React library .</li> <li>6. Own web application design</li> </ol>		Web Application Design
3 1.	Advanced Software Engineering Methods	K_W05, K_W10		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Modern application architectures and development of their creation methods. Basic principles of building modern multi-tier applications.</li> <li>2. Introduction to Java Enterprise Edition. Java EE application model. Components and containers, application servers.</li> <li>3. Servlet technology and Java Server Pages . Separation of executable code from the presentation layer. JSP expression language and JSTL library.</li> <li>4. Faces Technology . The Role of Application XML Descriptors . Enterprise JavaBeans . The Role of EJB on the Java EE Platform . EJB Component Types .</li> <li>5. Remote and local interfaces. Dependency and context injection (CDI). Java Message Service standard. JMS application architecture. Asynchronous and synchronous communication. Message-driven EJB components. JMS transactions.</li> </ol>	EGZ	Written exam

					<p>6. Access to databases in Java EE applications. JDBC, SQLJ mechanisms, JSTL SQL tag library.</p> <p>7. Object-Relational Mapping (O/RM). Java Persistence API.</p> <p>8. Using advanced design patterns to create modern multi-tier applications</p>		
			K_U10, K_U13, K_U20, K_U21, K_U23, K_U26	K_K01, K_K04, K_K06	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Organization of the development environment. Installation and configuration of the environment for creating JEE applications.</li> <li>2. Creating web applications based on servlets and JSP (Java Server Pages ). Session support in Java EE servlets . Separation of executable code from the presentation layer.</li> <li>3. JSP Expression Language . JSTL (JSP Standard Tag Library). Using EJB (Enterprise Java Beans ) to implement application business logic. Stateful and stateless EJB session beans. Using servlets and JSP as EJB clients.</li> <li>4. JPA (Java Persistence API) technology and application cooperation with databases. Concurrency management in JPA. Use of O/RM mechanisms.</li> <li>5. Creating a web interface based on JSF (Java Server Faces ) technology. Form data validation mechanisms. Internationalization of JEE business applications.</li> <li>6. Integration of presentation and business logic layers in JEE applications. Context and Dependency mechanism Injection . Creating applications using MDB (Message -Driven Database) message beans Beans ).</li> <li>7. Testing applications for the JEE platform.</li> <li>8. Practical exercises in the use of advanced patterns and pattern conglomerates</li> </ol>		Laboratory assignment. Attendance at classes
32.	Introduction to Cybersecurity	K_W02, K_W07, K_W08, K_W11		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Introduction to information protection - definitions, concepts, problems, areas of application. Digital information security and surveillance methods, social engineering.</li> <li>2. Contemporary attacks on digital information and modern protection mechanisms.</li> <li>3. Organization of information security in the organization Implementation of a model information security management system.</li> <li>4. Basic concepts of IT risk, penetration testing, information security audit. Principles of designing security systems and their assessment and incident response.</li> </ol>	ZAO	Written test

			K_U01, K_U04, K_U10, K_U13, K_U23	K_K01-K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Practical social engineering, surveillance, and data protection: analysis of typical threats and discussion of protection methods and incident response.</li> <li>2. Privacy and confidentiality in cloud environments and social networks. Configuring security services and testing them.</li> <li>3. Building an information security system taking into account risk analysis.</li> <li>4. Case studies ( case studies ) and simulation games covering typical cybersecurity and information protection scenarios, both in business and personal aspects.</li> </ol>		Lab task
33.	Computer network design	K_W07, K_W14, K_W15		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. The role and operation of the Spanning protocol Tree . Standard IEEE801.d</li> <li>2. Fresnel zones . Propagation models. Link attenuation calculations. Selection of link components: antennas, connectors, cables. Antenna polarization. Interference problem. Selection of WiFi channels .</li> <li>3. Specifics of wireless structures operation. Topology division. Access points operation.</li> <li>4. QoS Concepts</li> <li>5. Network Management</li> <li>6. Network Design</li> <li>7. Troubleshooting Network Problems</li> <li>8. Network Virtualization</li> <li>9. Network Automation</li> </ol>	ZAO	Written test
			K_U08, K_U14, K_U15, K_U18	K_K01, K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Construction and configuration of a network using IEEE802.1d. Analysis of network operation in selected configurations of the Spanning mechanism. Tree</li> <li>2. Virtualization of the network and its elements.</li> <li>3. Getting to know network monitoring software</li> <li>4. Using Virtualization to Test LAN Structures at OSI Layers 2 and 3</li> <li>5. Preparation of the network project</li> </ol>		Lab assignments or network project
34.	Basics of LAN operation	K_W02, K_W04, K_W07, K_W15		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Basic device configuration</li> <li>2. Switching concepts</li> <li>3. Virtual networks ( VLANs )</li> <li>4. Inter-VLAN Routing</li> <li>5. STP Concepts</li> <li>6. EtherChannel</li> <li>7. DHCPv4</li> </ol>	EGZ	Exam - test

					8. SLAAC and DHCPv6 9. FHRP Concepts 10. LAN Security Concepts 11. Switch Security Configuration 12. WLAN Concepts 13. WLAN configuration 14. Routing Concepts 15. Static IP routing		
			K_U05, K_U08, K_U11, K_U18, K_U19	K_K01, K_K04	Laboratories: 1. Basic configuration of CISCO switches 2. Basic configuration of CISCO routers 3. VLAN and Trunk Configuration 4. Configuring Inter-VLAN Routing Using the Router-on-a-Stick Method 5. Implementing Inter-VLAN Routing 6. EtherChannel implementation 7. Switch Security Configuration 8. Configuring IPv4 and IPv6 static and default routes		Laboratory tasks
35.	Scaling and Connecting CISCO Networks	K_W07, K_W08, K_W14		K_K01	Lectures: 1. Single Area OSPFv2 Concepts 2. Single Area OSPFv2 Configuration 3. Configuring multi-area OSPFv2 4. Network Security Concepts 5. ACL Concepts 6. Configuring IPv4 ACLs 7. NAT for IPv4 8. WAN Concepts 9. VPN and IPsec Concepts	EGZ	Exam - written test
			K_U01, K_U11, K_U18, K_U19	K_K01, K_K04	Laboratories: 1. Single Area OSPFv2 Configuration 2. Configuring multi-area OSPFv2 3. NAT Configuration for IPv4 4. PAT configuration 5. PPP configuration 6. CDP, LLDP and NTP protocol configuration 7. Managing configuration files 8. Password recovery procedures		Laboratory tasks
36.	Internet telephony services	K_W01, K_W07, K_W15		K_K01	Lectures: 1. Construction of the traditional PSTN network 2. Building a VoIP network. Benefits of using VoIP. Connection between the VoIP world and PSTN.	ZAO	Written test

					<ol style="list-style-type: none"> <li>3. Basic Concepts Scalable Numbering Plan</li> <li>4. Routing in the VoIP world</li> <li>5. Types of VoIP protocols.</li> <li>6. Converged Networks and Different Requirements for Different Traffic Types</li> </ol>		
			K_U01, K_U18, K_U19	K_K01, K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. DHCPv4 implementation</li> <li>2. Presentation of telephone calls in an example system: - VoIP with VoIP</li> <li>3. Identifying network traffic using Wireshark .</li> <li>4. Basic configuration of IP phones</li> <li>5. Creating a scalable numbering plan..</li> <li>6. Configuring multiple numbers on one IP phone</li> <li>7. Extended call routing configuration</li> </ol>		Laboratory tasks
37.	Network Monitoring and Incident Detection	K_W01, K_W08, K_W11			<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Introduction to monitoring the IT environment in an organization. Regulations requiring the implementation of monitoring processes. Tools for monitoring.</li> <li>2. Planning and implementation of IT architecture monitoring environment in the areas of infrastructure, configuration, software (services). Technical and organizational requirements.</li> <li>3. Planning and implementing an information security monitoring environment in an organization. Legal, technical and organizational requirements.</li> <li>4. Selection, implementation and tuning of solutions to selected monitoring issues.</li> <li>5. Analysis and conclusions based on data presented by implemented monitoring systems.</li> <li>6. Identification of incidents and implementation of reactive mechanisms.</li> </ol>	EGZ	Exam - test
			K_U01, K_U18, K_U19	K_K03, K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. A project involving the construction of two monitoring environments: IT infrastructure and information security.</li> <li>2. Exercises based on IT infrastructure models preinstalled and configured in a virtual environment. Based on these models, students conduct a situational analysis, as a result of which a decision is made on the choice of approach to implementing the monitoring process.</li> <li>3. Installation and configuration of the selected application package.</li> <li>4. Configuring end devices (depending on the selected system, it is agent-based or agentless).</li> </ol>		Laboratory Task Report

					5. Development of monitoring rules for the selected application (system), implementation and testing. Configuring alarms, alerts and warnings		
38.	Types, components and configuration of complex IT systems	K_W01, K_W05, K_W07, K_W14, K_W15, K_W17		K_K01	Lectures: 1. Introduction to complex information systems. 2. Components of information systems. 3. Types of information systems. 4. Architecture of information systems.. 5. Databases in complex systems. 6. Systems integration and middleware . 7. Systems performance management. 8. Deployment automation and DevOps practices . 9. Performance analysis and systems testing. 10. Modern trends in the construction of IT systems	ZAO	Written test
			K_U12, K_U21, K_U26	K_K01, K_K06	Laboratories: 1. Analysis of the structure of complex information systems: - identification of system layers; - system modeling using UML diagrams. 2. System infrastructure design: - server and storage configuration. - network design in an IT system using simulation tools. 3. Design and configuration of the application layer - creating client-server applications, - introduction to user interfaces (UI/UX) in client applications. 4. Implementation of communication between system components - GraphQL API configuration . - use of message brokers. 5. Integration of systems using middleware - designing integration flows, - implementation of simple ETL processes and their testing. 6. Data management in complex systems - creating a database: relational (RDBMS) and non-relational ( NoSQL ), - designing replication and mechanisms to ensure data consistency. 7. Testing system performance and scalability - conducting load tests, - scaling the system in the cloud. 8. Monitoring and optimizing complex IT systems - configuration of monitoring tools, - identification of system bottlenecks and process optimization		Lab report

39.	Technical and economic analysis of the IT systems implementation process	K_W05, K_W10, K_W16, K_W19		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Introduction to IT systems implementation</li> <li>2. Feasibility study and business plan development</li> <li>3. System Design and Requirements Analysis</li> <li>4. Economic analysis of IT system implementation</li> <li>5. Technical evaluation and supplier selection</li> <li>6. Project management in the system implementation process</li> <li>7. Infrastructure planning and integration</li> <li>8. Cost optimization strategies</li> <li>9. Training and change management</li> <li>10. Implementation risks and risk management</li> </ol>	ZAO	Written test
			K_U02, K_U03, K_U09, K_U17, K_U21, K_U23	K_K01, K_K02, K_K04	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Business and technical requirements analysis: <ul style="list-style-type: none"> <li>- Developing an analysis of customer needs and defining the goals of IT system implementation.</li> <li>- Creating functional and non-functional requirements specifications.</li> <li>- Practical use of requirements management tools.</li> </ul> </li> <li>2. Feasibility study and economic analysis: <ul style="list-style-type: none"> <li>- Conducting a feasibility analysis (technical, financial and organizational).</li> <li>- Development of a simple business plan for implementing an IT system.</li> <li>- Calculation of ROI (Return on Investment) and TCO (Total Cost of Ownership ) indicators.</li> </ul> </li> <li>3. Designing a system using UML: <ul style="list-style-type: none"> <li>- Creating use case, class, and sequence diagrams.</li> <li>- Designing a business process model (BPMN).</li> <li>- Practical application in the development of system specifications.</li> </ul> </li> <li>4. Technical Infrastructure Planning and Integration <ul style="list-style-type: none"> <li>- Development of an IT infrastructure diagram (servers, databases, network).</li> <li>- Creating a plan for data migration and integration with existing systems.</li> <li>- Simulation of simple integration scenarios.</li> </ul> </li> <li>5. Implementation project management <ul style="list-style-type: none"> <li>- Creating a project schedule.</li> <li>- Defining tasks, milestones and allocating resources.</li> <li>- Monitoring project progress and change management.</li> </ul> </li> <li>6. System testing and verification <ul style="list-style-type: none"> <li>- Creating a functional and non-functional test plan.</li> </ul> </li> </ol>		Lab report

					<ul style="list-style-type: none"> <li>- Practical execution of IT system tests (e.g. test scenarios).</li> <li>- Documentation of test results and error reporting.</li> </ul> <p>7. Risk management and corrective action planning:</p> <ul style="list-style-type: none"> <li>- Identification of project risks and development of a risk management plan.</li> <li>- Simulation of a crisis implementation scenario and planning of corrective actions.</li> <li>- Practical application of the risk matrix and risk management tools.</li> </ul> <p>8. Post-implementation review and system lifecycle management:</p> <ul style="list-style-type: none"> <li>- Development of post-implementation review procedures.</li> <li>- Planning system updates and maintenance from a life-cycle perspective.</li> <li>- A practical approach to assessing the durability of the implemented system.</li> </ul> <p>9. Training and change management:</p> <ul style="list-style-type: none"> <li>- Preparation of a training program for end users.</li> <li>- Practice in creating training materials and simulating a training session.</li> <li>- Analysis of activities supporting the acceptance of changes in the organization.</li> </ul>		
4 0.	IT systems implementation strategies	K_W05, K_W07, K_W09, K_W10, K_W16		K_K02, K_K05	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Introduction to IT systems implementation strategies.</li> <li>2. Requirements analysis and implementation planning.</li> <li>3. Approaches to the implementation of information systems.</li> <li>4. Data migration during the implementation process.</li> <li>5. Training and change management in the organization.</li> <li>6. Cloud deployment strategies.</li> <li>7. Implementing systems in microservice architecture .</li> <li>8. Risk management in the system implementation process.</li> <li>9. Testing and validating the system before implementation.</li> <li>10. Monitoring and optimizing the system after implementation.</li> </ol>	EGZ	Exam - test
			K_U03, K_U07, K_U10, K_U20, K_U21, K_U23	K_K03, K_K04	<p>Laboratories</p> <ol style="list-style-type: none"> <li>1. Requirements analysis and implementation planning: <ul style="list-style-type: none"> <li>- collecting business and technical requirements for the selected IT system,</li> <li>- development of functional and non-functional requirements specifications,</li> <li>- preparation of a simplified implementation schedule.</li> </ul> </li> <li>2. Choosing an implementation strategy: <ul style="list-style-type: none"> <li>- comparative analysis of two implementation approaches,</li> </ul> </li> </ol>		Lab report

					<ul style="list-style-type: none"> <li>- preparation of recommendations for the selection of an implementation strategy for a specific organizational case,</li> <li>- simulation of a project meeting to discuss the selected strategy.</li> </ul> <p>3. Data migration:</p> <ul style="list-style-type: none"> <li>- preparing a data migration plan from the existing system to the new one (e.g. data source analysis, data transformation),</li> <li>- Simulation of the data migration process using a spreadsheet,</li> <li>- risk assessment and preparation of recovery procedures in case of migration errors.</li> </ul> <p>4. Training design and change management:</p> <ul style="list-style-type: none"> <li>- preparation of training materials for end users (e.g. user manual for the new IT system),</li> <li>- developing a training plan (schedule, group division, training objectives),</li> <li>- simulation of a situation of managing resistance to change - case analysis and development of recommendations.</li> </ul> <p>5. Implementing the system in a cloud environment:</p> <ul style="list-style-type: none"> <li>- designing a simplified cloud solution for the selected IT system,</li> <li>- preparation of a cost estimate for implementation in a cloud environment,</li> <li>- analysis of security and risks related to cloud implementation.</li> </ul> <p>6. System testing and validation:</p> <ul style="list-style-type: none"> <li>- preparation of a functional and performance test plan,</li> <li>- IT system testing simulation,</li> <li>- preparation of a report on test results and proposals for improving the system.</li> </ul> <p>7. System monitoring and optimization:</p> <ul style="list-style-type: none"> <li>- preparation of a strategy for monitoring the operation of the IT system (e.g. KPIs, performance indicators),</li> <li>- conducting a case analysis: identifying problems and proposing optimization actions.</li> </ul>		
41.	Legal aspects of implementing IT systems	K_W10, K_W17, K_W18		K_K01	<p>Lectures:</p> <ol style="list-style-type: none"> <li>1. Introductory issues – legal provision, normative act, legal norm.</li> <li>2. Sources of IT law and the creation of IT law.</li> <li>3. Basic legal regulations in IT.</li> <li>4. Copyright in IT systems.</li> <li>5. Legal aspects of database protection.</li> <li>6. Industrial property protection in IT.</li> </ol>	EGZ	Exam - written test

					<p>7. Legal aspects of e-commerce.</p> <p>8. Protection of personal data during the implementation of IT systems.</p> <p>9. Legal conditions of the ICT (Information and Communications Technology) sector.</p> <p>10. Introduction to digital hygiene .</p>		
			K_U01, K_K21	K_K01, K_K02	<p>Laboratories:</p> <p>1. Practical aspects of creating contracts in connection with the implementation of IT systems. Software delivery contracts. Legal aspects of technology outsourcing . Cloud data storage contracts.</p> <p>2. Basic contract models in the IT industry in practice. Contracts for specific work. Service contracts.</p> <p>3. Access to public information and re- use in IT systems.</p> <p>4. Practical aspects of personal data protection in IT systems. Protection of the privacy of individuals. Respecting the rights and freedoms of individuals resulting from applicable legal provisions in Poland and the European Union.</p> <p>5. Intellectual property protection in IT - practical aspects of copyright and other forms of protection. Forms of protection of IT products</p>		Laboratory assignment
42.	Practical aspects of IT system implementation - case study	K_W01- K_W05, K_W08 - K_W16		K_K01, K_K02, K_K03	<p>Lectures:</p> <p>1. Introduction to IT system implementation</p> <ul style="list-style-type: none"> <li>- Definition of IT system implementation and its importance in the organizational context.</li> <li>- Key objectives and benefits of implementing the new system.</li> <li>- Roles and responsibilities of participants in the implementation process.</li> </ul> <p>2. Analysis of organizational needs and gathering requirements</p> <ul style="list-style-type: none"> <li>- The process of identifying business and technical requirements.</li> <li>- Requirements gathering techniques (interviews, surveys, documentation analysis).</li> <li>- Creating requirements specifications and process mapping.</li> </ul> <p>3. Planning the implementation of the IT system</p> <ul style="list-style-type: none"> <li>- Creating an implementation schedule: stages, milestones, and resource allocation.</li> <li>- Budgeting and resource allocation for the implementation project.</li> <li>- Principles of creating an implementation team and managing the team.</li> </ul> <p>4. IT system implementation phases</p>	ZAO	Written test

					<ul style="list-style-type: none"> <li>- Preparing the infrastructure and configuring the environment.</li> <li>- Data Migration – Data Migration Strategies and Tools.</li> <li>- Installation, configuration and personalization of the system according to requirements.</li> </ul> <p>5. System testing and quality control</p> <ul style="list-style-type: none"> <li>- Types of testing: functional, performance, acceptance.</li> <li>- Preparation of test scenarios and organization of test sessions.</li> <li>- Documenting test results and reporting bugs.</li> </ul> <p>6. End-User Training and Support</p> <ul style="list-style-type: none"> <li>- Creating a training plan and training materials.</li> <li>- Organization of workshops and training for users.</li> <li>- Creating a knowledge base and user support system.</li> </ul> <p>7. Risk and change management during implementation</p> <ul style="list-style-type: none"> <li>- Identification and assessment of risks in IT system implementation.</li> <li>- Risk management and change management strategies.</li> <li>- Ways to deal with employee resistance and integration of the new system.</li> </ul> <p>8. Post-implementation support and system monitoring</p> <ul style="list-style-type: none"> <li>- Conducting a post-implementation audit and assessing the system's effectiveness.</li> <li>- Maintaining, monitoring and optimizing the system after implementation.</li> <li>- Creating post-implementation documentation and technical support plan.</li> </ul> <p>9. IT system implementation case studies</p> <ul style="list-style-type: none"> <li>- A review of successful and unsuccessful IT system implementations in various industries.</li> <li>- Analysis of success factors and causes of implementation failures.</li> <li>- Drawing conclusions and recommendations based on case studies.</li> </ul>	
			K_U01 – K_U03, K_U05 – K_U08, K_U10 – K_U14, K_U16 – K_U18,K_U20 – K_U22	K_K04, K_K05, K_K06, K_K07, K_K08	<p>Laboratories:</p> <p>1. Conducting a needs analysis and creating requirements specifications</p> <ul style="list-style-type: none"> <li>- Exercises in identifying requirements based on the description of the company and its processes.</li> <li>- Creating functional and non-functional requirements specifications.</li> <li>- Risk analysis related to various system requirements.</li> </ul>	Practical tasks

					<ol style="list-style-type: none"> <li>2. Development of implementation schedule and resource planning <ul style="list-style-type: none"> <li>- Creating an implementation schedule with stages and milestones.</li> <li>- Assigning roles and responsibilities in the implementation project.</li> <li>- Simulation of resource planning and budgeting for an implementation project.</li> </ul> </li> <li>3. Preparing the environment and migrating data <ul style="list-style-type: none"> <li>- Test environment setup exercise.</li> <li>- Creating a data migration plan and running a migration simulation.</li> <li>- Discussing common migration issues and how to solve them.</li> </ul> </li> <li>4. Development of a training plan and preparation of training materials <ul style="list-style-type: none"> <li>- Creation of training scenarios and materials for end users.</li> <li>- Conducting a trial training and collecting participants' feedback.</li> <li>- Preparation of knowledge base and support documentation.</li> </ul> </li> <li>5. Change management process simulation <ul style="list-style-type: none"> <li>- Development of change management procedures and analysis of their impact on the project.</li> <li>- Preparation of change requests and their approval process.</li> <li>- Simulation of the team's reaction to project changes and their implementation.</li> </ul> </li> <li>6. Post-implementation audit and system effectiveness analysis <ul style="list-style-type: none"> <li>- Creating a post-implementation audit plan and conducting it.</li> <li>- Analysis of implementation results and assessment of project requirements fulfillment</li> <li>- Preparation of the final report and presentation of conclusions</li> </ul> </li> <li>7. Analysis of case studies of IT system implementations <ul style="list-style-type: none"> <li>- Working on real-world case studies of implementations in various industries.</li> <li>- Discussion of challenges encountered during implementations and their solutions.</li> <li>- Evaluating implementation strategies and drawing conclusions for the future.</li> </ul> </li> </ol>		
43.	Testing and maintenance of IT systems	K_W05, K_W07, K_W10,			Lectures: <ol style="list-style-type: none"> <li>1. Introduction to IT systems testing.</li> <li>2. Types of tests in information systems.</li> <li>3. Software testing process.</li> <li>4. Test automation</li> </ol>	EGZ	Exam - test

		K_W11, K_W16			<p>5. Testing in distributed and cloud environments.</p> <p>6. Error and defect management.</p> <p>7. Testing metrics and results analysis.</p> <p>8. Basics of maintaining IT systems.</p> <p>9. Management of system updates and modernization.</p> <p>10. Monitoring and diagnostics of IT systems</p>		
			K_U04, K_U10, K_U18-K_U20, K_U23	K_K02-K_K05	<p>Laboratories</p> <p>1. Test planning and organization:</p> <ul style="list-style-type: none"> <li>- creating a test plan for a given IT system project,</li> <li>- preparation of test cases for the selected system module,</li> <li>- practical exercises in test documentation management.</li> </ul> <p>2. Performing manual testing:</p> <ul style="list-style-type: none"> <li>- performing functional and non-functional tests on the example of a web system,</li> <li>- error reporting simulation and preparation of a detailed error report,</li> <li>- regression testing after making corrections to the system.</li> </ul> <p>3. Test automation:</p> <ul style="list-style-type: none"> <li>- test automation environment configuration,</li> <li>- writing simple automation scripts to test selected system functions,</li> <li>- analysis of automated test results and their comparison with manual test results,</li> </ul> <p>4. Testing in distributed and cloud environments:</p> <ul style="list-style-type: none"> <li>- test simulation in a cloud environment,</li> <li>- conducting performance and load tests,</li> <li>- preparation of a report with test results and recommendations for improving system performance.</li> </ul> <p>5. Error management and test results analysis:</p> <ul style="list-style-type: none"> <li>- entering errors into the system and logging them in the defect management tool,</li> <li>- analysis of reported bugs in terms of priorities and impact on the system,</li> <li>- creating test metrics (e.g. code coverage, number of defects) and reporting results to stakeholders.</li> </ul> <p>6. Maintenance of IT systems:</p> <ul style="list-style-type: none"> <li>- real-time system monitoring,</li> <li>- diagnosing system problems based on logs and monitoring alerts,</li> <li>- simulation of the system update process and analysis of its impact on the production environment.</li> </ul>		Lab report

44.	Engineering project	K_W01- K_W03 K_W05, K_W10, K_W13	K_U01, K_U03, K_U04, K_U12, K_U17, K_U26	K_K06	<p>Laboratories:</p> <ol style="list-style-type: none"> <li>1. Discussing the scope of the IT engineering project, its schedule and form, and determining the topics of projects implemented individually.</li> <li>2. Searching for source materials in computer science (publication databases, citation rules).</li> <li>3. Establishing principles for students' development of a solution to a practical problem in computer science and the form of its presentation.</li> <li>4. Techniques for correct inference and generalization of results in the context of engineering projects.</li> <li>5. Implementation of the engineering project</li> <li>6. Design and implementation of a diploma presentation</li> </ol>	ZAO	Design
45.	Seminar and diploma exam	K_W01- K_W20	K_U01, K_U02, K_U04	K_K01, K_K04-K_K06	<p>Seminar:</p> <ol style="list-style-type: none"> <li>1. Discussing and presenting to students the Rector's Order No. 50/2023/2024 regarding the principles of diplomas at the WSEI Academy</li> <li>2. Formulating tasks to be completed by students and discussing the conditions for passing the seminar in individual semesters, including the diploma examination;</li> <li>3. Assigning areas of diploma topics to students in individual semesters for independent development;</li> <li>4. Substantive discussion of diploma issues;</li> <li>5. Independent development by the student of a diploma project and a presentation on it;</li> <li>6. Presentation of the developed diploma problem by each student in front of the group;</li> <li>7. Group forum discussion, questions and answers;</li> <li>8. Assessment of the completed work for the seminar credit</li> </ol>	EGZ	Presentation of the diploma issue. Diploma exam
46.	Professional practice		K_U01 – K_U08, K_U10, K_U11, K_U13, K_U15- K_U22, K_U25-K_U27	K_K02- K_K04, K_K06	<p>Practice: And year</p> <p>Professional practice carried out at the University premises:</p> <ol style="list-style-type: none"> <li>1. Introduction to professional internships and meetings with practitioners.</li> </ol> <p>Professional practice carried out at an employer:</p> <ol style="list-style-type: none"> <li>1. Introduction to vocational training;</li> <li>2. Familiarisation with the status, structure and principles of operation of a given unit (entity) in which professional practice is carried out;</li> <li>3. Familiarization with occupational health and safety standards and fire protection regulations;</li> </ol>	REGRET	Group discussion, presentations, projects, tasks

				<p>4. Familiarization with the security privacy policy, rules for the protection of personal data and information (classified information) and document circulation rules;</p> <p>5. Analysis of the legal basis of the entity's operation and its characteristics;</p> <p>6. Performing selected work, tasks or activities typical of the field of study, specified in the " Vocational Practice Diary", in real-life conditions.</p> <p>2nd year</p> <p>Internship workshops held at the University's headquarters:</p> <p>1. Deepening knowledge and skills through teamwork by implementing a selected team project related to the field of study.</p> <p>Professional practice carried out at an employer:</p> <p>1. Performing selected work, tasks or activities typical of the field of study, specified in the "Vocational Practice Diary" in real-life conditions;</p> <p>2. Independent implementation by the student of a project concerning the company in which he/she is completing his/her professional internship under the supervision of the employer;</p> <p>3. Communicating in professional work through the appropriate selection and use of appropriate methods and tools, including information and communication technologies (ICT) and specialist terminology;</p> <p>4. Maintaining appropriate relationships in the professional environment and observing the principles of professional ethics.</p> <p>3rd year</p> <p>Internship workshops held at the University's headquarters:</p> <p>1. Completion of a practical task in the form of an individual project concerning the solution of a problem in the activities and functioning of a given organization related to the specialization chosen by the student.</p> <p>Professional practice carried out at an employer:</p> <p>1. Performing selected work, tasks or activities typical of the field of study, specified in the "Vocational Practice Diary" in real-life conditions;</p> <p>2. Independent implementation by the student of a project within the scope of his/her chosen specialization under the supervision of the employer;</p> <p>3. Using contacts with specialists and employees of the company to improve skills and competences in the implementation of innovative solutions related to the chosen specialty;</p>		
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					4. Maintaining appropriate relationships in the professional environment and compliance with the principles of professional ethics; 5. Preparation of a report on completed professional internships.		
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*Course coordinator: Piotr Bednarczuk .....*  
*(signature)*

*Dean of the Faculty : Michalina Gryniewicz -Jaworska .....*  
*(signature)*