

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 2023/2024 academic year

Ljubljana, 2023

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

The following may enrol in the first-cycle Computer Science and Mathematics interdisciplinary academic study programme:

- a) a candidate who has passed the general school-leaving examination (matura);
- b) a candidate who has passed the vocational school-leaving examination in a programme of secondary professional or secondary technical education for the professions of electrical engineer, land surveying engineer, geotechnical engineer, construction engineer, chemical engineer, logistics engineer, media engineer, metallurgical engineer, environmental protection engineer, machine engineer, electronic communications engineer, mechatronics engineer or computer engineer, or the general school-leaving examination in mathematics. If the candidate has already passed this subject as part of the vocational school-leaving examination, they must have passed another subject for the general school-leaving examination, but it may not be one that they have already taken as part of vocational school-leaving examination;

c) a candidate who completed 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

- Bachelor of Science

Professional or academic title (abbreviated)

- B. Sc.

CURRICULUM OF THE STUDY PROGRAMME WITH EXPECTED SUBJECT LECTURERS

STUDY PROGRAMME CURRICULUM COMPUTER SCIENCE AND MATHEMATICS

Year 1

				Contact hours									
	University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
1.	0039511	Analysis 1	Janez Mrčun, Oliver Dragičević, Sašo Strle	45		45			120	210	7	1st semester	no
2.	0039514	Discrete Structures 1	Primož Potočnik, Riste Škrekovski	45		45			90	180	6	1st semester	no
3.	0039580	Introduction to Digital Circuits	Nikolaj Zimic	45		30			105	180	6	1st semester	no
4.	0039583	Programming 1	Luka Fürst	45		30			105	180	6	1st semester	no
5.	0039516	Linear algebra	David Dolžan, Jakob Cimprič, Klemen Šivic	60		60			180	300	10	All-year	no
6.	0039512	Analysis 2	Barbara Drinovec Drnovšek, Janez Mrčun, Sašo Strle	45		45			120	210	7	2nd semester	no
7.	0039515	Discrete Structures 2	Primož Potočnik, Riste Škrekovski, Sandi Klavžar	45		45			90	180	6	2nd semester	no
8.	0039584	Programming 2	Boštjan Slivnik	45		30			105	180	6	2nd semester	no

9.	0039576	Computer Systems Architecture	Branko Šter	45		30			105	180	6	2nd semester	no
Total				420	0	360	0	0	1020	1800	60		

Year 2

				Contact hours									
	University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
1.	0039522	Analysis 3	Aleš Vavpetič, Barbara Drinovec Drnovšek Pavle Saksida	30		30			90	150	5	1st semester	no
2.	0039525	Combinatorics	Matjaž Konvalinka, Primož Potočnik, Sandi Klavžar	45		45			120	210	7	1st semester	no
3.	0039586	Algorithms and data structures 1	Tomaž Hočevar	45		30			105	180	6	1st semester	no
4.	0039591	Basics of Databases	Marko Bajec	45		30			105	180	6	1st semester	no
5.	0039588	Computability and Computational Complexity	Borut Robič	45		30			105	180	6	1st semester	no
6.	0039523	Topics in Mathematics	Primož Potočnik, Petar Pavešič	30		30			90	150	5	2nd semester	no
7.	0039526	Optimization Methods	Arjana Žitnik	45		45			120	210	7	2nd semester	no

8.	0070335	Principles of Programming Languages	Andrej Bauer	45		30			105	180	6	2nd semester	yes
9.	0039587	Algorithms and data structures 2	Borut Robič	45		30			105	180	6	2nd semester	no
10.	0039585	Computer Communications	Zoran Bosnić	45		30			105	180	6	2nd semester	no
Total				420	0	330	0	0	1050	1800	60		

Year 3

				Contact hours									
	University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
1.	0039531	Numerical methods	Bor Plestenjak, Emil Žagar, Marjetka Knez	45		45			120	210	7	1st semester	no
2.	0039610	Introduction to Artificial Intelligence	Zoran Bosnić	45		30			105	180	6	1st semester	no
3.	0101002	Modulski izbirni predmet 1/3		45		30			105	180	6	1st semester	yes
4.	0101003	Modulski izbirni predmet 2/3		45		30			105	180	6	1st semester	yes
5.	0039533	Probability and Statistics	Mihael Perman, Roman Drnovšek	60		60			180	300	10	All-year	no
6.	0101005	Modulski izbirni predmet 3/3		45		30			105	180	6	2nd semester	yes
7.	0070324	General elective course FMF		45		30			75	150	5	2nd semester	yes

8.	0070326	Specialist elective course		60		60			180	300	10	2nd semester	yes
9.	0039530	Undergraduate Thesis						20	100	120	4	2nd semester	no
Total				390	0	315	0	20	1075	1800	60		

Year 3, Module Informatics

				Contact hours									
	University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
1.	0039614	Electronic Business	Denis Trček	45		30			105	180	6	1st semester	yes
2.	0039622	Data Management Technologies	Matjaž Kukar	45	10	20			105	180	6	1st semester	yes
3.	0100860	Information Systems Development	Marko Bajec	45	20	10			105	180	6	2nd semester	yes
Total				135	30	60	0	0	315	540	18		

Year 3, Module Software

				Contact hours									
	University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
1.	0039629	Software Development Processes	Branko Matjaž Jurič	45	10	20			105	180	6	1st semester	yes
2.	0039613	System Software	Tomaž Dobravec	45	10	20			105	180	6	1st semester	yes

3.	0100984	Analysis of Algorithms and Heuristic Problem Solving	Marko Robnik Šikonja	45	10	20			105	180	6	2nd semester	yes
Total				135	30	60	0	0	315	540	18		

Year 3, Module Computer Systems and Networks

				Contact hours									
University Course Code	Course title	Lecturers		Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
1.	0039625	Computer Networks Modeling	Miha Mraz	45	10	20			105	180	6	1st semester	yes
2.	0039627	Distributed Systems Computer	Uroš Lotrič	45		30			105	180	6	1st semester	yes
3.	0039623	Mobile and Wireless Networks	Nikolaj Zimic	45	10	20			105	180	6	2nd semester	yes
Total				135	20	70	0	0	315	540	18		

Year 3, Module Artificial Intelligence

				Contact hours									
University Course Code	Course title	Lecturers		Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
1.	0039643	Intelligent Systems	Marko Robnik Šikonja	45	6	24			105	180	6	1st semester	yes
2.	0070358	Machine Perception	Matej Kristan	45	10	20			105	180	6	1st semester	yes

3.	0100896	Introduction to Data Mining	Blaž Zupan	45	20	10			105	180	6	2nd semester	yes
Total				135	36	54	0	0	315	540	18		

Year 3, Module Media Technologies

				Contact hours									
University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective	
1.	0039619	Computer Graphics and Game Technology	Matija Marolt	45	10	20			105	180	6	1st semester	yes
2.	0070361	Multimedia Systems	Luka Čehovin Zajc	45	10	20			105	180	6	1st semester	yes
3.	0069537	Platform Based Development	Veljko Pejović	45		30			105	180	6	2nd semester	yes
Total				135	20	70	0	0	315	540	18		

Year 3, Specialist elective courses

				Contact hours									
University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective	
1.	0039569	General Topology	Dušan Repovš, Janez Mrčun, Petar Pavešić	30		30			90	150	5	1st semester	yes
2.	0039565	Algebraic Curves	Pavle Saksida, Jakob Cimprič, Tomaž Košir	30		30			90	150	5	2nd semester	yes

3.	0039572	Introduction to Geometric Topology	Dušan Repovš, Sašo Strle	30		30			90	150	5	2nd semester	yes
4.	0039564	Affine and Projective Geometry	Aleš Vavpetič, Tomaž Košir	30		30			90	150	5	2nd semester	yes
5.	0039571	Coding Theory and Cryptography	Arjana Žitnik, Primož Potočnik	30		30			90	150	5	2nd semester	yes
6.	0039566	Financial Mathematics 1	Janez Bernik, Mihael Perman, Tomaž Košir	30		30			90	150	5	2nd semester	yes
7.	0039570	Game Theory	Matjaž Konvalinka, Sergio Cabello Justo	45		45			90	180	6	1st semester	yes
8.	0039567	Mathematical Modelling	Emil Žagar, George Mejak	30		30			90	150	5	2nd semester	yes
9.	0039568	Numerical Methods 2	Bor Plestenjak, Marjetka Knez	30		30			90	150	5	2nd semester	yes
Total				285	0	285	0	0	810	1380	46		