

## DESCRIPTION OF THE PROGRAM OF STUDIES

Main field of study **APPLIED COMPUTER SCIENCE**

Profile

General Academic

Level of studies Second

Form of studies

Full - Time

**1. General description**

<p><i>1.1 Number of semesters:</i></p> <p style="text-align: center;"><b>3</b></p>	<p><i>1.2 Total number of ECTS points necessary to complete studies at a given level:</i></p> <p style="text-align: center;"><b>90</b></p>
<p><i>1.3 Total number of hours:</i></p> <p style="text-align: center;"><b>1002</b></p>	<p><i>1.4 Prerequisites (particularly for second-level studies):</i></p> <p>The terms and conditions of recruitment applicable for a given academic year are approved annually by the Senate of Wrocław University of Science and Technology and announced by a relevant Internal Ordinance.</p>
<p><i>1.5 Upon completion of studies graduate obtains professional degree of:</i></p> <p style="text-align: center;"><b>MAGISTER INŻYNIER</b></p>	<p><i>1.6 Graduate profile, employability:</i></p> <p>Science is carried out in four specialties:</p> <ul style="list-style-type: none"> <li>• Education on the second level program of Applied Computer Software Engineering (IO) – in Polish</li> <li>• IT Systems Design (PSI) – in Polish</li> <li>• Applications of Specialized Information Technologies (ZSTI) – in Polish</li> <li>• Computer Engineering (CE) - in English</li> </ul> <p>Graduates of the II level program of Applied Informatics find employment mainly in IT companies involved in software development, implementation and maintenance. A very good command of English and ease in establishing contacts with employees coming from different cultural backgrounds predestine them to work in companies with international roots, such as Capgemini, Nokia Volvo IT Poland, Asseco Poland, or Comarch. They also work at IT services outsourcing companies such as PGS, ClearCode or Fingo, or at Polish market leaders such as Insert. A separate group of companies where graduates of Applied Informatics are employed are large companies with their own IT departments, such as banks.</p>

	<p>Graduates are employed, among others, in the following positions: software architect or engineer, project manager, quality assurance manager, database designer or security designer.</p> <p>Many students of Applied Informatics join their studies with professional work. This allows them to quickly gain experience and confront the knowledge and skills acquired at the university with practice.</p> <p>Students interested in the theoretical aspects of computer science can pursue their passions in scientific circles, research teams and, after completing their master degree, continue their studies at the Doctoral School.</p>
<p><i>1.7 Possibility of continuing studies:</i></p> <ul style="list-style-type: none"> <li>• Doctoral School</li> <li>• Postgraduate Studies</li> </ul>	<p><i>1.8 Indicate connection with University's mission and its development strategy:</i></p> <p>Applied Computer Science field of study is in line with the mission and strategy of Wrocław University of Science and Technology for 2023-30. In particular, it fits into the priority research area:</p> <p>1. "Information technology, data science and artificial intelligence," which includes, but is not limited to: computer science, algorithmics and software engineering, artificial intelligence and machine learning, human-computer interaction, data analysis and visualization methods, classification and prediction, natural language processing, data storage and transmission engineering, information processing and privacy, cyber security and cryptography, computer and mobile networks, Internet of Things, virtualization, augmented and virtual reality, multimedia techniques, and medical informatics.</p> <p>[Wrocław University of Technology Strategy 2023-2030, p. 17, Priority Research Areas,  <a href="https://pwr.edu.pl/fcp/LGBUKOQtTKlQhbx08SlkTUhZeUTgtCgg9ACFDC0RGS3xSFVZpCFghUHcKVigEQUw/1/public/2023/docs/strategia_pwr_2023_22-06-23.pdf">https://pwr.edu.pl/fcp/LGBUKOQtTKlQhbx08SlkTUhZeUTgtCgg9ACFDC0RGS3xSFVZpCFghUHcKVigEQUw/1/public/2023/docs/strategia_pwr_2023_22-06-23.pdf</a>]</p>

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

## 2. Detailed description

**2.1 Total number of learning outcomes in the program of study: W (knowledge) = 9, U (skills) = 14, K (competences) = 4,  
W + U + K = 27**

**2.2 For the main field of study assigned to more than one discipline - the number of learning outcomes assigned to the discipline:  
D1 (major) 27 (this number must be greater than half the total number of learning outcomes)**

**2.3 For the main field of study assigned to more than one discipline - percentage share of the number of ECTS points for each discipline:  
D1 100% ECTS points**

**2.4a.** For the general academic profile of the main field of study – the number of ECTS points assigned to the classes related to the University's academic activity in the discipline or disciplines to which the main field of study is assigned – **DN** (must be greater than 50% of the total number of ECTS points from 1.2) **61 ECTS**

**2.4b.** For the practical profile of the main field of study - the number of ECTS points assigned to the classes shaping practical skills (must be greater than 50% of the total number of ECTS points from 1.2)

## 2.5 Concise analysis of compliance of the assumed learning outcomes with the needs of the labor market

The assumed learning outcomes are in line with the needs of the labour market. This is evidenced by the results of analyses of labour market needs in the IT industry:

- Report from the 2nd edition of the research carried out in 2020-2021. <https://www.parp.gov.pl/component/publications/publication/branzowy-bilans-kapitalu-ludzkiego-ii-sektor-it>
- 1st edition of the research "Competence needs in the context of the consequences of the coronavirus pandemic "Summary report from the research on anti-COVID activities in the sectors: Information Technology and Telecommunications and Cyber Security.", Warsaw 2021. Research conducted within the framework of the activity of the Sectoral Competence Council - Information Technology and the Sectoral Competence Council Telecommunications and Cyber Security. [https://www.piit.org.pl/\\_\\_data/assets/pdf\\_file/0023/19184/raport\\_zbiorczy.pdf](https://www.piit.org.pl/__data/assets/pdf_file/0023/19184/raport_zbiorczy.pdf)
- Report "Wrocław IT sector", 2019, [https://www.wroclaw.pl/biznes/files/dokumenty/24951/Raport\\_ARAW\\_10-10-2019\\_Wroclawski\\_sekro\\_IT\\_web.pdf](https://www.wroclaw.pl/biznes/files/dokumenty/24951/Raport_ARAW_10-10-2019_Wroclawski_sekro_IT_web.pdf)
- "Prepare for IT recruitment in 2022 - IT labour market in Poland", <https://nexttechnology.io/pl/raport-rynek-pracy-it-w-polsce/>

The program of study is the result of close cooperation with members of the Social Council of the Faculty of Information and Communication Technology, which includes representatives of the management of leading IT companies in the Lower Silesia region. The assumed learning outcomes meet the current and prospective needs of the labor market. In particular, they meet the needs of:

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject / group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

- institutions and companies engaged in production, trade, service or research activities on specialists of IT departments, dealing with maintenance/development of IT tools supporting these activities,
- producers of information systems for various purposes (software designers, testers, administrators),
- companies that design, implement and maintain computer systems and networks in various economic and social units and organizations, both public and private.

In addition to domain knowledge in the field of modeling, design and implementation of various types of information systems, the major develops skills necessary not only for professional work, but also for research work. Emphasis is placed on soft skills, including organizational skills, teamwork, responsibility for assigned tasks, acquired through team projects. Skills of information acquisition, critical analysis of sources, debate are formed in seminars.

**2.6.** The total number of ECTS points that a student must obtain in classes requiring direct participation of academic teachers or other persons conducting classes and students (enter the sum of ECTS points for subjects/groups of classes marked with the BU<sup>1</sup> code) **45,5 ECTS**

**2.7.** Total number of ECTS points, which student has to obtain from basic sciences classes

Number of ECTS points for obligatory subjects	<b>2</b>
Number of ECTS points for optional subjects	<b>0</b>
Total number of ECTS points	<b>2</b>

**2.8.** Total number of ECTS points, which student has to obtain from practical classes, including project and laboratory classes (enter total number of ECTS points for subjects/group of classes denoted with code P)

Number of ECTS points for obligatory subjects	<b>4</b>
Number of ECTS points for optional subjects	<b>22 ECTS - major elective subjects, 32 ECTS - elective specialty courses</b>
Total number of ECTS points	<b>58</b>

**2.9.** Minimum number of ECTS points, which student has to obtain doing education blocks offered as part of University-wide classes or other main field of study (enter number of ECTS points for subjects/group of classes denoted with code O) **8 ECTS points**

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

**2.10.** Total number of ECTS points, which student may obtain doing optional blocks (min. 30% of total number of ECTS points)

**80** ECTS points including 22 ECTS elective courses from the main field of study and 58 ECTS which the student obtains by choosing one of the four specialisations.

### **3. Description of the process leading to learning outcomes acquisition:**

Obtaining the assumed learning outcomes is a result of crediting all subjects included in the Program of Studies, obtaining a positive grade in the master's thesis and passing the diploma exam. The process leading to the achievement of the assumed learning outcomes includes:

- active participation in organized classes: lectures, exercises, laboratories, projects and seminars, which use a variety of educational methods, including informative lectures with multimedia presentations, case studies, simulations and others, depending on the form of the class; the classes also use various teaching tools like the university's e-learning portal (e-Portal PWr) or MS Teams platform
- independent studies to consolidate, supplement and expand knowledge - the student's own work including systematic preparation for classes on the basis of materials provided by the instructors and recommended literature, preparation for colloquia and exams
- independent analytical and review studies during the preparation of the master's thesis - the student's own work including literature studies on the subject of the thesis, analysis of current solutions, etc.
- individual consultations with the instructors and the master thesis supervisor

The degree of achievement of learning outcomes is controlled through examinations, colloquia, presentations, reports, evaluation of student activity and others, depending on the form of the course. Subjects not passed within the timeframe provided in the study plan must be repeated in subsequent semesters.

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

## 4. List of education blocks:

### 4.1. List of obligatory blocks:

#### 4.1.1 List of general education blocks

##### 4.1.1.1 Liberal-managerial subjects block (min. 5 ECTS points):

No.	Subject group of classes code	Name of Subjectgroup of classes (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form <sup>2</sup> of Subjectgroup of courses	Way <sup>3</sup> of crediting	Subjectgroup of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN <sup>5</sup> classes	BU <sup>1</sup> classes			University-wide <sup>4</sup>	Concerning scientific activities <sup>5</sup>	Practical <sup>6</sup>	Type <sup>7</sup>
1	W08IST-SM4018W	Fundamentals of Business and Intellectual Property	2					K2IST_W08 K2IST_K02	30	90	3	0	1,2	T	Z	O		0	KO
2	W08IST-SM4017S	Ethics of New Technologies					1	K2IST_W09 K2IST_U11 K2IST_K03	15	60	2	0	0,7	T	Z	O		1	KO
Total			2	0	0	0	1		45	150	5	0	1,9					1	

##### 4.1.1.2 Foreign languages block (min. .3 ECTS points):

No.	Subject group of classes code	Name of Subjectgroup of classes (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form <sup>2</sup> of Subjectgroup of courses	Way <sup>3</sup> of crediting	Subjectgroup of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN <sup>5</sup> classes	BU <sup>1</sup> classes			University-wide <sup>4</sup>	Concerning scientific activities <sup>5</sup>	Practical <sup>6</sup>	Type <sup>7</sup>
1	SJO-SM0002	Foreign Language II		3				K2IST_U12	45	60	2	0	1,7	T	Z	O		2	KO
2	SJO-SM0001	Foreign Language I		1				K2IST_U12	15	30	1	0	0,7	T	Z	O		1	KO
Total			0	4	0	0	0		60	90	3	0	2,4					3	

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

### Altogether for general education blocks

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes <sup>5</sup>	Number of ECTS points for BU classes <sup>1</sup>
lec	cl	lab	pr	sem					
2	4	0	0	1	105	240	8	0	4,3

## 4.1.2 List of basic sciences blocks

### 4.1.2.1 Mathematics block

No.	Subject group of classes code	Name of Subjectgroup of classes (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form <sup>2</sup> of Subjectgroup of courses	Way <sup>3</sup> of crediting	Subjectgroup of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN <sup>5</sup> classes	BU <sup>1</sup> classes			University-wide <sup>4</sup>	Concerning scientific activities <sup>5</sup>	Practical <sup>6</sup>	Type <sup>7</sup>
1	W04IST-SM4020W	Methods of planning and analyzing experiments	1					K2IST_W01	15	30	1	0	0,7	T	Z			0	PD
		Total	1	0	0	0	0		15	30	1	0	0,7					0	

### 4.1.2.2 Physics block

No.	Subject group of classes code	Name of Subjectgroup of classes (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form <sup>2</sup> of Subjectgroup of courses	Way <sup>3</sup> of crediting	Subjectgroup of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN <sup>5</sup> classes	BU <sup>1</sup> classes			University-wide <sup>4</sup>	Concerning scientific activities <sup>5</sup>	Practical <sup>6</sup>	Type <sup>7</sup>
1	W04IST-SM4015W	Physics of Contemporary Computer Science	1					K2IST_W01	15	30	1	0	0,7	T	Z			0	PD
		Total	1	0	0	0	0		15	30	1	0	0,7					0	

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

### Altogether for basic sciences blocks:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes <sup>5</sup>	Number of ECTS points for BU classes <sup>1</sup>
lec	cl	lab	pr	sem					
2	0	0	0	0	30	60	2	0	1,4

### 4.1.3 List of the main field of study blocks

#### 4.1.3.1 *Obligatory main field of study blocks*

#### 4.1.3.2 ..... block

## 4.2 List of optional blocks

### 4.2.1 List of general education blocks

#### 4.2.1.1 Liberal-managerial subjects blocks (*min. .... ECTS points*):

### 4.2.2 List of basic sciences blocks

#### 4.2.2.1 *Mathematics block (min. .... ECTS points)*:

#### 4.2.2.2 *Physics block (min. .... ECTS points)*:

#### 4.2.2.3 *Chemistry block (min. .... ECTS points)*:

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses



## 4.2.3 List of blocks

### 4.2.3.1 Optional Main Field of Study Block (min. 22 ECTS points):

No.	Subject group of classes code	Name of Subjectgroup of classes (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form <sup>2</sup> of Subjectgroup of courses	Way <sup>3</sup> of crediting	Subjectgroup of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN <sup>5</sup> classes	BU <sup>1</sup> classes			University-wide <sup>4</sup>	Concerning scientific activities <sup>5</sup>	Practical <sup>6</sup>	Type <sup>7</sup>
1	W04IST-SM4039P	Monographic project				2		K2IST_U01 K2IST_U04 K2IST_U09 K2IST_U14 K2IST_K01	30	50	2	1	1,5	T	Z		T	2	K
2	W04IST-SM4040D	Master Thesis				0,8		K2IST_U01 K2IST_U04 K2IST_U09 K2IST_U14 K2IST_K02	12	450	18	15	0,5	T	Z		T	18	K
3	W04IST-SM4013S	Diploma seminar					2	K2IST_U01 K2IST_U10 K2IST_U11 K2IST_U14 K2IST_K01	30	50	2	1	1,4	T/Z (S)	Z		T	2	K
Total			0	0	0	2,8	2		72	550	22	17	3,4					22	

### Altogether for blocks:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes <sup>5</sup>	Number of ECTS points for BU classes <sup>1</sup>
lec	cl	lab	pr	sem					
0	0	0	2,8	2	72	550	22	17	3,4

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

## 4.2.4 List of specialization blocks

### 4.2.4.1 Specialization subjects – Computer Engineering blocks (min. 58 ECTS points):

No.	Subject group of classes code	Name of Subjectgroup of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form <sup>2</sup> of Subjectgroup of courses	Way <sup>3</sup> of crediting	Subjectgroup of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN <sup>5</sup> classes	BU <sup>1</sup> classes			Univ ersity - wide <sup>4</sup>	Concerni ng scientific activities <sup>5</sup>	Practical <sup>6</sup>	Type <sup>7</sup>
1	W04IST-SM4033G	Foundations of Knowledge Engineering (GK)	2	1			2	K2IST_W05 K2IST_U05	75	100	4	3	3,3	T/Z (W, S) T (C)	Z (W)		T	2	S
2	W04IST-SM4018G	Advanced Databases (GK)	2				2	K2IST_W05 K2IST_W07 K2IST_U03 K2IST_U05 K2IST_U08	60	150	6	5	2,9	T/Z (W) T (P)	E (W)		T	3	S
3	W04IST-SM4038G	Analysis of Web-based System (GK)	2				2	K2IST_W02 K2IST_W07 K2IST_U03	60	125	5	4	2,7	T/Z (W) T (P)	Z(W)		T	3	S
4	W04IST-SM4035G	Mobile and Multimedia Systems (GK)	2				2	K2IST_W06 K2IST_U06	60	100	4	2	2,8	T/Z (W) T (P)	Z (W)		T	2	S
5	W04IST-SM4032G	Software System Development (GK)	2				2	K2IST_W02 K2IST_W06 K2IST_W07 K2IST_U01 K2IST_U10 K2IST_U11 K2IST_U06 K2IST_U08 K2IST_U13 K2IST_K04	75	150	6	5	3,6	T/Z (W, S) T (P)	E (W)		T	3	S
6	W04IST-SM4034G	Project Management (GK)	2				2	K2IST_W02 K2IST_W06 K2IST_U07 K2IST_U13 K2IST_K04	75	125	5	4	3,3	T/Z (W, S) T (P)	Z (W)		T	3	S

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

7	W04IST-SM4003G	Advanced Topics in Artificial Intelligence (GK)	2		2	1	K21ST_W03 K21ST_W04 K21ST_U02 K21ST_U04	75	175	7	6	3,5	T/Z (W, S) T (P)	E (W)		T	4	S
8	W04IST-SM4031G	Advanced Cybersecurity Issues (GK)	2		1	2	K21ST_W06 K21ST_U01 K21ST_U10 K21ST_U11	75	125	5	4	3,6	T/Z (W, S) T (P)	Z (W)		T	3	S
9	W04IST-SM4026G	User Experience (GK)	2		3		K21ST_W02 K21ST_W06 K21ST_U06 K21ST_U09	75	125	5	4	3,4	T/Z (W) T (P)	E (W)		T	2	S
10	W04IST-SM4037G	Video Game Design (GK)	2		2		K21ST_W06 K21ST_U06	60	100	4	2	2,8	T/Z (W) T (P)	Z (W)		T	2	S
11	W04IST-SM4035S	Recent Advances in Computer Science				2	K21ST_W03 K21ST_U01 K21ST_U10 K21ST_U11 K21ST_K01	30	50	2	2	1,3	T/Z (S)	Z		T	2	S
12	W04IST-SM4030G	Research Methodology (GK)	2	2		1	K21ST_W01 K21ST_W04 K21ST_W07 K21ST_U02 K21ST_U03	75	125	5	3	3,2	T/Z (W, S) T (L)	Z (W)		T	3	S
<b>Total</b>			<b>22</b>	<b>1</b>	<b>2</b>	<b>18</b>	<b>10</b>	<b>795</b>	<b>1450</b>	<b>58</b>	<b>44</b>	<b>36,4</b>					<b>32</b>	

**Altogether for specialization blocks:**

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes <sup>5</sup>	Number of ECTS points for BU classes <sup>1</sup>
lec	cl	lab	pr	sem					
22	1	2	18	10	795	1450	58	44	36,4

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject / group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

**4.3 Training block - concerning principles of training crediting – attachment no. .... - not applicable**  
**Opinion of the Advisory Faculty Council concerning the rules of crediting training block**

Name of training			
Number of ECTS points	Number of ECTS points for BU <sup>1</sup> classes	Training crediting mode	Code
Training duration		Training objective	

**4.4 „Diploma dissertation” block (if it is foreseen at first level studies)**

Type of diploma dissertation	magister inżynier	
Number of diploma dissertation semesters	Number of ECTS points	Code
<b>1</b>	<b>18</b>	<b>W04IST-SM4040D</b>
<b>Character of diploma dissertation</b>		
Analytical and Research, Analytical and Designing, Analytical and Review		
Number of BU <sup>1</sup> ECTS points	<b>0,5</b>	
Number od ECTS DN <sup>5</sup> points	<b>15</b>	

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

## 5. Ways of verifying assumed learning outcomes

Form of classes	Ways of verifying assumed learning outcomes
lecture	examination, progress/final test, question/answering, discussion, presentation
class	progress/final test, question answering and solving problems at the blackboard
laboratory	pretest, report from laboratory, presentation of the task solution
project	preliminary project assumptions, assessments of subsequent stages of project implementation, project defence
seminar	participation in discussion, topic presentation, essay
training	not applicable
diploma dissertation	prepared diploma dissertation

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

## 6. Range of diploma examination

The range of the diploma examination is defined for a given training cycle. It is formulated as a list of the issues which are obligatory for students at the diploma examination. The set of examination questions is reviewed annually and updated as necessary for the next cycle of education. Modification of the study programme always results in an update of the range of the diploma examination. The range of the diploma examination is defined separately for each specialization. The list of examination issues below refers to the Computer Engineering specialization.

1. Application of Deep Learning in classification tasks
2. Basics of requirements engineering.
3. Business modelling, BPMN main ideas, and fundamental concepts.
4. Characteristics of data model, storage and data access methods for data: streaming and temporal.
5. Classification of video games platforms.
6. Classification versus Clustering. Exemplary methods.
7. Column data storage in databases: basic properties, performance, applications.
8. Designing of multimedia interface of computer applications.
9. Differences between IPv4 and Ipv6.
10. Evolutionary Computation.
11. Fusion of knowledge acquired from experts and discovered from data.
12. Generative Large Language Models: their applications and limitations
13. Incompleteness and uncertainty of knowledge.
14. Internet and Web services Architecture. Web and P2P systems.
15. Managing Data in AI: dataset development process, annotation and quality evaluation.
16. Measurement, estimation and prediction of communication time in the Internet.
17. Methods, techniques and tools used for designing and construction of mobile systems.
18. Modeling and meta-modeling.
19. Modern methods used in research methodology.
20. Nielsen's Usability Heuristics.
21. Patterns (architectural, design, program).

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

22. Postulates of research methodology.
23. Progress monitoring in software project.
24. Project team management.
25. Properties and scope of using UML.
26. Quality management in software development processes.
27. Query processing and optimization methods in relational databases.
28. Requirements elicitation techniques requirements classification, characteristics of requirements quality.
29. Rule-based knowledge representations in decision support systems.
30. Software project risk management.
31. Software project scheduling.
32. Stages and roles in the development of video games.
33. Testing software systems.
34. The role of artifacts traceability in software development processes.
35. The Web Server model. Access and scheduling algorithms for HTTP requests in a Web Server.
36. Time and cost estimation in projects — main issues and challenges.
37. Transfer learning, cross-lingual learning, Zero-shot and A Few Shot Learning
38. Use-cases, statecharts, sequence and activity diagrams.
39. User experience research methods and tools.
40. Security of web applications - Characterization of main vulnerabilities, attacks and their prevention based on the "OWASP top 10" document
41. Main security attributes on the example of the CIA triad. How can these attributes be ensured in computer systems.
42. Phishing attacks - characteristics and methods of prevention.

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

## 7. Requirements concerning deadlines for crediting subject/groups of subject for all courses in particular blocks

<i>No.</i>	<i>Subject / group of classes code</i>	<i>Name of subject / group of classes</i>	<i>Crediting by deadline of... (number of semester)</i>
1.		All courses/group of courses from the study plan for semester 1 and for semester 2	By the end of semester 2

## 8. Plan of studies (attachment no. ....)

Approved by faculty student government legislative body:

.....  
Date

.....  
name and surname, signature of student representative

.....  
Date

.....  
Dean's signature

<sup>1</sup>BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of classes – after the letter E or Z - enter in brackets the final subject form (lec, cl, lab, pr, sem)

<sup>4</sup>University-wide subject /group of classes – enter O

<sup>5</sup>DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

<sup>6</sup>Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical courses

<sup>7</sup>KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses