1.	**Field of study**	**Computer Science**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2020/2021 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time
7.	Academic year for which the revised course structure applies	2020/2021

Obligatory courses

				form of teaching				year 1						year 2		
								semester 1			semester 2			semester 3		
No.	Module	Lang.	E/C	Total	L	O	Total ECTS	L	O	E	L	O	E	L	O	E
1	Algorithmics and Advanced Data Structures	PL	E	60	30	30	4	30	30	4						
2	Computer simulations	PL	E	60	30	30	4	30	30	4						
3	Modern programming languages	PL	E	60	30	30	4	30	30	4						
4	Statistical analysis in research	PL	Z	30	15	15	2	15	15	2						
5	Computer network technologies	PL	Z	45	15	30	3				15	30	3			
6	Concurrent programming	PL	Z	30	15	15	2				15	15	2			
7	Data mining	PL	E	60	30	30	4				30	30	4			
8	Managing IT projects and teams	PL	Z	30	10	20	2				10	20	2			
9	Monographic lecture - Combinatorial machine learning	EN	Z	30	30		2				30		2			
10	General acedemic module or diploma module **[see description below]*	*	*	45	15	30	4							15	30	4
11	Intellectual property protection	PL	Z	15	15		2							15		2
12	IT for the Blind and Visually Impaired	PL	Z	15	15		2							15		2
13	Mathematical modeling of optimization problems	PL	Z	30	15	15	3							15	15	3
	TOTAL Obligatory courses:			**510**	**265**	**245**	**38**	**105**	**105**	**14**	**100**	**95**	**13**	**60**	**45**	**11**

Diploma courses

				form of teaching				year 1						year 2		
								semester 1			semester 2			semester 3		
No.	Module	Lang.	E/C	Total	L	O	Total ECTS	L	O	E	L	O	E	L	O	E
1	Diploma courses group I **[see description below]*	*	*	135	45	90	12	45	90	12						
2	Introduction to scientific research.	PL	Z	2		2	1		2	1						
3	Master's seminar I	PL	Z	15		15	2		15	2						
4	Monographic lecture	PL	Z	20	20		1	20		1						
5	Diploma courses group II **[see description below]*	*	*	135	45	90	12				45	90	12			
6	Master's seminar II	PL	Z	30		30	2					30	2			
7	Master's workshop	PL	Z	45		45	3					45	3			
8	Diploma courses group III **[see description below]*	*	*	45	15	30	4							15	30	4
9	Master's seminar III	PL	Z	30		30	10								30	10

10	Master's workshop	PL	Z	45		45	5											45	5
	TOTAL Diploma courses:			**502**	**125**	**377**	**52**	**65**	**107**	**16**	**45**	**165**	**17**	**15**	**105**	**19**
	TOTAL:			**1012**	**390**	**622**	**90**	**382**		**30**	**405**		**30**	**225**		**30**
TOTAL								**1012**								

The study ends with the awarding of a Master's Degree in the field of Computer Science.

* Groups of modules

Diploma courses group I

Description:						
The student selects three modules from the list. In the course of the whole education, no module can be repeated.						
Modules:	Lang.	**E/C**	**L**	**O**	**ECTS**
Administration of network services	PL	C	15	30	4
Advanced methods of data analysis	PL	C	15	30	4
Algorithmically generated graphics	PL	C	15	30	4
Artificial intelligence in computer graphics	PL	C	15	30	4
Biometric recognition and access control systems	PL	C	15	30	4
Cloud computing technologies	PL	C	15	30	4
cluster analysis algorithms in applications	PL	C	15	30	4
Computational Geometry	PL	C	15	30	4
Computational intelligence techniques	PL	C	15	30	4
Data analysis in business	PL	C	15	30	4
Data visualization	PL	C	15	30	4
Data warehouses	PL	C	15	30	4
Decision and association rules in knowledge data discovery	PL	C	15	30	4
Deep learning with neuralk networks	PL	C	15	30	4
Fractal Methods in Computer Graphics	PL	C	15	30	4
Fuzzy Sets nad Systems	PL	C	15	30	4
GPGPU computing	PL	C	15	30	4
Image and video processing techniques	PL	C	15	30	4
Image processing algorithms in biometrics and bioinformatics	PL	C	15	30	4
intelligent data processing	PL	C	15	30	4
Internet of Things technologies	PL	C	15	30	4
Internet protocols	PL	C	15	30	4
Introduction to data classificatin and clusterization in biometry	PL	C	15	30	4
Introduction to reverse engineering	PL	C	15	30	4
Machine learning in biometrics and bioinformatics	PL	C	15	30	4
Methods of group decision making	PL	C	15	30	4
Microcomputers and network couplers	PL	C	15	30	4
Mobile systems and applications	PL	C	15	30	4
Network Systems Security	PL	C	15	30	4
Object-relational database systems in biometry	PL	C	15	30	4
Outlier detection algorithms	PL	C	15	30	4
Procedural Content Generation	PL	C	15	30	4

Real-time Graphics	PL	C	15	30	4
Recommendation systems and social networks	PL	C	15	30	4
Script languages in data analysis	PL	C	15	30	4
Selected graph algorithms	PL	C	15	30	4
Systemy wspomagania decyzji	PL	C	15	30	4
Techniques for optimizing computer programs	PL	C	15	30	4
The concept of programming languages	PL	C	15	30	4
Web applications	PL	C	15	30	4
Wireless and sensor networks	PL	C	15	30	4

Diploma courses group II

Description:					
The student selects three modules from the list. In the course of the whole education, no module can be repeated.					
Modules:	Lang.	**E/C**	**L**	**O**	**ECTS**
Administration of network services	PL	C	15	30	4
Advanced methods of data analysis	PL	C	15	30	4
Algorithmically generated graphics	PL	C	15	30	4
Artificial intelligence in computer graphics	PL	C	15	30	4
Biometric recognition and access control systems	PL	C	15	30	4
Cloud computing technologies	PL	C	15	30	4
cluster analysis algorithms in applications	PL	C	15	30	4
Computational Geometry	PL	C	15	30	4
Computational intelligence techniques	PL	C	15	30	4
Data analysis in business	PL	C	15	30	4
Data visualization	PL	C	15	30	4
Data warehouses	PL	C	15	30	4
Decision and association rules in knowledge data discovery	PL	C	15	30	4
Deep learning with neuralk networks	PL	C	15	30	4
Fractal Methods in Computer Graphics	PL	C	15	30	4
Fuzzy Sets nad Systems	PL	C	15	30	4
GPGPU computing	PL	C	15	30	4
Image and video processing techniques	PL	C	15	30	4
Image processing algorithms in biometrics and bioinformatics	PL	C	15	30	4
intelligent data processing	PL	C	15	30	4
Internet of Things technologies	PL	C	15	30	4
Internet protocols	PL	C	15	30	4
Introduction to data classificatin and clusterization in biometry	PL	C	15	30	4
Introduction to reverse engineering	PL	C	15	30	4
Machine learning in biometrics and bioinformatics	PL	C	15	30	4
Methods of group decision making	PL	C	15	30	4
Microcomputers and network couplers	PL	C	15	30	4
Mobile systems and applications	PL	C	15	30	4
Network Systems Security	PL	C	15	30	4
Object-relational database systems in biometry	PL	C	15	30	4
Outlier detection algorithms	PL	C	15	30	4

Procedural Content Generation	PL	C	15	30	4
Real-time Graphics	PL	C	15	30	4
Recommendation systems and social networks	PL	C	15	30	4
Script languages in data analysis	PL	C	15	30	4
Selected graph algorithms	PL	C	15	30	4
Systemy wspomagania decyzji	PL	C	15	30	4
Techniques for optimizing computer programs	PL	C	15	30	4
The concept of programming languages	PL	C	15	30	4
Web applications	PL	C	15	30	4
Wireless and sensor networks	PL	C	15	30	4

Diploma courses group III

Description:					
The student selects one module from the list. In the course of the whole education, no module can be repeated.					
Modules:	Lang.	**E/C**	**L**	**O**	**ECTS**
Administration of network services	PL	C	15	30	4
Advanced methods of data analysis	PL	C	15	30	4
Algorithmically generated graphics	PL	C	15	30	4
Artificial intelligence in computer graphics	PL	C	15	30	4
Biometric recognition and access control systems	PL	C	15	30	4
Cloud computing technologies	PL	C	15	30	4
cluster analysis algorithms in applications	PL	C	15	30	4
Computational Geometry	PL	C	15	30	4
Computational intelligence techniques	PL	C	15	30	4
Data analysis in business	PL	C	15	30	4
Data visualization	PL	C	15	30	4
Data warehouses	PL	C	15	30	4
Decision and association rules in knowledge data discovery	PL	C	15	30	4
Deep learning with neuralk networks	PL	C	15	30	4
Fractal Methods in Computer Graphics	PL	C	15	30	4
Fuzzy Sets nad Systems	PL	C	15	30	4
GPGPU computing	PL	C	15	30	4
Image and video processing techniques	PL	C	15	30	4
Image processing algorithms in biometrics and bioinformatics	PL	C	15	30	4
intelligent data processing	PL	C	15	30	4
Internet of Things technologies	PL	C	15	30	4
Internet protocols	PL	C	15	30	4
Introduction to data classificatin and clusterization in biometry	PL	C	15	30	4
Introduction to reverse engineering	PL	C	15	30	4
Machine learning in biometrics and bioinformatics	PL	C	15	30	4
Methods of group decision making	PL	C	15	30	4
Microcomputers and network couplers	PL	C	15	30	4
Mobile systems and applications	PL	C	15	30	4
Network Systems Security	PL	C	15	30	4
Object-relational database systems in biometry	PL	C	15	30	4

Outlier detection algorithms	PL	C	15	30	4
Procedural Content Generation	PL	C	15	30	4
Real-time Graphics	PL	C	15	30	4
Recommendation systems and social networks	PL	C	15	30	4
Script languages in data analysis	PL	C	15	30	4
Selected graph algorithms	PL	C	15	30	4
Systemy wspomagania decyzji	PL	C	15	30	4
Techniques for optimizing computer programs	PL	C	15	30	4
The concept of programming languages	PL	C	15	30	4
Web applications	PL	C	15	30	4
Wireless and sensor networks	PL	C	15	30	4

General acedemic module or diploma module

Description:					
The student chooses one general academic module or one of the diploma modules not selected before.					
Modules:	Lang.	**E/C**	**L**	**O**	**ECTS**
Administration of network services	PL	C	15	30	4
Advanced methods of data analysis	PL	C	15	30	4
Algorithmically generated graphics	PL	C	15	30	4
Artificial intelligence in computer graphics	PL	C	15	30	4
Biometric recognition and access control systems	PL	C	15	30	4
Cloud computing technologies	PL	C	15	30	4
cluster analysis algorithms in applications	PL	C	15	30	4
Computational Geometry	PL	C	15	30	4
Computational intelligence techniques	PL	C	15	30	4
Data analysis in business	PL	C	15	30	4
Data visualization	PL	C	15	30	4
Data warehouses	PL	C	15	30	4
Decision and association rules in knowledge data discovery	PL	C	15	30	4
Deep learning with neuralk networks	PL	C	15	30	4
Fractal Methods in Computer Graphics	PL	C	15	30	4
Fuzzy Sets nad Systems	PL	C	15	30	4
GPGPU computing	PL	C	15	30	4
Image and video processing techniques	PL	C	15	30	4
Image processing algorithms in biometrics and bioinformatics	PL	C	15	30	4
intelligent data processing	PL	C	15	30	4
Internet of Things technologies	PL	C	15	30	4
Internet protocols	PL	C	15	30	4
Introduction to data classificatin and clusterization in biometry	PL	C	15	30	4
Introduction to reverse engineering	PL	C	15	30	4
Machine learning in biometrics and bioinformatics	PL	C	15	30	4
Methods of group decision making	PL	C	15	30	4
Microcomputers and network couplers	PL	C	15	30	4
Mobile systems and applications	PL	C	15	30	4
Network Systems Security	PL	C	15	30	4

Object-relational database systems in biometry	PL	C	15	30	4
Outlier detection algorithms	PL	C	15	30	4
Procedural Content Generation	PL	C	15	30	4
Real-time Graphics	PL	C	15	30	4
Recommendation systems and social networks	PL	C	15	30	4
Script languages in data analysis	PL	C	15	30	4
Selected graph algorithms	PL	C	15	30	4
Systemy wspomagania decyzji	PL	C	15	30	4
Techniques for optimizing computer programs	PL	C	15	30	4
The concept of programming languages	PL	C	15	30	4
Web applications	PL	C	15	30	4
Wireless and sensor networks	PL	C	15	30	4

Legend

Each semester consists of 15 weeks
E/C - examination/course work
E - ECTS
L - lecture, O - all forms of teaching excluding lecture (practical classes, laboratory classes, discussion classes, seminar, proseminar, language classes, field practice, workshop, internship, tutoring)