UNIVERSITY OF LJUBLJANA | **FRI** | **Faculty of Computer and Information Science**

SECOND CYCLE
MASTER'S STUDY PROGRAMME
COMPUTER AND INFORMATION SCIENCE

HANDBOOK
for students enrolled for the first time in the first year in the 2026/2027 academic year

Ljubljana, 2026

INFORMATION ABOUT THE STUDY PROGRAMME COMPUTER AND INFORMATION SCIENCE

Main objectives of the programme

The master's study programme in Computer and Information Science is intended to extend, broaden and enhance knowledge and skills acquired in the first cycle, and for the mastery of advanced practical and theoretical knowledge in the field of computer and information science. The programme keeps abreast of rapid technological progress and offers a foundation for lifelong learning and career success in both the local and international environment. The programme also provides a basis for research and development work and for a career in academia. Holders of the master's degree are capable of assuming senior and leading positions in industry, management, science and research. The programme is divided into thematic sets, which enables students to select subjects with aligned content. On their own initiative students can involve themselves in projects being pursued in individual Faculty research laboratories.

General competences

Masters of computer and information science build upon the competences acquired in the first cycle. Those that completed some other course in the first cycle will also flesh out their basic competence in computer and information science. Holders of the master's degree acquire the skills necessary to continue on to doctoral studies. The general competences acquired include:

- the ability to define, understand and deal with creative professional challenges in the field of computer and information science,
- a knowledge of linear algebra, of types, integral and discrete transformation, the functions of multiple variables and vector analysis,
- knowledge and use of functional programming,
- knowledge and application of analysis of algorithms, spatial data structures, parallel algorithms, hash codes, algorithms with assumptions, heuristic programming,
- knowledge and practical use of advanced procedures for data analysis,
- knowledge of input-output and peripheral devices, buses, network interfaces and drivers.

Subject-specific competences

By selecting subjects in specific thematic sets, holders of the master's degree in **both courses** acquire the following competences (depending on the selected course modules):

Intelligent Analysis of Data

● a knowledge of planning and conclusions, various methods of study, qualitative modelling, visualisation of models, combining algorithms, and interpreting predictions, connector rules and learning bots,

● practical use of advanced methods for data mining and data analysis,

● applying the theoretical basis of network science and applying network analysis,

● the ability to use approaches in selected technical fields and in the area of biology and genomes.

Media Technologies

● providing information and creating interactivity with emphasis on the development of user and data-focused multimedia software solutions,

● a knowledge of approaches for searching, extraction, capture and analysis of data from the web, taking account of the functioning and time analysis of algorithms,

● an understanding of the functioning and capacities of implementing methods of advanced computer graphics based on scientific literature,

● acquisition of knowledge in the field of computer audio production for technical and creative application in production environments.

Computer Systems and Computing

● interpreting the basic principles of operation of peripheral devices, planning and administration of computer systems,

● current processing methods and platforms as possible alternatives to classical electric transistor bivalent logic structures,

● a knowledge of the infrastructure for the operation of private, hybrid and personal clouds,

● acquisition of knowledge in the fields of parallel and distributed systems, parallel programming and processing.

Networks and Security

● a knowledge of the basics of cryptography and computer security,

● skills in protecting networks and privacy in modern information systems,

● a knowledge of sensor networks with limited processor capacity and limited power supply,

● a knowledge of the use of computers and information technology in forensic procedures.

Algorithms and Software

● transparent knowledge of the field of interaction between humans and computers,

● the ability to solve practical problems through theoretical computer science and creative technical tasks in the area of computer and information science, an understanding of basic topological concepts and constructions,

● an understanding of the field of approximation and random solving of computation problems,

● the ability to evaluate and implement programming languages and various programmer paradigms.

Computing Methods

● an understanding of basic topological concepts and constructions and the basics of numeric mathematics to solve practical problems,

● solving creative technical tasks in the area of computer and information science,

● the ability to use mathematical approaches in selected technical fields,

● a knowledge of alternative methods of processing and natural algorithms.

Machine Perception Methods

● a knowledge of advanced methods of analysing complex signals such as video recordings,

● the basics of processing biomedical signals and images,

● an overview of the field of biometrics and the fundamentals of biometric systems in the area of computer vision,

● mastery of the theory and use of basic algorithms and approaches in the area of processing natural language.

In addition to the above competences, students in the **Data Skills course** also acquire the following competences:

● applying mathematical knowledge to understand classical and modern approaches to machine learning and statistics,

● applying methods of machine learning to solve tasks of progression, classification into groups and drawing conclusions from data,

● applying programme tools in solving problems in the area of data skills,

● applying critical thinking in dealing with the social aspects of data skills (security, privacy, ethics),

● the ability to transfer fundamental knowledge of data skills to solving practical problems in specific fields, such as network analysis, bioinformatics, biometry, processing natural language, computer vision and artificial intelligence.

Admission requirements

Enrolment in the master's programme is open to candidates who have:

Completed 1st cycle study programmes in computer and information science or natural sciences or technical courses (mathematics, physics, electrical engineering, chemistry and chemical technology, mechanical engineering, civil engineering).

Completed 1st cycle study programmes in fields other than those indicated above who have passed the following 1st cycle FRI exams prior to enrolment: Programming 1, Discrete Structures, Introduction to Digital Circuits, Computer Systems Architecture, Introduction to Information Systems, or who covered the subject matter of these courses in their undergraduate studies.

Selection criteria for limited enrolment

In the event of a decision limiting enrolment, candidates will be selected depending on:

- GPA in first-cycle studies (40% of points),
- selection exam results (60%).

The selection exam will cover the fields of mathematics, programming, algorithms and computer systems. Demonstrating exceptional achievements that are evaluated on the basis of a structured CV and potential interview will form a constituent part of the overall assessment. The scope of exceptional achievements will be assessed by the FRI Committee for Study Affairs.

The selection exam will be held in accordance with the rules and criteria for evaluation in place at the Faculty.

Criteria for recognising knowledge and skills acquired prior to enrolment

The study programme enables the recognition of relevant knowledge acquired through formal, non-formal and experiential learning. This knowledge can be recognised as part of the completed study requirements, at up to 6 ECTS for one set (the approximate study programme for a course) of knowledge acquired outside of the Faculty. In the recognition process certificates and other documents are taken into account. Requests for recognition of acquired knowledge will be considered by the FRI Committee for Study Affairs and on its recommendation approved by the Faculty Senate.

Assessment methods

The methods of assessment comply with the UL Statutes and are set out in the curriculums.

Requirements for progression through the course

Students who have completed course units consisting of 54 credit points may enrol in the second year.
For repeat enrolment in the same year students must have completed at least half the programme requirements of that year (i.e. 30 credits).

Requirements for transferring between programmes

In accordance with the Criteria for Transferring between Programmes, transferring is possible from study programmes:

1. which upon completion guarantee similar competences and,
2. 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.

Requirements for transferring to the master's programme of Computer and Information Science from other (master's) programmes are:

- fulfilled requirements for enrolment in the master's programme in Computer and Information Science,
- fulfilled conditions for enrolment in the second year of the study specialisation in which the student is currently enrolled, with the added condition that they have completed the requirements in all courses that are essential for continuing or equivalent courses at other higher education institutions whose appropriateness is assessed by the Committee for Study Affairs.

Requirements for completing the study programme
The requirements for completing the proposed programme are the following for all students: fulfilled study obligations in enrolled courses, equivalent to at least 96 ECTS; a master's thesis prepared and submitted in accordance with the relevant rules, equivalent to 24 ECTS; and a successful public defence of the master's thesis.

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)

- Master of Science

Professional or academic title (female)

- Master of Science

Professional or academic title (abbreviated)

- M. Sc.

STUDY PROGRAMME CURRICULUM
COMPUTER AND INFORMATION SCIENCE

2026/2027

Name of study programme	**Computer and information science**
Programme characteristics	
Type	master's
Cycle	master
University of Ljubljana members	Faculty of Computer and Information Science, Večna pot 113, 1000 Ljubljana, Slovenija

Data Science (direction/track)

Year 1

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0125839	Mathematics 1	prof. dr. Polona Oblak	45		30			105	180	6	1st semester	no
2.	0129330	Principles of uncertainty	Aljaž Zalar, prof. dr. Erik Štrumbelj	45		30			105	180	6	1st semester	no
3.	0129331	Introduction to data science	izr. prof. dr. Slavko Žitnik, izr. prof. dr. Tomaž Curk	45		30			105	180	6	1st semester	no
4.	0644377	Empirical research methodology	prof. dr. Erik Štrumbelj	45		30			105	180	6	1st semester	no
5.	0086926	General elective course									6	1st semester	yes
6.	0129384	Mathematics 2	Aljaž Zalar, prof. dr. Gašper Fijavž, prof. dr. Polona Oblak, Žiga Virk	45		30			105	180	6	2nd semester	no
7.	0129383	Machine learning for data science 1	doc. dr. Tomaž Hočevar, prof. dr. Blaž Zupan	45		30			105	180	6	2nd semester	no

8.	0129453	Project	izr. prof. dr. Jure Demšar		30				150	180	6	2nd semester	no
9.	0644378	Data engineering	prof. dr. Erik Štrumbelj	45		30			105	180	6	2nd semester	no
10.	0086926	General elective course									6	2nd semester	yes
		Total		315	30	210	0	0	885	1440	60		

General elective course = General elective course + Specialist elective course from list PV

Year 2

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0127865	Machine learning for data science 2	prof. dr. Erik Štrumbelj	45		30			105	180	6	1st semester	no
2.	0127867	Bayesian statistics	izr. prof. dr. Jure Demšar	45		30			105	180	6	1st semester	no
3.	0100890	Specialist elective course from list PV									6	1st semester	yes
4.	0100890	Specialist elective course from list PV									6	1st semester	yes
5.	0070493	Master thesis			60				660	720	24	All-year	no
6.	0100890	Specialist elective course from list PV									6	2nd semester	yes
7.	0100890	Specialist elective course from list PV									6	2nd semester	yes
		Total		90	60	60	0	0	870	1080	60		

Specialist elective course from list PV

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					

1.	0073694	Machine Learning	doc. dr. Jana Faganeli Pucer	45	6	24			105	180	6	1st semester	yes
2.	0075157	Introduction to bioinformatics	Blaž Zupan	45	20	10			105	180	6	1st semester	yes
3.	0075159	Biomedical signal and image processing	Franc Jager	45		30			105	180	6	1st semester	yes
4.	0148113	Natural language processing	prof. dr. Marko Robnik Šikonja	45	10	20			105	180	6	2nd semester	yes
5.	0075165	Image based biometry	prof. dr. Peter Peer	45	10	20			105	180	6	1st semester	yes
6.	0075160	Advanced topics in computer vision	prof. dr. Matej Kristan	45	10	20			105	180	6	2nd semester	yes
7.	0075158	Web information extraction and retrieval	Marko Bajec	45	10	20			105	180	6	1st semester, 2nd semester	yes
8.	0127827	High performance computing	prof. dr. Uroš Lotrič	45	10	20			105	180	6	2nd semester	yes
9.	0127837	Deep learning	prof. dr. Danijel Skočaj	45		30			105	180	6	2nd semester	yes
10.	0127836	Big data	izr. prof. dr. Matjaž Kukar	45		30			105	180	6	2nd semester	yes
11.	0073688	Artificial Intelligence	prof. dr. Ivan Bratko	45	10	20			105	180	6	2nd semester	yes
12.	0127835	Network analysis	izr. prof. dr. Lovro Šubelj	45		30			105	180	6	2nd semester	yes
		Total		540	86	274	0	0	1260	2160	72		

Computer and Information Science (direction/track)

Year 1

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0125839	Mathematics 1	prof. dr. Polona Oblak	45		30			105	180	6	1st semester	no
2.	0126169	Module 1 - course 1		45		30			105	180	6	1st semester	yes
3.	0126170	Module 1 - course 2		45		30			105	180	6	1st semester	yes
4.	0126171	Module 2 - course 1		45		30			105	180	6	1st semester	yes
5.	0126172	Module 2 - course 2		45		30			105	180	6	1st semester	yes
6.	0126173	Module 1 - course 3		45		30			105	180	6	2nd semester	yes
7.	0126174	Module 1 - course 4		45		30			105	180	6	2nd semester	yes
8.	0126175	Module 2 - course 3		45		30			105	180	6	2nd semester	yes
9.	0126176	Module 2 - course 4		45		30			105	180	6	2nd semester	yes
10.	0069530	General elective courses		45		30			105	180	6	2nd semester	yes
		Total		450	0	300	0	0	1050	1800	60		

Year 2

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0126541	Module 3- course 1		45		30			105	180	6	1st semester	yes
2.	0126542	Module 3- course 2		45		30			105	180	6	1st semester	yes
3.	0086926	General elective courses									6	1st semester	yes

	University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
4.	0125850	Specialist elective course (any module/other)		45		30			105	180	6	1st semester, 2nd semester	yes
5.	0070493	Master thesis			60				660	720	24	All-year	no
6.	0127817	Module 3 - course 3		45		30			105	180	6	2nd semester	yes
7.	0127818	Module 3 - course 4		45		30			105	180	6	2nd semester	yes
		Total		225	60	150	0	0	1185	1620	60		

Electives: Students select 3 modules (of 4 subjects each), and can also select 1 professional elective (from any model or list of other offered subjects). External electives are envisaged for all general elective subjects.

I. **Intelligent Analysis of Data (module specialist elective courses)**

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0073694	Machine Learning	doc. dr. Jana Faganeli Pucer	45	6	24			105	180	6	1st semester	yes
2.	0075157	Introduction to bioinformatics	Blaž Zupan	45	20	10			105	180	6	1st semester	yes
3.	0073688	Artificial Intelligence	prof. dr. Ivan Bratko	45	10	20			105	180	6	2nd semester	yes
4.	0127835	Network analysis	izr. prof. dr. Lovro Šubelj	45		30			105	180	6	2nd semester	yes
		Total		180	36	84	0	0	420	720	24		

II. **Media technologies (module specialist elective courses)**

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0082114	Interaction and Information Design	doc. dr. Ciril Bohak	45	20	10			105	180	6	1st semester	yes
2.	0082596	Computer based sound production	Denis Trček	45		30			105	180	6	1st semester	yes
3.	0075158	Web information extraction and retrieval	Marko Bajec	45	10	20			105	180	6	1st semester, 2nd semester	yes

	University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
4.	0148094	Advanced Computer Graphics	prof. dr. Matija Marolt	45		30			105	180	6	2nd semester	yes
		Total		180	30	90	0	0	420	720	24		

III. Computer Systems and Computing (module specialist elective courses)

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0082618	Unconventional computing	Miha Mraz	45	20	10			105	180	6	1st semester	yes
2.	0082823	Cloud Computing	prof. dr. Branko Matjaž Jurič	45	20	10			105	180	6	1st semester	yes
3.	0127827	High performance computing	prof. dr. Uroš Lotrič	45	10	20			105	180	6	2nd semester	yes
4.	0127828	Computer Systems	prof. dr. Branko Šter	45		30			105	180	6	2nd semester	yes
		Total		180	50	70	0	0	420	720	24		

IV. Computer Networks and Security (module specialist elective courses)

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0082727	Cryptography and Computer Security	prof. dr. Aleksandar Jurišić	45	10	20			105	180	6	1st semester, 2nd semester	yes
2.	0082821	Information Security and Privacy	Denis Trček	45		30			105	180	6	1st semester	yes
3.	0082824	Digital forensic	izr. prof. dr. Andrej Brodnik	45		30			105	180	6	2nd semester	yes
4.	0082617	Wireless Sensor networks	prof. dr. Nikolaj Zimic	45	10	20			105	180	6	2nd semester	yes
		Total		180	20	100	0	0	420	720	24		

V. **Algorithmics and Software (module specialist elective courses)**

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0082828	Human-Computer Interaction	doc. dr. Ciril Bohak, izr. prof. dr. Luka Čehovin Zajc	45		30			105	180	6	1st semester	yes
2.	0088108	Functional programming	prof. dr. Zoran Bosnić	45	10	20			105	180	6	1st semester	yes
3.	0148105	Approximation and randomized algorithms	doc. dr. Uroš Čibej	45		30			105	180	6	2nd semester	yes
4.	0127821	Algorithms	izr. prof. dr. Andrej Brodnik	45	20	10			105	180	6	2nd semester	yes
		Total		180	30	90	0	0	420	720	24		

VI. **Computational Methods (module specialist elective courses)**

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0075167	Collective behaviour	izr. prof. dr. Iztok Lebar Bajec	45		30			105	180	6	1st semester	yes
2.	0153519	Topological data analysis	Žiga Virk	45	10	20			105	180	6	1st semester	yes
3.	0574758	Numerical Mathematics	Aljaž Zalar	45		30			105	180	6	1st semester, 2nd semester	yes
4.	0082841	Discrete Mathematics	prof. dr. Gašper Fijavž	45		30			105	180	6	2nd semester	yes
		Total		180	10	110	0	0	420	720	24		

VII. **Machine Perception Methods (module specialist elective courses)**

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					

#	University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
1.	0075159	Biomedical signal and image processing	Franc Jager	45		30			105	180	6	1st semester	yes
2.	0075165	Image based biometry	prof. dr. Peter Peer	45	10	20			105	180	6	1st semester	yes
3.	0148113	Natural language processing	prof. dr. Marko Robnik Šikonja	45	10	20			105	180	6	2nd semester	yes
4.	0075160	Advanced topics in computer vision	prof. dr. Matej Kristan	45	10	20			105	180	6	2nd semester	yes
		Total		180	30	90	0	0	420	720	24		

Specialist elective courses RI

#	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0075156	Perception in cognitive systems	Aleš Leonardis	45		30			105	180	6	1st semester	yes
2.	0082831	Management of production and service processes	prof. dr. Branko Matjaž Jurič	45	10	20			105	180	6	1st semester	yes
3.	0082843	Teaching algorithmic thinking	prof. dr. Janez Demšar	45	20	10			105	180	6	1st semester	yes
4.	0082861	Advanced Software Development Methods	prof. dr. Damjan Vavpotič	45	10	20			105	180	6	2nd semester	yes
5.	0127836	Big data	izr. prof. dr. Matjaž Kukar	45		30			105	180	6	2nd semester	yes
6.	0127837	Deep learning	prof. dr. Danijel Skočaj	45		30			105	180	6	2nd semester	yes
7.	0643957	Mobile sensing	izr. prof. dr. Veljko Pejović	45		30			105	180	6	1st semester	yes
8.	0643899	Fog Computing for Smart Services	Vlado Stankovski	45		30			105	180	6	2nd semester	yes
9.	0070555	Topics in Computer and Information Science	izr. prof. dr. Slavko Žitnik	45		30			105	180	6	2nd semester	yes

	University Course Code	Course title	Lecturers	Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study	Individual student work	Total hours	ECTS	Semesters	Elective
10.	0070593	Research seminar	izr. prof. dr. Slavko Žitnik	15	45				300	360	12	1st semester	yes
11.	0125916	Topical research themes 1	prof. dr. Matej Kristan	45	10	20			105	180	6	1st semester	yes
12.	0125917	Topical research themes 2	prof. dr. Matej Kristan	45	10	20			105	180	6	2nd semester	yes
		Total		510	105	270	0	0	1455	2340	78		

General elective courses

	University Course Code	Course title	Lecturers	Contact hours					Individual student work	Total hours	ECTS	Semesters	Elective
				Lectures	Seminar	Tutorials	Clinical tutorials	Other forms of study					
1.	0125918	Computer science and society 1	izr. prof. dr. Slavko Žitnik	5				40	45	90	3	1st semester, 2nd semester	yes
2.	0125919	Computer science and society 2	izr. prof. dr. Slavko Žitnik	5				40	45	90	3	1st semester, 2nd semester	yes
3.	0070559	Data mining and visualization	prof. dr. Marko Robnik Šikonja	45		30			105	180	6	1st semester, 2nd semester	yes
		Total		55	0	30	0	80	195	360	12		