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

SECOND-CYCLE INTERDISCIPLINARY MASTER'S STUDY PROGRAMME IN
COMPUTER SCIENCE EDUCATION

HANDBOOK

for students enrolled for the first time in the first year in the 2018/19 academic year

Ljubljana, 2018

CONTENTS

Presentation of the study programme

1. General information

Title of the programme
Computer and Information Science Education

Specialisation
None

Type and level
Master's study programme

Cycle
Second cycle

Duration, ECTS
2 years (4 semesters), 120 ECTS
Classes are conducted in Slovenian.

Study mode
Full time or part-time study

Obtained academic/professional title

- *magister profesor računalništva in informatike*,
- *magistrica profesorica računalništva in informatike*.

Title abbreviation *mag. prof. rač. inf.*

Area of study to which the programme belongs (ISCED):
This is an interdisciplinary programme and falls within the area of study Teacher training and education science (14) .
Scientific disciplines underlying the programme (according to the Frascati classification):
This interdisciplinary programme falls within the areas of Social sciences.
Levels of SQF, EQF and EHEQF: Slovenian Qualifications Framework (SQF) 8; European Qualifications Framework (EQF) 7; European Higher Education Qualifications Framework (EHEQF) Second Cycle.

2. Main objectives and general skills

Main objectives of the study programme
The objectives of the programme are training for the development and use of new information technologies, research in computer science education, and the ability to quickly grasp new

skills in computer science and its related areas of teaching. The studies involve continuous assessment of teaching goals with the aim of determining the extent of the study programme goals that have been achieved. At the end of the programme the set objectives are assessed through a broad and detailed Master's thesis.

General and subject-specific skills

General skills:

- Knowledge and application of appropriate research methods and development of own practice.
- Ability to research and transfer findings into practice.
- The ability to take responsibility for own professional development and learning through evaluation and reflection of personal work.
- Creating partner relationships with users and other groups.
- Developing new knowledge and understanding of the relevant field.
- Working to high ethical norms and professional codes of conduct.
- The ability to cooperate with an interdisciplinary team, while effectively communicating with all team members.
- Reflection on and evaluation of existing practice and recognition of unexploited possibilities for improving quality.
- Developing higher cognitive skills related to the discovery of new knowledge.
- Knowing and understanding development characteristics, differences and needs of students, and recognising their learning capabilities and problems, a comprehensive view of the student, encouraging the student's development into a responsible member of society.
- Use of specialist pedagogical knowledge for children with special needs.
- Adaptation of educational approaches to individual, social, linguistic and cultural differences of students.
- Knowing and understanding the content specifics of a class.
- Understanding and use of professional knowledge for meeting syllabus targets.
- Creating a supportive education environment, interpersonal relations and effective solutions to disciplinary problems, and developing social skills.

Subject-specific skills acquired through the programme:

- In-depth knowledge in didactics of computer and information science, and computer supported technologies in education.
- The ability to lead and actively participate in projects for software and e-material development.
- The ability to critically analyse computer-supported didactic tools and material.
- Understanding and knowledge of implementing computer and information skills in different areas of teaching in other fields.
- Practical knowledge and skills for using systems for computer-supported education (online classrooms, social networks, digital libraries etc.).
- The ability to cooperate in projects focused on the normalisation of educational institutions.
- A second-cycle graduate has the ability to independently carry out advanced development and organisational tasks in selected fields and to cooperate with experts from other fields to solve complex tasks and problems.

3. International comparison

The study programme has undergone comparison with foreign institutions with similar study programmes.

Foreign institutions with comparable study programmes (name, institution, country):
The comparison is for Master's study programmes in the field of computer and information science education.

- Informatikdidaktik Technische Universität Wien, Austria.
- Teaching primary and secondary subjects – Informatics, Comenius University in Bratislava, Faculty of Mathematics, Physics and Informatics, Slovakia.
- Lehramtmaster Informatik, Humboldt-Universität zu Berlin, Mathematisch - Naturwissenschaftliche Fakultät II, Germany.

4. International cooperation and mobility

Information on international cooperation for the Faculty of Education, University of Ljubljana, is available at http://www.pef.uni-lj.si/86.html; information for the Faculty of Computer and Information Science is available at http://izmenjave.fri.uni-lj.si/.

5. Admission requirements and selection criteria for limited enrolment

General requirements for enrolment in the second-cycle Master's study programme in Computer and Information Science Education

The Computer and Information Science Education study programme is open to:

a) Candidates who have completed a first-cycle study programme in the scope of at least 180 ECTS. They can enrol without any additional requirements, if they completed studies in the following professional fields (Paragraph 1, Article 38a of ZViS): computer science, mathematics, science and engineering, if the programmes consist of 60 ECTS in computer and information science skills.
b) Candidates who have completed a first-cycle study programme in other professional fields (Paragraph 2, Article 38a of ZViS) in the scope of at least 180 ECTS, if, prior to enrolment, they complete all study requirements that are essential for the continuation of study. These requirements are jointly determined by the UL FRI Committee for Student Affairs and the Faculty of Education Committee for Second-Cycle Postgraduate Study by way of comparing the professional fields, and they range from 10 to 60 ECTS. Candidates can complete these study requirements during their first-cycle studies, in training programmes or by completing exams prior to enrolment in the Master's study programme.
c) Candidates who have completed a professional study programme, adopted under the legal provisions in force prior to 11 June 2004, in a relevant professional field as defined under item a.

d) Candidates who have completed a professional study programme, adopted under the legal provisions in force prior to 11 June 2004, in other professional fields, if, prior to enrolment, they complete all study requirements that are essential for the continuation of study. These requirements are jointly determined by the FRI Committee for Student Affairs and the Faculty of Education Committee for Second-Cycle Postgraduate Study by comparing the professional fields, and they range from 10 to 60 ECTS. Candidates can complete these study requirements during their first cycle studies, in training programmes or by completing exams prior to enrolment in the Master's study programme.
e) The admission requirements are also met by candidates who have completed an equivalent study programme abroad and are enrolling under the same requirements as candidates who have completed their studies in Slovenia. Prior to enrolment in the study programme, they must undergo the process of recognition of education for the purpose of continuation of studies.

Selection criteria for limited enrolment
A decision on limited enrolment is made if the number of applications from candidates who meet the admission criteria significantly exceeds the number of available places. In this case the selection of candidates is made on the basis of the following criteria:

- Undergraduate studies GPA 60%,
- Elective course exam*, where candidates demonstrate their familiarity and knowledge of their desired specialised field of study 40%.

*In the elective course exam, candidates can achieve 40%, covering:

- 40% examination in computer and information science education courses.

6. Requirements for transferring between study programmes

Transferring between programmes is carried out pursuant to the Criteria for Transferring between Programmes (Official Gazette of the Republic of Slovenia No. 95/2010, 17/2011). Transferring between study programmes is defined as the transfer and continuation from the first study programme the student was enrolled in to the interdisciplinary second-cycle Master's study programme of Computer and Information Science Education (the second study programme).

1. 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 from the first study programme that are related to obligatory courses of the second study programme (Criteria for Transferring between Programmes, Official Gazette 95/2010, 17/2011, Article 6).

2. If it is decided in the education recognition process that the candidate achieved 60 ECTS, the candidate is then permitted to enrol in Year 2 of the interdisciplinary second-cycle programme of Computer and Information Science Education.

In this case, transfer is possible from:

- Second-cycle study programmes in relevant professional fields as defined under the section on admission requirements for this study programme;
- University study programmes, in force prior to 11 June 2004, in relevant professional fields as defined under the section on admission requirements for this study programme;
- Requirements for transfer are also met by candidates who have completed an equivalent study programme abroad, and apply under the same conditions as for candidates who completed their studies in Slovenia.

7. Criteria for recognising knowledge and skills acquired prior to enrolment

Knowledge and skills students acquired prior to enrolment, which are suitable in content and scope to the educational content of courses in the Master's second-cycle study programme of Computer and Information Science Education, can be recognised as completed study requirements. The recognition of knowledge and skills is jointly decided by the FRI Committee for Study Affairs and the PEF Committee for Second-Cycle Postgraduate Study on the basis of a written application by the student, enclosed certificates and transcripts, and other documents of proof of acquired knowledge and their content that are in accordance with the Rules on the procedure and criteria for recognising informally acquired knowledge and skills, adopted by the UL Senate at the session of 29 May 2007, and the Rules on the procedure and criteria for recognising informally acquired knowledge and skills adopted by the PEF Senate on 18 May 2006.

The key principles are:

- Every candidate has the possibility of requesting recognition of informally acquired knowledge and skills;
- Candidates must enclose all documents required for the evaluation of informally acquired knowledge and skills;
- The evaluation of acquired competences is based mainly on the educational goals and admission requirements of the study programme the candidate is applying for;
- Proven acquired competences and relevant documentation are recognised regardless of where and how the candidates acquired them; the applied methods guarantee fair evaluation, and the results of the evaluation are documented with an appropriate certificate.

A maximum of 60 ECTS can be recognised as knowledge and skills acquired outside of this study programme for:

- Candidates who have completed an undergraduate study programme in one of the relevant* professional fields assessed at 240 ECTS.
- Candidates who have completed a university study programme in force prior to 11 June 2004 in one of the relevant* professional fields.

*The relevant professional fields are defined under the admission criteria for this study programme.

8. Requirements for progression through the programme

For repeat enrolment in Year 1 students must complete at least half of the study requirements from Year 1 (i.e. 30 ECTS).
To enrol in a higher year, students must complete all exams from Year 1.

9. Requirements for completing studies

To complete the study programme, students must fulfil all requirements for all enrolled courses and successfully submit and defend their thesis.

This programme does not contain any parts which can be individually completed.

10. Methods of assessment

FRI follows the criteria and methods of assessment as stated in the UL Statutes. A more detailed description of assessment is regulated at FRI in the Study Regulations FRI UL , the Rules on the Master's Thesis of 2nd Cycle Studies at the Faculty of Computer and Information Science, University of Ljubljana.
The management, Committee for Study Affairs and the lecturers analyse the results and students' competences, and propose possible changes and actions to eliminate drawbacks (revision of content, changes in assignments, lecturers, literature, mode of teaching and

requirements for progression). A teacher's workshop is held annually to discuss problems and possible actions, attended by all teaching staff at FRI. The faculty's management and the Committee for Study Affairs are in charge of implementing the actions decided at the teacher's workshop. Criteria for assessment are consistently followed at the faculty.

In accordance with baselines developed in the Tuning project, assessment at UL PEF covers all levels of acquiring knowledge; the emphasis is on understanding, use, didactic aspects and reflection (in accordance with the planned study outcomes in the syllabus). Traditional forms of assessment (tests, oral/written exams, seminar assignments) are therefore, taking into account the specific features of individual courses, supplemented with projects and research, logs, practical assignments or products. This also includes solving real problems, solving open tasks (problems), the portfolio, presentations etc. The criteria and forms of assessment are provided in the study plan for individual study programmes and are publicly available on UL PEF's website (http://www.pef.uni-lj.si/index.php?id=149). The analysis of students' achievements and the analysis of data provided in surveys are the basis for potential changes in the study programme. The general rules of assessment are regulated by the Examination Rules, approved by the UL PEF Senate and available also to students on UL PEF's website (http://www.pef.uni-lj.si/index.php?id=193). An annual plan of examinations, containing the dates of every exam for every course, is produced in order to implement examinations in an organised fashion.

11. Syllabus

Legend:
L = number of lectures per week,
S = number of seminar hours,
T = number of tutorial exercises per week,
ECTS = number of ECTS points.

Each semester lasts 15 weeks.

YEAR 1

No.	Course	Semester 1 L/S/T	Semester 2 L/S/T	ECTS
63506	Mathematics II	45/0/30		6
63507	Functional Programming	45/10/20		6
5330	Education Theory	30/30/0		6
	General elective course 1*	30/0/30		6
	Elective computer science course 1*	45/0/30		6
63508	Algorithms		45/20/10	6
5333	Inclusive Pedagogical Work		30/0/30	4
5334	Sociological and Philosophical Aspects of Education		30/30/0	6
5331	Didactics		35/0/20	8 (6+2***)
63509	Computer Systems		45/0/30	6

* Students choose courses that amount to 6 ECTS from the list of elective courses from PEF, FRI or other member institutions of the University of Ljubljana.
** Distribution of hours of lectures, tutorials, seminars and other forms of study depends on the course. This is only an approximate distribution in order to calculate the total hours.
*** ECTS that students receive for practical training for each course. A part of practical training is carried out in tutorials as independent student work. The number of contact hours dedicated to practical training for a particular course can be seen in the section “Field work” and “Independent work”.

YEAR 2

No.	Course	Semester 1 L/S/T	Semester 2 L/S/T	ECTS
5328	Didactics of Computer Science	30/30/0		7 (6+1***)
5329	Methodology in Scientific Research	30/0/30		3
63518	E-Learning	45/10/20		6
5335	Psychology for Teachers	45/0/15		8 (6+2***)

	Elective computer science course 2*	45/0/30		6
5332	Practical Teacher Training			7
63547	Teaching Algorithmic Thinking		45/20/10	6 (3+3***)
63548	Master's thesis			17

* Students chose one computer science elective course worth 6 ECTS from the list of elective computer science courses. Students chose one elective computer science course from PEF's list and one from FRI's list.
** Distribution of hours of lectures, tutorials, seminars and other forms of study depends on the course. This is only an approximate distribution in order to calculate the total hours.
***ECTS that students receive for practical training for each course. A part of practical training is carried out in tutorials as independent student work. The number of contact hours dedicated to practical training for a particular course can be seen in the section "Field work" and "Independent work".

ELECTIVE COMPUTER SCIENCE COURSES

Students choose one computer science elective course worth 6 ECTS from the list. Throughout the programme, students chose one elective computer science course from PEF's list and one from FRI's list.

List of FRI elective computer science courses

No.	Course	Semester 1 L/S/T	Semester 2 L/S/T	ECTS
63510	Artificial Intelligence		45/10/20	6
63522	Numerical Mathematics		45/0/30	6
63557	Approximation and Randomized Algorithms	45/0/30		6
63520	Introduction to Bioinformatics	45/20/10		6
63515	Modern Software Development Methods		45/10/20	6
63521	Information Security and Privacy	45/0/30		6
63513	Perception in Cognitive Systems	45/0/30		6
63523	Computer-Based Sound Production	45/0/30		6
63527	Interaction and Information Design	45/20/10		6
63526	IT Governance		45/10/20	6
63525	Data Mining		45/20/10	6
63552	Advanced topics in computer vision		45/10/20	6

List of PEF elective computer science courses

No.	Course	Semester 1 L/S/T	Semester 2 L/S/T	ECTS
5336	Learning with Multimedia		45/0/30	6
5337	Computer-Supported Collaborative Work and Learning		45/0/30	6
5338	Intelligent Systems in Education		45/0/30	6
5339	Computer Games and Simulations for Education and Exploration		45/0/30	6
5340	Text and Web Mining in Education		45/0/30	6

Share of elective courses by year (ratio of ECTS that students acquire through compulsory and elective courses)

Year	Compulsory courses	Elective courses	Practical training	Master's thesis
Year 1	46 ECTS (76.7 %)	12 ECTS (20 %)	2 ECTS (3.3 %)	17 ECTS (28.3 %)
Year 2	24 ECTS (40 %)	6 ECTS (10 %)	13 ECTS (21.7 %)	
Total	**70 ECTS (58.3 %)**	**18 ECTS (15 %)**	**15 ECTS (12.5 %)**	**17 ECTS (14.2 %)**

12. Short presentation of courses

Compulsory courses

Didactics of Computer Science
Didactics is the field of teaching that increasingly deals with more effective learning. It is clearer every day that effective learning is not about a simple transfer of knowledge from teacher to student. It is more important that the teacher provides the right conditions for the student to acquire knowledge. This is especially relevant in computer science and the topics it covers. In this course, students will become acquainted with teaching theories, working methods for computer science subjects, assessment of knowledge and providing feedback, as well as methods for evaluating teaching. They will build their knowledge and also test it through practical work in school.

Methodology in Scientific Research
The aim of this module is to train students for independent research, to plan and implement an extensive research process, and to write scientific papers and reports on empirical (qualitative and quantitative) research. Students deepen their knowledge of teaching methodology and statistics from undergraduate studies by carrying out complex processes of statistical analysis used in education. The purpose of this module is to provide students with the methodological ability to prepare their Master's thesis.

Education Theory
The aim of the course is to train students to recognise different educational principles and concepts in the classroom and school, and to analyse and solve them through knowledge and understanding of various pedagogical concepts and regulations of the education process. The course will assist students in the creation of their own professional profile, their unique teaching style, as well as in reflecting upon their own work and constructing arguments for their own professional choices.

Didactics
Since didactics is a field dealing with education and training not limited to schools, students in this course learn about the basic terms: education as a process, the process of learning and teaching, education and development of the teacher's didactic skills, and the teacher's professional development. They learn how to plan, deliver and assess a class. They learn about the different taxonomies of teaching goals and develop their own skills of operative design and taxonomical distribution of objectives. They learn about different teaching methods and forms, and didactical approaches and systems (problem-solving education, project teaching work) which are directed to attaining goals of modern education. They learn about the articulation of class by stages, from introduction to assessment and evaluation of knowledge.

Practical Teacher Training
Practical teacher training in an authentic educational environment enables students to gain practical skills. With professional guidance and the support of a mentor, they learn systematic observation of pupils' learning and classroom dynamics, guided teaching processes and the analysis of pedagogical-psychological processes and relationships in primary and secondary school. Students learn about the role of the teacher and the social network – other teachers and professional colleagues, parents, pupils – and through this undergo professional specialisation. In collaboration with the Psychology for Teachers course, they also learn to keep a teaching portfolio.

Inclusive Teaching Work
Participants of this module acquire and develop an understanding and the ability to implement inclusiveness in the entire field of teaching and education. Participants strengthen and connect their knowledge of the concept of inclusivity and conditions that guarantee inclusive processes; they develop skills for critical reflection of processes, relationships, situations and other factors which do or do not enable and/or support or are against inclusiveness; they influence the processes which create conditions for cooperation, equal opportunities, equal access and fairness in an educational institution; they reflect the conditions that contribute to providing non-discriminatory work and respect for diversity; they develop practical approaches to inclusive work.

Sociological and Philosophical Aspects of Education
In this course, students learn about the position and rank of education in social subsystems; socially conditioned regulations in education; mechanisms to cope with possible reproduction of inequality in schools; the importance of an organised society and education institutions for the co-existence of diversity; different conceptualisations of schools as a mechanism of social promotion. They reflect, and in relation to social questions, critically evaluate various (their own and studied) teaching experience, and proactively and critically observe and reflect current educational developments. This course also aims to enable students to apply

sociological and philosophical questions to disciplinary problems in class, and to be able to deal with practical problems of teaching children on the basis of knowledge and understanding of the complexity of the education process.

Psychology for Teachers
In this course, students learn the basic concepts in the field of developmental, social and educational psychology, and the psychology of personality, all of which are related to educational work in schools (e.g. the concept of development and legality, personality development, learning, memory, skills, motivation, communication, assessment) and the characteristics of learning and teaching in different developmental stages, through different theoretical paradigms. With study props, students develop teaching strategies, motivational strategies and professional reflection. Through active study approaches that encourage the development of advanced cognitive processes, they deepen and broaden their knowledge of various pedagogical and psychological phenomena which teachers are confronted with on a daily basis in practice. In connection with practical teacher training, they also learn how to keep a teaching portfolio.

Mathematics II
The objective of this course is to review the basic mathematical topics which are necessary at this level of computer and information science and prepare the students for mastering applications of mathematical principles, methods and models in solving specific problems in various domains of computer and information science.

Functional Programming
Students who have finished undergraduate studies of computer science have already completed courses on the basics of programming and used various programming approaches and paradigms in other subjects. The objective of this course is to present this implicit knowledge within a unified perspective, following the recommendations of ACM and IEEE. Students will be exposed to various techniques within their relevant contexts and programming languages. Students lacking sufficient skills in programming will need to put in extra effort and also attend undergraduate courses if needed.

E-Teaching/E-Learning
Students will learn, both theoretically and through concrete examples, how to teach algorithmic thinking using methods that are appropriate for primary and secondary schools.

Teaching Algorithmic Thinking
Students will learn, both theoretically and through concrete examples, how to teach algorithmic thinking using methods that are appropriate for primary and secondary schools.

Computer Systems
The course aims to present some of the more advanced concepts in the field of computer systems to students who have completed undergraduate studies: digital logic, digital design, computer architecture, parallel and networked computer systems. It also includes some of the more basic concepts that students did not study at undergraduate level.

Algorithms
The aim of this course is to gain knowledge of the design and analysis of algorithms and data structures.

Master's Thesis
Depending on their Master's research subject, students choose a suitable research approach and draft a plan. In the theoretical part of the thesis, they summarise and synthesise the relevant scientific and research findings. With the help of their mentor, they form the research problem and break it down into specific research questions, including a hypothesis and objectives of the research, and choose the most appropriate technique of data collection, processing and display. Through a detailed research plan, students demonstrate the ability to integrate theory, research methodology and practical skills acquired during their course of study.

Elective courses

Artificial Intelligence
In-depth knowledge of the methods and techniques of Artificial Intelligence (AI). Ability to solve complex practical problems with AI methods. Competent use of AI methods and tools in research, including projects in other courses and in the final thesis project. Ability to conduct research in Artificial Intelligence.

Numerical Mathematics
The aim of this course is to introduce students of computer and information science to the basic methods of numerical mathematics and train them to independently solve numerical problems they will encounter in their work.

Approximation and Randomized Algorithms
Students will learn, both theoretically and through practical examples, how to use approximation and randomization techniques to solve practical yet intractable computational problems.

Introduction to Bioinformatics
The objective of the course is to familiarise students with basic computational methods and tools that can be used in bioinformatics, and with publically available databases in molecular biology. The course starts with an introduction to molecular biology and genomics, which will allow students of computer science to apply mathematical, statistical and computational techniques to problems concerning the evolution of living organisms, interactions of genes and biological processes, interactions between genome and phenotypes and diseases and more.

Modern Software Development Methods
The aim of this course is in-depth treatment and empirical evaluation of modern software development methods in comparison with traditional approaches. Students work on a project that serves as a case study for the evaluation of modern approaches in order to find its strengths and weaknesses.

Information Security and Privacy
The aim of the course is to educate students to be able to actively provide security and privacy in modern information systems, whether as system administrators or developers of new solutions.

Perception in Cognitive Systems
The objective of the course is to teach students basic competences in the area of artificial perception in cognitive systems, including selected computational theories of perception, computational models of perceptual processes, and the application of these models to design active cognitive robotic systems.

Computer-Based Sound Production
The goal of the course is to educate students (with technological and fine-arts backgrounds) to use computers for sound production, be it for purely technical purposes or creative application scenarios and production environments.

Interaction and Information Design
The objective of this course is to teach students the design and presentation of information with an emphasis on interactivity based on user and data centred multimedia software solutions.

IT Governance
IT governance in enterprises is consistent with the business strategy, development and maintenance of the enterprise architecture, strategic information systems planning, development and delivery of IT services, governance of IT processes, IT management and risk management.

Data Mining
Students will learn a number of core techniques for data mining. The course will include an introduction to data mining as well as a detailed study of several selected methods. It will also focus on the practical use of these methods in real-life problems. The course will use a scripting data mining environment, where students will learn how to use the existing data mining libraries and design and implement in code their own data mining solutions.

Advanced topics in computer vision
The course will include selected advanced topics in motion perception using computer vision. Concrete topics will change each year according to trends in this fast developing field.
in computer science and industry. Potential topics will include:

1. Overview of the field motion estimation and applications.
2. Optical flow estimation using least-squares.
3. Variational optical flow estimation.
4. Parametric template tracking using Lucas-Kanade.
5. Histogram-based tracking using Mean Shift
6. Tracking as stochastic optimization using cross entropy.
7. Recursive Bayes filter for online state estimation.
8. Tracking by Kalman filter.
9. Tracking by particle filters.
10. Tracking deformable objects by constellation models.
11. Methodologies of tracker comparison.
12. Tracking by classification.
13. Long-term tracking by detection.

Learning with Multimedia
Multimedia enables us to prepare and create learning support materials that are very efficient. In this course students will learn about cognitive aspects of multimedia usage and the ways in which knowledge of these aspects can be integrated ino the conceptualisation of support material. They will also supplement and strengthen their knowledge by participating in the conceptualisation and evaluation process of the learning materials.

Computer-Supported Collaborative Work and Training
In our modern world, the complexity of work processes requires us to be more and more dependent on mutual cooperation and teamwork. ICT enables effective communication support, collaboration and teamwork. In this course we will learn about the basic concepts and principles of cooperation and teamwork, and ways to integrate them into systems which enable this kind of work. Special emphasis will be on the meaning of cooperation and teamwork in learning processes.

Intelligent Systems in Education
Can a computer be a good teacher? A good teacher has an excellent understanding of the taught subject, can judge the extent of the student's knowledge, can see how a student is feeling when he/she is studying and is able to present the subject in an interesting way. A

good computer tutor is similar to a human one: it knows the current situation of every student, their knowledge and needs, and can appropriately guide them towards their goals, i.e. to learn the subject covered. Therefore, to know and understand the working of intelligent systems, we look at the mix of theoretical basics related to general methods of artificial intelligence; we also look at specific examples of their application in education.

Computer Games and Simulations for Education and Exploration
We live in a real and digital world at the same time. Our desire for stories, adventure and experience is transposed onto the digital world. Experience can be largely gained in the world of computer games, where we develop skills and competences for collaboration, mediation and so on. Why not create a world of stories, simulations and adventure? We can programme problem situations and games, which are fun and educational at the same time.

Text and Web Mining in Education
Nowadays, a lot of information and knowledge comes in text form and most of it is available online. Machine learning methods can be successfully applied to problems that require analysis of texts or linked texts, and content access logs. On the basis of content analysis given in texts and the analysis of content access, we can model users by their interests, knowledge, learning style (by using on-line testing), and then recommend additional content to them. Furthermore, we can present text content in different ways; we can use methods for text and web analysis in summary construction and visualisation of content.