

University *of Ljubljana*  
Faculty *of Computer and Information Science*  
Faculty *of Mathematics and Physics*



**FIRST CYCLE**  
**INTERDISCIPLINARY UNIVERSITY STUDY PROGRAMME**  
**COMPUTER SCIENCE AND MATHEMATICS**

**HANDBOOK**

for students enrolled for the first time in the first year in the 2019/2020 academic year

Ljubljana, 2019

# INFORMATION ABOUT THE STUDY PROGRAMME COMPUTER SCIENCE AND MATHEMATICS

## Main objectives of the programme

The objectives of the programme cover the acquisition of skills to develop and work with new information technologies, to conduct research in the fields of mathematics and theoretical computing, and the skills to rapidly assimilate new knowledge in the fields of computer science and information technology and in related fields of mathematics.

## General competences

General competences of a graduate acquired through the programme:

- the ability to use abstraction and analyse problems,
- the ability to synthesise and critically assess solutions,
- the ability to apply knowledge in practice,
- the ability to transfer knowledge and professional communication and writing skills,
- the ability to search sources and critically analyse information,
- the ability to undertake autonomous professional work and work in an (international) group,
- develop professional responsibility and ethics.

## Subject-specific competences

Subject-specific competences of a graduate acquired through the programme:

- fundamental skills in the field of theoretical computing, logic and discrete mathematics covering basic and advanced theoretical knowledge, practical knowledge and skills essential for both the computer science and mathematics fields,
- translate practical problems into the language of mathematics and theoretical computer science and qualitatively analyse the mathematical problems obtained in this way,
- create algorithms to solve problems and implement developed algorithms in relevant programming environments,
- analyse and present results,
- understanding of computer science and information science content and integrating it into other professionally relevant fields (economics, financial mathematics, organisational science, etc.),
- practical knowledge and skills in the use of software, hardware and information technologies,
- first-cycle graduates are capable of independently performing less complex and complex developmental engineering and organisational tasks in their own fields,
- basic competences in the field of computer science and mathematics that enable the continuation of studies in the second cycle.

## Admission requirements

Enrolment in the programme is open to students who:

- a) have passed the general school-leaving examination (matura),
- b) have passed the vocational matura in any four-year secondary school programme and an examination in the matura subject of Mathematics; if the candidate has already passed this subject in the vocational matura, an examination in any other matura subject; the optional subject may not be a subject which the candidate has already taken in the vocational matura,
- c) have completed an academic secondary programme (gimnazija) or any four-year secondary school programme before 1 June 1995.

## Selection criteria for limited enrolment

If enrolment is limited, candidates referred to in points

a) and c) will be selected based on:

- overall grades in the general matura or school-leaving exam, 60% of points,

- GPA in years 3 and 4 of secondary school, 20% of points,
- grades in mathematics in years 3 and 4 of secondary school, 20% of points;

b) will be selected depending on:

- overall grades in the vocational matura, 30% of points,
- grade in one matura exam subject, 30% of points,
- GPA in years 3 and 4 of secondary school, 20% of points,
- grades in mathematics in years 3 and 4 of secondary school, 20% of points.

### Criteria for recognising knowledge and skills acquired prior to enrolment

The study programme enables the recognition of relevant knowledge acquired through non-formal or experiential learning. This knowledge can be recognised as part of the completed study requirements, generally at up to 6 ECTS for knowledge acquired outside the university. Formally acquired knowledge is recognised such that comparable study content of a programme is recognised at the level of ECTS ascribed to the acquired knowledge. In the recognition process certificates and other documents are taken into account.

### Assessment methods

The methods of assessment comply with the [UL Statutes](#) and are set out in the curriculums.

### Requirements for progression through the course

Requirements for progressing to a higher year.

Students who have completed course units consisting of 53 credit points may enrol in the second year.

Students who have completed all the requirements of the first year and course units consisting of 53 credits in the second year may enrol in the third year.

### Requirements for retaking a year

To retake a year, students must complete the following:

- a) at least half of the requirements from the study programme of that year (30 ECTS),
- b) all exams from the years before.

Students can only retake a year once in their course of study; changing programme is also considered retaking a year, because of the uncompleted requirements of the previous study programme.

### Requirements for transferring between programmes

In accordance with the Criteria for Transferring between Programmes, transferring is possible from study programmes which upon completion guarantee similar competences and which enable the recognition of at least half of the obligations based on the European Credit Transfer System (ECTS) from the first study programme relating to compulsory subjects of the second study programme. Transferring from other programmes is possible after the first year of study. Conditions for transfer to the interdisciplinary first-cycle academic study programme Computer Science and Mathematics from another programme:

- completed requirements for enrolment in the programme,
- the relevant authority of participating faculties defines, on the basis of a comparison of programmes, the requirements to be recognised and the year in which the candidate can enrol, and consequently issues a decision. Transferring to other programmes is possible on the basis of the provisions applicable to such programmes.

### Transfer from other programmes at the Faculty of Computer and Information Science

Transfer to the programme is possible after the first and second years of study at FRI.

Transfer is possible after the first year if in the programme Computer and Information Science (UN) candidates have completed the following subjects: Programming 1, Basics of Mathematical Analysis, Discrete Structures, Basics of Digital Circuits, Programming 2, Linear Algebra, Computer Communications and Architecture of Computer Systems. Candidates must also within one year pass

the exams in Analysis 2 and Discrete Structures 2 in the Computer Science and Mathematics programme.

After the second year transfer is possible if in the programme Computer and Information Science (UN) candidates have completed all the stated subjects from the first year and joint subjects from the second year (Algorithms and Data Structures 1 and 2, Basics of Databases, Computability and Computational Complexity and Principles of Programme Languages) in the programme Computer Science and Mathematics (UN). Candidates must also within one year pass the exams in Analysis 3, Combinatorics and Optimisation Methods in the Computer Science and Mathematics (UN) programme.

Transfer from programmes at the Faculty of Mathematics and Physics

Transfer to the programme is possible after the first and second years of study at FMF.

Transfer is possible after the first year if in the programme Mathematics (UN) candidates have completed the subjects Analysis 1, Algebra 1, Logic and Sets, Introduction to Programming and Computer practical classes. Candidates must also within one year pass the exams in Discrete Structures 2, Basics of Digital Circuits and Architecture of Computer Systems in the Computer Science and Mathematics (UN) programme.

After the second year transfer is possible if in the programme Mathematics (UN) candidates have completed all the stated subjects from the first year and the subjects Analysis 2a and 2b (or Analysis 2), Programming 1, Programming 2 and Discrete Mathematics 1. Candidates must also within one year pass the exams in Algorithms and Data Structures 1 and 2, Optimisation Methods, Principles of Programme Languages, Basics of Databases, Computability and Computational Complexity and Computer Communications in the Computer Science and Mathematics (UN) programme.

Requirements for completing the study programme

The requirements for completion of the proposed programme are the passing of all exams and other requirements, including the diploma seminar, in a total of 180 ECTS.

Requirements for completing individual parts of the programme if the programme contains them

The study programme contains no parts that can be completed individually. The programme is integral.

Professional or academic title (male)

- diplomirani inženir računalništva in matematike (UN)

Professional or academic title (female)

- diplomirana inženirka računalništva in matematike (UN)

Professional or academic title (abbreviated)

- dipl. inž. rač. in mat. (UN)

## CURRICULUM OF THE STUDY PROGRAMME WITH EXPECTED SUBJECT LECTURERS

No specified direction (Study programme)

### YEAR 1

No.	Course code	Study unit	Lecturer	Contact hours					Individ. work	Total	ECTS	Semester	Elective
				Lectures	Seminar	Tutorial	Laboratory work	Field work					
1.	27201	Analysis 1	Janez Mrčun, Sašo Strle	45		45			120	210	7	Fall	No
2.	27202	Discrete Structures 1	Primož Potočnik, Riste Škrekovski	45		45			90	180	6	Fall	No
3.	63204	Introduction to Digital Circuits	Nikolaj Zimic	45		30			105	180	6	Fall	No
4.	63277	Programming 1	Viljan Mahnič	45		30			105	180	6	Fall	No
5.	27203	Linear Algebra	Jakob Cimprič, Karin Cvetko-Vah	60		60			180	300	10	Fall, Spring	No

6.	27204	Analysis 2	Janez Mrčun, Sašo Strle	45		45			120	210	7	Spring	No
7.	27205	Discrete Structures 2	Primož Potočnik, Riste Škrekovski	45		45			90	180	6	Spring	No
8.	63278	Programming 2	Boštjan Slivnik	45		30			105	180	6	Spring	No
9.	63212	Computer Systems Architecture	Branko Šter	45		30			105	180	6	Spring	No
Total				420	0	360	0	0	1020	1800	60		

## YEAR 2

				Contact hours									
No.	Course code	Study unit	Lecturer	Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	Total	ECTS	Semester	Elective
1.	27207	Analysis 3	Aleš Vavpetič, Pavle Saksida	30		30			90	150	5	Fall	No
2.	27208	Combinatorics	Matjaž Konvalinka, Primož Potočnik, Sandi Klavžar	45		45			120	210	7	Fall	No
3.	63279	Algorithms and Data Structures I	Igor Kononenko	45		30			105	180	6	Fall	No
4.	63208	Fundamentals of Databases	Marko Bajec	45		30			105	180	6	Fall	No

5.	63283	Computability and Computational Complexity	Borut Robič	45		30			105	180	6	Fall	No
6.	27209	Topics in Mathematics	Primož Potočnik, Sergio Cabello Justo	30		30			90	150	5	Spring	No
7.	27210	Optimisation Methods	Arjana Žitnik, Marko Petkovšek	45		45			120	210	7	Spring	No
8.	63220	Principles of Programming Languages	Andrej Bauer	45		30			105	180	6	Spring	No
9.	63280	Algorithms and Data Structures I	Borut Robič	45		30			105	180	6	Spring	No
10.	63209	Computer Communications	Zoran Bosnić	45		30			105	180	6	Spring	No
Total				420	0	330	0	0	1050	1800	60		

### YEAR 3

				Contact hours									
No.	Course code	Study unit	Lecturer	Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	Total	ECTS	Semester	Elective
1.	27215	Numerical Methods	Bor Plestenjak, Emil Žagar, Marjetka Knez	45		45			120	210	7	Fall	No
2.	63214	Introduction to Artificial Intelligence	Zoran Bosnić	45		30			105	180	6	Fall	No

3.	0012	Module elective course 1/3		45		30			105	180	6	Fall	Yes
4.	0013	Module elective course 2/3		45		30			105	180	6	Fall	Yes
5.	27216	Probability and Statistics	Mihael Perman, Roman Drnovšek	60		60			180	300	10	Fall, Spring	No
6.	0014	Module elective course 3/3		45		30			105	180	6	Spring	Yes
7.	0001	Specialist electives		45		30			75	150	5	Spring	Yes
8.	0002	General electives		60		60			180	300	10	Spring	Yes
9.	63282	Diploma Seminar						20	100	120	4	Spring	No
Total				390	0	315	0	20	1075	1800	60		

### Year 3, Module Informatics

				Contact hours									
No.	Course code	Study unit	Lecturer	Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	Total	ECTS	Semester	Elective
1.	63249	Electronic Business	Denis Trček	45		30			105	180	6	Fall	Yes



2.	63226	Data Management Technologies	Matjaž Kukar	45	10	20			105	180	6	Fall	Yes
3.	63252	Information Systems Development	Marko Bajec	45	20	10			105	180	6	Spring	Yes
Total				135	30	60	0	0	315	540	18		

### Year 3, Module Software

				Contact hours									
No.	Course code	Study unit	Lecturer	Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	Total	ECTS	Semester	Elective
1.	63254	Software Development Processes	Branko Matjaž Jurič	45	10	20			105	180	6	Fall	Yes
2.	63264	System Software	Tomaž Dobravec	45	10	20			105	180	6	Fall	Yes
3.	63263	Analysis of Algorithms and Heuristic Problem Solving	Marko Robnik Šikonja	45	10	20			105	180	6	Spring	Yes
Total				135	30	60	0	0	315	540	18		

### Year 3, Module Computer Systems and Networks

				Contact hours									

No.	Course code	Study unit	Lecturer	Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	Total	ECTS	Semester	Elective
1.	63257	Computer Networks Modelling	Miha Mraz	45	10	20			105	180	6	Fall	Yes
2.	63261	Distributed Systems	Uroš Lotrič	45	10	20			105	180	6	Fall	Yes
3.	63259	Mobile and Wireless Networks	Nikolaj Zimic	45	10	20			105	180	6	Spring	Yes
		Total		135	30	60	0	0	315	540	18		

### Year 3, Module Artificial Intelligence

				Contact hours									
	Šifra	Ime	Nosilci	Predavanja	Seminarji	Vaje	Klinične vaje	Druge obl. štud.	Samostojno delo	Ure skupaj	ECTS	Semestri	Izbiren
1.	63266	Intelligent Systems	Marko Robnik Šikonja	45	6	24			105	180	6	Fall	Yes
2.	63267	Machine Perception	Matej Kristan	45	10	20			105	180	6	Fall	Yes
3.	63251	Introduction to Data Mining	Blaž Zupan	45	20	10			105	180	6	Spring	Yes
		Skupno		135	36	54	0	0	315	540	18		

### Year 3, Module Media Technologies

				Contact hours									
No.	Course code	Study unit	Lecturer	Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	Total	ECTS	Semester	Elective
1.	63269	Computer graphics and Game Technology	Matija Marolt	45	10	20			105	180	6	Fall	Yes
2.	63270	Multimedia Systems	Matej Kristan	45	10	20			105	180	6	Fall	Yes
3.	63287	Platform-Based Development	Veljko Pejović	45		30			105	180	6	Spring	Yes
		Total		135	20	70	0	0	315	540	18		

### Year 3, Specialist elective courses

				Contact hours									
No.	Course code	Study unit	Lecturer	Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	Total	ECTS	Semester	Elective
1.	27217	General Topology	Dušan Repovš, Janez Mrčun, Petar Pavešić	30		30			90	150	5	Fall	Yes
2.	27218	Algebraic Curves	Pavle Saksida, Tomaž Košir	30		30			90	150	5	Spring	Yes

3.	27219	Introduction to Geometrical Topology	Dušan Repovš, Sašo Strle	30		30			90	150	5	Spring	Yes
4.	27220	Affine and Projective Geometry	Aleš Vavpetič, Bojan Magajna, Tomaž Košir	30		30			90	150	5	Spring	Yes
5.	27221	Coding Theory and Cryptography	Arjana Žitnik, Marko Petkovšek, Primož Potočnik	30		30			90	150	5	Spring	Yes
6.	27222	Financial Mathematics 1	Janez Bernik, Mihael Perman, Tomaž Košir	30		30			90	150	5	Spring	Yes
7.	27223	Game Theory	Matjaž Konvalinka, Sergio Cabello Justo	45		45			90	180	6	Fall	Yes
8.	27224	Mathematical Modelling	Emil Žagar, George Mejak	30		30			90	150	5	Spring	Yes
9.	27225	Numerical Methods 2	Bor Plestenjak, Marjetka Knez	30		30			90	150	5	Spring	Yes

	Total	285	0	285	0	0	810	1380	46	
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