

DESCRIPTION OF THE PROGRAM OF STUDIES

Main field of study: Applied Computer Science

Profile: general academic

Level of studies: first-level

Form of studies: full-time studies

1. General description

<p><i>1.1 Number of semesters:</i></p> <p style="text-align: center;">7</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;">210</p>
<p><i>1.3 Total number of hours:</i></p> <p style="text-align: center;">2475</p>	<p><i>1.4 Prerequisites (particularly for second-level studies):</i></p> <p>Qualification is based on the results of the matriculation exam, in accordance with the terms and recruitment procedure established for a given academic year</p>
<p><i>1.5 Upon completion of studies graduate obtains professional degree of:</i></p> <p style="text-align: center;">INŻYNIER (ENGINEER)</p>	<p><i>1.6 Graduate profile, employability:</i></p> <p>A graduate has qualifications including knowledge, skills and engineering competences in the following areas:</p> <ul style="list-style-type: none"> • Computer architecture and organization and low-level programming of devices, such as elements of the Internet of Things (IoT). • Programming languages, algorithms and data structures, programming paradigms and effective programming techniques. • Computer networks, system administration and cybersecurity. • Databases and data warehouses including database design.

	<ul style="list-style-type: none"> • Software design and project management. • Advanced programming methods and tools, artificial intelligence and knowledge engineering, mobile applications and distributed systems. • Various aspects of multimedia • Trends in IT. <p>The graduate also has knowledge of basic sciences: mathematical analysis, algebra with analytical geometry, logic, discrete mathematics, probability and statistics, and physics which are necessary to solve engineering problems and to continue studies at the second degree.</p> <p>An important supplement to the education is knowledge of the basics of entrepreneurship as well as social and professional problems of IT. In addition, the graduate knows English sufficiently to enable him or her to express freely, also in writing, on topics related to the work performed.</p> <p>Soft skills and the ability to work in a team are also important in educating IT engineers.</p> <p>Graduates of the first degree studies in Applied Computer Science may be employed in IT companies and IT departments of banks and financial institutions or enterprises in Wrocław, as well as throughout Poland and even abroad. Graduates are employed as software testers, programmers, designers, service technicians, system administrators and IT security specialists.</p>
<p><i>1.7 Possibility of continuing studies:</i></p> <p>Graduates may continue their studies in the same or similar field in the second-level degree studies.</p>	<p><i>1.8 Indicate connection with University's mission and its development strategy:</i></p> <p>The program of study in Applied Computer Science at the Faculty of Computer Science and Management is consistent with the mission of Wrocław University of Science and Technology and its development strategy.</p> <p>The program provides the opportunity to acquire knowledge, skills, engineering competences and social competences necessary for a modern IT engineer. The mandatory courses and modules of elective courses offered as part of the study program</p>

	<p>meet the requirements of the Polish Qualifications Framework, and – on the other hand – they meet the dynamically changing needs of the social and economic environment. It is expressed, among others, through:</p> <ul style="list-style-type: none"> • Participation of members of the Faculty Social Council in the work on the study program. • Participation of highly qualified specialists from outside the university in conducting didactic activities. • Offering student internships in companies or IT departments. <p>Practical classes are held in specialized laboratories with modern computer equipment, dedicated apparatus and software, regularly modernized. Acting in accordance with the strategy of Wrocław University of Science and Technology in the field of internationalization, the Faculty of Computer Science and Management offers first-level studies in Applied Computer Science also in English for candidates from Poland and foreigners. Additionally, students can participate in international exchange programs (e.g. ERASMUS +).</p>
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2. Detailed description

2.1 Total number of learning outcomes in the program of study:

W (knowledge) = 22, U (skills) = 22, K (competences) = 4, W + U + K = 48

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) (this number must be greater than half the total number of learning outcomes)

D2

D3

D4

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% ECTS points

D2% ECTS points

D3% ECTS points

D4% 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) 144**
- 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 study program is the result of close cooperation with the Social Council of the Faculty of Computer Science and Management. The Council includes representatives of the management of leading IT companies in the Lower Silesia. The assumed learning outcomes meet the current and prospective needs of the market. In particular, the outcomes meet needs for IT specialists of different companies (e-commerce, service, research) dealing with the maintenance/development of IT tools supporting their activities, developers of IT systems as well as companies designing, implementing and maintaining computer systems and networks.

- 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 courses / groups of courses marked with the BU¹ code) 126 ECTS**

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

Number of ECTS points for obligatory subjects	39
Number of ECTS points for optional subjects	0
Total number of ECTS points	39

- 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 courses/group of courses denoted with code P)**

Number of ECTS points for obligatory subjects	40
Number of ECTS points for optional subjects	43
Total number of ECTS points	83

- 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 courses/groups of courses denoted with code O) 35 ECTS points**

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

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

The educational process includes active participation in classes organized at the university: lectures, classes, exercises, laboratories, projects and seminars, as well as student's self-learning activities allowing for consolidation, supplementation and extension of knowledge. If necessary, the student can take advantage of individual consultations. The learning outcomes are further developed during mandatory student's internship.

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. 6 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1.	ZMZ001643W	Basics of entrepreneurship	2					30	60	2	1,2		T	Z					
2.	SCZ001115S	Presentation Techniques				2		30	60	2	1,2		T	Z					
3.	INZ004440W	IT Social and Professional Problems	2					30	60	2	1,2		T	Z					
		Total	4			2		90	180	6	3,6								

4.1.1.4 Information technologies block (min. 9 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1.	INZ004400Wc	Computer System Organization (GK)	2	1				45	90	3	1,8		T	Z (w)					
2.	INZ004399Wc	Structural and Object oriented Programming (GK)	2	2				60	120	4	2,4		T	E (w)					
3.	INZ004399L	Structural and Object oriented Programming			2			30	60	2	1,2		T	Z				P (2)	PD
		Total	4	3	2			135	270	9	5,4								2

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 ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	225	450	15		9
8	3	2					

4.1.2 List of basic sciences blocks

4.1.2.1 Mathematics block

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses		
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶
1.	MAT001688Wc	Algebra and Analytic Geometry (GK)	2	2				60	180	6		3,6	T	E (w)	O			PD
2.	MAT001689Wc	Mathematical Analysis I (GK)	2	2				60	180	6		3,6	T	E (w)	O			PD
3.	MAT001690Wc	Mathematical Analysis II (GK)	2	1				45	150	5		3	T	E (w)	O			PD
4.	INZ004406Wc	Discrete Mathematics (GK)	2	2				60	150	5		3	T	Z (w)				PD
5.	INZ004410Wc	Theory of Probabilistic and Statistics (GK)	2	2				60	200	7		4,2	T	E (w)				PD
		Total	10	9				285	860	29		17,4						

4.1.2.2 Physics block

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses		
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶
1.	FZP001136Wc	General Physics I (GK)	2	1				45	120	4		2,4	T	Z (w)	O			PD
2.	FZP001137Wc	General Physics II (GK)	2	1				45	120	4		2,4	T	E (w)	O			PD
3.	FZP001137L	General Physics II	4	2	1			15	60	2		1,2	T	Z	O			P (2)
		Total						105	300	10		6						2

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 ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab					
14	11	1	390	1160	39		23,4

4.1.3 List of the main field of study blocks

4.1.3.1 Obligatory main field of study blocks

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses		
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶
1.	INZ004402Wc	Logic for IT Specialists (GK)	2	2					60	150	5	3	T	E(w)	DN			K
2.	INZ004403L	Data Structures and Algorithms			2				30	60	2	1,2	T	Z	DN		P(2)	K
3.	INZ004403Wc	Data Structures and Algorithms (GK)	2	1					45	120	4	2,4	T	E(w)	DN			K
4.	INZ004404W	Computer Architecture	2						30	60	2	1,2	T	Z	DN			K
5.	INZ004404L	Computer Architecture			2				30	60	2	1,2	T	Z	DN		P(2)	K
6.	INZ004405W	Operating Systems	2						30	60	2	1,2	T	Z	DN			K
7.	INZ004405L	Operating Systems			2				30	60	2	1,2	T	Z	DN		P(2)	K
8.	INZ004407W	Computer Networks	3						45	110	4	2,4	T	E	DN			K
9.	INZ004407L	Computer Networks			2				30	90	3	1,8	T	Z	DN		P(3)	K
10.	INZ004408W	Effective Programming Techniques	1						15	60	2	1,2	T	Z	DN			K
11.	INZ004408L	Effective Programming Techniques			2				30	90	3	1,8	T	Z	DN		P(3)	K
12.	INZ004409L	Programming paradigms			2				30	60	2	1,2	T	Z	DN		P(2)	K
13.	INZ004409Wc	Programming paradigms (GK)	2	1					45	140	5				DN			K
14.	INZ002023L	Data Bases			1				15	60	2	1,2	T	Z	DN		P(2)	K
15.	INZ002023Wc	Databases (GK)	2	1					45	115	4	2,4	T	E(w)	DN			K
16.	INZ002024L	Systems Analysis and Decision Support Methods			1				15	50	2	1,2	T	Z	DN		P(2)	K
17.	INZ002024Wc	Systems Analysis and Decision Support Methods (GK)	2	1					45	140	5	3	T	E(w)	DN			K
18.	INZ002027W	Introduction to IoT	2						30	60	2	1,2	T	E	DN			K
19.	INZ002027L	Introduction to IoT			2				30	90	3	1,8	T	Z	DN		P(3)	K
20.	INZ004414L	Basics of Software Engineering			1				15	30	1	0,6	T	Z	DN		P(1)	K

4.2 List of optional blocks

4.2.1 List of general education blocks

4.2.1.1 Liberal-managerial subjects blocks: block M10 – Humanistic subject (min. 3 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours				Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses		
			lec	cl	lab	pr		sem	ZZU	CNPS	Total	DN ⁵ classes			BU ¹ classes	Concerni ng scientific activities ⁵	University -wide ⁴
1.	INZ118560BK	Humanities subject 1	2					30	90	3	1,8	T	Z	O			KO
2.	INZ118560BK	Humanities subject 2	2					30	90	3	1,8	T	Z	O			KO
		Total	2					30	90	3							

4.2.1.2 Foreign languages block (min. 5 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours				Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses		
			lec	cl	lab	pr		sem	ZZU	CNPS	Total	DN ⁵ classes			BU ¹ classes	Concerni ng scientific activities ⁵	University -wide ⁴
1.	JZL100927BK	Foreign language A1/A2/ B1/ B2.1/ C1.1	4					30	60	2	1,2	T	Z	O			KO
2.	JZL100928BK	Foreign language B2.2/C1.2	4					60	90	3	1,8	T	Z	O			KO
		Total	8					120	150	5	3						

4.2.1.3 Sporting classes block (0. ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours				Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses		
			lec	cl	lab	pr		sem	ZZU	CNPS	Total	DN ⁵ classes			BU ¹ classes	Concerni ng scientific activities ⁵	University -wide ⁴
1.	WFW030000BK	Sports I	2					30	30	0	0	T	Z	O			KO
2.	WFW030000BK	Sports II	2					30	30	0	0	T	Z	O			KO
		Total	2					60	60								

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 ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem			
2	12				300	8	4,8

4.2.3 List of blocks

4.2.3.1 M1 block - Administration of Computer Systems (min. 4 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours				Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr		sem	ZZU	CNPS	Total	DN ⁵ classes			BU ¹ classes	University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶
1.	INZ004415WI	Linux Server Administration (GK)	2		2			60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
2.	INZ004468WI	Managing IT infrastructure (GK)	2		2			60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
3.	INZ002026WI	Routing and Switching in Computer Networks (GK)	2		2			60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
		Total	2		2			60	120	4	4	2,4					2	

4.2.3.2 M2 block – Web Technologies (min. 4 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours				Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr		sem	ZZU	CNPS	Total	DN ⁵ classes			BU ¹ classes	University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶
1.	INZ004420WI	Web Systems Programming (GK)	2		2			60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
2.	INZ002028WI	Developing Web Applications with .NET (GK)	2		2			60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
		Total	2		2			60	120	4	4	2,4					2	

4.2.3.3 M3 block - Database Design (min. 4 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses					
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷		
1.	INZ004422Wp	Database Systems Engineering (GK)	1			2			45	120	4		4	T	Z (w)			DN	P (2)	K	
2.	INZ004470Wp	Database Programming (GK)	1			2			45	120	4		4	T	Z (w)			DN	P (2)	K	
3.	INZ004424Wp	Database Design (GK)	1			2			45	120	4		4	T	Z (w)			DN	P (2)	K	
		Total	1			2			45	120	4	4	4	2,4						2	

4.2.3.4 M4 block – Mobile applications (min. 4 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses					
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷		
1.	INZ002029W1	Mobile Applications for Android (GK)	2		2				60	120	4		4	T	Z (w)			DN	P (2)	K	
2.	INZ002030W1	Mobile Applications for IOS (GK)	2		2				60	120	4		4	T	Z (w)			DN	P (2)	K	
		Total	2		2				60	120	4	4	4	2,4						2	

4.2.3.5 M5 block – Project Management Basics (min. 4 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses					
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷		
1.	INZ002032W1s	Introduction to IT Project Management (GK)	1		2		1		60	120	4		4	T	Z (w)			DN	P (2)	K	
2.	INZ002033W1s	Support for IT Project Management (GK)	1		2		1		60	120	4		4	T	Z (w)			DN	P (2)	K	
		Total	1		2		1		60	120	4	4	4	2,4						2	

4.2.3.6 M6 block – Distributed Systems (min. 4 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1.	INZ002035WI	Distributed Computer Systems (GK)	2		2				60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
2.	INZ004470WI	Cloud programming (GK)	2		2				60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
		Total	2		2				60	120	4	4	2,4						2

4.2.3.7 M7 block – Programming Tools and Technologies (min. 4 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1.	INZ004376WI	Game Programming (GK)	2		2				60	110	4	4	2,4	T	Z (w)		DN	P (2)	K
2.	INZ004436WI	Advanced Web Technologies (GK)	2		2				60	110	4	4	2,4	T	Z (w)		DN	P (2)	K
		Total	2		2				60	110	4	4	2,4						2

4.2.3.8 M8 block – Multimedia (min. 4 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1.	INZ004437WI	Computer Graphics (GK)	2		2				60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
2.	INZ004438WI	Programming Multimedia Applications (GK)	2		2				60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
3.	INZ004439WI	Digital Media Processing Techniques (GK)	2		2				60	120	4	4	2,4	T	Z (w)		DN	P (2)	K
		Total	2		2				60	120	4	4	2,4	2,4					2

4.2.3.9 M9 block – Current trends in Computer Science (min. 5 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours				Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/group of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr		sem	ZZU	CNPS	Total	DN ⁵ classes			BU ¹ classes	University-wide ⁴	Concerning scientific activities ⁵	Practical ⁶
1.	INZ002040WI	Data Science (GK)	2		2			60	120	5	5	3	T	Z (w)		DN	P (3)	K
2.	INZ002041WI	Neural Networks (GK)	2		2			60	120	5	5	3	T	Z (w)		DN	P (3)	K
3.	INZ002042WI	Metaheuristics in Problems Solving (GK)	2		2			60	120	5	5	3	T	Z (w)		DN	P (3)	K
4.	INZ002043WI	Human-Computer Interaction (GK)	2		2			60	120	5	5	3	T	Z (w)		DN	P (3)	K
		Total	2		2			60	120	5	5	3						3

4.2.3.10 Other elective courses/group of courses (min. 25 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours				Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/group of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr		sem	ZZU	CNPS	Total	DN ⁵ classes			BU ¹ classes	University-wide ⁴	Concerning scientific activities ⁵	Practical ⁶
1.	INZ002017Ps	Team Project (GK)			8	1		135	600	20	20	2,4	T	Z		DN	P (19)	K
2.	INZ002044Q	Practical training			8	1		160	760	5	1	2,4		Z		DN	P (5)	K
		Total					135	760	25	20	2,4							24

Altogether for blocks:

lec	Total number of hours			Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
	cl	lab	pr				
16	18	10	2	1830 (including 160 of training)	62 (including 5 of training)	58	37,2 (including 3 of training)

4.3 Training block – concerning principles of training crediting – attachment no. 4

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 ¹ classes	Training crediting mode	Code
5	3	Z	
Training duration	Training objective		
4 weeks	Getting familiar with the functioning of an IT company or IT department. Getting knowledge about the design, programming, testing or implementation of professional IT solutions as well as practical system administration (connection with one or more mandatory courses is necessary). Implementation of typical IT tasks required practical skills and social competences gained so far, with particular focus on group work.		

5. Ways of verifying assumed learning outcomes

Type of classes	Ways of verifying assumed learning outcomes
lecture	Examination, progress/final test
class	progress/final test
laboratory	pretest, report from laboratory, assessment of a solution delivered by student during laboratory
project	project defence, project documentation
seminar	participation in discussion, topic presentation, essay
training	report from training

6. Range of diploma examination

1. Basic digital circuits: logic gates, switches, sequence circuits.
2. Binary arithmetic, Boolean functions, Karnaugh tables.
3. Rules of structural programming. Overview of structural statements.
4. Object-oriented programming – basic concepts and their applications.
5. Basic operations on sets, functions and relations. Propositional calculus. Predicate calculus.
6. Deterministic finite automata – definitions, applications.
7. Examples of computer architectures: von Neuman, Princeton, Harvard.
8. RISC and CISC processors – characteristics, differences.
9. Graphs. Spanning trees. Euler and Hamilton cycles. Cohesion. Graph traversal algorithms.

10. Algorithm – definition. Sorting algorithms. Search algorithms.
11. Basics of algorithm analysis. Computational complexity.
12. Layered structure of the operating system. The concept of system kernel.
13. The OSI layer model.
14. Data link layer protocols. Ethernet network. TCP/IP internet protocol stack.
15. Application layer protocols.
16. Effective programming techniques – examples.
17. Memory management. Common problems. Pointers.
18. Selection of programming paradigms for solving IT problems.
19. Functional programming and imperative programming.
20. Abstract data types and their implementation in programming languages.
21. Identification algorithms of static objects. Analytical and numerical optimization methods.
22. The specificity of the Internet of Things (IoT), application areas, solving problems resulting from a large number of devices, their distribution and a number of generated data.
23. Hardware solutions supporting communication and communication protocols used in embedded systems and IoT.
24. Database models. Relational database. Normalization. Transactions.
25. SQL language. Characteristics. Sub-languages.
26. Software life cycle models.
27. Software development methodologies.
28. The use of lists, sets and dictionaries in Python.
29. Differences and similarities between Java and Python.
30. Principles of parallel programming in Python.
31. UML as a project specification language. Diagrams and their application.
32. Architectural and design patterns – classification, examples, applications.
33. Data protection methods.
34. Basic cryptographic algorithms.
35. Multidimensional data modeling (transactional and analytical data systems, types of multidimensional OLAP structures).
36. ETL process.
37. MDX expressions and directives.
38. Methods of knowledge processing in expert systems.
39. Inference in non-monotonic logic – a planning task.

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

No.	Course / group of courses code	Name of course / group of courses	Crediting by deadline of... (number of semester)
1.	FZP001136Wc	General Physics I (GK)	5
2.	INZ004400Wc	Computer System Organization (GK)	3
3.	INZ004399Wc	Structural and Object oriented Programming (GK)	3
4.	INZ004399L	Structural and Object oriented Programming	3
5.	INZ004402Wc	Logic for IT Specialists (GK)	5
6.	MAT001688Wc	Algebra and Analytic Geometry (GK)	5
7.	MAT001689Wc	Mathematical Analysis I (GK)	5
8.	INZ004403L	Data Structures and Algorithms	6
9.	INZ004403Wc	Data Structures and Algorithms (GK)	6
10.	INZ004404W	Computer Architecture	6
11.	INZ004404L	Computer Architecture	6
12.	INZ004405W	Operating Systems	6
13.	INZ004405L	Operating Systems	6
14.	FZP001137L	General Physics II	5
15.	FZP001137Wc	General Physics II (GK)	5
16.	INZ004406Wc	Discrete Mathematics (GK)	5
17.	MAT001690Wc	Mathematical Analysis II (GK)	5
18.	ZMZ001643W	Basics of entrepreneurship	6
19.	INZ004407W	Computer Networks	6
20.	INZ004407L	Computer Networks	6
21.	INZ004408W	Effective Programming Techniques	6
22.	INZ004408L	Effective Programming Techniques	6
23.	INZ004409L	Programming paradigms	6
24.	INZ004409Wc	Programming paradigms (GK)	6
25.	INZ004410Wc	Theory of Probabilistic and Statistics (GK)	5
26.	JZL100927BK	Foreign language A1/A2/ B1/ B2.1/ C1.1	5
27.	WFW030000BK	Sports I	5
28.	INZ002023L	Databases	6
29.	INZ002023Wc	Databases (GK)	6
30.	INZ002024L	Systems Analysis and Decision Support Methods	6
31.	INZ002024Wc	Systems Analysis and Decision Support Methods (GK)	6

32.	INZ002027W	Introduction to IoT	6
33.	INZ002027L	Introduction to IoT	6
34.	INZ004414L	Basics of Software Engineering	5
35.	INZ004414Wc	Basics of Software Engineering (GK)	5
36.	JZL100928BK	Foreign language B2.2/C1.2	6
37.	WFW030000BK	Sports II	6
38.	SCZ001115S	Presentation Techniques	6
39.	INZ004418W	Cybersecurity	6
40.	INZ004418L	Cybersecurity	6
41.	INZ002025W	Script Languages	6
42.	INZ002025L	Script Languages	6
43.	INZ004419W	Software Engineering	6
44.	INZ004419P	Software Engineering	6
45.	INZ004427W	Artificial intelligence and knowledge engineering	6
46.	INZ004427L	Artificial intelligence and knowledge engineering	6
47.	INZ002031W	Data Warehouses	6
48.	INZ002031L	Data Warehouses	6
49.	INZ004440W	IT Social and Professional Problems	6

8. Plan of studies (attachment no. 4)

Approved by faculty student government legislative body:

11.03.2021.

Date

Mateusz Sobch, Mateusz Sobch
name and surname of student representative

Udziejewicz Tomasz

Docent hab. inż. Katarzyna Tworek, prof. uczelni
(3)

11.03.2021

Date

* delete as appropriate