Zał. nr 2 do ZW 64/2012

Attachment no. …. to Programme of Education

PROGRAMME OF STUDIES

SPECIALIZATION: **Security and Reliability of Information Systems**

1. Description

Number of semesters: 3	*Number ECTS points necessary to obtain qualifications: 90*
Prerequisites (particularly for the second-level studies): *Competition of the first level study diplomas.* *Required: Bachelor Degree, preferably in computer science or in a related area. Applicants with a bachelor degree outside of computer science must demonstrate significant proficiency in computer science. Any area of requirements can be satisfied through courses completed at the bachelor level or by suitable experience.* *Each application is assessed individually on its merits.* *Description of learning outcomes for second degree in Computer Science does not apply to the following learning outcomes listed in the description of qualifications of the second degree in the field of education corresponding to an area of technical sciences* *knowledge: T2A_W06, T2A_W08* *skills: T2A_U13, T2A_U14*	*Upon completion of studies graduate obtains* *professional degree of: magister (MSc)* *~~1st~~/2nd* level qualifications*

social competences: T2A_K01, T2A_K02, T2A_K03, T2A_K04 *The candidate who on completion of degree studies and other forms of education did not receive some of the above. competence, may take a second degree in Computer Science, where the deficiency of competence can be achieved by the completion of classes in dimension than 30 ECTS credits*	
Possibility of continuing studies: *The possibility of undertaking doctoral studies (third degree)*	*Graduate profile, employability:* *At the second level of study. students can choose 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 specializations are given in English.* *The result of education is the knowledge, skills and social competence, which are included in annex No. 1 to the Education Program.* *Extended knowledge in the field of specialization* *Gained skills:* *• is able to solve complex computing tasks using advanced informatics techniques*

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

	in the field of studied specialization: security and reliability of information systems, intelligent information systems, Internet and mobile technology, software engineering, systems design, database systems, information systems, decision support systems, teleinformatic *• is able to create models, analyze them and takes decision for different types of objects* *• acquires information from literature, databases and other sources, also in English, integrates obtained information, interprets it, critically evaluates, conclusions and formulates justifies opinions* *• communicates using a variety of techniques, also in English, prepares a elaboration in Polish language and short scientific report in English on the results of their own research. In the case of foreign students can prepare a short reserch report in Polish, but the full report in English* *• defines the directions of further learning and implements the process of self-learning* *A graduate can be employed in IT companies as well as in companies and organizations that uses tools and information systems as managers or specialist. They can work as: System Analyst, Programmer Analyst, System Consultant, designer of information systems, manager, system architect , etc.*
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 studies is carried out at 12*

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	specializations (9 in Polish language, 3 in English language) that reflect the current needs of the region, and the place and role of the Wrocław University of Technology as a leading university and research centre in the region. Differentiation of substantive specialization is justified by the dynamically changing of market needs, and by the academics staff having achievements at the highest level in the discipline of computer science. Development of specialties takes place in the framework of international agreements and international research and teaching programs (eg. an international agreement with universities in Vietnam contributed to the creation of Intelligent Information Systems specialization).Moreover, development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, in which students take part. They can carrying out research as well as diploma theses. Teaching at a high level must be based on adequate laboratory facilities in which students can develop their skills. The Institute has the necessary computing equipment, laboratories and software to conduct teaching at the second study level, but in accordance to the mission of the university - is currently under construction the project of a new building (investment shared with the Faculty of Mechanical Engineering and the Faculty of Chemistry), in which will be built complex of 16 specialized teaching laboratories for students of the second and third degree level of study in Computer Science. *These are the following laboratories: Safety and Reliability of Information Systems Laboratory, Intelligent Multimedia Data Mining Systems Laboratory, Modeling and Analysis of Web-based Systems Laboratory, Software Engineering*

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	Laboratory, Information System Design and Knowledge Management Laboratory, Advanced Database Systems Laboratory, Multimedia Laboratory, Intelligent multi-agent systems and sensors networks Laboratory, Wired and Wireless Computer Networks and Engineering of Teleinformatic Traffic Laboratory, System Recognition and Data Exploration Laboratory, Internet Testing and Measurement Laboratory, Multimedia and Mobile Technologies Laboratory, Laboratory and Scaled Hybrid Processing Technology, Internet of Things, Web of Things Technologies Laboratory, Intelligent Measurement Systems Smart Grid Laboratory, Application of Modelling, Identification and Optimization in Medicine and Sport Laboratory. *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, 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.*

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

Fields of science: technical sciences

Scientific discipline: informatics

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

A graduate of the second degree, specializing in Safety and Reliability Systems (SRS) will acquire the knowledge, skills and competences needed in the labor market for the positions: (1) a specialist in the field of network security and Web-based systems, (2) the safety specialist IT infrastructure, processes business servers and websites, and data and information resources in a corporation or institution.

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4. List of education modules:
4.1. List of obligatory modules:
4.1.1 List of general education modules

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				
0	0	0	0	0	0	0	0	0

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	INZ 003758W	Advanced Methods and Techniques of Data Analysis	2	0	0	0	0	K2INF_W01 K2INF_W05	30	60	2	1,2	T	Z			PD	Ob.
2	INZ 003758L	Advanced Methods and Techniques of Data Analysis	0	0	2	0	0	K2INF_U05	30	120	4	2,4	T	Z		P	PD	Ob.
		Total	2		2				60	180	6	3,6						

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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				
2		2			60	180	6	3,6

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	INZ 003760C	Modeling and Business Analysis	0	2	0	0	0	K2INF_U06	30	90	3	1,8	T	Z			K	Ob.
2	INZ 003760W	Modeling and Business Analysis	1	0	0	0	0	K2INF_W03	15	60	2	1,2	T	E			K	Ob.
3	INZ 003762S	Information Systems	0	0	0	0	2	K2INF_W04	30	60	2	1,2	T	Z			K	Ob.
4	INZ 003762W	Information Systems	1	0	0	0	0	K2INF_W04	15	60	2	1,2	T	Z			K	Ob.
5	INZ 003761C	Decision Support Systems	0	1	0	0	0	K2INF_U05	15	30	1	0,6	T	Z			K	Ob.
6	INZ 003761P	Decision Support Systems	0	0	0	1	0	K2INF_U05	15	60	2	1,2	T	Z		P	K.	Ob.
7	INZ 003761W	Decision Support Systems	1	0	0	0	0	K2INF_W02	15	60	2	1,2	T	E			K	Ob.

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[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
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8	INZ 003759P	Teletraffic theory and engineering	0	0	0	2	0	K2INF_U05	30	90	3	1,8	T	Z		P	K	Ob.
9	INZ 003759W	Teletraffic theory and engineering	1	0	0	0	0	K2INF_W04	15	30	1	0,6	T	Z			K	Ob.
		Total	6	3	0	3	2		270	630	21	12,6						

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]
pr	sem							
6	3	0	3	2	270	630	21	12,6

4.2 List of optional modules

4.2.1 List of general education modules

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		Foreign language 1	0	3	0	0	0	K2INF_U04	45	60	2	1,2	T	Z	O		KO	W
2		Foreign language 2	0	1	0	0	0	K2INF_U04	15	30	1	0,6	T	Z	O		KO	W

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Total		4					60	90	3	1,8							

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]
pr	sem							
	4				60	90	3	1,8

4.2.4 List of specialization modules

4.2.4.1 *Specialty courses* module (*Safety and reliability of information systems* specialty) (min. 60 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	INZ 003822WL	Network and security systems	2	0	2	0	0	K2INF_W03,K2INF_W04	60	210	7	4,2	T	E		P(2)	S	W
2	INZ 003821WL	Cryptography	2	0	2	0	0	K2INF_W01,K2INF_W05	60	210	7	4,2	T	E		P(3)	S	W
3	INZ 003823WS	Reliability models of information systems	2	0	0	0	2	K2INF_W03,K2INF_W05	60	210	7	4,2	T	E			S	W
4	INZ 003826WL	Advanced information security systems	2	0	2	0	0	K2INF_W03,K2INF_U05	60	180	6	3,6	T	Z		P(3)	S	W
5	INZ 003829WS	Safety management systems for IT infrastructure	1	0	0	0	1	K2INF_W03, K2INF_W04, K2INF_W01	30	60	2	1,2	T	Z			S	W

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6	INZ 003818P	Master's thesis project I						K2INF_U08	30	60	2	0,6	T	Z			S	W
7	INZ 003819D	Master's thesis project II						K2INF_U08	150	540	18	6	T	Z			S	W
8	INZ 003820S	Diploma seminar					2	K2INF_U08	30	60	2	1,2	T	Z			S	W
		Total	9	0	6	0	5		480	1530	51	30,6						

4.2.4.2 *Optional specialty courses* module I (*Safety and reliability of information systems* specialty) (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	INZ 003825WL	Diagnostic of information systems	1	0	2	0	0	K2INF_W02-K2INF_W05, K2INF_U06-K2INF_07	45	150	5	3,0	T	Z		P(2)	S	W
2	INZ 003824WL	Programming secure applications	1	0	2	0	0	K2INF_W02-K2INF_W05, K2INF_U06-K2INF_07,K2INF_U09	45	150	5	3,0	T	Z		P(2)	S	W
		Total	1	0	2	0	0		45	150	5	3,0						

4.2.4.3 *Optional specialty courses* module II (*Safety and reliability of information systems* specialty) (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	INZ 002643WS	Quantum cryptographic systems	1	0	0	0	2	K2INF_W01, K2INF_W05	45	120	4	2,4	T	Z			S	W
2	INZ 02644WS	Testing and reliability of computer systems	1	0	0	0	2	K2INF_W01, K2INF_W05	45	120	4	2,4	T	Z			S	W
		Total	2				2		45	120	4	2,4						

Altogether for specialization modules:

Total number of hours	Total	Total	Total	Number of

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					number of ZZU hours	number of CNPS hours	number of ECTS points	ECTS points for BK classes[1]
lec	cl	lab	pr	sem				
9/10	0/1	4/5	5/6	3/4	570	1800	60	36

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**
-	-	-	-

Training duration	**Training objective**
-	

4.4 *Diploma dissertation* module

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
2	**20**	
Character of diploma dissertation		
Literature survey, project, computer program, etc.		
Number of BK[1] ECTS points	**6,6**	

5. Ways of verifying assumed educational effects

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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])

48,6 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 ….	63
Total number of ECTS points	90

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 …….	20
Number of ECTS points for optional subjects ….	5

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Total number of ECTS points	25

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)

3 ECTS points

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

63 ECTS points

11. Range of diploma dissertation

Range for all specializations

1 Modeling and metamodeling.
2 Properties and applications of UML and LOTOS languages.
3 Problems of transformation and consistency models.
4 Validation and verification of models.
5 The differences between information retrieval and data searching.
6 Operation of an information system on the network.
7 Multimedia technologies used in information systems.
8 The effectiveness of information systems.
9 The tasks of computer network design.
10 Network Traffic Classification.
11 Network Management.
12 Methods of fixing bugs in ICT systems.
13 Quality of service concept in telecommunication networks.
14 The concept of decision-making system and computerized decision support system.
15 Systems engineering approach.
16 Decision problems for complex operations.

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17 Basic problems, methods and algorithms of discrete optimization.
18 The basic method of "soft-computing (smart)".
19 Decision making under uncertainty.
20 Methods and algorithms for recognition.
21 Expectations methodology of science.
22 Modern sciencemetric methods.

Range for Security and Reliability of Information Systems specjalization

1. Cryptographic algorithms
2. Cryptographic systems and protocols
3. Mechanisms of hardware and software information security
4. Models of information systems security
5. Security policy
6. Assessment of safety information
7. Public Key Infrastructure
8. Attacks against information systems
9. Secure network communications
10. Security of network applications and services
11. Security of Web services and databases
12. Detection systems and intrusion prevention (IDS and IPS)
13. Modeling of system reliability
14. Testing and assessment of the reliability of information systems
15. System reliability structures

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

16. The probability of failure of information systems
17. Methods to increase reliability and fault tolerance in computer systems
18. Threats to information systems security
19. Models and strategies of diagnostic systems
20. Diagnostic software and computer networks - theories and formalisms

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.	INZ003758W	Advanced methods and techniques of data analysis	1
2.	INZ003759W	Theory and data communications traffic engineering	1
3.	INZ003760W	Business modelling and analysis	1
4.	INZ003761W	Decision support systems	1
5.	INZ003763W	Research methodology	1
6.	INZ003762W	Information systems	1
7.	INZ003821WL	Cryptography	2
8.	INZ003822WL	Network and security systems	2
9.	INZ003823WS	Reliability models of information systems	2
10.	INZ003829WS	Safety management systems for IT infrastructure	2
11.	INZ003825WL, INZ003824WL	Optional specialty courses module I	2
12.	INZ003818P	Diploma thesis I	2
13.	INZ003826WL	Advanced information security systems	3
14.	INZ002643WS, INZ02644WS	Optional specialty courses module II	3
15.	INZ003819D	Diploma thesis II	3

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[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

16.	INZ003820S	Diploma seminar	3

13. Plan of studies (attachment no. ……)

Approved by faculty student government legislative body:

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

....
Date, Dean's signature

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Zał. nr 2 do ZW 64/2012

Attachment no. …. to Programme of Education

PROGRAMME OF STUDIES

SPECIALIZATION: Software Engineering

1. Description

Number of semesters: 3	*Number ECTS points necessary to obtain qualifications: 90*
Prerequisites (particularly for the second-level studies): *Competition of the first level study diplomas.* *Required: Bachelor Degree, preferably in computer science or in a related area. Applicants with a bachelor degree outside of computer science must demonstrate significant proficiency in computer science. Any area of requirements can be satisfied through courses completed at the bachelor level or by suitable experience.* *Each application is assessed individually on its merits.* *Description of learning outcomes for second degree in Computer Science does not apply to the following learning outcomes listed in the description of qualifications of the second degree in the field of education corresponding to an area of technical sciences* *knowledge: T2A_W06, T2A_W08* *skills: T2A_U13, T2A_U14* *social competences: T2A_K01, T2A_K02, T2A_K03, T2A_K04* *The candidate who on completion of degree studies and other forms*	*Upon completion of studies graduate obtains* *professional degree of: magister (MSc)* *~~1st~~/2nd* level qualifications*

of education did not receive some of the above. competence, may take a second degree in Computer Science, where the deficiency of competence can be achieved by the completion of classes in dimension than 30 ECTS credits	
Possibility of continuing studies: *The possibility of undertaking doctoral studies (third degree)*	*Graduate profile, employability:* *At the second level of study. students can choose 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 specializations are given in English.* *The result of education is the knowledge, skills and social competence, which are included in annex No. 1 to the Education Program.* *Extended knowledge in the field of specialization* *Gained skills:* *• is able to solve complex computing tasks using advanced informatics techniques in the field of studied specialization: security and reliability of information systems, intelligent information systems, Internet and mobile technology, software engineering, systems design, database systems,*

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[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

	information systems, decision support systems, teleinformatic • *is able to create models, analyze them and takes decision for different types of objects* • *acquires information from literature, databases and other sources, also in English, integrates obtained information, interprets it, critically evaluates, conclusions and formulates justifies opinions* • *communicates using a variety of techniques, also in English, prepares a elaboration in Polish language and short scientific report in English on the results of their own research. In the case of foreign students can prepare a short reserch report in Polish, but the full report in English* • *defines the directions of further learning and implements the process of self-learning* *A graduate can be employed in IT companies as well as in companies and organizations that uses tools and information systems as managers or specialist. They can work as: System Analyst, Programmer Analyst, System Consultant, designer of information systems, manager, system architect , etc.*
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 studies is carried out at 12 specializations (9 in Polish language, 3 in English language) that reflect the current needs of the region, and the place and role of the Wrocław University of Technology as a leading university and research centre*

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[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

	in the region. Differentiation of substantive specialization is justified by the dynamically changing of market needs, and by the academics staff having achievements at the highest level in the discipline of computer science. Development of specialties takes place in the framework of international agreements and international research and teaching programs (eg. an international agreement with universities in Vietnam contributed to the creation of Intelligent Information Systems specialization).Moreover, development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, in which students take part. They can carrying out research as well as diploma theses. Teaching at a high level must be based on adequate laboratory facilities in which students can develop their skills. The Institute has the necessary computing equipment, laboratories and software to conduct teaching at the second study level, but in accordance to the mission of the university - is currently under construction the project of a new building (investment shared with the Faculty of Mechanical Engineering and the Faculty of Chemistry), in which will be built complex of 16 specialized teaching laboratories for students of the second and third degree level of study in Computer Science. *These are the following laboratories: Safety and Reliability of Information Systems Laboratory, Intelligent Multimedia Data Mining Systems Laboratory, Modeling and Analysis of Web-based Systems Laboratory, Software Engineering Laboratory, Information System Design and Knowledge Management Laboratory, Advanced Database Systems Laboratory,*

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[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

	Multimedia Laboratory, Intelligent multi-agent systems and sensors networks Laboratory, Wired and Wireless Computer Networks and Engineering of Teleinformatic Traffic Laboratory, System Recognition and Data Exploration Laboratory, Internet Testing and Measurement Laboratory, Multimedia and Mobile Technologies Laboratory, Laboratory and Scaled Hybrid Processing Technology, Internet of Things, Web of Things Technologies Laboratory, Intelligent Measurement Systems Smart Grid Laboratory, Application of Modelling, Identification and Optimization in Medicine and Sport Laboratory. *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, 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.*

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

Fields of science: technical sciences

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
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[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

Scientific discipline: informatics

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

Studies in Software Engineering meets demands of:
a) institutions and companies engaged in manufacturing, trade, service and research for IT professionals involved in the maintenance and/or development of tools supporting the business at a strategic level (planning and management),
b) producers of management information systems, decision-making and control systems for IT professionals of software production departments (e.g. contact with customers, analysts, designers)
c) consulting firms and integrators for systems analysts, software developers, system consultants, computer system designers, project managers, system architects
d) companies which design software systems for many types of applications specific to a given domain.

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[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. List of education modules:
4.1. List of obligatory modules:
4.1.1 List of general education modules

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				
0	0	0	0	0	0	0	0	0

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	INZ003758W	Advanced Methods and Techniques of Data Analysis	2	0	0	0	0	K2INF_W01 K2INF_W05	30	60	2	1,2	T	Z			PD	Ob.
2	INZ 003758L	Advanced Methods and Techniques of Data Analysis	0	0	2	0	0	K2INF_U05	30	120	4	2,4	T	Z		P	PD	Ob.
		Total	2		2				60	180	6	3,6						

[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				
2		2			60	180	6	3,6

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	INZ003760C	Modeling and Business Analysis	0	2	0	0	0	K2INF_U06	30	90	3	1,8	T	Z			K	Ob.
2	INZ003760W	Modeling and Business Analysis	1	0	0	0	0	K2INF_W03	15	60	2	1,2	T	E			K	Ob.
3	INZ003762S	Information Systems	0	0	0	0	2	K2INF_W04	30	60	2	1,2	T	Z			K	Ob.
4	INZ003762W	Information Systems	1	0	0	0	0	K2INF_W04	15	60	2	1,2	T	Z			K	Ob.
5	INZ003761C	Decision Support Systems	0	1	0	0	0	K2INF_U05	15	30	1	0,6	T	Z			K	Ob.
6	INZ003761P	Decision Support Systems	0	0	0	1	0	K2INF_U05	15	60	2	1,2	T	Z		P	K.	Ob.
7	INZ003761W	Decision Support Systems	1	0	0	0	0	K2INF_W02	15	60	2	1,2	T	E			K	Ob.

[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	INZ003759P	Teletraffic theory and engineering	0	0	0	2	0	K2INF_U05	30	90	3	1,8	T	Z		P	K	Ob.
9	INZ003759W	Teletraffic theory and engineering	1	0	0	0	0	K2INF_W04	15	30	1	0,6	T	Z			K	Ob.
		Total	6	3	0	3	2		270	630	21	12,6						

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]
pr	sem							
6	3	0	3	2	270	630	21	12,6

4.2 List of optional modules

4.2.1 List of general education modules

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		Foreign language 1	0	3	0	0	0	K2INF_U04	45	60	2	1,2	T	Z	O		KO	W
2		Foreign language 2	0	1	0	0	0	K2INF_U04	15	30	1	0,6	T	Z	O		KO	W
		Total		4					60	90	3	1,8						

[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]
pr	sem							
	4				60	90	3	1,8

4.2.4 List of specialization modules

4.2.4.1 *Specialization subjects (e.g. whole specialization)* modules *(min. 60 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	INZ 003765WL	Architecture and Technologies of Web Services	2	0	2	0	0	K2INF_W06 K2INF _U07 K2INF_U08	60	180	6	3,6	T	Z		P	S	W
2	INZ 003766WPS	Quality Models and Metrics in Software Engineering	1	0	0	2	1	K2INF_W06 K2INF _U01 K2INF_U08	60	240	8	4,8	T	E		P	S	W
3	INZ 003776WL	Modeling and implementation of business data	1	0	2	0	0	K2INF_W05, K2INF_U06	45	120	4	2,4	T	Z		P	S	W
4	INZ 003767WP	Software System Design	1	0	0	2	0	K2INF_W06 K2INF_U07 K2INF_U08	45	180	6	3,6	T	E		P	S	W
5	INZ	Management of Development and Integration of Information Systems II	0	0	0	1	0	K2INF_U08	15	60	2	1,2				P	S	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

	003769P																	
6	INZ 003764WS	Management of Development and Integration of Information Systems	2	0	0	0	1	K2INF_W06 K2INF _U01 K2INF_U08	45	120	4	2,4	T	Z			S	W
7	INZ 003818P	Master Thesis I						K2INF_U08	30	60	2	1,2	T	Z			S	W
8	INZ 003819D	Master Thesis II						K2INF_U08	150	540	18	10,6	T	Z			S	W
9	INZ 003820S	Master Seminar					2	K2INF_U08	30	60	2	1,2	T	Z			S	W
		Total	7	0	4	5	2		480	1560	52	31,2						

4.2.4.2 Moduł *Przedmiot wybieralny I* *(min. 4 pkt ECTS):*

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	INZ 003813 Wc	Theoretical Foundations of Distributed Processes (GK)	2	1	0	0	0	K2INF_W06 K2INF_U06	45	120	4	2,4	T	Z			S	W
2	INZ 003814 Wps	Agile Software Development (GK)	1	0	0	1	1	K2INF_W06 K2INF_U08	45	120	4	2,4	T	Z		P	S	W
		Razem	3	1	0	1	1		45	120	4	2,4						

4.2.4.3 Moduł *Przedmiot wybieralny II* *(min. 4 pkt ECTS):*

No..	Course/group of courses	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Field-of-study educational effect	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	se		ZZU	CNPS	total	BK			university	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

	code						m	symbol				classes[1]			-wide[4]			
1	INZ 003816 Wls	IT services design in organization (GK)	1		1		1	K2INF_ W06 K2INF_ U03 K2INF _ U06	45	120	4	2,4		Z		P	S	W
2	INZ 003817 Wls	Writing papers using LaTeX (GK)	1		1		1	K2INF_ W06 K2INF _ U01 K2INF_ U03 K2INF_ U08	45	120	4	2,4		Z		P	S	W
	INZ 003815 Wl	Programming on Windows Azure Platform	1	0	2	0	0	K2INF_ W06 K2INF _ U07 K2INF_ U08	45	120	4	2,4		Z		P	S	W
		Razem	1		1		1		45	120	4	2,4						

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				
9/10	0/1	4/5	5/6	3/4	525	1800	60	36

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**

[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	20		

Training duration	Training objective
	6,6

4.4 Diploma dissertation module

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
Character of diploma dissertation		
Literature survey, project, computer program, etc.		
Number of BK[1] ECTS points		

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])

48,6. ECTS

[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

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 ….	63
Total number of ECTS points	90

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 …….	9
Number of ECTS points for optional subjects ….	16
Total number of ECTS points	25

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)

3 ECTS points

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

63 ECTS points

11. Range of diploma dissertation

Range for all specializations

1 Modeling and metamodeling.

2 Properties and applications of UML and LOTOS languages.

3 Problems of transformation and consistency models.

[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 Validation and verification of models.
5 The differences between information retrieval and data searching.
6 Operation of an information system on the network.
7 Multimedia technologies used in information systems.
8 The effectiveness of information systems.
9 The tasks of computer network design.
10 Network Traffic Classification.
11 Network Management.
12 Methods of fixing bugs in ICT systems.
13 Quality of service concept in telecommunication networks.
14 The concept of decision-making system and computerized decision support system.
15 Systems engineering approach.
16 Decision problems for complex operations.
17 Basic problems, methods and algorithms of discrete optimization.
18 The basic method of "soft-computing (smart)".
19 Decision making under uncertainty.
20 Methods and algorithms for recognition.
21 Expectations methodology of science.
22 Modern sciencemetric methods.

Range for Software Engineering specjalization

1. Architectural and design patterns
2. MDA – models, idea, transformations
3. Domain languages – idea, supporting tools
4. Measures in software engineering
5. Software quality models
6. Prediction models in software engineering

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[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

7. Methods to improve products and processes in software development
8. Empirical researches in software engineering - types, sample research areas
9. Characteristics of software development projects (on PRINCE2 example)
10. Methods for information project's cost estimation.
11. Risk in information projects - analysis, assessment, monitoring and prevention.
12. Problems in project team management.
13. Model and technology communication infrastructure of web services.
14. Security infrastructure in web services environment.
15. Models and transactions technologies in web services environment.
16. The orchestration of business processes in BPEL.
17. SOA - the idea and supporting technologies.
18. Earned Value Method as a way of IT project evaluation.
19. Point method for estimating the risk of IT project. What reactions can be selected to response to threats and opportunities?
20. The objectives of modeling and data mining – the business aspect.
21. Characteristics of transactional and analytical data models.
22. Data mining techniques.

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)*
		Advanced Methods and Techniques of Data	1
		Teletraffic Theory and Engineering	
		Modeling and Business Analysis	
		Decision Support Systems	
		Methodology of Empirical Sciences	

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

		Information Systems	
		Software System Design	2
		Architecture and Technologies of Web Services	2
		Master Thesis I	2
		Quality Models and Metrics in Software Engineering	2
		Elective course I	2
		Management of Development and Integration of Information Systems	3
		Management of Development and Integration of Information Systems II	3
		Master Thesis II	3
		Diploma Seminar	3
		Modelling and implementation of business data	3
		Elective course II	3

13. Plan of studies (attachment no. ……)

Approved by faculty student government legislative body:

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

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[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

....
Date, Dean’s signature

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
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[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
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Zał. nr 2 do ZW 64/2012

Attachment no. …. to Programme of Education

PROGRAMME OF STUDIES

SPECIALIZATION Intelligent Information Systems

1. Description

Number of semesters: 3	*Number ECTS points necessary to obtain qualifications: 90*
Prerequisites (particularly for the second-level studies): *Competition of the first level study diplomas.* *Required: Bachelor Degree, preferably in computer science or in a related area. Applicants with a bachelor degree outside of computer science must demonstrate significant proficiency in computer science. Any area of requirements can be satisfied through courses completed at the bachelor level or by suitable experience.* *Each application is assessed individually on its merits.* *Description of learning outcomes for second degree in Computer Science does not apply to the following learning outcomes listed in the description of qualifications of the second degree in the field of education corresponding to an area of technical sciences* *knowledge: T2A_W06, T2A_W08*	*Upon completion of studies graduate obtains* *professional degree of: magister (MSc)* *~~1st~~/2nd* level qualifications*

skills: T2A_U13, T2A_U14 *social competences: T2A_K01, T2A_K02, T2A_K03, T2A_K04* *The candidate who on completion of degree studies and other forms of education did not receive some of the above. competence, may take a second degree in Computer Science, where the deficiency of competence can be achieved by the completion of classes in dimension than 30 ECTS credits*	
Possibility of continuing studies: *The possibility of undertaking doctoral studies (third degree)*	*Graduate profile, employability:* *At the second level of study. students can choose 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 specializations are given in English.* *The result of education is the knowledge, skills and social competence, which are included in annex No. 1 to the Education Program.* *Extended knowledge in the field of specialization*

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[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

	Gained skills: *• is able to solve complex computing tasks using advanced informatics techniques in the field of studied specialization: security and reliability of information systems, intelligent information systems, Internet and mobile technology, software engineering, systems design, database systems, information systems, decision support systems, teleinformatic* *• is able to create models, analyze them and takes decision for different types of objects* *• acquires information from literature, databases and other sources, also in English, integrates obtained information, interprets it, critically evaluates, conclusions and formulates justifies opinions* *• communicates using a variety of techniques, also in English, prepares a elaboration in Polish language and short scientific report in English on the results of their own research. In the case of foreign students can prepare a short reserch report in Polish, but the full report in English* *• defines the directions of further learning and implements the process of self-learning* *A graduate can be employed in IT companies as well as in companies and organizations that uses tools and information systems as managers or specialist. They can work as: System Analyst, Programmer Analyst, System Consultant, designer of information systems, manager, system architect , etc.*

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[4]University-wide course /group of courses – enter O
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[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

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 studies is carried out at 12 specializations (9 in Polish language, 3 in English language) that reflect the current needs of the region, and the place and role of the Wrocław University of Technology as a leading university and research centre in the region. Differentiation of substantive specialization is justified by the dynamically changing of market needs, and by the academics staff having achievements at the highest level in the discipline of computer science. Development of specialties takes place in the framework of international agreements and international research and teaching programs (eg. an international agreement with universities in Vietnam contributed to the creation of Intelligent Information Systems specialization).Moreover, development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, in which students take part. They can carrying out research as well as diploma theses. Teaching at a high level must be based on adequate laboratory facilities in which students can develop their skills. The Institute has the necessary computing equipment, laboratories and software to conduct teaching at the second study level, but in accordance to the mission of the university - is currently under construction the project of a new building (investment shared with the Faculty of Mechanical Engineering and the Faculty of Chemistry), in which will be built complex of 16 specialized teaching laboratories for students of the second and third degree level of study in Computer Science.* *These are the following laboratories: Safety and Reliability of Information Systems*

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[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

	Laboratory, Intelligent Multimedia Data Mining Systems Laboratory, Modeling and Analysis of Web-based Systems Laboratory, Software Engineering Laboratory, Information System Design and Knowledge Management Laboratory, Advanced Database Systems Laboratory, Multimedia Laboratory, Intelligent multi-agent systems and sensors networks Laboratory, Wired and Wireless Computer Networks and Engineering of Teleinformatic Traffic Laboratory, System Recognition and Data Exploration Laboratory, Internet Testing and Measurement Laboratory, Multimedia and Mobile Technologies Laboratory, Laboratory and Scaled Hybrid Processing Technology, Internet of Things, Web of Things Technologies Laboratory, Intelligent Measurement Systems Smart Grid Laboratory, Application of Modelling, Identification and Optimization in Medicine and Sport Laboratory. *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, 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.*

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

Fields of science: technical sciences

Scientific discipline: informatics

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

Learning outcomes are consistent with the needs of: (i) companies engaged in various activities in manufacturing, service or business, the IT professionals, the analysis of a variety of data for decision support, (ii) manufacturers of advanced systems, for analysts, designers, specialists for the relationships with customers.

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[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)
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[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

4. List of education modules:
4.1. List of obligatory modules:
4.1.1 List of general education modules

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				
0	0	0	0	0	0	0	0	0

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	INZ 003758W	Advanced Methods and Techniques of Data Analysis	2	0	0	0	0	K2INF_W01 K2INF_W05	30	60	2	1,2	T	Z			PD	Ob.
2	INZ 003758L	Advanced Methods and Techniques of Data Analysis	0	0	2	0	0	K2INF_U05	30	120	4	2,4	T	Z		P	PD	Ob.
		Total	2		2				60	180	6	3,6						

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[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				
2		2			60	180	6	3,6

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	INZ003760C	Modeling and Business Analysis	0	2	0	0	0	K2INF_U06	30	90	3	1,8	T	Z			K	Ob.
2	INZ003760W	Modeling and Business Analysis	1	0	0	0	0	K2INF_W03	15	60	2	1,2	T	E			K	Ob.
3	INZ003762S	Information Systems	0	0	0	0	2	K2INF_W04	30	60	2	1,2	T	Z			K	Ob.
4	INZ003762W	Information Systems	1	0	0	0	0	K2INF_W04	15	60	2	1,2	T	Z			K	Ob.
5	INZ003761C	Decision Support Systems	0	1	0	0	0	K2INF_U05	15	30	1	0,6	T	Z			K	Ob.
6	INZ003761P	Decision Support Systems	0	0	0	1	0	K2INF_U05	15	60	2	1,2	T	Z		P	K.	Ob.
7	INZ003761W	Decision Support Systems	1	0	0	0	0	K2INF_W02	15	60	2	1,2	T	E			K	Ob.

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[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	INZ003759P	Teletraffic theory and engineering	0	0	0	2	0	K2INF_U05	30	90	3	1,8	T	Z		P	K	Ob.
9	INZ003759W	Teletraffic theory and engineering	1	0	0	0	0	K2INF_W04	15	30	1	0,6	T	Z			K	Ob.
		Total	6	3	0	3	2		270	630	21	12,6						

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]
pr	sem							
6	3	0	3	2	270	630	21	12,6

4.2 List of optional modules

4.2.1 List of general education modules

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		Foreign language 1	0	3	0	0	0	K2INF_U04	45	60	2	1,2	T	Z	O		KO	W
2		Foreign language 2	0	1	0	0	0	K2INF_U04	15	30	1	0,6	T	Z	O		KO	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
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[7] Optional – enter W, obligatory – enter Ob

Total		4					60	90	3	1,8							

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]
pr	sem							
	4				60	90	3	1,8

4.2.4 List of specialization modules

4.2.4.1 *Specialization subjects (e.g. whole specialization)* modules *(min. 60 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	INZ 003778WP	Soft computing - methods and application	2	0	0	2	0	K2INF_W07 K2INF_U10	50	180	6	3,6	T	E		P	S	W
2	INZ 003779WL	Machine learning	2	0	2	0	0	K2INF_W06 K2INF_U08	55	180	6	3,6	T	Z		P	S	W
3	INZ 003781WP	Vision systems	1	0	0	2	0	K2INF_W08 K2INF_U12	45	180	6	3,6	T	Z		P	S	W
4	INZ 003782WP	Natural language engineering	1	0	0	2	0	K2INF_W09 K2INF_U13	45	180	6	3,6	T	Z		P	S	W
5	INZ 003784WP	New trends in neural computations	1	0	0	2	0	K2INF_W06 K2INF_U11	45	120	4	2,4	T	Z		P	S	W
6	INZ 003785S	Knowledge discovery from data	0	0	0	0	2	K2INF_W10 K2INF_U17	45	120	4	2,4	T	Z			S	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

7	INZ 003783WL	Parallel and Distributed Processing	1	0	2	0	0	K2INF_W04 K2INF_U07	45	120	4	2,4	T	Z		P	S	W
8	INZ 003786S	Stimulation techniques of creative thinking	0	0	0	0	2	K2INF_W01 K2INF_U05	30	60	2	1,2	T	Z			S	W
	INZ003818P	Diploma Thesis I						K2INF_U08	30	60	2	0,6	T	Z			S	W
	INZ003819D	Diploma Thesis II						K2INF_U08	150	540	18	6	T	Z			S	W
	INZ003820S	Diploma Seminar					2	K2INF_U08	30	60	2	1,2	T	Z			S	W
		Total	8	0	4	8	4		570	1800	60	36						

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				
8	0	4	8	4	360	1140	38	22,8

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**
Training duration	**Training objective**		

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
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[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

4.4 Diploma dissertation module

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
2	**20**	
Character of diploma dissertation		
Literature survey, project, computer program, etc.		
Number of BK[1] ECTS points	**6,6**	

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

[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

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])

48,6. 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 ….	63
Total number of ECTS points	90

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 …….	9
Number of ECTS points for optional subjects ….	32
Total number of ECTS points	90

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)

…3…. ECTS points

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

…63.. ECTS points

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[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

11. Range of diploma dissertation

Range for all specializations

1 Modeling and metamodeling.
2 Properties and applications of UML and LOTOS languages.
3 Problems of transformation and consistency models.
4 Validation and verification of models.
5 The differences between information retrieval and data searching.
6 Operation of an information system on the network.
7 Multimedia technologies used in information systems.
8 The effectiveness of information systems.
9 The tasks of computer network design.
10 Network Traffic Classification.
11 Network Management.
12 Methods of fixing bugs in ICT systems.
13 Quality of service concept in telecommunication networks.
14 The concept of decision-making system and computerized decision support system.
15 Systems engineering approach.
16 Decision problems for complex operations.
17 Basic problems, methods and algorithms of discrete optimization.
18 The basic method of "soft-computing (smart)".
19 Decision making under uncertainty.
20 Methods and algorithms for recognition.
21 Expectations methodology of science.
22 Modern sciencemetric methods.

Range for Intelligent Information Systems specjalization

[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

1. Organization of distributed systems
2. Evaluation of parallel systems
3. Types of machine learning
4. Induction learning: methods and applications
5. Case Based Reasoning
6. Reinforcement learning
7. Ensemble of classifiers
8. Rough sets in machine learning
9. Knowledge discovery from data: process, application, problems
10. Image models: feature vectors, invariants, space relations
11. Image understanding as a process of semantic analysis
12. Classification, annotation, interpretation, and understanding in image analysis
13. Soft computing versus classical (algorithmic) computing
14. List and characterize the soft computing techniques
15. Neural networks of third generation (neuron specificity, Network architecture, way of learning, input output coding)
16. Neural Network with stochastics
17. Fundamentals of natural language formal description: assumptions and methods
18. Contemporary language technology: tools, language resources and their application
19. Natural language processing: typical phases, aims, useful methods
20. Examples of computer decision support systems

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]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

		Advanced Methods and Techniques of Data	1
		Teletraffic Theory and Engineering	1
		Modeling and Business Analysis	1
		Decision Support Systems	1
		Methodology of Empirical Sciences	1
		Information Systems	1
		Diploma Thesis I	2
		Soft computing - methods and application	2
		Machine learning	2
		Vision systems	2
		Natural language engineering	2
		Parallel and Distributed Processing	2
		New trends in neural computations	3
		Knowledge discovery from data	3
		Stimulation techniques of creative thinking	3
		Diploma Seminar	3
		Diploma Thesis II	3

13. Plan of studies (attachment no. ……)

Approved by faculty student government legislative body:

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

[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

....
Date, Dean’s signature

[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
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[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

Zał. nr 2 do ZW 64/2012

Attachment no. …. to Programme of Education

PROGRAMME OF STUDIES

Web and Mobile Technologies

1. Description

Number of semesters: 3	*Number ECTS points necessary to obtain qualifications: 90*
Prerequisites (particularly for the second-level studies): *Competition of the first level study diplomas.* *Required: Bachelor Degree, preferably in computer science or in a related area. Applicants with a bachelor degree outside of computer science must demonstrate significant proficiency in computer science. Any area of requirements can be satisfied through courses completed at the bachelor level or by suitable experience.* *Each application is assessed individually on its merits.* *Description of learning outcomes for second degree in Computer Science does not apply to the following learning outcomes listed in the description of qualifications of the second degree in the field of education corresponding to an area of technical sciences* *knowledge: T2A_W06, T2A_W08* *skills: T2A_U13, T2A_U14* *social competences: T2A_K01, T2A_K02, T2A_K03, T2A_K04* *The candidate who on completion of degree studies and other forms of education did not receive some of the above. competence, may take a second degree in Computer Science, where the deficiency of competence can be achieved by the*	*Upon completion of studies graduate obtains* *professional degree of: magister (MSc)* *~~1st~~/2nd* level qualifications*

completion of classes in dimension than 30 ECTS credits.	
The possibility to continue studies: *The possibility of undertaking doctoral studies (third degree)*	*Graduate profile, employability:* *At the second level of study. students can choose 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 specializations are given in English.* *The result of education is the knowledge, skills and social competence, which are included in annex No. 1 to the Education Program.* *Extended knowledge in the field of specialization* *Gained skills:* *• is able to solve complex computing tasks using advanced informatics techniques in the field of studied specialization: security and reliability of information systems, intelligent information systems, Internet and mobile technology, software engineering, systems design, database systems, information systems, decision support systems, teleinformatic* *• is able to create models, analyze them and takes decision for different types of objects* *• acquires information from literature, databases and other sources, also in English, integrates obtained information, interprets it, critically evaluates, conclusions and formulates justifies opinions* *• communicates using a variety of techniques, also in English, prepares a elaboration in Polish language and short scientific report in English on the results of their own research. In the case of foreign students can prepare a short reserch report in Polish, but the full report in English*

	• defines the directions of further learning and implements the process of self-learning *A graduate can be employed in IT companies as well as in companies and organizations that uses tools and information systems as managers or specialist. They can work as: System Analyst, Programmer Analyst, System Consultant, designer of information systems, manager, system architect , etc.*
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 studies is carried out at 12 specializations (9 in Polish language, 3 in English language) that reflect the current needs of the region, and the place and role of the Wrocław University of Technology as a leading university and research centre in the region. Differentiation of substantive specialization is justified by the dynamically changing of market needs, and by the academics staff having achievements at the highest level in the discipline of computer science. Development of specialties takes place in the framework of international agreements and international research and teaching programs (eg. an international agreement with universities in Vietnam contributed to the creation of Intelligent Information Systems specialization).Moreover, development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, in which students take part. They can carrying out research as well as diploma theses. Teaching at a high level must be based on adequate laboratory facilities in which students can develop their skills. The Institute has the necessary computing equipment, laboratories and software to conduct teaching at the second study level, but in accordance to the mission of the university - is currently under construction the project of a new building (investment shared with the Faculty of Mechanical Engineering and the Faculty of Chemistry), in which will be built complex of 16 specialized teaching laboratories for students of the second and third degree level of study in Computer Science.* *These are the following laboratories: Safety and Reliability of Information Systems Laboratory, Intelligent Multimedia Data Mining Systems Laboratory, Modeling and Analysis of Web-based Systems Laboratory,*

	Software Engineering Laboratory, Information System Design and Knowledge Management Laboratory, Advanced Database Systems Laboratory, Multimedia Laboratory, Intelligent multi-agent systems and sensors networks Laboratory, Wired and Wireless Computer Networks and Engineering of Teleinformatic Traffic Laboratory, System Recognition and Data Exploration Laboratory, Internet Testing and Measurement Laboratory, Multimedia and Mobile Technologies Laboratory, Laboratory and Scaled Hybrid Processing Technology, Internet of Things, Web of Things Technologies Laboratory, Intelligent Measurement Systems Smart Grid Laboratory, Application of Modelling, Identification and Optimization in Medicine and Sport Laboratory. *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, 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.*

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

Science area: technical sciences
Scientific discipline: Informatics

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

Meet demands:

a) institutions and companies engaged in manufacturing, trade, service and research for IT professionals involved in the maintenance / development of tools supporting the business at a strategic level (planning and management),

b) the producers of management information systems, decision-making and control of the business and IT professionals of software production departments (spec. ds contact with customers, analysts, designers)
c) consulting firms and integrators for systems analysts / analysts, software developers, consultants, system, computer system designers, project managers, architects, systems,
d) companies design systems for many specific applications-specific specialty.

4. List of education modules:
4.1. List of obligatory modules:
4.1.1 List of general education modules

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				
0	0	0	0	0	0	0	0	0

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	INZ 003758W	Advanced Methods and Techniques of Data Analysis	2	0	0	0	0	K2INF_W01 K2INF_W05	30	60	2	1,2	T	Z			PD	Ob.
2	INZ 003758L	Advanced Methods and Techniques of Data Analysis	0	0	2	0	0	K2INF_U05	30	120	4	2,4	T	Z		P	PD	Ob.
		Total	2		2				60	180	6	3,6						

[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				
2		2			60	180	6	3,6

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	INZ 003760C	Modeling and Business Analysis	0	2	0	0	0	K2INF_U06	30	90	3	1,8	T	Z			K	Ob.
2	INZ 003760W	Modeling and Business Analysis	1	0	0	0	0	K2INF_W03	15	60	2	1,2	T	E			K	Ob.
3	INZ 003762S	Information Systems	0	0	0	0	2	K2INF_W04	30	60	2	1,2	T	Z			K	Ob.
4	INZ 003762W	Information Systems	1	0	0	0	0	K2INF_W04	15	60	2	1,2	T	Z			K	Ob.
5	INZ 003761C	Decision Support Systems	0	1	0	0	0	K2INF_U05	15	30	1	0,6	T	Z			K	Ob.
6	INZ 003761P	Decision Support Systems	0	0	0	1	0	K2INF_U05	15	60	2	1,2	T	Z		P	K.	Ob.

[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

7	INZ 003761W	Decision Support Systems	1	0	0	0	0	K2INF _W02	15	60	2	1,2	T	E			K	Ob.
8	INZ 003759P	Teletraffic theory and engineering	0	0	0	2	0	K2INF_ U05	30	90	3	1,8	T	Z		P	K	Ob.
9	INZ 003759W	Teletraffic theory and engineering	1	0	0	0	0	K2INF _W04	15	30	1	0,6	T	Z			K	Ob.
		Total	6	3	0	3	2		270	630	21	12,6						

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]
pr	sem							
6	3	0	3	2	270	630	21	12,6

4.2 List of optional modules

4.2.1 List of general education modules

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		Foreign language 1	0	3	0	0	0	K2INF _U04	45	60	2	1,2	T	Z	O		KO	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		Foreign language 2	0	1	0	0	0	K2INF_U04	15	30	1	0,6	T	Z	O		KO	W
		Total		4					60	90	3	1,8						

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]
pr	sem							
	4				60	90	3	1,8

4.2.4 List of specialization modules

4.2.4.1 *Specialization subjects (Internet and Mobile Technologies) (min. 60 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	INZ 003771W	Internet Infrastructure and Research	3	0	0	0	0	K2INF_W06	45	120	4	2,4	T	E			S	W
2	INZ 003771L	Internet Infrastructure and Research	0	0	2	0	0	K2INF_U08	30	90	3	1,8	T	Z		P	S	W.
3	INZ 003771S	Internet Infrastructure and Research	0	0	0	0	2	K2INF_U08	30	60	2	1,2	T	Z			S	W
4	INZ 003769W	Modeling and Analysis of Web Systems	2	0	0	0	0	K2INF_W06	30	90	3	1,8	T	E			S	W
5	INZ 003769L	Modeling and Analysis of Web Systems	0	0	1	0	0	K2INF_U08	15	60	2	1,2	T	Z		P	S	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

6	INZ 003774W	Parallel and Distributed Programming	2	0	0	0	0	K2INF_W 06	30	90	3	1,8	T	Z			S	W
7	INZ 003774L	Parallel and Distributed Programming	0	0	2	0	0	K2INF_U 08	30	90	3	1,8	T	Z		P	S	W
8	INZ 003770P	Team Project	0	0	0	3	0	K2INF_U 08	45	240	8	4,8	T	Z		P	S	W
9	INZ 003775W	Monographic Subject	1	0	0	0	0	K2INF_W 06	30	60	1	0,6	T	Z			S	W
10	INZ 003775L	Monographic Subject	0	0	2	0		K2INF_U 08	15	60	3	1,8	T	Z		P	S	W
11	INZ 003772W	Mobile Systems and Multimedia	1	0	0	0	0	K2INF_W 06	15	45	2	1,2	T	Z			S	W
12	INZ 003772L	Mobile Systems and Multimedia	0	0	3	0	0	K2INF_U 08	45	135	4	2,4	T	Z		P	S	W
13	INZ 003818P	Diploma Thesis I						K2INF_ U08	30	60	2	0,6	T	Z			S	W
14	INZ 003819D	Diploma Thesis II						K2INF_ U08	150	540	18	6	T	Z			S	W
15	INZ 003820S	Diploma Seminar					2	K2INF_ U08	30	60	2	1,2	T	Z			S	W
		Total	9	0	10	3	4		530	1740	60	30,6						

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]
pr	sem							
10		8	3	3	530	1740	60	30,6

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**

[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

-	-	-	-

Training duration	Training objective
-	-

4.4 Diploma dissertation module

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
2	**2 + 18**	
Character of diploma dissertation		
Project, computer program, theoretical study		
Number of BK[1] ECTS points	**12**	

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

[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

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])

48,6 ECTS points

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 ….	63
Total number of ECTS points	90

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 …….	9
Number of ECTS points for optional subjects ….	23
Total number of ECTS points	90

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)

3 ECTS point

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

…63…. ECTS points

11. Range of diploma dissertation

Range for all specializations

1 Modeling and metamodeling.
2 Properties and applications of UML and LOTOS languages.
3 Problems of transformation and consistency models.
4 Validation and verification of models.
5 The differences between information retrieval and data searching.
6 Operation of an information system on the network.
7 Multimedia technologies used in information systems.
8 The effectiveness of information systems.
9 The tasks of computer network design.
10 Network Traffic Classification.
11 Network Management.
12 Methods of fixing bugs in ICT systems.
13 Quality of service concept in telecommunication networks.
14 The concept of decision-making system and computerized decision support system.
15 Systems engineering approach.
16 Decision problems for complex operations.
17 Basic problems, methods and algorithms of discrete optimization.
18 The basic method of "soft-computing (smart)".
19 Decision making under uncertainty.
20 Methods and algorithms for recognition.
21 Expectations methodology of science.
22 Modern sciencemetric methods.

Range for Web and Mobile Technologies specjalization

[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

23 Internet Architecture and Web services. Web and P2P systems.
24 HTTP and P2P. Characteristics of Internet traffic. Exponential law on the Internet.
25 Grids and clusters. Operational problems and development.
26 Definitions and distance estimation in the Internet.
27 Basic problems and methods of "discovering" the Internet.
28 Identification of the topology of the Internet. Internet tomography.
29 Measurement, assessment and prediction time data on the Internet.
30 Quality Assurance services on the Internet. Methods and solutions.
31 Web-based transactions and the assessment of their performance.
32 Effective and reliable getting resources on the Internet.
33 Model of the web server. Access and scheduling algorithms for HTTP requests in a web server.
34 Methods and algorithms for distributing HTTP requests in clusters and distributed web systems.
35 Methods and algorithms for content caching.
36 Organization of CDN service delivery network.
37 Objectives and methods of measurement of the Internet. Tools and measurement services. The MWING system.
38 Tests and measurements in the field of Internet topology, traffic, status, and applications.
39 The use of data mining in the analysis of web server logs.
40 The use of data mining to analyze the performance of web systems.
41 The use of geostatistical methods and spatial regression analysis of Internet performance
42 Architecture of distributed systems and parallel and distributed processing methods and parallel.
43 Processing and data media interface design multimedia computer applications.
44 Methods, techniques, software tools used for solving the tasks of design and construction of mobile systems.

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)*
		Advanced Methods and Techniques of Data	1
		Teletraffic Theory and Engineering	1

[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

		Modeling and Business Analysis	1
		Decision Support Systems	1
		Methodology of Empirical Sciences	1
		Information Systems	1
		Modeling and Analysis of Web Systems	2
		Team Project	2
		Internet Infrastructure and Research	2
		Mobile Systems and Multimedia	2
		Parallel and Distributed Programming	3
		Monographic Subject	3
		Diploma ThesisI	2
		Diploma ThesisII	3
		Diploma Seminar	3

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

[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

Zał. nr 2 do ZW 64/2012

Attachment no. …. to Programme of Education

PROGRAMME OF STUDIES

Designing IT Systems

1. Description

Number of semesters: 3	*Number ECTS points necessary to obtain qualifications: 90*
Prerequisites (particularly for the second-level studies): *Competition of the first level study diplomas.* *Required: Bachelor Degree, preferably in computer science or in a related area. Applicants with a bachelor degree outside of computer science must demonstrate significant proficiency in computer science. Any area of requirements can be satisfied through courses completed at the bachelor level or by suitable experience.* *Each application is assessed individually on its merits.* *Description of learning outcomes for second degree in Computer Science does not apply to the following learning outcomes listed in the description of qualifications of the second degree in the field of education corresponding to an area of technical sciences* *knowledge: T2A_W06, T2A_W08* *skills: T2A_U13, T2A_U14* *social competences: T2A_K01, T2A_K02, T2A_K03, T2A_K04* *The candidate who on completion of degree studies and other forms of education did not receive some of the above. competence, may take a second degree in Computer Science, where the deficiency of competence can be achieved by the*	*Upon completion of studies graduate obtains* *professional degree of: magister (MSc)* *~~1st~~/2nd* level qualifications*

completion of classes in dimension than 30 ECTS credits.	
The possibility to continue studies: *The possibility of undertaking doctoral studies (third degree)*	*Graduate profile, employability:* *At the second level of study. students can choose 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 specializations are given in English.* *The result of education is the knowledge, skills and social competence, which are included in annex No. 1 to the Education Program.* *Extended knowledge in the field of specialization* *Gained skills:* *• is able to solve complex computing tasks using advanced informatics techniques in the field of studied specialization: security and reliability of information systems, intelligent information systems, Internet and mobile technology, software engineering, systems design, database systems, information systems, decision support systems, teleinformatic* *• is able to create models, analyze them and takes decision for different types of objects* *• acquires information from literature, databases and other sources, also in English, integrates obtained information, interprets it, critically evaluates, conclusions and formulates justifies opinions* *• communicates using a variety of techniques, also in English, prepares a elaboration in Polish language and short scientific report in English on the results of their own research. In the case of foreign students can prepare a short reserch report in Polish, but the full report in English*

	• defines the directions of further learning and implements the process of self-learning *A graduate can be employed in IT companies as well as in companies and organizations that uses tools and information systems as managers or specialist. They can work as: System Analyst, Programmer Analyst, System Consultant, designer of information systems, manager, system architect , etc.*
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 studies is carried out at 12 specializations (9 in Polish language, 3 in English language) that reflect the current needs of the region, and the place and role of the Wrocław University of Technology as a leading university and research centre in the region. Differentiation of substantive specialization is justified by the dynamically changing of market needs, and by the academics staff having achievements at the highest level in the discipline of computer science. Development of specialties takes place in the framework of international agreements and international research and teaching programs (eg. an international agreement with universities in Vietnam contributed to the creation of Intelligent Information Systems specialization).Moreover, development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, in which students take part. They can carrying out research as well as diploma theses. Teaching at a high level must be based on adequate laboratory facilities in which students can develop their skills. The Institute has the necessary computing equipment, laboratories and software to conduct teaching at the second study level, but in accordance to the mission of the university - is currently under construction the project of a new building (investment shared with the Faculty of Mechanical Engineering and the Faculty of Chemistry), in which will be built complex of 16 specialized teaching laboratories for students of the second and third degree level of study in Computer Science.* *These are the following laboratories: Safety and Reliability of Information Systems Laboratory, Intelligent Multimedia Data Mining Systems Laboratory, Modeling and Analysis of Web-based Systems Laboratory,*

	Software Engineering Laboratory, Information System Design and Knowledge Management Laboratory, Advanced Database Systems Laboratory, Multimedia Laboratory, Intelligent multi-agent systems and sensors networks Laboratory, Wired and Wireless Computer Networks and Engineering of Teleinformatic Traffic Laboratory, System Recognition and Data Exploration Laboratory, Internet Testing and Measurement Laboratory, Multimedia and Mobile Technologies Laboratory, Laboratory and Scaled Hybrid Processing Technology, Internet of Things, Web of Things Technologies Laboratory, Intelligent Measurement Systems Smart Grid Laboratory, Application of Modelling, Identification and Optimization in Medicine and Sport Laboratory. *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, 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.*

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

Science area: technical sciences
Scientific discipline: Informatics

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

Meet demands:

a) institutions and companies engaged in manufacturing, trade, service and research for IT professionals involved in the maintenance / development of tools supporting the business at a strategic level (planning and management),

b) the producers of management information systems, decision-making and control of the business and IT professionals of software production departments (spec. ds contact with customers, analysts, designers)
c) consulting firms and integrators for systems analysts / analysts, software developers, consultants, system, computer system designers, project managers, architects, systems,
d) companies design systems for many specific applications-specific specialty.

4. List of education modules:
4.1. List of obligatory modules:
4.1.1 List of general education modules

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				
0	0	0	0	0	0	0	0	0

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	INZ 003758W	Advanced Methods and Techniques of Data Analysis	2	0	0	0	0	K2INF_W01 K2INF_W05	30	60	2	1,2	T	Z			PD	Ob.
2	INZ 003758L	Advanced Methods and Techniques of Data Analysis	0	0	2	0	0	K2INF_U05	30	120	4	2,4	T	Z		P	PD	Ob.
		Total	2		2				60	180	6	3,6						

[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				
2		2			60	180	6	3,6

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	INZ 003763W	Methodology of Empirical Sciences	2	0	0	0	0	K2INF_W05	30	90	3	1,8	T	Z			K	Ob.
2	INZ 003760C	Modeling and Business Analysis	0	2	0	0	0	K2INF_U06	30	90	3	1,8	T	Z			K	Ob.
3	INZ 003760W	Modeling and Business Analysis	1	0	0	0	0	K2INF_W03	15	60	2	1,2	T	E			K	Ob.
4	INZ 003762S	Information Systems	0	0	0	0	2	K2INF_W04	30	60	2	1,2	T	Z			K	Ob.
5	INZ 003762W	Information Systems	1	0	0	0	0	K2INF_W04	15	60	2	1,2	T	Z			K	Ob.
6	INZ 003761C	Decision Support Systems	0	1	0	0	0	K2INF_U05	15	30	1	0,6	T	Z			K	Ob.

[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

7	INZ 003761P	Decision Support Systems	0	0	0	1	0	K2INF _U05	15	60	2	1,2	T	Z		P	K.	Ob.
8	INZ 003761W	Decision Support Systems	1	0	0	0	0	K2INF _W02	15	60	2	1,2	T	E			K	Ob.
9	INZ 003759P	Teletraffic theory and engineering	0	0	0	2	0	K2INF_ U05	30	90	3	1,8	T	Z		P	K	Ob.
10	INZ 003759W	Teletraffic theory and engineering	1	0	0	0	0	K2INF _W04	15	30	1	0,6	T	Z			K	Ob.
		Total	6	3	0	3	2		270	630	21	12,6						

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	3	0	3	2	270	630	21	12,6

4.2 List of optional modules

4.2.1 List of general education modules

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		Foreign language 1	0	3	0	0	0	K2INF _U04	45	60	2	1,2	T	Z	O		KO	W
2		Foreign language 2	0	1	0	0	0	K2INF	15	30	1	0,6	T	Z	O		KO	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

								_U04										
		Total		4					60	90	3	1,8						

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				
	4				60	90	3	1,8

4.2.4 List of specialization modules

4.2.4.1 *Specialization subjects (Designing IT Systems) (min. 60 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	INZ 003818P	MSc Thesis				2		K2INF_U03	30	60	2	1,2	T	Z			K	W
2	INZ 003791W	Semantic Web	2					S2PSI_W07, S2PSI_W08, S2PSI_W09	30	120	4	2,4	T	E			S	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

3	INZ 003791L	Semantic Web			2			S2PSI_U10, S2PSI_U11	30	90	3	1,8	T	Z		P	S	W
4	INZ 003791S	Semantic Web					1	S2PSI_W07, S2PSI_W08, S2PSI_W09	15	60	2	1,2	T	Z			S	W
5	INZ 003790W	Human-Computer Interaction	2					S2PSI_W09, S2PSI_W10	30	90	3	1,8	T	Z			S	W
6	INZ 003790L	Human-Computer Interaction			2			S2PSI_U13, S2PSI_U14, S2PSI_U16	30	90	3	1,8	T	Z		P	S	W
7	INZ 003827W	Software Project Management	2					S2PSI_W06	30	120	4	2,4	T	E			S	W
8	INZ 003827P	Software Project Management				2		S2PSI_U17, S2PSI_U08, S2PSI_U09	30	90	3	1,8	T	Z		P	S	W
9	INZ 003789W	Implementation Techniques for Information Systems	2					S2PSI_W11, S2PSI_W08, S2PSI_W09	30	90	3	1,8	T	Z			S	W
10	INZ 003789L	Implementation Techniques for Information Systems			2			S2PSI_U15, S2PSI_U17	30	90	3	1,8	T	Z		P	S	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

11	INZ 003819D	MSc Thesis I				10		K2INF_U03	150	540	18	10,8	T	Z			K	W
12	INZ 003820 S	Diploma seminar				2		K2INF_U01, K2INF_U02	30	60	2	1,2	T	Z			S	W
13	INZ 003795W	Computational Intelligence Methods	2					S2PSI_W10, S2PSI_W07, S2PSI_W08, S2PSI_W09	30	90	3	1,8	T	Z			S	W
14	INZ 003795L	Computational Intelligence Methods			2			S2PSI_U12	30	90	3	1,8	T	Z		P	S	W
	INZ 003794W	Integration of Information Systems	2					S2PSI_W06, S2PSI_W07, S2PSI_W08, S2PSI_W10, S2PSI_W11	30	60	2	1,2	T	Z			S	
15	INZ 003794S	Integration of Information Systems					1	S2PSI_W06, S2PSI_W07, S2PSI_W08, S2PSI_W10, S2PSI_W11	15	60	2	1,2	T	Z			S	W
		Razem	12		8	16	2		570	1800	60	36						

[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				
12		8	16	2	570	1800	60	36

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**
-	-	-	-

Training duration	**Training objective**
-	-

4.4 Diploma dissertation module

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
2	**2 + 18**	
Character of diploma dissertation		
Project, computer program, theoretical study		
Number of BK[1] ECTS points	**12**	

[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])

48,6 ECTS points

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 ….	63
Total number of ECTS points	90

[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 …….	9
Number of ECTS points for optional subjects ….	23
Total number of ECTS points	90

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)

3 ECTS point

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

…63…. ECTS points

11. Scope of diploma dissertation

Scope for all specializations

1 Modeling and metamodeling.
2 Properties and applications of UML and LOTOS languages.
3 Problems of transformation and consistency models.
4 Validation and verification of models.
5 The differences between information retrieval and data searching.
6 Operation of an information system on the network.
7 Multimedia technologies used in information systems.
8 The effectiveness of information systems.

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[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

9 The tasks of computer network design.
10 Network Traffic Classification.
11 Network Management.
12 Methods of fixing bugs in ICT systems.
13 Quality of service concept in telecommunication networks.
14 The concept of decision-making system and computerized decision support system.
15 Systems engineering approach.
16 Decision problems for complex operations.
17 Basic problems, methods and algorithms of discrete optimization.
18 The basic method of "soft-computing (smart)".
19 Decision making under uncertainty.
20 Methods and algorithms for recognition.
21 Expectations methodology of science.
22 Modern sciencemetric methods.

Scope for Designing IT Systems specialization

23 Standards of content description in Semantic Web
24 Software tools for Semantic Web
25 Ontology engineering in Semantic Web
26 Knowledge processing in web intelligence systems
27 Models and methods of computational intelligence
28 Objectives and models of knowledge integration in information systems
29 Personalization of information systems
30 Human-computer interaction styles
31 Methods for testing usability of interactive systems
32 Modern architectures of information systems
33 Planning IT project accomplishment
34 Risk management in IT projects
35 Quality management in IT projects

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

36 Team management in IT projects

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)*
		Advanced Methods and Techniques of Data	1
		Teletraffic Theory and Engineering	1
		Modeling and Business Analysis	1
		Decision Support Systems	1
		Methodology of Empirical Sciences	1
		Information Systems	1
		Semantic Web	2
		Human-Computer Interaction	2
		Software Project Management	2
		Implementation Techniques for Information Systems	2
		MSc Thesis I	2
		Diploma seminar	3
		Computational Intelligence Methods	3
		Integration of Information Systems	3
		Diploma Seminar	3
		MSc Thesis II	3

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

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

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
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Zał. nr 2 do ZW 64/2012

Attachment no. …. to Programme of Education

PROGRAMME OF STUDIES

Specialization: Database Systems

1. Description

Number of semesters: 3	*Number ECTS points necessary to obtain qualifications: 90*
Prerequisites (particularly for the second-level studies): *Competition of the first level study diplomas.* *Required: Bachelor Degree, preferably in computer science or in a related area. Applicants with a bachelor degree outside of computer science must demonstrate significant proficiency in computer science. Any area of requirements can be satisfied through courses completed at the bachelor level or by suitable experience.* *Each application is assessed individually on its merits.* *Description of learning outcomes for second degree in Computer Science does not apply to the following learning outcomes listed in the description of qualifications of the second degree in the field of education corresponding to an area of technical sciences* *knowledge: T2A_W06, T2A_W08* *skills: T2A_U13, T2A_U14*	*Upon completion of studies graduate obtains* *professional degree of: magister (MSc)* *~~1st~~/2nd* level qualifications*

social competences: T2A_K01, T2A_K02, T2A_K03, T2A_K04 *The candidate who on completion of degree studies and other forms of education did not receive some of the above. competence, may take a second degree in Computer Science, where the deficiency of competence can be achieved by the completion of classes in dimension than 30 ECTS credits*	
Possibility of continuing studies: *The possibility of undertaking doctoral studies (third degree)*	*Graduate profile, employability:* *At the second level of study. students can choose 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 specializations are given in English.* *The result of education is the knowledge, skills and social competence, which are included in annex No. 1 to the Education Program.* *Extended knowledge in the field of specialization* *Gained skills:*

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[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

	• is able to solve complex computing tasks using advanced informatics techniques in the field of studied specialization: security and reliability of information systems, intelligent information systems, Internet and mobile technology, software engineering, systems design, database systems, information systems, decision support systems, teleinformatic *• is able to create models, analyze them and takes decision for different types of objects* *• acquires information from literature, databases and other sources, also in English, integrates obtained information, interprets it, critically evaluates, conclusions and formulates justifies opinions* *• communicates using a variety of techniques, also in English, prepares a elaboration in Polish language and short scientific report in English on the results of their own research. In the case of foreign students can prepare a short reserch report in Polish, but the full report in English* *• defines the directions of further learning and implements the process of self-learning* *A graduate can be employed in IT companies as well as in companies and organizations that uses tools and information systems as managers or specialist. They can work as: System Analyst, Programmer Analyst, System Consultant, designer of information systems, manager, system architect , etc.*
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*

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[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

	Technology. Teaching program at Informatics field of studies is carried out at 12 specializations (9 in Polish language, 3 in English language) that reflect the current needs of the region, and the place and role of the Wrocław University of Technology as a leading university and research centre in the region. Differentiation of substantive specialization is justified by the dynamically changing of market needs, and by the academics staff having achievements at the highest level in the discipline of computer science. Development of specialties takes place in the framework of international agreements and international research and teaching programs (eg. an international agreement with universities in Vietnam contributed to the creation of Intelligent Information Systems specialization).Moreover, development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, in which students take part. They can carrying out research as well as diploma theses. Teaching at a high level must be based on adequate laboratory facilities in which students can develop their skills. The Institute has the necessary computing equipment, laboratories and software to conduct teaching at the second study level, but in accordance to the mission of the university - is currently under construction the project of a new building (investment shared with the Faculty of Mechanical Engineering and the Faculty of Chemistry), in which will be built complex of 16 specialized teaching laboratories for students of the second and third degree level of study in Computer Science. *These are the following laboratories: Safety and Reliability of Information Systems Laboratory, Intelligent Multimedia Data Mining Systems Laboratory,*

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[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

	Modeling and Analysis of Web-based Systems Laboratory, Software Engineering Laboratory, Information System Design and Knowledge Management Laboratory, Advanced Database Systems Laboratory, Multimedia Laboratory, Intelligent multi-agent systems and sensors networks Laboratory, Wired and Wireless Computer Networks and Engineering of Teleinformatic Traffic Laboratory, System Recognition and Data Exploration Laboratory, Internet Testing and Measurement Laboratory, Multimedia and Mobile Technologies Laboratory, Laboratory and Scaled Hybrid Processing Technology, Internet of Things, Web of Things Technologies Laboratory, Intelligent Measurement Systems Smart Grid Laboratory, Application of Modelling, Identification and Optimization in Medicine and Sport Laboratory. *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, 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.*

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[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
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[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

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

Fields of science: technical sciences

Scientific discipline: informatics

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

The speciality is preparing in the modeling of data and designing advanced systems of databases, of new technologies of databases (in it stream-oriented, mobile, of real time), of managing transactions, the query optimization of both tuning up databases, quality assessment of systems of databases, advanced methods of the data analysis, methods and algorithms of the information retrieval, the identification of both analysis of threats and the safety and the data recovery

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
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[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. List of education modules:
4.1. List of obligatory modules:
4.1.1 List of general education modules

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				
0	0	0	0	0	0	0	0	0

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	INZ 003758W	Advanced Methods and Techniques of Data Analysis	2	0	0	0	0	K2INF_W01 K2INF_W05	30	60	2	1,2	T	Z			PD	Ob.
2	INZ 003758L	Advanced Methods and Techniques of Data Analysis	0	0	2	0	0	K2INF_U05	30	120	4	2,4	T	Z		P	PD	Ob.
		Total	2		2				60	180	6	3,6						

Altogether for general education modules

[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 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				
2		2			60	180	6	3,6

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	INZ 003760C	Modeling and Business Analysis	0	2	0	0	0	K2INF_U06	30	90	3	1,8	T	Z			K	Ob.
2	INZ 003760W	Modeling and Business Analysis	1	0	0	0	0	K2INF_W03	15	60	2	1,2	T	E			K	Ob.
3	INZ 003762S	Information Systems	0	0	0	0	2	K2INF_W04	30	60	2	1,2	T	Z			K	Ob.
4	INZ 003762W	Information Systems	1	0	0	0	0	K2INF_W04	15	60	2	1,2	T	Z			K	Ob.
5	INZ 003761C	Decision Support Systems	0	1	0	0	0	K2INF_U05	15	30	1	0,6	T	Z			K	Ob.
6	INZ 003761P	Decision Support Systems	0	0	0	1	0	K2INF_U05	15	60	2	1,2	T	Z		P	K.	Ob.
7	INZ 003761W	Decision Support Systems	1	0	0	0	0	K2INF_W02	15	60	2	1,2	T	E			K	Ob.
8	INZ	Teletraffic theory and engineering	0	0	0	2	0	K2INF_	30	90	3	1,8	T	Z		P	K	Ob.

[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

	003759P								U05										
9	INZ 003759W	Teletraffic theory and engineering	1	0	0	0	0	K2INF _W04	15	30	1	0,6	T	Z			K	Ob.
		Total	6	3	0	3	2		270	630	21	12,6						

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]
pr	sem							
6	3	0	3	2	270	630	21	12,6

4.2 List of optional modules

4.2.1 List of general education modules

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		Foreign language 1	0	3	0	0	0	K2INF _U04	45	60	2	1,2	T	Z	O		KO	W
2		Foreign language 2	0	1	0	0	0	K2INF _U04	15	30	1	0,6	T	Z	O		KO	W
		Total		4					60	90	3	1,8						

[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
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[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
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[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]
pr	sem							
	4				60	90	3	1,8

4.2.4 List of specialization modules

4.2.4.1 *Specialization subjects (e.g. whole specialization)* modules *(min.60 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.	INZ 003818P	Diploma thesis	0	0	0	2	0	K2INF_U03	30	60	2	1,2	T	Z			S	W
2.	INZ 003780W	Information retrieval systems	1	0	0	0	0	K2INF_W06_S2SBD_W05	15	60	2	1,2	T	Z			S	W
3.	INZ 003780P	Information retrieval systems	0	0	0	2	0	K2INF_U08_S2SBD_U10	30	60	2	1,2	T	Z		P	S	W
4.	INZ003787W	Deductive databases	2	0	0	0	0	K2INF_W06_S2SBD_W04	30	120	4	2,4	T	E			S	W
5.	INZ 003787P	Deductive databases	0	0	0	2	0	K2INF_U08_S2SBD_U05	30	120	4	2,4	T	Z		P	S	W
6.	INZ 003788W	Database Security	2	0	0	0	0	K2INF_W06_S2SBD_W03	30	120	4	2,4	T	E			S	W
7.	INZ 003788P	Database Security	0	0	0	1	0	K2INF_U08_S2SBD_U06 K2INF_U08_S2SBD_U04	15	60	2	1,2	T	Z		P	S	W
8.	INZ 003792W	Implementation of Database Systems	2	0	0	0	0	K2INF_W06_S2SBD_W02	30	90	3	1,8	T	Z			S	W
9.	INZ	Implementation of Database Systems	0	0	0	1	0	K2INF_U08_S2SBD_U02	15	30	1	0,6	T	Z		P	S	W

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[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

	003792P							K2INF_U08_S2SBD_U06											
10.	INZ 003796W	New database technologies	1	0	0	0	0	K2INF_W06_S2SBD_W01	15	60	2	1,2	T	Z			S	W
11.	INZ 003796L	New database technologies	0	0	2	0	0	K2INF_U08_S2SBD_U01 K2INF_U08_S2SBD_U03	30	90	3	1,8	T	Z		P	S	W
12.	INZ 003796S	New database technologies	0	0	0	0	1	K2INF_U08_S2SBD_U09	15	30	1	0,6	T	Z			S	W
13.	INZ 003819D	Diploma thesis	0	0	0	10	0	K2INF_U03	150	540	18	10,8	T	Z			S	W
14.	INZ 003820S	Diploma seminar	0	0	0	2	0	K2INF_U01 K2INF_U02	30	60	2	1,2	T	Z			S	W
15.	INZ 003793W	Multimedia Databases	1	0	0	0	0	K2INF_W06_S2SBD_W01 K2INF_W06_S2SBD_W02	15	60	2	1,2	T	Z			S	W
16.	INZ 003793P	Multimedia Databases	0	0	0	2	0	K2INF_U08_S2SBD_U07	30	60	2	1,2	T	Z		P	S	W
17.	INZ 003800W	Advanced database systems	2	0	0	0	0	K2INF_W06_S2SBD_W01	30	90	3	1,8	T	Z			S	W
18.	INZ 003800P	Advanced database systems	0	0	0	2	0	K2INF_U08_S2SBD_U08, K2INF_U08_S2SBD_U05 K2INF_U08_S2SBD_U04 K2INF_U08_S2SBD_U02 K2INF_U08_S2SBD_U01	30	90	3	1,8	T	Z		P	S	W
		Total	11	0	2	24	1		570	1800	60	36						

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

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				

[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

11	0	2	24	1	570	1800	60	36

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**
Training duration	**Training objective**		

4.4 Diploma dissertation module

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
2	20	
Character of diploma dissertation		
Literature survey, project, computer program, etc.		
Number of BK[1] ECTS points	6,6	

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

[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

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])

48,6 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 ….	63
Total number of ECTS points	90

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 …….	26
Number of ECTS points for optional subjects ….	0
Total number of ECTS points	26

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[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

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)

3 ECTS points

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

63 ECTS points

11. Range of diploma dissertation

Range for all specializations

1 Modeling and metamodeling.
2 Properties and applications of UML and LOTOS languages.
3 Problems of transformation and consistency models.
4 Validation and verification of models.
5 The differences between information retrieval and data searching.
6 Operation of an information system on the network.
7 Multimedia technologies used in information systems.
8 The effectiveness of information systems.
9 The tasks of computer network design.
10 Network Traffic Classification.
11 Network Management.
12 Methods of fixing bugs in ICT systems.
13 Quality of service concept in telecommunication networks.
14 The concept of decision-making system and computerized decision support system.
15 Systems engineering approach.
16 Decision problems for complex operations.
17 Basic problems, methods and algorithms of discrete optimization.
18 The basic method of "soft-computing (smart)".
19 Decision making under uncertainty.
20 Methods and algorithms for recognition.

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[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

21 Expectations methodology of science.
22 Modern sciencemetric methods.
….

Range for Database Systems specjalization

1. Data models.
2. Functional dependencies and relations schema normalization.
3. Relational data model.
4. Object data model.
5. Database languages – SQL.
6. Query optimization.
7. Query processing in multimedia databases.
8. Database security.
9. Database design methods.
10. Transactional processing in database systems
11. Database quality assessment.
12. Information retrieval methods.

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...*

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
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[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

			(number of semester)
		Advanced Methods and Techniques of Data	1
		Teletraffic Theory and Engineering	1
		Modeling and Business Analysis	1
		Decision Support Systems	1
		Methodology of Empirical Sciences	1
		Information Systems	1
		Diploma thesis I	2
		Information retrieval systems	2
		Deductive databases	2
		Database Security	2
		Implementation of Database Systems	2
		New database technologies	2
		Diploma thesis II	3
		Diploma seminar	3
		Multimedia Databases	3

13. Plan of studies (attachment no. ……)

Approved by faculty student government legislative body:

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

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

....
Date, Dean’s signature

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Zał. nr 2 do ZW 64/2012

Attachment no. …. to Programme of Education

PROGRAMME OF STUDIES

SPECIALIZATION: Information Systems

1. Description

Number of semesters: 3	*Number ECTS points necessary to obtain qualifications: 90*
Prerequisites (particularly for the second-level studies): *Competition of the first level study diplomas.* *Required: Bachelor Degree, preferably in computer science or in a related area. Applicants with a bachelor degree outside of computer science must demonstrate significant proficiency in computer science. Any area of requirements can be satisfied through courses completed at the bachelor level or by suitable experience.* *Each application is assessed individually on its merits.* *Description of learning outcomes for second degree in Computer Science does not apply to the following learning outcomes listed in the description of qualifications of the second degree in the field of education corresponding to an area of technical sciences*	*Upon completion of studies graduate obtains* *professional degree of: magister (MSc)* *~~1st~~/2nd* level qualifications*

knowledge: T2A_W06, T2A_W08 *skills: T2A_U13, T2A_U14* *social competences: T2A_K01, T2A_K02, T2A_K03, T2A_K04* *The candidate who on completion of degree studies and other forms of education did not receive some of the above. competence, may take a second degree in Computer Science, where the deficiency of competence can be achieved by the completion of classes in dimension than 30 ECTS credits*	
Possibility of continuing studies: *The possibility of undertaking doctoral studies (third degree)*	*Graduate profile, employability:* *At the second level of study. students can choose 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 specializations are given in English.* *The result of education is the knowledge, skills and social competence, which are included in annex No. 1 to the Education Program.*

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	Extended knowledge in the field of specialization *Gained skills:* *• is able to solve complex computing tasks using advanced informatics techniques in the field of studied specialization: security and reliability of information systems, intelligent information systems, Internet and mobile technology, software engineering, systems design, database systems, information systems, decision support systems, teleinformatic* *• is able to create models, analyze them and takes decision for different types of objects* *• acquires information from literature, databases and other sources, also in English, integrates obtained information, interprets it, critically evaluates, conclusions and formulates justifies opinions* *• communicates using a variety of techniques, also in English, prepares a elaboration in Polish language and short scientific report in English on the results of their own research. In the case of foreign students can prepare a short reserch report in Polish, but the full report in English* *• defines the directions of further learning and implements the process of self-learning* *A graduate can be employed in IT companies as well as in companies and organizations that uses tools and information systems as managers or specialist. They can work as: System Analyst, Programmer Analyst, System Consultant, designer of information systems, manager, system architect , etc.*

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[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

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 studies is carried out at 12 specializations (9 in Polish language, 3 in English language) that reflect the current needs of the region, and the place and role of the Wrocław University of Technology as a leading university and research centre in the region. Differentiation of substantive specialization is justified by the dynamically changing of market needs, and by the academics staff having achievements at the highest level in the discipline of computer science. Development of specialties takes place in the framework of international agreements and international research and teaching programs (eg. an international agreement with universities in Vietnam contributed to the creation of Intelligent Information Systems specialization).Moreover, development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, in which students take part. They can carrying out research as well as diploma theses. Teaching at a high level must be based on adequate laboratory facilities in which students can develop their skills. The Institute has the necessary computing equipment, laboratories and software to conduct teaching at the second study level, but in accordance to the mission of the university - is currently under construction the project of a new building (investment shared with the Faculty of Mechanical Engineering and the Faculty of Chemistry), in which will be built complex of 16 specialized teaching laboratories for students of the second and third degree level of study in Computer Science.*

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[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

	These are the following laboratories: Safety and Reliability of Information Systems Laboratory, Intelligent Multimedia Data Mining Systems Laboratory, Modeling and Analysis of Web-based Systems Laboratory, Software Engineering Laboratory, Information System Design and Knowledge Management Laboratory, Advanced Database Systems Laboratory, Multimedia Laboratory, Intelligent multi-agent systems and sensors networks Laboratory, Wired and Wireless Computer Networks and Engineering of Teleinformatic Traffic Laboratory, System Recognition and Data Exploration Laboratory, Internet Testing and Measurement Laboratory, Multimedia and Mobile Technologies Laboratory, Laboratory and Scaled Hybrid Processing Technology, Internet of Things, Web of Things Technologies Laboratory, Intelligent Measurement Systems Smart Grid Laboratory, Application of Modelling, Identification and Optimization in Medicine and Sport Laboratory. *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, 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*

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[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

	Institute of Informatics are as follows: Capgemini, IBM, Microsoft Corp., Nokia Siemens Networks, Volvo, InsERT.

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

Fields of science: technical sciences

Scientific discipline: informatics

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

They correspond with the demands of:

a) Institutions and business that run a production, commercial, service or research activity for experts of IT departments who are engaged in maintaining/development of information tools supporting this activity at strategic level (planning, management),

b) Producers of management and control information systems – for salesmen and workers of software production departments (account managers, analysts, designers, testers).

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[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. List of education modules:

4.1. List of obligatory modules:

4.1.1 List of general education modules

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				
0	0	0	0	0	0	0	0	0

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	INZ 003758W	Advanced Methods and Techniques of Data Analysis	2	0	0	0	0	K2INF_W01 K2INF_W05	30	60	2	1,2	T	Z			PD	Ob.
2	INZ 003758L	Advanced Methods and Techniques of Data Analysis	0	0	2	0	0	K2INF_U05	30	120	4	2,4	T	Z		P	PD	Ob.
		Total	2		2				60	180	6	3,6						

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[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)
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[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				
2		2			60	180	6	3,6

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	INZ 003760C	Modeling and Business Analysis	0	2	0	0	0	K2INF_U06	30	90	3	1,8	T	Z			K	Ob.
2	INZ 003760W	Modeling and Business Analysis	1	0	0	0	0	K2INF_W03	15	60	2	1,2	T	E			K	Ob.
3	INZ 003762S	Information Systems	0	0	0	0	2	K2INF_W04	30	60	2	1,2	T	Z			K	Ob.
4	INZ 003762W	Information Systems	1	0	0	0	0	K2INF_W04	15	60	2	1,2	T	Z			K	Ob.
5	INZ 003761C	Decision Support Systems	0	1	0	0	0	K2INF_U05	15	30	1	0,6	T	Z			K	Ob.
6	INZ	Decision Support Systems	0	0	0	1	0	K2INF	15	60	2	1,2	T	Z		P	K.	Ob.

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[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

	003761P							_U05										
7	INZ 003761W	Decision Support Systems	1	0	0	0	0	K2INF _W02	15	60	2	1,2	T	E			K	Ob.
8	INZ 003759P	Teletraffic theory and engineering	0	0	0	2	0	K2INF_ U05	30	90	3	1,8	T	Z		P	K	Ob.
9	INZ 003759W	Teletraffic theory and engineering	1	0	0	0	0	K2INF _W04	15	30	1	0,6	T	Z			K	Ob.
		Total	6	3	0	3	2		270	630	21	12,6						

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]
pr	sem							
6	3	0	3	2	270	630	21	12,6

4.2 List of optional modules

4.2.1 List of general education modules

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		Foreign language 1	0	3	0	0	0	K2INF	45	60	2	1,2	T	Z	O		KO	W

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[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

								_U04											
2		Foreign language 2	0	1	0	0	0	K2INF _U04	15	30	1	0,6	T	Z	O		KO	W
		Total		4					60	90	3	1,8						

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]
pr	sem							
	4				60	90	3	1,8

4.2.4 List of specialization modules

4.2.4.1 *Specialization subjects (e.g. whole specialization)* modules *(min. 60 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	INZ03797W	Designing and Management of Information Systems	2					K2INF_W03 K2INF_W04 K2INF_W06	30	120	4	2,4	T	E			S	W
2	INZ03797P	Designing and Management of Information Systems				2		K2INF_U05 K2INF_U08	30	120	4	2,4	T	Z		P	S	W
3	INZ 003799W	Integration of Information Systems	2					K2INF_W06	30	120	4	2,4	T	E			S	W
4	INZ	Integration of Information Systems				2		K2INF_U08	30	90	3	1,8	T	Z		P	S	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

	003799P																	
5	INZ 003798S	Prospective of Information Systems Development					2	K2INF_W06 K2INF_U01 K2INF_U02 K2INF_U03	30	90	3	1,8	T	Z			S	W
6	INZ 003801W	Advanced Multimedia Technologies in Information Systems	2					K2INF_W05 K2INF_W06	30	90	3	1,8	T	Z			S	W
7	INZ 003801L	Advanced Multimedia Technologies in Information Systems			2			K2INF_U05 K2INF_U08	30	90	3	1,8	T	Z		P	S	W
8	INZ 003809W	Advanced Internet Information Search	2	0	0	0	0	K2INF_W06	30	90	3	1,8	T	Z			S	W
9	INZ 003809S	Advanced Internet Information Search	0	0	0	0	1	K2INF_W06 K2INF_U01 K2INF_U02 K2INF_U03	15	30	1	0,6		Z			S	W
10	INZ 003810W	Social Media	2	0	0	0	0	K2INF_W06	30	90	3	1,8	T	Z			S	W
11	INZ 003810S	Social Media	0	0	0	0	1	K2INF_W06 K2INF_U01 K2INF_U02 K2INF_U03	15	30	1	0,6	T	Z			S	W
12	INZ 003802W	Business Information Systems	2	0	0	0	0	K2INF_W06	30	90	3	1,8	T	Z			S	W
13	INZ 003802P	Business Information Systems	0	0	0	2	0	K2INF_U08	30	90	3	1,8	T	Z		P	S	W
14	INZ 003811W	Digital Image and Video Processing	2	0	0	0	0	K2INF_W06	30	90	3	1,8	T	Z			S	W
15	INZ 003811L	Digital Image and Video Processing	0	0	1	0	0	K2INF_U08	15	30	1	0,6	T	Z		P	S	W
16	INZ 003812W	Speech Recognition and Synthesis	2	0	0	0	0	K2INF_W06	30	90	3	1,8	T	Z			S	W
17	INZ 003812L	Speech Recognition and Synthesis	0	0	1	0	0	K2INF_U08	15	30	1	0,6	T	Z		P	S	W
18	INZ 003818P	Degree Work I						K2INF_U08	30	60	2	1,2	T	Z			S	W

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[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

19	INZ 003819D	Degree Work II						K2INF_U08	150	540	18	10,8	T	Z			S	W
20	INZ 003820S	Diploma seminar					2	K2INF_U08	30	60	2	1,2	T	Z			S	W
		Total	16	0	4	6	6		660	2040	68	40,8						

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				
16	0	4	6	6	660	2040	68	40,8
12	*0*	*3*	*6*	*5*	*570*	*1800*	*60*	*36*

Total number of hours, ZZU hours, CNPS hours, ECTS points and ECTS points for BK classes including all the alternatives of optional courses.
Total number of hours, ZZU hours, CNPS hours, ECTS points and ECTS points for BK classes resulting from plan of the studies (e.g. including two optional courses).

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]**	**Code**

Training duration	**Training objective**

4.4 Diploma dissertation module

[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

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
2	**20**	
Character of diploma dissertation		
Literature survey, project, computer program, etc.		
Number of BK[1] ECTS points	6,6	

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])

48,6 ECTS

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

[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

Number of ECTS points for obligatory subjects …….	27
Number of ECTS points for optional subjects ….	63
Total number of ECTS points	90

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 …….	16
Number of ECTS points for optional subjects ….	1
Total number of ECTS points	17

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)

3 ECTS points

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

63 ECTS points

11. Range of diploma dissertation

Range for all specializations

1 Modeling and metamodeling.

2 Properties and applications of UML and LOTOS languages.

[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

3 Problems of transformation and consistency models.
4 Validation and verification of models.
5 The differences between information retrieval and data searching.
6 Operation of an information system on the network.
7 Multimedia technologies used in information systems.
8 The effectiveness of information systems.
9 The tasks of computer network design.
10 Network Traffic Classification.
11 Network Management.
12 Methods of fixing bugs in ICT systems.
13 Quality of service concept in telecommunication networks.
14 The concept of decision-making system and computerized decision support system.
15 Systems engineering approach.
16 Decision problems for complex operations.
17 Basic problems, methods and algorithms of discrete optimization.
18 The basic method of "soft-computing (smart)".
19 Decision making under uncertainty.
20 Methods and algorithms for recognition.
21 Expectations methodology of science.
22 Modern sciencemetric methods.

Range of Information Systems specialization:

1. Types of information system documentation created during system designing and implementation.
2. Cost estimate of IT project.
3. Management of versions and configurations supporting system.
4. Shedules of IT undertaking.
5. Standards, norms and legal regulations reffering to IT projects.
6. Characteristics and tasks of ESB bus.

[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

7. Modeling of data exchange structures using XML schema.
8. Integration of business processes using network services.
9. Data access protection: coding and biometrics.
10. Electronic signature.
11. Electronic banking and Internet secure payment systems.
12. Multimodal Signal processing: multimodal analysis, multimodal information fusion, methods of modalities integration.
13. Multimodal human-computer interaction: multimodal input, output modalities integration.
14. Multimodal information gathering, indexing and retrieval. Multimodal data bases.
15. Digital media processing in multimodal communication.

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)*
		Advanced Methods and Techniques of Data	1
		Teletraffic Theory and Engineering	1
		Modeling and Business Analysis	1
		Decision Support Systems	1
		Methodology of Empirical Sciences	1
		Information Systems	1
		Diploma Thesis I	2
		Designing and Management of Information Systems	2
		Integration of Information Systems	2
		Prospective of Information Systems Development	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

		Advanced Multimedia Technologies in Information Systems	2
		Optional Course I	2
		Business Information Systems	3
		Diploma Thesis II	3
		Diploma Seminar	3
		Optional Course II	3

13. Plan of studies (attachment no. ……)

Approved by faculty student government legislative body:

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

....
Date, Dean's signature

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

Zał. nr 2 do ZW 64/2012

Attachment no. 2 to Programme of Education

PROGRAMME OF STUDIES
Main field of study: Computer Science
Specialization: Decision Support Systems

1. Description

Number of semesters: 3	*Number ECTS points necessary to obtain qualifications: 90*
Prerequisites (particularly for the second-level studies): *Competition of the first level study diplomas.* *Required: Bachelor Degree, preferably in computer science or in a related area. Applicants with a bachelor degree outside of computer science must demonstrate significant proficiency in computer science. Any area of requirements can be satisfied through courses completed at the bachelor level or by suitable experience.* *Each application is assessed individually on its merits.* *Description of learning outcomes for second degree in Computer Science does not apply to the following learning outcomes listed in the description of qualifications of the second degree in the field of education corresponding to an area of technical sciences*	*Upon completion of studies graduate obtains* *professional degree of: magister (MSc)* *~~1st~~/2nd* level qualifications*

knowledge: T2A_W06, T2A_W08 *skills: T2A_U13, T2A_U14* *social competences: T2A_K01, T2A_K02, T2A_K03, T2A_K04* *The candidate who on completion of degree studies and other forms of education did not receive some of the above. competence, may take a second degree in Computer Science, where the deficiency of competence can be achieved by the completion of classes in dimension than 30 ECTS credits*	
Possibility of continuing studies: *The possibility of undertaking doctoral studies (third degree)*	*Graduate profile, employability:* *At the second level of study. students can choose 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 specializations are given in English.* *The result of education is the knowledge, skills and social competence, which are included in annex No. 1 to the Education Program.* *Extended knowledge in the field of specialization*

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[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

	Gained skills: *• is able to solve complex computing tasks using advanced informatics techniques in the field of studied specialization: security and reliability of information systems, intelligent information systems, Internet and mobile technology, software engineering, systems design, database systems, information systems, decision support systems, teleinformatic* *• is able to create models, analyze them and takes decision for different types of objects* *• acquires information from literature, databases and other sources, also in English, integrates obtained information, interprets it, critically evaluates, conclusions and formulates justifies opinions* *• communicates using a variety of techniques, also in English, prepares a elaboration in Polish language and short scientific report in English on the results of their own research. In the case of foreign students can prepare a short reserch report in Polish, but the full report in English* *• defines the directions of further learning and implements the process of self-learning* *A graduate can be employed in IT companies as well as in companies and organizations that uses tools and information systems as managers or specialist. They can work as: System Analyst, Programmer Analyst, System Consultant, designer of information systems, manager, system architect , etc.*
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 studies is carried out at 12*

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[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

	specializations (9 in Polish language, 3 in English language) that reflect the current needs of the region, and the place and role of the Wrocław University of Technology as a leading university and research centre in the region. Differentiation of substantive specialization is justified by the dynamically changing of market needs, and by the academics staff having achievements at the highest level in the discipline of computer science. Development of specialties takes place in the framework of international agreements and international research and teaching programs (eg. an international agreement with universities in Vietnam contributed to the creation of Intelligent Information Systems specialization).Moreover, development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, in which students take part. They can carrying out research as well as diploma theses. Teaching at a high level must be based on adequate laboratory facilities in which students can develop their skills. The Institute has the necessary computing equipment, laboratories and software to conduct teaching at the second study level, but in accordance to the mission of the university - is currently under construction the project of a new building (investment shared with the Faculty of Mechanical Engineering and the Faculty of Chemistry), in which will be built complex of 16 specialized teaching laboratories for students of the second and third degree level of study in Computer Science. *These are the following laboratories: Safety and Reliability of Information Systems Laboratory, Intelligent Multimedia Data Mining Systems Laboratory, Modeling and Analysis of Web-based Systems Laboratory, Software Engineering Laboratory, Information System Design and Knowledge Management Laboratory, Advanced Database Systems Laboratory, Multimedia Laboratory, Intelligent multi-agent systems*

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[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

	and sensors networks Laboratory, Wired and Wireless Computer Networks and Engineering of Teleinformatic Traffic Laboratory, System Recognition and Data Exploration Laboratory, Internet Testing and Measurement Laboratory, Multimedia and Mobile Technologies Laboratory, Laboratory and Scaled Hybrid Processing Technology, Internet of Things, Web of Things Technologies Laboratory, Intelligent Measurement Systems Smart Grid Laboratory, Application of Modelling, Identification and Optimization in Medicine and Sport Laboratory. *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, 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.*

2. Fields of science and scientific disciplines to which educational effects apply:
Technical Sciences, Computer Science

[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

Fields of science: technical sciences
Scientific discipline: informatics

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

Educational effects meet labor market needs of:

a) institutions and manufacturing, trade, service or research companies concerning IT specialists working in maintenance/development of computer science tools supporting their strategic activity (planning, management),

b) manufacturers of control and (or) management computer systems concerning employees from sales departments and software production departments (e.g. designers, testers, analysts, specialists responsible for personal contacts with clients).

[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. List of education modules:
4.1. List of obligatory modules:
4.1.1 List of general education modules

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				
0	0	0	0	0	0	0	0	0

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	INZ 003758W	Advanced Methods and Techniques of Data Analysis	2	0	0	0	0	K2INF_W01 K2INF_W05	30	60	2	1,2	T	Z			PD	Ob.
2	INZ 003758L	Advanced Methods and Techniques of Data Analysis	0	0	2	0	0	K2INF_U05	30	120	4	2,4	T	Z		P	PD	Ob.
		Total	2		2				60	180	6	3,6						

[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				
2		2			60	180	6	3,6

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	INZ 003760C	Modeling and Business Analysis	0	2	0	0	0	K2INF_U06	30	90	3	1,8	T	Z			K	Ob.
2	INZ 003760W	Modeling and Business Analysis	1	0	0	0	0	K2INF_W03	15	60	2	1,2	T	E			K	Ob.
3	INZ 003762S	Information Systems	0	0	0	0	2	K2INF_W04	30	60	2	1,2	T	Z			K	Ob.
4	INZ 003762W	Information Systems	1	0	0	0	0	K2INF_W04	15	60	2	1,2	T	Z			K	Ob.
5	INZ 003761C	Decision Support Systems	0	1	0	0	0	K2INF_U05	15	30	1	0,6	T	Z			K	Ob.
6	INZ 003761P	Decision Support Systems	0	0	0	1	0	K2INF_U05	15	60	2	1,2	T	Z		P	K.	Ob.
7	INZ 003761W	Decision Support Systems	1	0	0	0	0	K2INF_W02	15	60	2	1,2	T	E			K	Ob.

[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	INZ 003759P	Teletraffic theory and engineering	0	0	0	2	0	K2INF_U05	30	90	3	1,8	T	Z		P	K	Ob.
9	INZ 003759W	Teletraffic theory and engineering	1	0	0	0	0	K2INF_W04	15	30	1	0,6	T	Z			K	Ob.
		Total	6	3	0	3	2		270	630	21	12,6						

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]
pr	sem							
6	3	0	3	2	270	630	21	12,6

4.2 List of optional modules

4.2.1 List of general education modules

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		Foreign language 1	0	3	0	0	0	K2INF_U04	45	60	2	1,2	T	Z	O		KO	W
2		Foreign language 2	0	1	0	0	0	K2INF_U04	15	30	1	0,6	T	Z	O		KO	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

	Total		4					60	90	3	1,8						

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]
pr	sem							
	4				60	90	3	1,8

4.2.4 List of specialization modules

4.2.4.1 *Specialization subjects (e.g. whole specialization)* modules *(min. 60. 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	INZ003773W	Decision Making in Operation Systems	2	0	0	0	0	K2INF_W06	30	109	4	2,4	T	E			S	W
2	INZ003773P	Decision Making in Operation Systems	0	0	0	1	0	K2INF_U08	15	109	3	1,8	T	Z		P	S	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

3	INZ003773S	Decision Making in Operation Systems	0	0	0	0	2	K2INF_U08	30	52	2	1,2	T	Z			S	W
4	INZ003828W	Intelligent Decision Support Systems	2	0	0	0	0	K2INF_W06	30	40	1	0,6	T	Z			S	W
5	INZ003828C	Intelligent Decision Support Systems	0	1	0	0	0	K2INF_U08	15	60	2	1,2	T	Z			S	W
6	INZ003828L	Intelligent Decision Support Systems	0	0	1	0	0	K2INF_U08	15	60	2	1,2	T	Z		P	S	W
7	INZ003828P	Intelligent Decision Support Systems	0	0	0	2	0	K2INF_U08	30	110	4	2,4	T	Z		P	S	W
8	INZ003768W	System Identification and Pattern Recognition Techniques in Computer Science	2	0	0	0	0	K2INF_W06	30	120	4	2,4	T	E			S	W
9	INZ003768C	System Identification and Pattern Recognition Techniques in Computer Science	0	2	0	0	0	K2INF_U08	30	90	3	1,8	T	Z			S	W
10	INZ003768L	System Identification and Pattern Recognition Techniques in Computer Science	0	0	2	0	0	K2INF_U08	30	90	3	1,8	T	Z		P	S	W
11	INZ003831W	Control of Computer Systems	2	0	0	0	0	K2INF_W06	30	50	2	1,2	T	Z			S	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

12	INZ003831P	Control of Computer Systems	0	0	0	1	0	K2INF_U08	15	70	2	1,2	T	Z		P	S	W
13	INZ003830W	Implementation of Decision Support Systems	1	0	0	0	0	K2INF_W06	15	60	2	1,2	T	Z			S	W
14	INZ003830L	Implementation of Decision Support Systems	0	0	1	0	0	K2INF_U08	15	30	1	0,6	T	Z		P	S	W
15	INZ003830P	Implementation of Decision Support Systems	0	0	0	2	0	K2INF_U08	30	90	3	1,8	T	Z		P	S	W
16	INZ003818P	Diploma Thesis I				2		K2INF_U08	30	60	2	1,2	T	Z			S	W
17	INZ003819D	Diploma Thesis II	0	0	0	10	0	K2INF_U08	150	540	18	10,8	T	Z			S	W
18	INZ003820S	Diploma Seminar	0	0	0	0	2	K2INF_U08	30	60	2	1,2	T	Z			S	W
		Total	9	3	4	18	4		570	1800	60	36						

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				
9	3	4	18	4	570	1800	60	36

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

[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

Name of training			
Number of ECTS points	**Number of ECTS points for BK classes[1]**	**Training crediting mode**	**Code**
-	-	-	

Training duration	Training objective
-	-

4.4 Diploma dissertation module

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
2	20	
Character of diploma dissertation		
Literature survey, project, computer program, etc.		
Number of BK[1] ECTS points	6,6	

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

[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

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])

48,6 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 ….	63
Total number of ECTS points	90

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 …….	9
Number of ECTS points for optional subjects ….	18
Total number of ECTS points	90

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)

3 ECTS points

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

63 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

11. Range of diploma dissertation

....

Range for all specializations

1 Modeling and metamodeling.
2 Properties and applications of UML and LOTOS languages.
3 Problems of transformation and consistency models.
4 Validation and verification of models.
5 The differences between information retrieval and data searching.
6 Operation of an information system on the network.
7 Multimedia technologies used in information systems.
8 The effectiveness of information systems.
9 The tasks of computer network design.
10 Network Traffic Classification.
11 Network Management.
12 Methods of fixing bugs in ICT systems.
13 Quality of service concept in telecommunication networks.
14 The concept of decision-making system and computerized decision support system.
15 Systems engineering approach.
16 Decision problems for complex operations.
17 Basic problems, methods and algorithms of discrete optimization.
18 The basic method of "soft-computing (smart)".
19 Decision making under uncertainty.
20 Methods and algorithms for recognition.
21 Expectations methodology of science.
22 Modern sciencemetric methods.

Range for Decision Support Systems specjalization

[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

1. Algorithms for identification of static plants.
2. Identification of time-varying plants.
3. Identification of dynamic plants.
4. Adaptive and extremal control.
5. Learning control systems.
6. Control of plants with knowledge representation.
7. Application of neural networks to control, fuzzy control.
8. Design, control and management in manufacturing systems.
9. Complexes of operations.
10. Allocation in complexes of operations.
11. Task scheduling.
12. Optimization in networks- selected algorithms.
13. Methods and solution algorithms for NP-hard optimization problems.
14. Application of artificial intelligence techniques and metaheuristics to combinatorial problems.
15. Admission control in computer networks.
16. Rate allocation in computer networks.
17. Congestion control in computer networks.
18. Allocation problems in computer networks.
19. Control of task allocation.
20. Application of MVC
21. Integration methods of different platforms applications.
22. Architecture of application for mobile platforms. Comparison with client-server application.
23. Examples of computer decision support systems.

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...*

[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

			(number of semester)
1.	INZ 003758W	Advanced Methods and Techniques of Data Analysis	1
2.	INZ 003759W	Teletraffic Theory and Engineering	1
3.	INZ 003760W	Modeling and Business Analysis	
4.	INZ 003761W	Decision Support Systems	1
5.	INZ 003763W	Methodology of Empirical Sciences	1
6.	INZ 003762W	Information Systems	1
7.	INZ 003773W	Decision Making in Operation Systems	2
8.	INZ 003828W	Intelligent Decision Support Systems	2
9.	INZ 003768W	System Identification and Pattern Recognition Techniques in Computer Science	2
10.	INZ 003818P	Diploma Thesis I	2
11.	INZ 003831W	Control of Computer Systems	2
12.	INZ 003830W	Implementation of Decision Support Systems	2
13.	INZ 003819D	Diploma Thesis II	2
14.	INZ 003820S	Diploma Seminar	2

13. Plan of studies (attachment no. ……)

[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

Approved by faculty student government legislative body:

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

....
Date, Dean’s signature

[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

Zał. nr 2 do ZW 64/2012

Attachment no. …. to Programme of Education

PROGRAMME OF STUDIES

SPECIALIZATION: Information and communication technologies (teleinformatics)

1. Description

Number of semesters: 3	*Number ECTS points necessary to obtain qualifications: 90*
Prerequisites (particularly for the second-level studies): *Competition of the first level study diplomas.* *Required: Bachelor Degree, preferably in computer science or in a related area. Applicants with a bachelor degree outside of computer science must demonstrate significant proficiency in computer science. Any area of requirements can be satisfied through courses completed at the bachelor level or by suitable experience.* *Each application is assessed individually on its merits.* *Description of learning outcomes for second degree in Computer Science does not apply to the following learning outcomes listed in the description of qualifications of the second degree in the field of education corresponding to an area of technical sciences* *knowledge: T2A_W06, T2A_W08*	*Upon completion of studies graduate obtains* *professional degree of: magister (MSc)* *~~1st~~/2nd* level qualifications*

skills: T2A_U13, T2A_U14 *social competences: T2A_K01, T2A_K02, T2A_K03, T2A_K04* *The candidate who on completion of degree studies and other forms of education did not receive some of the above. competence, may take a second degree in Computer Science, where the deficiency of competence can be achieved by the completion of classes in dimension than 30 ECTS credits*	
Possibility of continuing studies: *The possibility of undertaking doctoral studies (third degree)*	*Graduate profile, employability:* *At the second level of study. students can choose 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 specializations are given in English.* *The result of education is the knowledge, skills and social competence, which are included in annex No. 1 to the Education Program.* *Extended knowledge in the field of specialization*

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[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

	Gained skills: *• is able to solve complex computing tasks using advanced informatics techniques in the field of studied specialization: security and reliability of information systems, intelligent information systems, Internet and mobile technology, software engineering, systems design, database systems, information systems, decision support systems, teleinformatic* *• is able to create models, analyze them and takes decision for different types of objects* *• acquires information from literature, databases and other sources, also in English, integrates obtained information, interprets it, critically evaluates, conclusions and formulates justifies opinions* *• communicates using a variety of techniques, also in English, prepares a elaboration in Polish language and short scientific report in English on the results of their own research. In the case of foreign students can prepare a short reserch report in Polish, but the full report in English* *• defines the directions of further learning and implements the process of self-learning* *A graduate can be employed in IT companies as well as in companies and organizations that uses tools and information systems as managers or specialist. They can work as: System Analyst, Programmer Analyst, System Consultant, designer of information systems, manager, system architect , etc.*

[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

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 studies is carried out at 12 specializations (9 in Polish language, 3 in English language) that reflect the current needs of the region, and the place and role of the Wrocław University of Technology as a leading university and research centre in the region. Differentiation of substantive specialization is justified by the dynamically changing of market needs, and by the academics staff having achievements at the highest level in the discipline of computer science. Development of specialties takes place in the framework of international agreements and international research and teaching programs (eg. an international agreement with universities in Vietnam contributed to the creation of Intelligent Information Systems specialization).Moreover, development of Informatics field of study is realized by participating of Institute of Informatics in different international research and educational programs, in which students take part. They can carrying out research as well as diploma theses. Teaching at a high level must be based on adequate laboratory facilities in which students can develop their skills. The Institute has the necessary computing equipment, laboratories and software to conduct teaching at the second study level, but in accordance to the mission of the university - is currently under construction the project of a new building (investment shared with the Faculty of Mechanical Engineering and the Faculty of Chemistry), in which will be built complex of 16 specialized teaching laboratories for students of the second and third degree level of study*

[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

	in Computer Science. *These are the following laboratories: Safety and Reliability of Information Systems Laboratory, Intelligent Multimedia Data Mining Systems Laboratory, Modeling and Analysis of Web-based Systems Laboratory, Software Engineering Laboratory, Information System Design and Knowledge Management Laboratory, Advanced Database Systems Laboratory, Multimedia Laboratory, Intelligent multi-agent systems and sensors networks Laboratory, Wired and Wireless Computer Networks and Engineering of Teleinformatic Traffic Laboratory, System Recognition and Data Exploration Laboratory, Internet Testing and Measurement Laboratory, Multimedia and Mobile Technologies Laboratory, Laboratory and Scaled Hybrid Processing Technology, Internet of Things, Web of Things Technologies Laboratory, Intelligent Measurement Systems Smart Grid Laboratory, Application of Modelling, Identification and Optimization in Medicine and Sport Laboratory.* *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, 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*

[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

	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.

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

Fields of science: technical sciences

Scientific discipline: informatics

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

The program gain is to prepare for design, analysis, management and optimization of ICT (Information and Communication Technology) distributed systems taking into account various aspects of data transfer, tasks and resources scheduling, computer communication resources efficient utilization, knowledge utilization for services personalization, delivery of quality of services as well as security, reliability and safety as well as current trends in contemporary data communication and processing systems. Such graduate profile satisfies requirements for alumni having knowledge about distributed ICT systems design, analysis and management.

[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. List of education modules:
4.1. List of obligatory modules:
4.1.1 List of general education modules

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				
0	0	0	0	0	0	0	0	0

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	INZ 003758W	Advanced Methods and Techniques of Data Analysis	2	0	0	0	0	K2INF_W01 K2INF_W05	30	60	2	1,2	T	Z			PD	Ob.
2	INZ 003758L	Advanced Methods and Techniques of Data Analysis	0	0	2	0	0	K2INF_U05	30	120	4	2,4	T	Z		P	PD	Ob.
		Total	2		2				60	180	6	3,6						

[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				
2		2			60	180	6	3,6

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	INZ 003760C	Modeling and Business Analysis	0	2	0	0	0	K2INF_U06	30	90	3	1,8	T	Z			K	Ob.
2	INZ 003760W	Modeling and Business Analysis	1	0	0	0	0	K2INF_W03	15	60	2	1,2	T	E			K	Ob.
3	INZ 003762S	Information Systems	0	0	0	0	2	K2INF_W04	30	60	2	1,2	T	Z			K	Ob.
4	INZ 003762W	Information Systems	1	0	0	0	0	K2INF_W04	15	60	2	1,2	T	Z			K	Ob.
5	INZ 003761C	Decision Support Systems	0	1	0	0	0	K2INF_U05	15	30	1	0,6	T	Z			K	Ob.
6	INZ 003761P	Decision Support Systems	0	0	0	1	0	K2INF_U05	15	60	2	1,2	T	Z		P	K.	Ob.
7	INZ 003761W	Decision Support Systems	1	0	0	0	0	K2INF_W02	15	60	2	1,2	T	E			K	Ob.

[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	INZ 003759P	Teletraffic theory and engineering	0	0	0	2	0	K2INF_U05	30	90	3	1,8	T	Z		P	K	Ob.
9	INZ 003759W	Teletraffic theory and engineering	1	0	0	0	0	K2INF_W04	15	30	1	0,6	T	Z			K	Ob.
		Total	6	3	0	3	2		270	630	21	12,6						

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]
pr	sem							
6	3	0	3	2	270	630	21	12,6

4.2 List of optional modules

4.2.1 List of general education modules

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		Foreign language 1	0	3	0	0	0	K2INF_U04	45	60	2	1,2	T	Z	O		KO	W
2		Foreign language 2	0	1	0	0	0	K2INF_U04	15	30	1	0,6	T	Z	O		KO	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

Total		4					60	90	3	1,8							

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]
pr	sem							
	4				60	90	3	1,8

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]
1	INZ003818P	Diploma thesis I	0	0	0	2	0	K2INF_U03	30	60	3	3	T	Z			S	Ob
2	INZ003803W	Methods of knowledge integration	2	0	0	0	0	K2INF_W05	30	120	4	4	T	Z			S	Ob
3	INZ003832WL	Intelligent information systems - services and applications	2	0	2	0	0	K2INF_W04	60	180	6	6	T	E			S	Ob
4	INZ003804WP	ICT project management	2	0	0	2	0	K2INF_W03	60	180	6	6	T	E			S	Ob

[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	INZ003805WL	Integrated management systems	2	0	1	0	0	K2INF_W03	45	150	5	5	T	Z			S	Ob
6	INZ003806WP	Infrastructure of intelligent building	2	0	0	2	0	K2INF_W02	60	180	6	6	T	Z			S	Ob
7	INZ003819D	Diploma thesis II	0	0	0	10	0	K2INF_U03	150	540	18	18	T	Z			S	Ob
8	INZ003820S	Diploma seminar	0	0	0	2	0	K2INF_U01 K2INF_U02	30	60	2	2	T	Z			S	Ob
9	INZ003807WP	Systems security and safety	2	0	0	2	0	K2INF_W04	60	150	5	5	T	Z			S	Ob
10	INZ003808WS	Computer communication and telecommunication systems	2	0	0	0	1	K2INF_W02	45	150	5	5	T	Z			S	Ob
		Total	14	0	3	20	1		570	1800	60	60						

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

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				
14	0	3	20	1	570	1800	60	60

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**

[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

Training duration	Training objective

4.4 Diploma dissertation module

Type of diploma dissertation	Licencjat / inżynier / magister / magister inżynier	
Number of diploma dissertation semesters	**Number of ECTS points**	**Code**
2	20	
Character of diploma dissertation		
Literature survey, project, computer program, etc.		
Number of BK[1] ECTS points	6,6	

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

[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

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])

48,6 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 ….	63
Total number of ECTS points	90

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 …….	36
Number of ECTS points for optional subjects ….	0
Total number of ECTS points	36

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)

3 ECTS points

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

63 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

11. Range of diploma dissertation

Range for all specializations

1 Modeling and metamodeling.
2 Properties and applications of UML and LOTOS languages.
3 Problems of transformation and consistency models.
4 Validation and verification of models.
5 The differences between information retrieval and data searching.
6 Operation of an information system on the network.
7 Multimedia technologies used in information systems.
8 The effectiveness of information systems.
9 The tasks of computer network design.
10 Network Traffic Classification.
11 Network Management.
12 Methods of fixing bugs in ICT systems.
13 Quality of service concept in telecommunication networks.
14 The concept of decision-making system and computerized decision support system.
15 Systems engineering approach.
16 Decision problems for complex operations.
17 Basic problems, methods and algorithms of discrete optimization.
18 The basic method of "soft-computing (smart)".
19 Decision making under uncertainty.
20 Methods and algorithms for recognition.
21 Expectations methodology of science.
22 Modern sciencemetric methods.

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[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

Range for Information and communication technologies (teleinformatics) specjalization

1. Knowledge integration methods
2. Intelligent information systems – services and applications
3. ICT project management methods
4. Integrated information systems
5. Integrated management systems
6. Infrastructure of intelligent building
7. ICT systems security and safety
8. Social networks and its applications
9. Contemporary ICT systems

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)*
		Advanced Methods and Techniques of Data	1
		Teletraffic Theory and Engineering	1
		Modeling and Business Analysis	1
		Decision Support Systems	1
		Methodology of Empirical Sciences	1
		Information Systems	2
		Diploma thesis I	2
		Methods of knowledge integration	2
		Intelligent information systems - services and applications	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

		ICT project management	3
		Integrated management systems	3
		Infrastructure of intelligent building	3
		Systems security and safety	3
		Computer communication and telecommunication systems	3
		Diploma thesis II	3
		Diploma seminar	3

13. Plan of studies (attachment no. ……)

Approved by faculty student government legislative body:

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

....
Date, Dean's signature

[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