

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



**FIRST CYCLE UNIVERSITY STUDY PROGRAMME
COMPUTER AND INFORMATION SCIENCE
HANDBOOK**

Ljubljana, 2016

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Presentation of the study programme

1. About the study programme

The first cycle of the Computer and Information Science University Study Programme lasts 3 years (6 semesters) and comprises 180 ECTS.

The professional title to be obtained is:

- diplomirani inženir računalništva in informatike (UN),
- diplomirana inženirka računalništva in informatike (UN).

The professional title is given in accordance with the Professional and Academics Titles Act as: “diplomirani/-a inženir/-ka računalništva in informatike (UN)”, abbreviated to “dipl. inž. rač. in inf. (UN)”.

2. Main objectives and general skills of the programme

Computer and information science is one of the leading breakthrough fields that have been shaping today's economy, education, culture, administration and other areas. The striking growth of computer technology dictates the need for highly qualified staff capable of developing, managing and maintaining user and systems technology and the IT systems based on those technologies. This study programme is inviting for young people interested in computer and information science. The programme is comparable to international standards and keeps up with the rapid development of computer science and the latest knowledge. In view of all this, the study programme accordingly provides future engineers with a sufficient professional basis to be able to keep abreast of technological changes and successfully continue their career at home as well as on an international level.

The study programme allows students to tailor courses according to their preferences and motivation, in keeping with the possibilities offered by professional specialisations. The core courses are followed by elective modules that offer specialisations in different professional fields.

General skills

General skills acquired in the programme

- developing skills in critical, analytical and synthetic thinking;
- the ability to define, understand and solve creative professional challenges in computer and information science;
- the ability to transfer knowledge and professional communication skills and writing skills;
- the ability to search for resources and critically analyse information;
- professional, environmental and social responsibility;
- the ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science;
- the ability to acquire new and enhance acquired technical knowledge;
- skills for group work in the field, including with experts in other technical fields;
- the development of professional responsibility and ethics;
- basic theoretical knowledge acquired in the fields of computer science and information technology and in the natural sciences and mathematics, which provides an excellent basis for continuing studies at the next level, both in computer science and in technical fields.

Specific skills acquired in the programme

- basic skills in computer and information science, which include basic theoretical skills, and skills essential for the field of computer and information science (mathematical treatment of problems, theoretical basis of computer science);
- the ability to understand and apply computer and information science knowledge to other technical and relevant fields (economics, organisational science, etc.);
- practical knowledge and skills in the development of software, hardware and information technologies, which are a necessary part of a successful professional's work in computer and information science (programming, computer architecture, networks);
- the ability to independently perform demanding engineering and organisational tasks in their specialised fields and independently solve specific well-defined tasks in computer and information science;

The programme's international comparison

For comparison we relied on four study programmes in our vicinity, which we find related to our study programme:

- Bachelor Program, Eidgenössische Technische Hochschule (ETH), Switzerland, <http://www.inf.ethz.ch/education/bachelor>
- Informatik: Software & Information Engineering, Technische Universität Vienna, Austria, <http://www.tuwien.ac.at/>
- Wirtschaftsinformatik, Technische Universität Vienna, Austria, <http://www.tuwien.ac.at/>
- Laurea in Informatica, Università di Torino, Italy, <http://www.educ.di.unito.it/>

3. Admission requirements and selection criteria for limited enrolment

Candidates meeting the following requirements can enrol in the university study programme:

- a) A completed Matura exam;
- b) A completed vocational Matura exam at any secondary school and an exam in one of the following subjects: computer science, mathematics or physics; the chosen subject must not be the same as the subject the candidate passes for the vocational Matura exam;
- c) Any four-year secondary school study programme completed before 1 June 1995.

In the event of a decision limiting enrolment, candidates referred to in points a) and b) will be selected according to:

- the GPA in the Matura exam or secondary school final exam 60%;
- the GPA of the 3rd and 4th years of secondary school 40%.

Candidates from point b) will be selected according to:

- the GPA in the vocational Matura exam 20%;
- the GPA of the 3rd and 4th years of secondary school 40%;
- the grade average of one Matura exam subject 40%.

4. Criteria for recognizing knowledge and skills acquired prior to enrolment

The study programme enables the recognition of relevant knowledge acquired through formal and informal learning or experience. 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 university. 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 Student Affairs.

5. Requirements for progression through the programme

Requirements for progressing to a higher year:

To enrol in a higher year students must pass all exams from the year in progress and all exams from previous years.

Requirements for retaking a year:

To retake a year the following must be completed:

- at least half of the requirements from the study programme of the year in progress (30 ECTS);
- all exams from the years before.

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

Advice and guidance for students

The Career Centre at the Faculty of Computer and Information Science and tutors will be in direct contact with students during their course of study, in order to motivate them to progress in their professional areas and help them with difficulties, problems and crises that might interfere with their studies. Students can also seek guidance and help from the Career Centre of the University of Ljubljana at any time.

6. Requirements for completing the study programme

To complete the study programme students must pass all exams and fulfil all requirements, including a diploma thesis paper, in a total amount of at least 180 ECTS.

7. 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 that are related to obligatory courses of the second study programme.

Transferring from other programmes is possible after the first year of study. The requirements for transferring to the University Programme Computer and Information Science from other programmes (university and professional) are:

- an equivalent curriculum in Mathematics and Physics under the programme from which students transfer; the recognised courses must have at least as many credits as the aforementioned courses;
- the appropriate authority defines, on the basis of the comparison of both programmes, the requirements to be recognised and the year in which the candidate can enrol, and consequently issues a decision;
- transferring is possible on the basis of the provisions applicable to such programmes. The requirements for transferring to the University Programme Computer and Information Science from professional programmes are:
- recognised ECTS credits the candidate obtained in the professional study programme; due to the variability and the different levels of difficulty in professional programmes, the level of the candidate's knowledge is assessed by a special Admissions Committee, headed by the Vice Dean for Education, and it consequently approves the courses to be recognised for each individual student;
- based on a comparison of both programmes, the appropriate Faculty authority defines the requirements to be recognised and the year in which the candidate can enrol, and issues a decision.

8. Assessment

The assessment methods are defined in the study programmes for individual courses. The general rules for assessment methods are regulated by the FRI Study Rules and Regulations. The assessment methods for all courses are either in the form of written or oral examinations. These assessment methods include: tests from exercises, defences of tests, oral examinations, seminars and projects, presentations of seminar and project work. The grading scale is in accordance with the Statutes of the University of Ljubljana. All assessments are graded on a scale from 1-10, where 6-10 are passing grades and 1-5 failing grades.

9. Syllabus

The organisation of the three-year programme is demonstrated in the study model below and individual courses are presented in the course syllabus. Year 1 is the same for all students and consists of 10 obligatory courses. In Year 2, 8 courses are obligatory, one course is a specialist elective course, where students can choose from three offered courses, and one course is a general elective course. In Year 3 there are two obligatory courses, a general elective course and the thesis paper, which students produce as part of the Diploma Seminar subject. Students choose two modules out of the eight offered modules. Each module has three different courses, which represent a different focus. Students who achieve an 8.5 GPA in the first two years and do not retake a year can choose any of the module courses. Tutors will assist and advise them in their choice. Consequently, these students will not be limited to two modules, but will be able to choose 6 courses (three in each module) out of any of the offered modules (24 courses).

In addition, students also have the option of choosing English, available in three difficulty levels. Each of them is worth 3 credits and is considered a general elective course. The Faculty offers these courses, because it is aware of the importance of a foreign language and enables students to choose and improve their level of English. However, the English language course is worth only 3 ECTS, therefore students must take another course to achieve 6 ECTS – the credit points evaluated for general elective courses in the programme. The Faculty also offers the following general elective courses:

- “Topics in Computer and Information Science”, which is provided by lecturers from other universities on exchange programmes, who contribute their knowledge and the latest developments in computer and information science;
- Computer Science Practice I and II;
- Computer Science Skills.

Students may also complete 6 ECTS in the second and third years by taking subjects at other faculties.

STUDY MODEL

YEAR 1



YEAR 2



YEAR 3



Legend:

- | | |
|-------------------------------|----------------------|
| ● Obligatory courses | ● Elective module I |
| ● Specialist elective courses | ● Elective module II |
| ● General elective courses | ● Thesis paper |

Legend:

L = number of lectures

S = number of seminar exercises

T = number of theoretical and tutorial exercises

ECTS = number of ECTS points.

Each Semester lasts 15 weeks.

YEAR 1

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|--|---------------------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63277 | Programming 1 | Viljan Mahnič | 45/0/30 | | 6 | |
| 63202 | Calculus | Nežka Mramor Kosta | 45/0/30 | | 6 | |
| 63203 | Discrete Structures | Gašper Fijavž | 45/0/30 | | 6 | |
| 63204 | Introduction to Digital Circuits | Nikolaj Zimic | 45/0/30 | | 6 | |
| 63205 | Physics | Irena Drevenšek Olenik | 45/0/30 | | 6 | |
| 63278 | Programming 2 | Boštjan Slivnik | | 45/0/30 | 6 | |
| 63207 | Linear Algebra | Bojan Orel | | 45/0/30 | 6 | |
| 63212 | Computer Systems Architecture | Branko Šter | | 45/0/30 | 6 | |
| 63209 | Computer Communications | Zoran Bosnić | | 45/0/30 | 6 | |
| 63215 | Introduction to Information systems | Dejan Lavbič | | 45/0/30 | 6 | |

YEAR 2

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|---|-----------------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63279 | Algorithms and Data Structures 1 | Igor Kononenko | 45/0/30 | | 6 | |
| 63208 | Basics of Databases | Marko Bajec | 45/0/30 | | 6 | |
| 63213 | Probability and Statistics | Aleksander Jurišić | 45/10/20 | | 6 | |
| 63218 | Computer Systems Organisation | Patricio Bulić | 45/0/30 | | 6 | |
| 63283 | Computability and Computational Complexity | Borut Robič | 45/0/30 | | 6 | |
| 63216 | Theory of Information and Systems | Uroš Lotrič | | 45/10/20 | 6 | |
| 63280 | Algorithms and Data Structures 2 | Borut Robič | | 45/0/30 | 6 | |
| 63217 | Operating Systems | Borut Robič | | 45/0/30 | 6 | |
| | General elective course * | | | 45/0/30 | 6 | |
| | Specialist elective course ** | | | 45/0/30 | 6 | |

* Mathematical Modelling, Principles of Programming Languages, Computer Technologies

** English Language (Level A, B, C), Topics in Computer and Information Science, Computer Science in Practice I, Computer Science in Practice II, Computer Science Skills

YEAR 3

| No. | Study unit | Lecturer | Semester 1 L/S/T | Semester 2 L/S/T | ECTS | Note |
|-------|---|---------------|---------------------|---------------------|------|------|
| 63214 | Introduction to Artificial Intelligence | Ivan Bratko | 45/0/30 | | 6 | |
| | Module elective course I | | 45/0/30 | | 6 | |
| | Module elective course I | | 45/0/30 | | 6 | |
| | Module elective course II | | 45/0/30 | | 6 | |
| | Module elective course II | | 45/0/30 | | 6 | |
| 63256 | Software Engineering | Viljan Mahnič | | 45/10/20 | 6 | |
| | Module elective course I | | | 45/0/30 | 6 | |
| | Module elective course II | | | 45/0/30 | 6 | |
| | General elective course ** | | | 45/0/30 | 6 | |
| 63281 | Diploma seminar | Franc Solina | | 45/10/5 | 6 | |

** English Language (Level A, B, C), Topics in Computer and Information Science, Computer Science in Practice I, Computer Science in Practice II, Computer Science Skills

SPECIALIST ELECTIVE COURSES

| No. | Study unit | Lecturer | Semester 1 L/S/T | Semester 2 L/S/T | ECTS | Note |
|-------|-------------------------------------|--------------------|---------------------|---------------------|------|------|
| 63219 | Mathematical Modelling | Nežka Mramor Kosta | | 45/0/30 | 6 | |
| 63220 | Principles of Programming Languages | Ivan Bratko | | 45/0/30 | 6 | |
| 63221 | Computer Technologies | Rok Žitko | | 45/0/30 | 6 | |

MODULE ELECTIVE COURSES

I. Information Systems

| No. | Study unit | Lecturer | Semester 1 L/S/T | Semester 2 L/S/T | ECTS | Note |
|-------|-----------------------------|---------------|---------------------|---------------------|------|------|
| 63249 | Electronic Business | Denis Trček | 45/0/30 | | 6 | |
| 63250 | Organisation and Management | Tomaž Hovelja | | 45/10/20 | 6 | |
| 63251 | Introduction to Data Mining | Blaž Zupan | 45/20/10 | | 6 | |

II. Management of Information Systems

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|-------------------------------------|--------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63252 | Information Systems Development | Marko Bajec | 45/20/10 | | 6 | |
| 63226 | Data Management Technologies | Matjaž Kukar | 45/10/20 | | 6 | |
| 63253 | Informatics Planning and Management | Rok Rupnik | | 45/0/30 | 6 | |

III. Software Development

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|--------------------------------|---------------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63254 | Software Development Processes | Branko Matjaž Jurič | 45/10/20 | | 6 | |
| 63255 | Web Programming | Zoran Bosnić | 45/20/10 | | 6 | |
| 63287 | Platform-Based Development | Zoran Bosnić | | 45/0/30 | 6 | |

IV. Computer Networks

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|------------------------------|----------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63257 | Computer Networks Modelling | Miha Mraz | 45/10/20 | | 6 | |
| 63258 | Communication Protocols | Mojca Ciglarič | 45/0/30 | | 6 | |
| 63259 | Mobile and Wireless Networks | Nikolaj Zimic | | 45/10/20 | 6 | |

V. Computer Systems

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|--|----------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63260 | Digital Design | Patricio Bulić | 45/10/20 | | 6 | |
| 63261 | Distributed Systems | Uroš Lotrič | 45/10/20 | | 6 | |
| 63262 | Computer Systems Reliability and Performance | Miha Mraz | | 45/20/10 | 6 | |

VI. Algorithms and System Utilities

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|--|----------------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63263 | Computation Complexity and Heuristic Programming | Marko Robnik Šikonja | 45/10/20 | | 6 | |
| 63264 | System Software | Tomaž Dobravec | 45/10/20 | | 6 | |
| 63265 | Compilers | Boštjan Slivnik | | 45/0/30 | 6 | |

VII. Artificial Intelligence

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|------------------------------------|--------------------------------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63266 | Intelligent Systems | Igor Kononenko, Marko Robnik Šikonja | 45/6/24 | | 6 | |
| 63267 | Machine Perception | Matej Kristan | 45/10/20 | | 6 | |
| 63268 | Development of Intelligent Systems | Danijel Skočaj | | 45/0/30 | 6 | |

VIII. Media Technologies

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|---------------------------------------|----------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63269 | Computer graphics and Game Technology | Matija Marolt | 45/10/20 | | 6 | |
| 63270 | Multimedia Systems | Matej Kristan | 45/10/20 | | 6 | |
| 63271 | Introduction to Graphic Design | Narvika Bovcon | | 45/0/30 | 6 | |

GENERAL ELECTIVE COURSES

| No. | Study unit | Lecturer | Semester 1 | Semester 2 | ECTS | Note |
|-------|--|----------------------------------|------------|------------|------|------|
| | | | L/S/T | L/S/T | | |
| 63222 | English Language – Level A | Marina Štros Bračko | | 30/0/15 | 3 | |
| 63223 | English Language – Level B | Marina Štros Bračko | 30/0/15 | | 3 | |
| 63224 | English Language – Level C | Marina Štros Bračko | | 20/0/15 | 3 | |
| 63225 | Topics in Computer and Information Science | Lectures from other universities | 45/0/30 | | 6 | |
| 63241 | Computer Science in Practice I | Vice Dean for Education | 5/0/0 | | 3 | |
| 63242 | Computer Science in Practice II | Vice Dean for Education | | 5/0/0 | 3 | |
| 63284 | Computer Science Skills | Study Programme Coordinator | 15/0/45 | | 3 | |
| 63248 | Economics and Entrepreneurships | Mateja Drnovšek | | 45/10/20 | 6 | |

The study programme is based on modules that are carried out in Year 3. Students can choose two out of the eight modules offered. Each of the modules represents a different computer and information science topic, enabling students to choose their general study topic profile with the two selected modules.

Students who complete a Socrates/Erasmus exchange at a foreign university can transfer a maximum of 30 ECTS (if they are abroad for one semester) or 60 ECTS (if they are abroad for one year) from the courses completed at their exchange university.

10. International Mobility

Students can transfer 60 credits from any computer and information science programme affirmed by the FRI Committee for Student Affairs. The Faculty of Computer and Information Science has signed [Erasmus+ exchange programme](#) contracts with numerous foreign universities.

11. Presentation of individual courses

The presentation of individual courses is available on the Faculty website.