PROGRAM OF STUDIES

FACULTY: Faculty of Information and Communication Technology
MAIN FIELD OF STUDY: Applied Computer Science
BRANCH OF SCIENCE: Computer Engineering
DISCIPLINES:

D1 Information and Communication Technology (major discipline)
D2* ……...
D3* ……
D4* ……

EDUCATION LEVEL: second-level studies *
FORM OF STUDIES: full-time studies *
PROFILE: general academic *
LANGUAGE OF STUDY: English

Content:

Resolution no. … of the Senate of Wroclaw University of Science and Technology

In effect since 2023/2024

*delete as applicable

ASSUMED LEARNING OUTCOMES

FACULTY: Faculty of Information and Communication Technology
MAIN FIELD OF STUDY: Applied Computer Science
EDUCATION LEVEL: second-level studies
PROFILE: general academic

Location of the main-field-of study:

Branch of science: Engineering and Technical Sciences (pol. Nauki inżynieryjno-techniczne)

Discipline / disciplines (for several disciplines, please indicate the major discipline): Information and Communication Technology (pol. Informatyka techniczna i telekomunikacja)

Explanation of the markings:
P6U – universal first degree characteristics corresponding to education at the first-level studies - 6 PRK level *
P7U – universal first degree characteristics corresponding to education at the second-level studies - 7 PRK level *

P6S – second degree characteristics corresponding to education at the first-level studies - 6 PRK level *
P7S – second degree characteristics corresponding to education at the second-level studies - 7 PRK level *

W - category "knowledge"
U - category "skills"
K - category "social competences"
K (*faculty symbol*) _W1, K (*faculty symbol*) _W2, K (*faculty symbol*) _W3, … - main-field-of study learning outcomes related to the category "knowledge"
K (*faculty symbol*) _U1, K (*faculty symbol*) _U2, K (*faculty symbol*) _U3, … - main-field-of study learning outcomes related to the category "skills"
K (*faculty symbol*) _K1, K (*faculty symbol*) _K2, K (*faculty symbol*) _K3, … - main-field-of study learning outcomes related to the category "social competences"
S (*faculty symbol*) _W.., S (*faculty symbol*) _W.., S (*faculty symbol*) _W.., … - specialization learning outcomes related to the category "knowledge"
S (*faculty symbol*) _U.., S (*faculty symbol*) _U.., S (*faculty symbol*) _U.., … - specialization learning outcomes related to the category "skills"
S (*faculty symbol*) _K.., S (*faculty symbol*) _K.., S (*faculty symbol*) _K.., … - specialization learning outcomes related to the category "social competences"
… _inż. – learning outcomes related to the engineer competences

* delete as applicable

Main field of study learning outcomes	Description of learning outcomes for the main-field-of study Applied Computer Science After completion of studies, the graduate:	Reference to PRK characteristics		
		Universal first degree characteristics (U)	Second degree characteristics typical for qualifications obtained in higher education (S)	
			Characteristics for qualifications on 6 / 7* levels of PRK	Characteristics for qualifications on 6 and 7 levels of PRK, enabling acquiring engineering competences
KNOWLEDGE (W)				
KIST_W01	Has an extended and deepened knowledge of mathematics and physics, useful for formulating and solving complex tasks in the field of applied informatics	P7U_W	P7S_WG	
KIST_W02	Knows and understands the basic processes occurring during the life cycle of information objects and systems	P7U_W	P7S_WG	P7S_WG_inż
KIST_W03	Knows the main development trends of the discipline of technical informatics and telecommunication	P7U_W	P7S_WG	
KIST_W04	Is familiar with basic research methods and tools	P7U_W	P7S_WG	
KIST_W05	Is familiar with various methods and techniques of representation and analysis of data	P7U_W	P7S_WG	
KIST_W06	Has knowledge of the design of complex information systems and the management of such projects	P7U_W	P7S_WG	P7S_WG_inż
KIST_W07	Knows ways to represent models used in computer science	P7U_W	P7S_WG	
KIST_W08	Knows and understands the rules of setting up, conducting and developing various forms of business, taking into account economic, legal and other non-technical considerations, including rules of protection of industrial property and copyright law	P7U_W	P7S_WK	P7S_WK_inż
KIST_W09	Knows the fundamental dilemmas of modern civilization	P7U_W	P7S_WK	
SKILLS (U)				
KIST_U01	Is able to search for information from different sources, is able to its critical analysis, synthesis and creative interpretation and presentation using information and communication techniques	P7U_U	P7S_UW	
KIST_U02	Can formulate and test hypotheses for simple research problems	P7U_U	P7S_UW	
KIST_U03	Knows how to plan and conduct experiments, analyze and interpret	P7U_U	P7S_UW	P7S_UW_inż

	the results obtained, and draw conclusions			
KIST_U04	Is able to select and apply appropriate methods (analytical, simulation, experimental) and research tools to the problem at hand. Is able to integrate knowledge in the applied computer science domain	P7U_U	P7S_UW	P7S_UW_inż
KIST_U05	Knows how to select and apply various methods and techniques for data representation and analysis	P7U_U	P7S_UW	P7S_UW_inż
KIST_U06	Is able to design (according to a given specification also considering non-technical aspects) and implement an information system or its components in selected environments, taking into account quality characteristics, e.g. security, usability, performance. Is able to evaluate the usefulness and applicability of new technologies	P7U_U	P7S_UW	P7S_UW_inż
KIST_U07	Is able to manage an IT project and estimate the implementation cost/time of the proposed solution and/or activities undertaken	P7U_U	P7S_UW	P7S_UW_inż
KIST_U08	Knows how to develop a model according to a given specification	P7U_U	P7S_UW	
KIST_U09	Is able to critically analyze existing technical solutions and propose improvements if necessary	P7U_U	P7S_UW	P7S_UW_inż
KIST_U10	Is able to communicate on specialized topics with different audiences	P7U_U	P7S_UK	
KIST_U11	Knows how to conduct a debate	P7U_U	P7S_UK	
KIST_U12	Is able to communicate in English or another foreign language at the B2+ level of the Common European Framework of Reference for Languages, including specialized terminology; knows a second foreign language at the A1 or A2 level of the Common European Framework of Reference for Languages	P7U_U	P7S_UK	
KIST_U13	Is able to lead a team and collaborate with others in team projects	P7U_U	P7S_UO	
KIST_U14	Can plan and implement the process of self-education, identify possible directions for further lifelong learning, as well as guide others in this area	P7U_U	P7S_UU	
SOCIAL COMPETENCES (K)				
KIST_K01	Is ready to critically evaluate the incoming content, and is aware of the importance of knowledge in problem solving	P7U_K	P7S_KK	
KIST_K02	Is able to think and act creatively and entrepreneurially	P7U_K	P7S_KO	
KIST_K03	Is ready to take action in the public interest	P7U_K	P7S_KO	
KIST_K04	Is ready to responsibly performing professional roles. Knows and obeys the principles of professional ethics.	P7U_K	P7S_KR	

Zał. nr 3 do ZW 16/2020

Attachment no. 2. to the Program of Studies

DESCRIPTION OF THE PROGRAM OF STUDIES

Main field of study: Applied Computer Science
Specialization: Computer Engineering

Profile General Academic

Level of studies: Second

Form of studies Full - Time

1. General description

1.1 Number of semesters: **4**	*1.2 Total number of ECTS points necessary to complete studies at a given level:* **120**
1.3 Total number of hours: **1200**	*1.4 Prerequisites (particularly for second-level studies):* 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.
1.5 Upon completion of studies graduate obtains professional degree of: **Magister inżynier**	*1.6 Graduate profile, employability:* Science is carried out in four specialties: • Education on the second level program of Applied Computer Software Engineering (IO) • Design of information systems (PSI) • Applications of specialized information technologies (ZSTI) • Computer Engineering (CE) - specialization conducted in English

	Although the plan of study of each specialization focuses on different aspects of modern applied computer science, each allows students to achieve the same learning outcomes. In particular, a graduate of the master degree program in Applied Computer Science: • Has the knowledge and practical skills to design various types of complex information systems of different types. • Is able to implement an information system (or its components) in different environments, taking into account qualitative characteristics of the solution, such as security, performance or usability. Is able to critically evaluate available and new technologies in terms of their applicability to a specific situation. • Has knowledge of IT project management. Is familiar with IT tools that support the management of this type of project. • Is ready to perform a variety of professional roles in particular is able to manage the work of a team implementing a complex IT project. • Has knowledge of modeling, knows the ways of representation of models used in information technology. Knows how to build a model according to a given specification. • Knows various methods and techniques of representation and analysis of data. Knows how to interpret the analysis results obtained. • Is able to search for information from various sources, is able to critically analyze, synthesize and creatively interpret them. Is able to present them using information and communication techniques. • Is prepared to work in scientific and research institutions. Knows basic research methods and tools. He is able to formulate and test hypotheses, select and apply research methods and tools appropriate to the problem being solved, as well as plan and conduct experiments, analyze the obtained results and formulate conclusions. • Is aware of the importance of knowledge in problem solving and the dynamics of its changes, especially in the field of applied computer science. Therefore, he is able to plan and carry out the process of self-education, and, taking into account the main development trends in the field of applied computer science and telecommunications, determine the directions of further lifelong learning. • Is able to communicate on specialized topics with diverse audiences, also in foreign languages. He also knows how to debate. 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. Graduates are employed, among others, in the following positions: software architect or engineer, project manager, quality assurance manager, database designer or security designer. 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. 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.
1.7 Possibility of continuing studies: • Eligibility to apply for admission to a doctoral school • Non-degree postgraduate programmes	*1.8 Indicate connection with University's mission and its development strategy:* The plan of study of the second-level studies in Applied Informatics conducted at the Faculty of Information and Communication Technology is in line with the mission of Wroclaw University of Science and Technology and its development strategy. The program provides the opportunity to acquire new and deepen previously acquired, diversified substantive: knowledge, skills (including engineering) and social competencies necessary for a modern master of science in the discipline of Technical Informatics and Telecommunications. The plan of study of the master degree program in Applied Informatics is implemented in three specializations in Polish: Software Engineering, Information Systems Design and Applications of Specialized Information Technologies. In addition, acting in accordance with the internationalization strategy of the University, the Faculty of Information and Communication Technology offers a specialization - Computer Engineering - conducted in English. This specialty is intended for Polish and foreign candidates, including those who have a bachelor's degree. In addition, all master degree students can participate in international exchange programs (e.g. ERASMUS+).

	Subjects, offered by particular specializations, on the one hand meet the requirements of the Polish Qualification Framework, and on the other hand, in accordance with the mission of Wrocław University of Science and Technology, meet the dynamically changing needs of the socio-economic environment. Since the academic year 2021/2022 a Social Council has been established in the Department of Information and Communication Technology. The Social Council is composed of the management representatives of leading IT companies in the Lower Silesia region. Consultants appointed by the Council shall contribute to the development of the program of study. The high quality and relevance of the content provided to students during classes is ensured by scientific and teaching staff with significant achievements in the discipline of Technical Informatics and Telecommunications. The instructors enable students to participate in their research, including those carried out in research projects of national and international scope, for example, by carrying out master's theses. This results in joint publications. In addition, the quality of practical classes is assured by the regularly developed and upgraded IT infrastructure, which consists of specialized teaching and research laboratories equipped with modern computer equipment, unique apparatus and software.

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)
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 100% 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)

62 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 program of the study takes into account the results of the research into market analysis, development trends and IT competence needs that were carried out in the recent years. The research, their results and the resulting conclusions are presented in the studies below:

- „Wrocławski sektor IT" 2019, raport opracowany przez Agencję Rozwoju Aglomeracji Wrocławskiej S.A. (ARAW) i Stowarzyszenie ITCorner we współpracy z Centrum Badawczo-Rozwojowym Biostat Sp. z o.o.
  https://www.wroclaw.pl/biznes/files/dokumenty/24951/Raport_ARAW_10-10-2019_Wroclawski_sektro_IT_web.pdf
- Branża IT w dobie pandemii „Analiza sytuacji pracodawców, kluczowych trendów rozwojowych i zapotrzebowania na kompetencje".
  https://www.parp.gov.pl/component/publications/publication/branzowy-bilans-kapitalu-ludzkiego-ii-sektor-it
  Raport podsumowujący II edycję badań realizowanych w latach 2020-2021.
- „Potrzeby kompetencyjne w kontekście skutków pandemii koronawirusa „Raport zbiorczy z badania dotyczącego działań anty COVIDowych w sektorach: Informatyka oraz Telekomunikacja i Cyberbezpieczeństwo.", Warszawa 2021.
  https://www.piit.org.pl/__data/assets/pdf_file/0023/19184/raport_zbiorczy.pdf

Raport z I edycji badań przeprowadzonych w ramach działania Sektorowej Rady ds. Kompetencji – Informatyka oraz Sektorowej Rady ds. Kompetencji - Telekomunikacja i Cyberbezpieczeństwo.

- Przygotuj się na rekrutację IT w 2022 roku - Rynek pracy IT w Polsce https://nexttechnology.io/pl/raport-rynek-pracy-it-w-polsce/

The assumed learning outcomes meet the current and prospective needs of the labor market. In particular, they meet the needs of:

- 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 numerous seminars and master thesis I.

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): **72,2 ECTS**

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

Number of ECTS points for obligatory subjects	2
Number of ECTS points for optional subjects	0
Total number of ECTS points	2

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	0
Number of ECTS points for optional subjects	56
Total number of ECTS points	56

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):

8 ECTS points

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

113 ECTS points

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

Obtaining the assumed learning outcomes is the result of passing all subjects included in the plan of study, a positive evaluation of the master's thesis and passing the diploma exam.

The process leading to the achievement of the assumed learning outcomes within the Applied Informatics field of study includes:

- active participation in classes organized at the university: 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 classes
- independent studies to consolidate, supplement and expand knowledge
- independent analytical and review studies during the preparation of the master's thesis
- individual consultations with academic teachers and the supervisor of the master's thesis

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 classes.

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.	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	W08IST-SM4018W	Fundamentals of Business and Intellectual Protection	2					KIST_W08, KIST_K02	30	90	3	0	1,8	T	Z	O			KO
2	W08IST-SM4017S	Ethics of New Technologies					1	KIST_W09, KIST_U11, KIST_K03	15	60	2	0	1,2	T	Z	O			KO
		Total	2	0	0	0	1		45	150	5	0	3						

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	**0**	**0**	**0**	**1**	**45**	**150**	**5**	**0**	**3**

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	W04IST-SM4020G	Methods of planning and analyzing experiments	1					KIST_W01	15	30	1	0	0,6	T	Z				PD
		Total	1	0	0	0	0		15	30	1	0	0,6						

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	W04IST-SM4015G	Physics of Contemporary Computer Science	1					KIST_W01	15	30	1	0	0,6	T	Z				PD
		Total	1	0	0	0	0		15	30	1	0	0,6						

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					
2	**0**	**0**	**0**	**0**	**30**	**60**	**2**	**0**	**1,2**

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):*

4.2.1.2 *Foreign languages* block *(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/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	SJO-SM0002	Foreign Language II		3				KIST_U12	45	60	2	0	1,5	T	Z	O			KO
2	SJO-SM0001	Foreign Language I		1				KIST_U12	15	30	1	0	0,5	T	Z	O			KO
		Total	0	4	0	0	0		60	90	3	0	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					
0	**4**	**0**	**0**	**0**	**60**	**90**	**3**	**0**	**2**

4.2.1.3 Sporting classes block *(0. ECTS points):*

4.2.1.4 *Information technologies* block *(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):*

4.2.3 List of blocks

4.2.3.1 Optional *main field of study* block *(min. 22 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]
6	W04IST-SM4016P	Master Thesis I				2		KIST_U01, KIST_U09, KIST_U14, KIST_K01	30	60	2	1	1,2	T	Z			P (2)	K
2	W04IST-SM4014D	Master Thesis II				10		KIST_U01, KIST_U09, KIST_U14, KIST_K02	150	540	18	15	10,8	T	Z			P (18)	K
1	W04IST-SM4013S	Diploma seminar					2	KIST_U01, KIST_U10, KIST_U11 KIST_U14, KIST_K01	30	60	2	1	1,2	T/Z (S)	Z				K
		Total	0	0	0	12	2		210	660	22	17	13,2					20	

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					
0	**0**	**0**	**12**	**2**	**210**	**660**	**22**	**17**	**13,2**

4.2.4 List of specialization blocks

4.2.4.1 *Specialization subjects – Computer Engineering* blocks *(min. **88** 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	W04IST-SM4004G	Information Systems Modelling and Analysis (GK)	2	2				KIST_W02, KIST_W07, KIST_U08	60	210	7	4	4,2	T/Z (W)	E (W)				S
2	W04IST-SM4009G	Foundations of Knowledge Engineering (GK)	2	2				KIST_W05, KIST_U05	60	210	7	3	4,2	T/Z (W)	E (W)				S
3	W04IST-SM4002G	Advanced Databases (GK)	1			2		KIST_W05, KIST_U03	45	180	6	3	3,6	T/Z (W)	Z (W)			P (4)	S
4	W04IST-SM4007G	Mobile and Multimedia Systems (GK)	2		2			KIST_W06, KIST_U06	60	180	6	3	3,6	T/Z (W)	Z (W)			P(3)	S
5	W04IST-SM4008G	Software System Development (GK)	2			2	1	KIST_W02, KIST_W06, KIST_U01, KIST_U10, KIST_U11, KIST_U06, KIST_U08 , KIST_U13, KIST_K04	75	210	7	4	4,2	T/Z (W, S)	E (W)			P (3)	S
6	W04IST-SM4021G	Project Management (GK)	2			2		KIST_W02, KIST_W06, KIST_U07, KIST_U13, KIST_K04	60	180	6	3	3,6	T/Z (W)	Z (W)			P (3)	S
7	W04IST-SM4102G	Advanced Computer Networks (GK)	2		2			KIST_W02, KIST_W03, KIST_U03	60	180	6	2	3,6	T/Z (W)	Z (W)			P (3)	S
8	W04IST-SM4005G	Analysis of Web-based Systems (GK)	2		2			KIST_W02, KIST_W07, KIST_U03	60	210	7	3	4,2	T/Z (W)	E (W)			P (3)	S
9	W04IST-SM4003G	Advanced Topics in Artificial Intelligence (GK)	2			2		KIST_W03, KIST_W04, KIST_U02, KIST_U04	60	210	7	5	4,2	T/Z (W)	E (W)			P (3)	S
10	W04IST-SM4107G	Data Warehouses (GK)	1		2	1		KIST_W05, KIST_U05	60	210	7	3	4,2	T/Z (W)	E (W)			P (4)	S
11	W04IST-	User Experience (GK)	2			2		KIST_W02,	60	180	6	4	3,6	T/Z	Z (W)			P (3)	S

	SM4022G							KIST_W06, KIST_U06, KIST_U09						(W)					
12	W04IST-SM4109G	Video Game Design (GK)	2		2			KIST_W06, KIST_U06	60	150	5	2	3	T/Z (W)	Z (W)			P (3)	S
13	W04IST-SM4019S	Recent Advances in Computer Science					1	KIST_W03, KIST_U01, KIST_U10, KIST_U11, KIST_K01	15	30	1	1	0,6	T/Z (S)	Z				S
14	W04IST-SM4006G	Parallel and Distributed Computing (GK)	2	1	1			KIST_W02, KIST_W03, KIST_U02	60	180	6	3	3,6	T/Z (W)	Z (W)			P (2)	S
15	W04IST-SM4010W	Research Methodology (GK)	2		2			KIST_W01, KIST_W04, KIST_W07, KIST_U02, KIST_U03	60	120	4	2	2,4	T/Z (W)	Z (W)			P (2)	S
		Total	26	5	13	11	2		855	2640	88	45	52,8					36	

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[5]	Number of ECTS points for BU classes[1]
lec	cl	lab	pr	sem					
26	**5**	**13**	**11**	**2**	**855**	**2640**	**88**	**45**	**52,8**

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

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**

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**
2	**2 + 18**	W04IST-SM4016P, W04IST-SM4014D
Character of diploma dissertation		
Analytical and Research, Analytical and Designing, Analytical and Review		
Number of BU[1] ECTS points	**12**	
Number of DN[5] ECTS points	**16**	

5. Ways of verifying assumed learning outcomes

Type of classes	**Ways of verifying assumed learning outcomes**
lecture	e.g. examination, progress/final test
class	e.g. progress/final test
laboratory	e.g. pretest, report from laboratory
project	e.g. project defence
seminar	e.g. participation in discussion, topic presentation, essay
training	e.g. report from training
diploma dissertation	prepared diploma dissertation

6. Range of diploma examination:

1. Automatic program parallelisation, dependencies in sequential programs, identification of parallelism
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. Evaluations of parallel systems: performance metrics, scalability of parallel systems, Amdhal, Gustafson and other laws.
11. Evolutionary Computation.
12. Fusion of knowledge acquired from experts and discovered from data.
13. Incompleteness and uncertainty of knowledge.
14. Internet and Web services Architecture. Web and P2P systems.
15. Measurement, estimation and prediction of communication time in the Internet.
16. Methods, techniques and tools used for designing and construction of mobile systems.
17. Modeling and meta-modeling.
18. Modern methods used in research methodology.
19. Nielsen's Usability Heuristics.
20. Patterns (architectural, design, program).
21. Postulates of research methodology.
22. Progress monitoring in software project.
23. Project team management.
24. Properties and scope of using UML.
25. Query processing and optimization methods in relational databases.
26. Requirements elicitation techniques requirements classification, characteristics of requirements quality.
27. Rule-based knowledge representations in decision support systems.
28. Software project risk management.
29. Software project scheduling.
30. Stages and roles in the development of video games.
31. Static and dynamic interconnection networks, typical topologies, different routing strategies.
32. The Web Server model. Access and scheduling algorithms for HTTP requests in a Web Server.
33. Time and cost estimation in projects — main issues and challenges.
34. Topologies of Computer Network.
35. Use-cases, statecharts, sequence and activity diagrams.
36. User experience research methods and tools.

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.	W04IST-SM4004G	Information Systems Modelling and Analysis (GK)	3
2.	W04IST-SM4002G	Advanced Databases (GK)	3
3.	W04IST-SM4007G	Mobile and Multimedia Systems (GK)	4
4.	W04IST-SM4009G	Foundations of Knowledge Engineering (GK)	3
5.	W04IST-SM4008G	Software System Development (GK)	4
6.	W04IST-SM4021G	Project Management (GK)	4
7.	W04IST-SM4102G	Advanced Computer Networks (GK)	4
8.	W04IST-SM4005G	Analysis of Web Systems (GK)	4
9.	W04IST-SM4003G	Advanced Topics of Artificial Intelligence (GK)	4
10.	W04IST-SM4019S	Recent Advances in Computer Science (GK)	4
11.	W04IST-SM4107G	Data Warehouses (GK)	4
12.	W04IST-SM4022G	User Experience (GK)	4
13.	W04IST-SM4109G	Video Game Design (GK)	4
14.	W04IST-SM4006G	Parallel and Distributed Computing (GK)	4
15.	W04IST-SM4010W	Research Methodology (GK)	4

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

*delete as appropriate