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

1.1 Number of semesters: **7**	*1.2 Total number of ECTS points necessary to complete studies at a given level:* **210**
1.3 Total number of hours: **2475**	*1.4 Prerequisites (particularly for second-level studies):* Qualification is based on the results of the matriculation exam, in accordance with the terms and recruitment procedure established for a given academic year
1.5 Upon completion of studies graduate obtains *professional degree of:* **INŻYNIER (ENGINEER)**	*1.6 Graduate profile, employability:* A graduate has qualifications including knowledge, skills and engineering competences in the following areas: • 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.

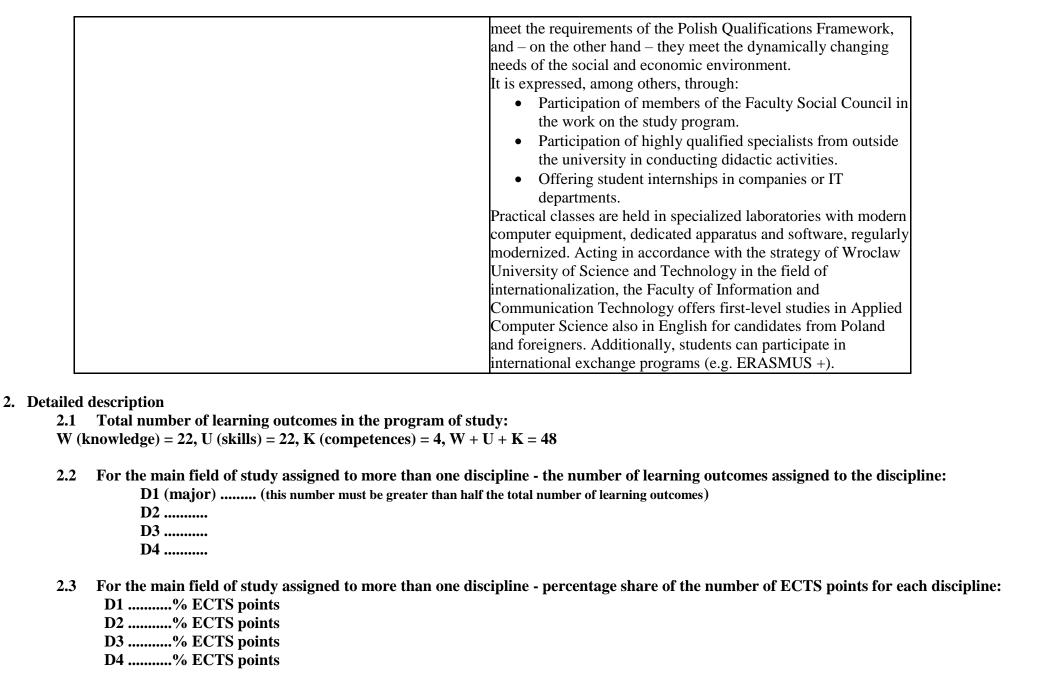|	
	- Software design and project management. - Advanced programming methods and tools, artificial intelligence and knowledge engineering, mobile applications and distributed systems. - Various aspects of multimedia - Trends in IT. The graduate also has knowledge of basic sciences: mathematical analysis, 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. 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. Soft skills and the ability to work in a team are also important in educating IT engineers. 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.
1.7 Possibility of continuing studies: Eligibility to apply for admission to second-cycle study programmes, non-degree postgraduate programmes.	*1.8 Indicate connection with University's mission and its development strategy:* The program of study in Applied Computer Science at the Faculty of Information and Communication Technology is consistent with the mission of Wrocław University of Science and Technology and its development strategy. 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

	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: • 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. Practical classes are held in specialized laboratories with modern computer equipment, dedicated apparatus and software, regularly modernized. Acting in accordance with the strategy of Wroclaw University of Science and Technology in the field of internationalization, the Faculty of Information and Communication Technology 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 +).

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) **133**

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 members of the Social Council of the Faculty of Information and Communication Technology. 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 BU[1] 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)

34 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/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]	Type[7]
1.	ZMZ001643W	Basics of entrepreneurship	2					K1INF_W19	30	60	2		1,2	T	Z				KO
2.	SCZ001115S	Presentation Techniques					2	K1INF_U18	30	60	2		1,2	T	Z				KO
3.	INZ004440W	IT Social and Professional Problems	2					K1INF_W20 K1INF_W22	30	60	2		1,2	T	Z				KO
		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/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]	Type[7]
1.	INZ004400Wc	Computer System Organization (GK)	2	1				K1INF_W06	45	90	3		1,8	T	Z (w)				PD
2.	INZ004399Wc	Structural and Object oriented Programming (GK)	2	2				K1INF_W03 K1INF_U01 K1INF_U02	60	120	4		2,4	T	Z (w)				PD
3.	INZ004399L	Structural and Object oriented Programming			2			K1INF_W03 K1INF_U01 K1INF_U02	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	pr	sem					
8	3	2		2	225	450	15		9

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/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]	Type[7]
1.	MAT001688Wc	Algebra and Analytic Geometry (GK)	2	2				K1INF_W01	60	180	6		3,6	T	E (w)	O			PD
2.	MAT001689Wc	Mathematical Analysis I (GK)	2	2				K1INF_W01	60	180	6		3,6	T	E (w)	O			PD
3.	MAT001690Wc	Mathematical Analysis II (GK)	2	1				K1INF_W01	45	150	5		3	T	E (w)	O			PD
4.	INZ004406Wc	Discrete Mathematics (GK)	2	2				K1INF_W01	60	150	5		3	T	Z (w)				PD
5.	INZ004410Wc	Theory of Probabilistic and Statistics (GK)	2	2				K1INF_W01	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/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]	Type[7]
1.	FZP001136Wc	General Physics I (GK)	2	1				K1INF_W02	45	120	4		2,4	T	Z (w)	O			PD
2.	FZP001137Wc	General Physics II (GK)	2	1				K1INF_W02	45	120	4		2,4	T	E (w)	O			PD
3.	FZP001137L	General Physics II			1			K1INF_W02	15	60	2		1,2	T	Z	O		P (2)	PD
		Total	4	2	1				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	pr	sem					
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]	Type[7]
1.	INZ004402Wc	Logic for IT Specialists (GK)	2	2				K1INF_W01	60	150	5	5	3	T	E (w)		DN		K
2.	INZ004403L	Data Structures and Algorithms			2			K1INF_W03 K1INF_U01	30	60	2	2	1,2	T	Z		DN	P (2)	K
3.	INZ004403Wc	Data Structures and Algorithms (GK)	2	1				K1INF_W03 K1INF_U01	45	120	4	4	2,4	T	E (w)		DN		K
4.	INZ004404W	Computer Architecture	2					K1INF_W06 K1INF_U04 K1INF_U05	30	60	2	2	1,2	T	Z		DN		K
5.	INZ004404L	Computer Architecture			2			K1INF_W06 K1INF_U04 K1INF_U05	30	60	2	2	1,2	T	Z		DN	P (2)	K
6.	INZ004405W	Operating Systems	2					K1INF_W08 K1INF_U06	30	60	2	2	1,2	T	Z		DN		K
7.	INZ004405L	Operating Systems			2			K1INF_W08 K1INF_U06	30	60	2	2	1,2	T	Z		DN	P (2)	K
8.	INZ004407W	Computer Networks	3					K1INF_W09 K1INF_U07	45	110	4	4	2,4	T/Z	E		DN		K
9.	INZ004407L	Computer Networks			2			K1INF_W09 K1INF_U07	30	90	3	3	1,8	T	Z		DN	P (3)	K
10.	INZ004408W	Effective Programming Techniques	1					K1INF_W03 K1INF_U01	15	60	2	2	1,2	T/Z	Z		DN		K
11.	INZ004408L	Effective Programming Techniques			2			K1INF_W03 K1INF_U01	30	90	3	3	1,8	T	Z		DN	P (3)	K
12.	INZ004409L	Programming paradigms			2			K1INF_W04 K1INF_U02	30	60	2	2	1,2	T	Z		DN	P (2)	K
13.	INZ004409Wc	Programming paradigms (GK)	2	1				K1INF_W04 K1INF_U02	45	140	5	5	3	T/Z(w)	E(w)		DN		K
14.	INZ002023L	Data Bases			1			K1INF_W12 K1INF_U03 K1INF_U04	15	60	2	2	1,2	T	Z		DN	P (2)	K
15.	INZ002023Wc	Databases (GK)	2	1				K1INF_W12 K1INF_U03 K1INF_U04	45	115	4	4	2,4	T/Z(w)	E(w)		DN		K
16.	INZ002024L	Systems Analysis and Decision Support Methods			1			K1INF_W11 K1INF_U06	15	50	2	2	1,2	T	Z		DN	P (2)	K
17.	INZ002024Wc	Systems Analysis and Decision Support Methods (GK)	2	1				K1INF_W11 K1INF_U06	45	140	5	5	3	T/Z(w)	E(w)		DN		K
18.	INZ002027W	Introduction to IoT	2					K1INF_W09 K1INF_U04 K1INF_U07	30	60	2	2	1,2	T/Z	E		DN		K
19.	INZ002027L	Introduction to IoT			2			K1INF_W09 K1INF_U04 K1INF_U07	30	90	3	3	1,8	T	Z		DN	P (3)	K
20.	INZ004414L	Basics of Software Engineering			1			K1INF_W05 K1INF_U03	15	30	1	1	0,6	T	Z		DN	P (1)	K

No.	Course code	Course name	lec	cl	lab	pr	sem	Learning outcomes	ZZU	CNPS	ECTS	ECTS (DN)	ECTS (BU)	form	form		DN	P	K
21.	INZ004414Wc	Basics of Software Engineering (GK)	1	2				K1INF_W05 K1INF_U03	45	90	3	3	1,8	T/Z(w)	Z(w)		DN		K
22.	INZ004418W	Cybersecurity	2					K1INF_W10 K1INF_U08	30	90	3	3	1,8	T/Z	E		DN		K
23.	INZ004418L	Cybersecurity			2			K1INF_W10 K1INF_U08	30	60	2	2	1,2	T	Z		DN	P (2)	K
24.	INZ002025W	Script Languages	2					K1INF_W03 K1INF_U01	30	85	3	3	1,8	T/Z	E		DN		K
25.	INZ002025L	Script Languages			2			K1INF_W03 K1INF_U01	30	90	3	3	1,8	T	Z		DN	P (3)	K
26.	INZ004419W	Software Engineering	2					K1INF_W14 K1INF_U03 K1INF_U04 K1INF_U21	30	90	3	3	1,8	T/Z	E		DN		K
27.	INZ004419P	Software Engineering				2		K1INF_W14 K1INF_U03 K1INF_U04 K1INF_U21	30	90	3	3	1,8	T	Z		DN	P (3)	K
28.	INZ004427W	Artificial intelligence and knowledge engineering	2					K1INF_W13 K1INF_U06	30	60	2	2	1,2	T/Z	E		DN		K
29.	INZ004427L	Artificial intelligence and knowledge engineering			2			K1INF_W13 K1INF_U06	30	90	3	3	1,8	T	Z		DN	P (3)	K
30.	INZ002031W	Data Warehouses	2					K1INF_W12 K1INF_U06	30	60	2	2	1,2	T/Z	E		DN		K
31.	INZ002031L	Data Warehouses			2			K1INF_W12 K1INF_U06	30	60	2	2	1,2	T	Z			P (3)	K
		Total	31	8	25	2			990	2530	86	86	51,6					36	

Altogether (for main field of study 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					
31	8	25	2		990	2530	86	86	51,6

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. 2 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]	Type[7]
1.		Humanities subject 1	2					K1INF_W21	30	90	2		1,2	T	Z	O			KO
2.		Humanities subject 2	2					K1INF_W21	30	90	2		1,2	T	Z	O			KO
		Total	2						30	90	2		1,2						

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/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]	Type[7]
1.	JZL100927BK	Foreign language A1/A2/ B1/ B2.1/ C1.1		4				K1INF_U19	30	60	2		1,2	T	Z	O			KO
2.	JZL100928BK	Foreign language B2.2/C1.2		4				K1INF_U19	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/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]	Type[7]
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				210	300	7		4,2

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			Form² of course/gr oup of courses	Way³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN⁵ classes	BU¹ classes			University -wide⁴	Concerning scientific activities⁵	Practical⁶	Type⁷
1.	INZ004415Wl	Linux Server Administration (GK)	2		2			K1INF_W08 K1IN_U14	60	120	4	4	2,4	T/Z(w)	Z (w)		DN	P (2)	K
2.	INZ004468Wl	Managing IT infrastructure (GK)	2		2			K1INF_W08 K1IN_U14	60	120	4	4	2,4	T/Z(w)	Z (w)		DN	P (2)	K
3.	INZ002026Wl	Routing and Switching in Computer Networks (GK)	2		2			K1INF_W08 K1IN_U14	60	120	4	4	2,4	T/Z(w)	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			Form² of course/gr oup of courses	Way³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN⁵ classes	BU¹ classes			University -wide⁴	Concerning scientific activities⁵	Practical⁶	Type⁷
1.	INZ004420Wl	Web Systems Programming (GK)	2		2			K1INF_W07 K1INF_U11	60	120	4	4	2,4	T/Z(w)	Z (w)		DN	P (2)	K
2.	INZ002028Wl	Developing Web Applications with .NET (GK)	2		2			K1INF_W07 K1INF_U11	60	120	4	4	2,4	T/Z(w)	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.	INZ004470Wp	Database Programming (GK)	1			2		K1INF_W14 K1INF_U03 K1INF_U04	45	120	4	4	2,4	T/Z(w)	Z (w)			DN	P (2)	K
2.	INZ004424Wp	Database Design (GK)	1			2		K1INF_W14 K1INF_U03 K1INF_U04	45	120	4	4	2,4	T/Z(w)	Z (w)			DN	P (2)	K
		Total	1			2			45	120	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.	INZ002029Wl	Mobile Applications for Android (GK)	2		2			K1INF_W07 K1INF_U11	60	120	4	4	2,4	T/Z(w)	Z (w)			DN	P (2)	K
2.	INZ002030Wl	Mobile Applications for IOS (GK)	2		2			K1INF_W07 K1INF_U11	60	120	4	4	2,4	T/Z(w)	Z (w)			DN	P (2)	K
		Total	2		2				60	120	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.	INZ002032Wls	Introduction to IT Project Management (GK)	1		2		1	K1INF_W17 K1INF_U09 K1INF_U16 K1INF_U18	60	120	4	4	2,4	T/Z(w)	Z (w)			DN	P (2)	K
2.	INZ002033Wls	Support for IT Project Management (GK)	1		2		1	K1INF_W17 K1INF_U09 K1INF_U16 K1INF_U18	60	120	4	4	2,4	T/Z(w)	Z (w)			DN	P (2)	K
		Total	1		2		1		60	120	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.	INZ002035Wl	Distributed Computer Systems (GK)	2		2			K1INF_W07 K1INF_U11 K1INF_U16	60	120	4	4	2,4	T/Z(w)	Z (w)		DN	P (2)	K
2.	INZ004470Wl	Cloud programming (GK)	2		2			K1INF_W07 K1INF_U11 K1INF_U16	60	120	4	4	2,4	T/Z(w)	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.	INZ004376Wl	Game Programming (GK)	2		2			K1INF_W16 K1INF_U13	60	110	4	4	2,4	T/Z(w)	Z (w)		DN	P (2)	K
2.	INZ004436Wl	Advanced Web Technologies (GK)	2		2			K1INF_W16 K1INF_U13	60	110	4	4	2,4	T/Z(w)	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.	INZ004437Wl	Computer Graphics (GK)	2		2			K1INF_W15 K1INF_U12	60	120	4	4	2,4	T/Z(w)	Z (w)		DN	P (2)	K
2.	INZ004438Wl	Programming Multimedia Applications (GK)	2		2			K1INF_W15 K1INF_U12	60	120	4	4	2,4	T/Z(w)	Z (w)		DN	P (2)	K
3.	INZ004439Wl	Digital Media Processing Techniques (GK)	2		2			K1INF_W15 K1INF_U12	60	120	4	4	2,4	T/Z(w)	Z (w)		DN	P (2)	K
		Total	2		2				60	120	4	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]	Type[7]
1.	INZ002040Wl	Data Science (GK)	2		2			K1INF_W18 K1INF_U10	60	120	5	5	3	T/Z(w)	Z (w)		DN	P (3)	K
2.	INZ002041Wl	Neural Networks (GK)	2		2			K1INF_W18 K1INF_U10	60	120	5	5	3	T/Z(w)	Z (w)		DN	P (3)	K
3.	INZ002042Wl	Metaheuristics in Problems Solving (GK)	2		2			K1INF_W18 K1INF_U10	60	120	5	5	3	T/Z(w)	Z (w)		DN	P (3)	K
4.	INZ002043Wl	Human–Computer Interaction (GK)	2		2			K1INF_W18 K1INF_U10	60	120	5	5	3	T/Z(w)	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]	Type[7]
1.	INZ002017Ps	Team Project (GK)				8	1	K1INF_U10 K1INF_U17 K1INF_U20 K1INF_U21 K1INF_U22 K1INF_K01 K1INF_K02 K1INF_K03 K1INF_K04	135	600	20	10	12,6	T	Z		DN	P (19)	K
2.	INZ002044Q	Practical training							160	160	5	0	3		Z		DN	P (5)	K
		Total				8	1		135	760	26	10	15,6					24	

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[5]	Number of ECTS points for BU classes[1]
lec	cl	lab	pr	sem					
16		18	10	2	660	1830 (including 160 of training)	63 (including 5 of training)	47	37,8 (including 3 of training)

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

Opinion of the 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:

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

....
Date   Dean's signature

*delete as appropriate