GRADUATE UNIVERSITY STUDY OF COMPUTER ENGINEERING AT THE FACULTY OF ENGINEERING OF THE UNIVERSITY RIJEKA

Recently, the Expert Council of the Centre for studies at the University of Rijeka has submitted a draft program of the graduate study of computer engineering that is to be performed at the Faculty of Engineering. This study is a logical extension of the existing undergraduate computer engineering according to the Bologna 3 + 2 year model of study. Also, it would complement the offer for performance of graduate university studies, which currently consist of graduate university mechanical engineering, naval architecture and electrical engineering studies.

The foundation of the undergraduate program of computer engineering at the Faculty of Engineering in Rijeka in 2008 was greatly appreciated among the high-school students and ICT business sector. With a timely accreditation of a graduate program, the Faculty wants to provide our currently enrolled undergraduate students with an opportunity to continue their education at our institution, which will improve competitiveness of the region against other university centres.

It is known that we are deficient in computer engineers in Croatia due to the fact that the total number of graduated computer engineers in Croatia does not meet the market needs. In the first two years of the implementation of the undergraduate program of computer engineering, the admission quotas were very quickly filled whereas these days, while enrolment has been carried out through Central Enrolment Office and state-run A-level examination, the interest for the program significantly rises so that there were 6,3 students applying for every available position. As the trend of further development and growth of information technologies and related jobs is continuing, a further stable interest of the market for this engineering major is expected. The northern Adriatic region is large enough to justify the foundation of the graduate program of computer engineering as it will enable students to study closer to home, while the regional industry will get educated professionals within their region.

The study program is connected to the local community both by the students and instructors. The students will be sent to do their internship with relevant companies from the region, while, on the other hand, there will be experts from industry participating in the teaching process. Through the partnership with industry, students are provided with an education based on tools and problems from the real world and the direct contact with companies which will employ these students after the graduation.
While preparing this program, the opinions and recommendations from the industry stakeholders and the current trends of the development in science and technology were taken into consideration, as well as the expressed wishes of students in terms of the desired tracks of specialization. That resulted in the program including key elements of today's computer- and communications - engineering, such as: modern programming languages, development of applications for the Internet or mobile devices, programming of embedded components, mobile communication systems and protocols, biomedical engineering and multimedia applications, to mention just a few.

Prior to writing this proposal for the graduate program of computer engineering, the applicant had done research of comparable programs at higher education institutions in Croatia and the programs of outstanding institutions of the United States of America and Canada as well as European institutions. Following that research, the concept of the proposed graduate program includes a principle of flexible selection of courses by students, which is a common model at world's leading universities. With respect to the programs of other national institutions, the applicant included not only the key competences that are to be met by the program but also cared to achieve some comparative advantages in the program selection. A common model of all competitive universities today comprises a small number of fundamental courses, which characterize a particular module (i.e. a track of specialty) and are compulsory to enrol in, then a larger number of elective courses, which provide an extension of knowledge that was acquired in the compulsory courses, and amongst them a student chooses those that correspond to competences he/she wants to build, and, lastly, a smaller number of elective courses that a student can freely choose from, even outside his/her module.
Following such principle schemes, and yet adapting them to the situation with the existing schemes of the programs of study at the applicant institution, the following structure of the graduate program of computer engineering is proposed: 120 ECTS credits are required to earn the Master's of Computer Engineering degree, of which 27 ECTS credits come from the fundamental courses that are common to both modules, program engineering and computer systems being proposed, 13 ECTS credits come from the fundamental courses that are listed under a particular module, 42 ECTS credits come from the advanced courses that are an extension to the fundamental courses, 10 ECTS are earned through the freely elective courses that students can choose at any department of the University, regardless of the module (i.e. area of specialty) the students are associated with, 10 ECTS credits through two research projects, 5 ECTS credits through an internship with some company, 3 ECTS credits through an elective course in the area of social sciences, and 10 ECTS credits are covered with the accepted Master's thesis. It can be seen from the above description that the proposed program is compliant with the strategic goals of the University of Rijeka since it enables flexible ways of studying, strengthens the University as a research university through the three

semesters of student research work, maintains its relations with economy, whereas by means of the freely elective courses it fosters internal mobility of students as a preparation for their future external mobility.

Admission to the Graduate Program in Computer Engineering is open to persons holding an Undergraduate Program degree in information technology or electrical engineering with at least 180 ECTS credits. Also, persons holding a degree in related undergraduate study programs at other faculties can also apply for admission. In this case, additional admission criteria may be also prescribed.
The student selection procedure is based on the average grade point from an undergraduate study programme.

Graduate Program in Computer Engineering covers large parts of key information and communication technologies used in today's society based on information. The overall aim of the program is to provide students with knowledge and skills required in industry and economy as well as to prepare them for acquisition of new knowledge and skills in understanding, designing and controlling digital technology. Upon completion of the program, the student will be able to actively participate in different sectors of modern society in which computer engineering represents added value and improves the quality of life like industry, private and public sector, banking, entertainment, transportation, energy sector, environment preservation etc. Searching for innovative solutions in system integration and information processing problems, the student will favour interdisciplinary approach. He will autonomously design and control systems, analyse problems and propose solutions during hardware and software development and networking. The student will acquire necessary knowledge and skills to design system components and processes for specific areas. He will be aware of and have particular regard to the importance of human values during the course of the studies and afterwards. Through team work in various projects and through relationships with professors, researchers and industry the student will acquire general skills, in interpersonal terms.
By the end of the programme the student will have attained knowledge and understanding of:

- systems, platforms and tools specific to certain industry areas,
- business processes and organization of typical IT departments,
- Open source and Open access paradigms,
- standards, problems, and applications pertaining to information and information security,
- design, development and management of information and communication systems,
- communication protocols commonly used in industry,
- necessary administrative and system maintenance knowledge ,
- basic machine learning algorithms for creating representation models,
- theory and tools for signal processing and analysis,
- location-based telecommunication services,
- principles and techniques of current mobile communication systems,
- basic aspects of design, implementation and evaluation of interactive system user interfaces,
- design, development and testing of software in different environments,
- protocols and methods for distributed Internet solution implementation,
- project and human resource management and organizational issues in software projects,
- knowledge and skills indispensable for analysis and synthesis of system modelling using mathematical modelling techniques and computer simulation methods.

By the end of the program the student will have the following skills of:

- application of theoretical knowledge from different disciplines in design, development and management of information and communication systems and applications,
- taking into consideration different criteria during system development like security, functionality, cost effectiveness and influence on the environment,
- using appropriate technologies to manage, collect, organize, process and deliver information,
- applying known methods and tools so as to solve problems efficiently,
- detecting problems in existing network infrastructures,
- designing, installing and extending of existing network-based systems as well as optimization of their software and hardware maintenance,
- implementation and maintenance of software applications,
- analysis, designing, developing, adjusting, testing and maintenance of both desktop and Internet applications,
- application of the principles for designing user interfaces and interactive systems with high level of usability,
- establishing and maintaining the consistency of the program product and its functional features, in accordance with the default specification, design and operating data, throughout the life cycle,
- using specialized applications to create digital media,
- application of software engineering management principles and techniques,
- presentation of graphically data and/or concepts
- maintaining data and systems integrity and information protection from accidental disclosure, destruction, unauthorized access or modification and improper use

- application of mobile communication technologies,
- system integration (hardware, software, network interfaces, drivers).

The students will be encouraged to take responsibility during studies, especially in order to autonomously carry out tasks assigned to them during projects, seminars, and other duties. The best students will have the opportunity to reach their full potential through research projects and flexible courses with mentor's guidance. They will build competences to manage, perform and review their work autonomously during analyses, development and implementation of complex systems. Especially, their entrepreneurial spirit will be encouraged.

Upon completion of the accreditation process and obtaining the admission agreement to perform the study, a complete study programme will be available at the website of the Faculty www.riteh.uniri.hr in the menu *Obrazovanje,* and the beginning of the study is scheduled for the academic year 2011/2012.

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