Zał. nr 2 do ZW 64/2012

Attachment no. …. to Programme of Education

PROGRAMME OF STUDIES

1. Description

Number of semesters:	*Number ECTS points necessary to obtain qualifications: 210*
Prerequisites (particularly for second-level studies): *The competition of grades from maturity certificate and certificate of secondary school.* *In case of foreign students, secondary school certificate, received after the completion of a recognized secondary school (total 12 years of education), being the equivalent of Polish maturity certificate accepted by Kuratorium Oświaty.*	*Upon completion of studies graduate obtains* *professional degree of: engineer (inż)* *1st/~~2nd~~* level qualifications*
Possibility of continuing studies: *the possibility to continue study at the second level*	*Graduate profile, employability:* *First level studies (undergraduate - engineer degree) are not divided into specializations. It gives students opportunity to get basic knowledge in the area of informatics including programming, algorithms and data structures, programming languages and techniques, computer architecture, computer networks, databases and data warehouses, embedded systems including mobile systems, distributed and web-based systems, multimedia, intelligent systems and IT project management - needed for design, development and exploitation of modern IT solutions among others for the Internet and e-economy. Studies shows a variety of computer applications in*

	technical, economic and biomedical systems. They learn methods of data collection and processing, basic of decision-making, methods of artificial intelligence and expert systems. IT knowledge is complemented by knowledge of physics and mathematics, management science and social communication. The graduate has the ability to efficiently use modern tools of information technology and has wide social skills such as ability to cooperate and work in a team, understands the needs and knows the capabilities of continuous education, understands the ethical, economic and law conditions of computer engineer activity. He knows English language at the B2 level. In the case of foreign students studying in English language, they know Polish language at a basic level. *Obtained knowledge and abilities gives opportunity to continue education at the second level by choosing one of 12 specialisation offered by Faculty of Computer Science and Management: security of information systems, informatics technologies of knowledge management, intelligent information systems, Internet and mobile technologies, software engineering, information systems, database systems, decision support systems, teleinformatics, intelligent information systems, computer engineering, information technologies. It is a general Faculty offer. In each admission process different specializations may be open, which one will be open depends on students preference. Moreover some of the specializations and the first level of study in each academic year*

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[7] Optional – enter W, obligatory – enter Ob

	are given in English also. *Gained during first level of study skills can be grouped into five groups of skills:* *• use modern information technology tools and systems* *• design and create software solutions in IT and non-IT systems for various applications and made in different technologies* *• implementation and deploying efficient, reliable, safe and satisfying user requirements IT solutions* *• evaluation, improvement, proposing and developing solutions that include computer system,* *• management, administration, installation, deploying, and testing of IT tools and systems* *A graduate can be employed in companies that produce software or in companies, which designs, deploys and administers computer networks or computer systems for different applications in economic or social sectors of public and private organizations:* *• Application / system programmer* *• Network administrator* *• Linux / Windows systems administrator*

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	• *Computer engineer / IT specialist / serviceman / tester* • *Webdesigner/Webdeveloper/Webmaster* *A graduate can works as an employee or manager as well as can be IT company owner.*
Indicate connection with University's mission and its development strategy:	*Informatics field of study is carried out at the Faculty of Computer Science and Management, which is one of the largest of 12 faculties of Wrocław University of Technology. Teaching program at Informatics field of study at the first level of study represents differentiated substantially canon of knowledge, skills and competencies necessary for modern informatics engineer. It is consistent with the mission of the University and its development strategy, which requires from graduates certain the skills with an emphasis on social skills and competences to allow actively formulate and build the private future and prosperity as well as at the University, and the region. Offered curriculum meets the requirements of the National Education Framework and builds graduate skills, based on current and future information technology methods and tools, which vary significantly in education cycle. Substantive differentiation of program is justified by dynamically changing market needs, and by academics having the highest qualifications in the discipline of informatics. Development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, for example: ERASMUS, COST, etc. Academics and*

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	students take part in these programs carrying out research as well as diploma theses. Teaching at a high level based on the modern and constantly modernized laboratories in which students can develop their practical skills. The Institute has the necessary computing equipment, laboratories and software for the first level students, moreover ZPI and diploma students have access to integrated virtualized computing platform. According to the mission of the University for needs in terms of relations with region and its economy, the Institute has strong relations with local as well foreign IT companies. Cooperation with companies includes the following forms: ordering projects by IT companies, ordering projects by IT companies, ordering reviews for innovation, special lectures for students conducted by experts from companies, realization by students diploma thesis on topics in which company is interested in, realization during Team Project course projects in which company is interested in, practical training for students, sponsoring of student competitions organized by the Institute of Informatics, joint seminars of business professionals and employees of the Faculty of Computer Science and Management organized by the IT Companies Forum, hardware and software support by IT companies for academic initiatives. The most important companies which cooperates with the Institute of Informatics are as follows: Capgemini, IBM, Microsoft Corp., Nokia Siemens Networks, Volvo, InsERT. The Institute of Informatics is one of the first academic institution, which have a laboratory for students with specialized

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	professional training, organized by the IBM Academic Initiative, Microsoft IT Academy, Cisco Academy, Advanced Digital Broadcasting. What's more these activities are included into teaching process.

2. Fields of science and scientific disciplines to which educational effects apply:

Informatics direction is general academic profile that belongs to education area of technical sciences

3. Concise analysis of consistency between assumed educational effects and labour market needs

Correspond to the needs of:

a) institutions and companies engaged in an activity of manufacturing, trade, services and research for IT professionals involved in the maintenance / development of IT tools to support this activity at the operational and strategic (planning, management) levels,
b) manufacturers of IT systems for various purposes (designers, programmers, testers, administrators),
c) companies designing, deploying and maintaining computer systems and networks in different departments of enterprises and social organizations, both public and private.

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4. List of education modules:

4.1. List of obligatory modules:

4.1.1 List of general education modules

4.1.1.1 *Liberal-managerial subjects* module *(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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	ZMZ1496W	Introduction to Management Science	2					K1INF_W18	30	60	2	1,2	T	Z			KO	Ob
		Total	2						30	60	2	1,2						

4.1.1.2 *Foreign languages* module *(min. ..... 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
		Total																

4.1.1.3 *Sporting classes* module *(min. .... 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
		Total																

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4.1.1.4 *Information technologies* module *(min. .... 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0250Wl	Introduction to Programming **(GK)**	2		2			K1INF_W04, K1INF_U01, K1INF_U14	60	210	7	4,2	T	Z		(3)	KO	Ob.
2	INZ0251Wc	Introduction to Computer Systems **(GK)**	2	1				K1INF_W08	45	150	5	3,0	T	Z			KO	Ob
		Total	4	1	2	0	0		105	360	12	7,2						

Altogether for general education modules

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes[1]
lec	cl	lab	pr	sem				
6	1	2	0	0	135	420	14	8,4

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[4]University-wide course /group of courses – enter O
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[7] Optional – enter W, obligatory – enter Ob

4.1.2 List of basic sciences modules

4.1.2.1 *Mathematics* module

No..	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	MAP1070C	Elementary Linear Algebra		2				K1INF_W01	30	60	2	1,2	T	Z	O		PD	Ob.
2	MAP1070W	Elementary Linear Algebra	2					K1INF_W01	30	90	3	1,8	T	E	O		PD	Ob.
3	MAP1043C	Mathematical Analysis I		2				K1INF_W01	30	60	2	1,2	T	Z	O		PD	Ob.
4	MAP1043W	Mathematical Analysis I	2					K1INF_W01	30	120	4	2.4	T	E	O		PD	Ob
5	MAP2005C	Mathematical Analysis II		2				K1INF_W01	30	90	2	1,2	T	Z	O		PD	Ob
6	MAP2005W	Mathematical Analysis II	2					K1INF_W01	30	120	4	2,4	T	E	O		PD	Ob
7	INZ0257C	Theory of Probabilistic and Statistics		2				K1INF_W02	30	60	2	1,2	T	Z			PD	Ob.
8	INZ0257W	Theory of Probabilistic and Statistics	2					K1INF_W02	30	90	4	2,4	T	E			PD	Ob.
		Total	8	8					240	690	23	13,8						

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4.1.2.2 *Physics* module

No..	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	FZP1052C	General Physics		1				K1INF_W03	15	60	2	1,2	T	Z	O		PD	Ob.
2	FZP1052W	General Physics	2					K1INF_W03	30	90	3	1,8	T	E	O		PD	Ob.
3	FZP2079L	General Physics			1			K1INF_W03, K1INF_U07, K1INF_U14	15	60	2	1,2	T	Z	O	P	PD	Ob
		Total	2	1	1				60	210	7	4,2						

4.1.2.3 *Chemistry* module

No..	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
		Total																

4.1.2.4 *Electronics and metrology module*

No..	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0252Wc	Electronics and Metrology – basic principles **(GK)**	2	1				K1INF_W07, K1INF_W08, K1INF_U14	45	150	5	3,0	T	Z			PD	Ob
2	INZ0256L	Electronics and Metrology – basic principles			2			K1INF_W07, K1INF_U14	30	60	2	1,2	T	Z		P	PD	Ob.
		Total	2	1	2				75	210	7	4,2						

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Altogether for basic sciences modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes[1]
lec	cl	lab	pr	sem				
12	10	3	0	0	375	1110	37	22,2

4.1.3 List of main-field-of-study modules

4.1.3.1 *Obligatory main-field-of-study* modules

No..	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0253Wl	Computer Architecture and Organization **(GK)**	2		2			K1INF_W08, K1INF_U06, K1INF_U14	60	150	6	3,6	T	E		(3)	K	Ob
2	INZ0254Wcl	Data Structures and Algorithms***(GK)***	2	1	2			K1INF_W04, K!INF_U01, K1INF_U14	75	180	6	3,6	T	E		(3)	K	Ob
3	INZ0255C	Theory of Information and Signals		2				K1INF_W11, K1INF_U07	30	60	2	1,2	T	Z			K	Ob
4	INZ0255W	Theory of Information and Signals	2					K1INF_W11	30	120	4	2,4	T	E			K	Ob.
5	INZ0258C	Logics and Discrete Mathematics		2				K1INF_W02, K1INF_W17	30	90	3	1,8	T	Z			K	Ob
6	INZ0258W	Logics and Discrete Mathematics	2					K1INF_W02, K1INF_W17	30	90	3	1,8	T	E			K	Ob

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7	INZ0259Wcl	Databases **(GK)**	2	1	1			K1INF_W07, K1INF_W16 K1INF_W22, K1INF_U19, K1INF_U04, K1INF_U09, K1INF_U14	60	150	5	3,0	T	E		(2)	K	Ob
8	INZ00260Wl	Object-Oriented Programming **(GK)**	2		2			K1INF_U02, K1INF_U14 K1INF_W05, K1INF_W06	60	150	4	2,4	T	Z		(2)	K	Ob.
9	INZ0297W	Systems analysis and decision support methods in Computer	2					K1INF_W15	30	90	3	1,8	T	E			K	Ob
10	INZ0297c	Systems analysis and decision support methods in Computer		1				K1INF_U15 K1INF_U14	15	30	1	0,6	T	Z			K	Ob
11	INZ0297l	Systems analysis and decision support methods in Computer			1			K1INF_W15	15	60	1	0,6	T	Z		P	K	Ob
12	INZ0262W	Computer Networks and Communications	2					K1INF_W11	30	30	3	1,8	T	E			K	Ob
13	INZ0262l	Computer Networks and Communications			2			K1INF_U08, K1INF_U07, K1INF_U09, K1INF_U14	30	60	2	1,2	T	Z		P	K	Ob
14	INZ0263Wcl	Introduction to Software Engineering **(GK)**	2	1	1			K1INF_U03, K1INF_U14, K1INF_W07	60	150	5	3,0	T	E		(2)	K	Ob
15	INZ0264Wl	Operating Systems **(GK)**	2		2			K1INF_W10 K1INF_U03	60	150	5	3,0	T	Z		(2)	K	Ob
16	INZ0265Wl	Multimedia Embedded Systems **(GK)**	2		2			K1INF_U04, K1INF_U06, K1INF_W09,	60	150	5	3,0	T	Z		(2)	K	Ob
17	ZMZ1496W	Introduction to Management Science	2					K1INF_W18	30	60	2	1,2	T	Z			KO	Ob

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18	INZ0268Wl	Data Warehouses **(GK)**	2		2			K1INF_U03, K1INF_U04, K1INF_U16, K1INF_U14 K1INF_W07K1INF_W15	60	150	5	3,0	T	Z		(2)	K	Ob
19	INZ0298W	Computer Control Systems	1					K1INF_W15, K1INF_W21	150	30	2	1,2	T	E			K	Ob
21	INZ0298l	Computer Control Systems			2			K1INF_W07, K1INF_U15, K1INF_U18, K1INF_U14	30	90	2	1,2	T	Z		P	K	Ob
22	INZ0298p	Computer Control Systems				1		K1INF_W07, K1INF_U15, K1INF_U18, K1INF_K02	15	60	1	0,6	T	Z		P	K	Ob
23	INZ0270Wp	Software System Development **(GK)**	2			2		K1INF_U02, K1INF_U03, K1INF_U04, K1INF_U13, K1INF_U14,K1INF_W05, K1INF_W07	60	150	5	3,0	T	E		(2)	K	Ob.
24	INZ0277Wl	Introduction to Parallel and Distributed Systems **(GK)**	2	1	1			K1INF_U04, K1INF_U14 K1INF_W12	60	150	5	3,0	T	E		(2)	K	Ob
25	INZ0278Wl	Computer Security **(GK)**	2	1	1			K1INF_U03, K1INF_U09, K1INF_U14, K1INF_W13	60	120	4	2,4	T	E		(2)	K	Ob
27	INZ0279Wl	Introduction to Artificial Intelligence **(GK)**	2		2			K1INF_U07, K1INF_U16, K1INF_U14, K1INF_W15	60	120	4	2,4	T	E		(2)	K	Ob
28	INZ0284Wl	Internet Technologies **(GK)**	2		2			K1INF_U06, K1INF_U07, K1INF_U14, K1INF_U05, K1INF_W14	60	120	4	2,4	T	Z		(2)	K	Ob
		Total	37	10	25	3	0		1125	2760	92	55,2						

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Altogether (for main-field-of-study modules):

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes[1]
lec	cl	lab	pr	sem				
37	10	25	3	0	1125	2760	92	55,2

4.2 List of optional modules

4.2.1 List of general education modules

4.2.1.1 Liberal-managerial subjects modules *(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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0295s	Computer Ethics					2	K1INF_W20, K1INF_K03, K1INF_K05	30	60	2	1,2	T	Z			K	W
2	INZ0287W	Social and Law Aspects of Computer Science	2					K1INF_W20, K1INF_W19, K1INF_K03, K1INF_K05	30	60	2	1,2	T	Z			K	W
3	INZ0288W	Copywrite and Related Computer Law **(GK)**	1				1	K1INF_W20, K1INF_W19, K1INF_K03, K1INF_K05	30	60	2	1,2	T	Z			K	W
4	INZ0287W	Social and Law Aspects of Computer Science	2					K1INF_W20, K1INF_W19, K1INF_K03, K1INF_K05	30	60	2	1,2	T	Z			K	W
		Total	3				1		60	120	4							

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

4.2.1.2 *Foreign languages* **module** *(min5 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	JZL100400BK	Foreign language		4				K1INF_U17	60	60	2	1,2	T	Z	O		KO	W
2	JZL100400BK	Foreign language		4				K1INF_U17	60	90	3	1,8	T	E	O		KO	W
		Total		8					120	150	5	3						

4.2.1.3 Sporting classes module *(min1 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	WFW000000BK	Sports		2				K1INF_K08	30	30	1	0,6	T	Z	O		KO	W
		Total		2					30	30	1							

4.2.1.4 *Information technologies* **module** *(min. .... 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
		Total																

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

Altogether for general education modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes[1]
lec	cl	lab	pr	sem				
3	10	0	0	1	210	300	10	6

4.2.2 List of basic sciences modules

4.2.2.1 *Mathematics* module *(min. .... 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
		Total																

4.2.2.2 *Physics* module *(min. .... 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
		Total																

4.2.2.3 *Chemistry* module *(min. .... 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

		Total																

Altogether for basic sciences modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes[1]
lec	cl	lab	pr	sem				

4.2.3 List of main-field-of-study modules

4.2.3.1 Database Programming - Module M_1 *(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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0266Wp	Database Design **(GK)**	2			2		K1INF_W07, K1INF_W16, K1INF_W22, K1INF_U03, K1INF_U04, K1INF_U09, K1INF_U16, K1INF_U19	60	150	5	3,0	T	Z		(3)	K	W
2	INZ0267Wl	Client-Server Architecture **(GK)**	2			2		K1INF_W07, K1INF_W16, K1INF_W22, K1INF_U03, K1INF_U04, K1INF_U09, K1INF_U16, K1INF_U19	60	150	5	3,0	T	Z		(3)	K	W
		Razem	2	0	0	2	0		60	150	5	3,0						

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

4.2.3.2 Multimedia - Module M_2 *(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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0271Wl	Introduction to Computer Graphics **(GK)**	2		2			K1INF_U04, K1INF_U09, K1INF_U11, K1INF_U12, K1INF_U14, K1INF_W23	60	150	5	3,0	T	Z		(3)	K	W
2	INZ0272Wl	Multimedia Information Systems **(GK)**	2		2			K1INF_U04, K1INF_U09, K1INF_U11, K1INF_U12, K1INF_U14, K1INF_W23	60	150	5	3,0	T	Z		(3)	K	W
		Razem	2	0	2	0	0		60	150	5	3,0						

4.2.3.3 Web application programming - Module M_3 *(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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0273Wl	Java and Internet programming **(GK)**	1		2			K1INF_U04, K1INF_U09, K1INF_U11, K1INF_U12, K1INF_U14, K1INF_W05, K1INF_W06, K1INF_W07	45	120	4	2,4	T	Z		(2)	K	W
2	INZ0274Wl	Programming of Web-based systems **(GK)**	1		2			K1INF_U04, K1INF_U09,	45	120	4	2,4	T	Z		(2)	K	W

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

								K1INF_U11, K1INF_U12, K1INF_U14, K1INF_W05, K1INF_W06, K1INF_W07									
		Total	1	0	2	0	0		45	120	4	2,4						

4.2.3.4 Software Project Management - Module M_4 *(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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0275Wl	Software Project Management **(GK)**	2		1			K1INF_U10, K1INF_K02, K1INF_U14, K1INF_W18	45	120	4	2,4	T	Z		(2)	K	W
2	INZ0276Wls	Software Project Management Techniques **(GK)**	1		1		1	K1INF_U10, K1INF_K02, K1INF_U14, K1INF_W18	45	120	4	2,4	T	Z		(2)	K	W
		Total	1	0	1	0	1		45	120	4	2,4						

4.2.3.5 Network and computer systems - Module M_5 module *(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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0282Wl	Security in Computer Network **(GK)**	2		2			K1INF_U03, K1INF_U09, K1INF_U14, K1INF_W13	60	150	5	3,0	T	Z		(3)	K	W

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

2	INZ0283Wl	System Administration **(GK)**	2		2			K1INF_W10, K1INF_W11, K1INF_U08,, K1INF_U09, K1INF_U14	60	150	5	3,0	T	Z		(3)	K	W
		Total	2	0	2	0	0		60	150	5	3,0						

4.2.3.6 Technologies and programming tools - Module M_6 *(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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0289Wcl	Programming Languages and Paradigms **(GK)**	2	1	1			K1INF_W05, K1INF_W06 K1INF_U02, K1INF_U14	60	150	5	3,0		Z		(2)	K	W
2	INZ0290Wl	User Interface Development **(GK)**	2		2			K1INF_U06, K1INF_U07, K1INF_U13, K1INF_W04	60	150	5	3,0	T	Z		(2)	K	W
3	INZ0291Wcl	Program Translation Techniques **(GK)**	2	1	1			K1INF_U01, K1INF_W06	60	150	5	3,0	T	Z		(2)	K	W
4	INZ0292Wc	Numerical Methods **(GK)**	2	2				K1INF_U01, K1INF_W04	60	150	5	3,0	T	Z			K	W
		Total	2	1	1		0		60	150	5	3,0						

4.2.3.7 Development trends in computer science - Module M_7 module *(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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0293Wl	E-Business Concept and Technologies **(GK)**	2		2			K1INF_U11, K1INF_W14, K1INF_W12, K1INF_K01,	60	150	5	3,0	T	Z		(2)	K	W

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

								K1INF_K06											
2	INZ0294Wc	Theory of Computation **(GK)**	2	2				K1INF_K01, K1INF_W04	60	150	5	3,0	T	Z			K	W
		Total	2	1	1	0	0		60	150	5	3,0						

4.2.3.8 Elective subjects module *(min.26 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INZ0280P	Preparatory Project				2		K1INF_K01, K1INF_K02, K1INF_K03, K1INF_K04, K1INF_K05, K1INF_U11, K1INF_U12, K1INF_U13	30	60	2	1,2	T	Z		P	K	W
2	INZ0281P	Team Project				4		K1INF_U02, K1INF_U05, K1INF_U06, K1INF_U10, K1INF_U12, K1INF_U13, K1INF_K01, K1INF_K03, K1INF_K04, K1INF_K05	60	150	5	3,0	T	Z		P	K	W
3	INZ0285s	Diploma Seminar					2	K1INF_K01, K1INF_K02, K1INF_K03, K1INF_K04, K1INF_K05, K1INF_U11, K1INF_U12, K1INF_U13	30	60	2	1,2	T	Z			K	W

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

4	INZ0286p	Diploma Thesis				6		K1INF_K01, K1INF_K02, K1INF_K03, K1INF_K04, K1INF_K05, K1INF_U11, K1INF_U12, K1INF_U13	90	360	12	7,2	T	Z		P	K	W
5	INZ0295Q	Practical Training								150	5							
		Total	0	0	0	12	2		210	780	26	12,6						

Altogether for main-field-of-study modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes[1]
lec	cl	lab	pr	sem				
12	2	9	14	3	600	1770	59	32,4

4.2.4 List of specialization modules

4.2.4.1 *Specialization subjects (e.g. whole specialization)* modules *(min. .... 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					Field-of-study educational 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	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
		Total																

4.2.4.2 ……*(e.g. diploma profile)* module *(min. .... ECTS points):*

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

Altogether for specialization modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes[1]
lec	cl	lab	pr	sem				

4.3 Training module (Faculty Council resolution on principles of crediting training – attachment no. …)

Name of training			
Number of ECTS points	**Number of ECTS points for BK classes[1]**	**Training crediting mode**	**Code**
5	**0**	**Z**	INZ0295Q

Training duration	**Training objective**
4 weeks	*Familiarization with the professional IT solutions, their designing, programming, deploying and administration of IT companies. Then formulation and implementation of simple engineering tasks to check the previously acquired skills and competences, especially including the teamwork.*

4.4 Diploma dissertation module

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
1	**12**	INZ0286p
Character of diploma dissertation		
Project, computer program		
Number of BK[1] ECTS points	**7,2**	

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

5. Ways of verifying assumed educational effects

Type of classes	Ways of verifying assumed educational effects
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. Total number of ECTS points, which student has to obtain from classes requiring direct academic teacher-student contact (enter total of ECTS points for courses/groups of courses denoted with code BK[1])

…123,2…. ECTS

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

Number of ECTS points for obligatory subjects …….	27	
Number of ECTS points for optional subjects ….	0	
Total number of ECTS points	27	

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

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

Number of ECTS points for obligatory subjects …….	41	
Number of ECTS points for optional subjects ….	36	
Total number of ECTS points	77	

9. Minimum number of ECTS points, which student has to obtain doing education modules 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 OG)

…25…. ECTS points

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

…69…. ECTS points

11. Range of diploma dissertation

1. Basic operations on sets, functions and relations. Sentential calculus. Calculus of Predicates.
2. Graphs (basic concepts, spanning tree, Euler and Hamilton cycles, consistency).
3. The concept of the algorithm.
4. Fundamentals of algorithm analysis. Computational complexity.
5. An examples of algorithms. Sorting algorithms, selection, search.
6. Elements of a programming language: variables, data types, expressions, statements and control structures.
7. Object-oriented programming (classes and objects). Inheritance and polymorphism.
8. Basic elements of digital structures.
9. Von Neumann computer architecture.
10. Microcomputers - organization and architecture.
11. Parallel computers architecture.

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12. Embedded systems architecture. Designing of embedded systems. MHP design environment.
13. Information systems models (general- and specific-purposes systems).
14. Local and wide area networks – topological structures.
15. Reference models of computer networks (Open System Interconnection/International Standard Organization and Transport Control Protocol/Internet Protocol models).
16. Protocols of computer networks.
17. Data link layer protocols. Ethernet. TCP/IP protocols stack.
18. Client-server model. Http protocol.
19. Transmission channels and their organization for information transmission purposes.
20. Websites and web application programming language.
21. Distributed systems.
22. Communication in distributed systems.
23. Algorithms for data exchange. Mechanisms of the implementation of distributed services.
24. Inter process communication (IPC).
25. Software development methodology.
26. Structural and object-oriented software design.
27. Models of software life cycle.
28. UML as a language of design specifications.
29. Design patterns.
30. Project Management - the structure of work, planning, scheduling, monitoring and quality.
31. Artificial intelligence - basic concepts, area of studies, areas of application.
32. Database models. A relational database. Normalization. Transactions.
33. Basics of SQL.
34. Basics of database and data warehouses design.
35. Mechanisms of knowledge processing in expert systems
36. Operating system.
37. The layered structure of the operating system.The concept of the system kernel.
38. Computer and Network Security.
39. Security models. Information flow model. Security of IP and IP v6 protocol.

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40. Structure and properties of control systems. Typical control algorithms. Construction and structure of a typical computer control systems.
41. Static object identification algorithms. Analytical and numerical methods of optimization.

12. Requirements concerning deadlines for crediting courses/groups of courses for all courses in particular modules

No.	*Course code*	*Name of course*	*Crediting by deadline of... (number of semester)*
1	FZP1052C	General Physics	3
2	FZP1052W	General Physics	3
3	MAP1070C	Elementary Linear Algebra	3
4	MAP1070W	Elementary Linear Algebra	3
5	MAP1043C	Mathematical Analysis I	3
6	MAP1043W	Mathematical Analysis I	3
7	INZ0250Wl	Introduction to Programming (GK)	3
8	INZ0251Wc	Introduction to Computer Systems (GK)	3
9	FZP2079L	General Physics	4
10	MAP2005C	Mathematical Analysis II	4
11	MAP2005W	Mathematical Analysis II	4
12	INZ0252Wc	Electronics and Metrology – basic principles (GK)	4
13	INZ0253Wl	Computer Architecture and Organization (GK)	4
14	INZ0254Wcl	Data Structures and Algorithms (GK)	4
15	INZ0255C	Theory of Information and Signals	5

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16	INZ0255W	Theory of Information and Signals	5
17	INZ0256L	Electronics and Metrology – basic principles	5
18	INZ0257C	Theory of Probabilistic and Statistics	5
19	INZ0257W	Theory of Probabilistic and Statistics	5
20	INZ0258C	Logics and Discrete Mathematics	5
21	INZ0258W	Logics and Discrete Mathematics	5
22	INZ0259Wcl	Databases **(GK)**	5
23	INZ00260Wl	Object-Oriented Programming **(GK)**	5
24	W	Systems analysis and decision support methods in Computer Science	6
25	C	Systems analysis and decision support methods in computer Science	6
26	L	Systems analysis and decision support methods in Computer Science	6
27	INZ0262W	Computer Networks and Communications	6
28	INZ0262l	Computer Networks and Communications	6
29	INZ0263Wcl	Introduction to Software Engineering **(GK)**	6
30	INZ0264Wl	Operating Systems **(GK)**	6
31	INZ0265Wl	Multimedia Embedded Systems **(GK)**	6
32	ZMZ1496W	Introduction to Management Science	5
33	INZ0268Wl	Data Warehouses **(GK)**	5
34	…….W	Computer Control Systems	5
35	……..L	Computer Control Systems	5
36	……..P	Computer Control Systems	5
37	INZ0270Wp	Software System Development **(GK)**	5
38	INZ0277Wl	Introduction to Parallel and Distributed Systems **(GK)**	6

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39	INZ0278Wl	Computer Security **(GK)**	6
40	INZ0279Wl	Introduction to Artificial Intelligence **(GK)**	6
41	JZL100400BK	Foreign languages	6
42	WFW000000BK	Sports	6
43	INZ0284Wl	Internet Technologies **(GK)**	7

13. Plan of studies (attachment no. 1)

Approved by faculty student government legislative body:

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

....
Date, Dean's signature

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