UNIVERSITY OF ZAGREB

FACULTY OF ELECTRICAL ENGINEERING
AND COMPUTING

P R O G R E S S
R E P O R T

2009/2010
&
2010/2011

Zagreb, Croatia

November 2011

Published by:

SVEUČILIŠTE U ZAGREBU
FAKULTET ELEKTROTEHNIKE I RAČUNARSTVA

Unska 3, Zagreb, Croatia
www.fer.hr

Editor:
Prof. Mislav Grgić, Ph.D.

Photos:
Assoc. Prof. Gordan Gledec, Ph.D.
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FER Archive

ISSN 1332-554X

Printed by:
Kerschoffset Zagreb d.o.o.

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Dean's preface

The Faculty of Electrical Engineering and Computing (in Croatian: Fakultet elektrotehnike i računarstva - FER) of the University of Zagreb is undoubtedly the leading educational and R&D institution in the fields of electrical engineering, computing, and information and communication technology in the Republic of Croatia. Over the last 92 years (from 1919 until 1956 as the Electrical Engineering Department of the Technical Faculty, from 1956 until 1994 as the Faculty of Electrical Engineering, and from 1995 until the present under its current name), FER has contributed greatly to the development of Croatian industry and businesses in all the mentioned fields. FER's contribution is manifested mostly through the education of versatile engineers, as well as through numerous national R&D projects.

In today's socio-economic circumstances, FER's objective is to ensure the highest possible level of educational, research and professional development for its students and employees. One crucial step towards this goal is establishing an institutional framework which will guarantee both efficient organization of all Faculty services and appropriate care for the development of human resources. In that respect, one can readily identify four strongly interconnected pillars: (1) education, (2) R&D, (3) human resources, and (4) organizational framework. It is clear that FER can maintain its leading position in Croatia only through integrated development of all four pillars. Through such synchronized actions, FER can achieve a better competitive position in the future, enabling us to enter and maintain partnering relationships with similar institutions in the European Research and Education Area.

Scientific research is one of the basic activities of every R&D oriented faculty and, as such, FER is no exception. In that respect, we must maintain the highest possible research standards, not only because of FER's history and position in Croatian society, but also due to our responsibility for developing high-technology products and collaborating/establishing businesses that are associated with such products. FER must be an incubator for new scientific and research ideas that will be transferred to the national economy. Part of this transfer can be achieved through educational activities, such as masters and doctoral studies. Equally important is the licensing of research results and innovations achieved directly from research projects with national companies.

I am convinced that FER has the research capacities needed for achieving significantly higher scientific and research productivity. It is my belief that "unlocking" our research potential can be achieved through a combination of clearly defined institutional research objectives, good management of existing resources, and coordination of professional activities. The guidelines for our scientific activities are: (1) basic scientific research, (2) partnership with businesses, with an emphasis on national enterprises, and (3) international collaboration based on R&D projects.

Finally, I would like to express my acknowledgment and gratitude to our faculty, staff, students, graduates and friends who, all together, consolidate their efforts to continuously make FER a more enchanting place to work, teach, study and research.

Prof. Nedjeljko Perić, Ph.D.
Dean

Contents

1. General Information

Faculty of Electrical Engineering and Computing

By the decision of the Parliament of the People's Republic of Croatia, on 26 April 1956, the former College of Engineering of the University of Zagreb was divided into four new faculties, one of them becoming the

Faculty of Electrical Engineering,
which started its independent existence
on July 1, 1956.

This was the start of the third, modern stage in the development of electrical engineering in Croatia, characterised by a turbulent development in electronics, electrical power engineering, electrical industry plants, automation, communications and computing.

The Faculty of Electrical Engineering (ETF - Elektrotehnički fakultet, in Croatian) existed under this name until 7 February 1995 when it was renamed the

Faculty of Electrical Engineering
and Computing

Under its new name the Faculty of Electrical Engineering and Computing (FER - Fakultet elektrotehnike i računarstva, in Croatian) continued its development with a commitment to the permanent improvement of its curriculum.

The Faculty buildings "A", "B" and "C" at the present location (Unska 3, Zagreb) were completed and Faculty of Electrical Engineering and Computing equipped in 1963. With the support of the industry and government a new building ("D") was built and inaugurated in 1989 and today the Faculty offers substantial educational and R&D facilities including 35 lecture halls, more than 60 laboratories, Congress centre, tele-conference centre, central library and 12 department libraries, student restaurant, sport and recreation facilities on 43308 m2.

The Faculty is organised in 12 departments which represent the focal points of education, research and development in various fields:

Department of Applied Physics (established in 1945)
Department of Applied Mathematics (1919)
Department of Applied Computing (2005)
Department of Electrical Engineering Fundamentals and Measurements (1924)
Department of Electric Machines, Drives and Automation (1925)
Department of Power Systems (1934)
Department of Telecommunications (1951)
Department of Electronic Systems and Information Processing (1942)
Department of Control and Computer Engineering (1954)
Department of Electroacoustics (1954)
Department of Electronics, Microelectronics, Computer and Intelligent Systems (1943)
Department of Wireless Communications (1954)

Research staff of the Faculty of Electrical Engineering and Computing of the University of Zagreb	
Professors and lecturers	
Full professors	74
Associate professors	38
Assistant professors	48
Assistants	26
Junior researchers	133
Researchers	59

The present research and educational staff comprises more than 160 professors and 210 teaching and research assistants.

In the last few decades research and development at the Faculty has been carried out through projects promoted and funded by the Croatian Ministry of Science, Education and Sports in the fields of Applied Physics and Mathematics and in the fields of Electrical Engineering and Computing. With 19 approved scientific programmes and 74 approved scientific projects in 2007 the Faculty represents the leading institution in the fields of Electrical Engineering and Computing in Croatia. Additionally, researchers of the Faculty are currently leaders of 7 FP7 projects, 3 SEE-ERA.net PLUS projects, 10 multilateral COST actions, 4 bilateral projects, 2 TEMPUS projects, 1 NATO project, as well as the leaders of a number of industrial projects.

Determined to remain a respectable research institution, FER undertakes scientific research at the highest levels of international standing. The Faculty has developed valuable international cooperation with many research institutions around the world, either directly or through inter-university cooperation. The number of international projects in the last two years makes the Faculty of Electrical Engineering and Computing one of the most internationally active institutions in Croatia.

Nowadays, FER counts around 3800 students at the undergraduate and graduate level, 200 students at the old Dipl.-Ing. Level and 450 Ph.D. students. All those numbers clearly emphasize our highly spirited activities in teaching and research.

Finally, as an endorsement of the teaching and research excellence, FER has obtained the accreditation for the bachelor and master study programs from the ASIIN agency (Akkreditierungsagentur für Studiengänge der Ingenieurwissenschaften, der Informatik, der Naturwissenschaften und der Mathematik). The accreditation was issued on the 23 March 2006, 23 March 2007 and 4 October 2011 by a decision of the Accreditation Commission and is valid until the 30 September 2012.

Management and administration

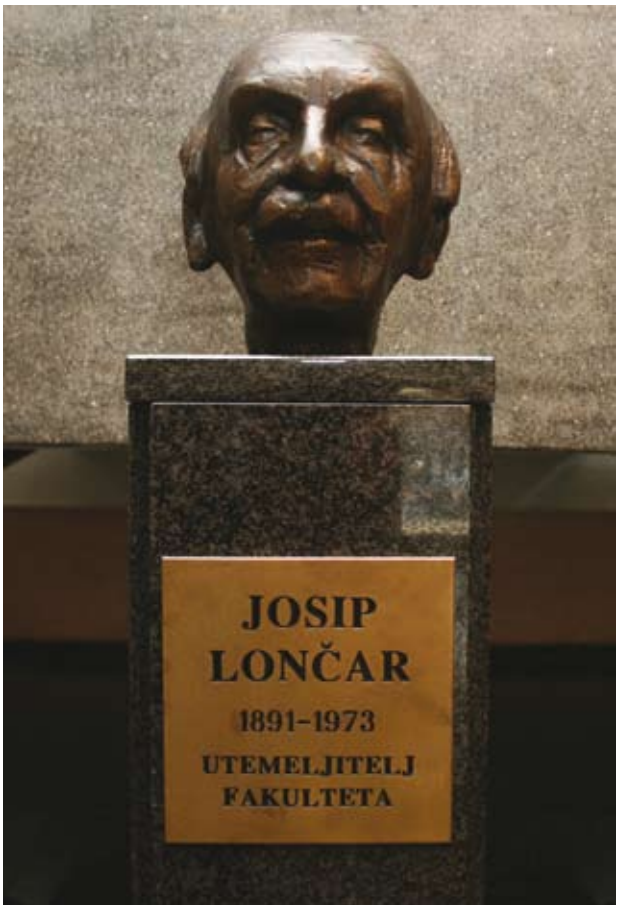
2. Historical Overview

The first building of the Technical College

When the University of Zagreb was reorganised in 1874 to become the first modern university in Croatia, it offered only the humanistic trivium of the Faculty of Law, the Theological College and the Faculty of Arts and Letters. However, documents show that in the wake of the momentous scientific discoveries at the end of the 19th century, its reformers had already made provision for the future establishment of faculties of natural sciences, engineering and other related disciplines.

The building in Vukotinovićeva street where some departments were located from 1947 to 1963

Although the Academy traditionally promoted mainly arts and sciences, a strong technical culture and tradition developed alongside, particularly electrical engineering. Zagreb established its first telegraph connection with Vienna as early as 1850, when, on September 28, the first telegram was sent from Vienna to Zagreb by Josip Jelacic, the Civil Governor of Croatia, Slavonia and Dalmatia; in 1875, a major scientific book was printed in Zagreb: Betriebsstörungen oberirdischer Telegraphen-Leitungen, deren Aufsuchung und Behebung, by Ferdinand Kovačević, a pioneer and the first Croatian designer in the field of telegraphy; the first exchange in Zagreb was set up by Wilim Schwarz in 1886 and the first telephone was introduced in 1887; near the city of Šibenik, on the river Krka, on the beautiful waterfalls of Skradinski buk the hydro-power plant “Krka” was put in operation on August 28, 1895 (power generator 320 kVA, frequency 42 Hz), together with a polyphase transmission system



Bronze bust of Prof. Lončar, one of the founders of the Faculty of Electrical Engineering and Computing.

(a 3 kV transmission line, 11 km long) to supply the city of Šibenik with electrical power - the first system of this kind in Croatia.

Zagreb was the cradle of the study of electrical engineering and electro technical sciences in Croatia: the first electric bulbs were described by Bogoslav Šulek in 1880, and the book On Magnetism and Electricity by Oton Kučera was published in 1891 by the Cultural Society of Croatia (Matica hrvatska). The Society of Engineers and Architects of Croatia and Slavonia, at their Annual Assembly held on February 21, 1898, proposed to establish a Technical College with an Engineering Department in Zagreb. In1910, Dr. Juraj Žerjavić, the abbot and parson of Marija Bistrica established by a deed of donation a foundation for the establishment and maintenance of the College of Engineering at the University of Zagreb and a year later, the Civil Governor of Croatia, Slavonia and Dalmatia, Dr. Nikola Tomašić, carried out a poll which resulted in the decision to set up a Technical College. At the beginning of the 20th century, the Cultural Society of Croatia published quite a number of books dedicated to the application of natural sciences (electrical engineering), under the common title Modern Time Inventions, in which Oton Kucera, Stanko Plivelic and Juraj Božičević dedicated large chapters to electrical generators, motors, electric vehicles, electric energy transmission and accumulators. At that time, the Hon. Marcel Kiepach, Križevčanin, became known by his patents -the use of the dynamo for illumination (Paris, 1911) and an electric device for remote compass indication (London, 1911).

The Technical College was founded by the decree of the State Commissioners' Council on December 10, 1918 and accepted its first students on October 1, 1919.

Among other departments, the College also had the Department of Electrical Engineering. On March 31, 1926 the Technical College was renamed the College of Engineering. The newly founded College started work on the 1st of April of the same year. In that year, the University Senate awarded an honorary Ph.D. degree to Nikola Tesla (the inventor of several hundred patents in the field of electromagnetism, polyphase alternating current, high-frequency radio and wireless communications). The first radio broadcast station in Croatia and southeastern Europe was constructed in Zagreb already in 1926 (the first radio broadcast was on May 15, 1926), only 6 years after the beginning of radio-diffusion in America. One of its initiators was young Dr. Josip Lončar, who worked together with Oton Kučera and Miroslav Plohl. In 1927, Josip Loncar published his first book under the title Construction of Receiving Radio Stations, Part 1 (1927) and Part 2 (1929), where he elaborated the field of radiophony, combining scientific discourse with a popular approach and which promoted him as a pioneer of radiophony in Croatia.

In the thirties, the study of electrical engineering was registered under the name of the Department of Electrical and Mechanical Engineering and at that time all the fundamental electrical engineering subjects were lectured by Josip Lončar, part-time assistant professor (Elements of Electrical Engineering, Electrical Measurements and Introduction to Radio). All other electrical engineering subjects for obtaining a university degree in engineering were lectured by Miroslav Plohl (High-Voltage Techniques, Transmission and Distribution of Electric Energy, Accumulators). The first steps in laboratory and research work were done in the Department of Electrical Engineering, established in the academic year 1928/29 and situated in a separately constructed building, behind the central building on nowadays Roosevelt Square. The founder of the Department and its first Head was Miroslav Plohl, who was appointed full professor in the same academic year. When Jure Horvat joined the College of Engineering, the

subject Power Engineering was introduced, followed by Electric Energy Production in the academic year 1933/34, by Transient Processes in Electrical Devices in the academic year 1935/36 and, for the first time, by Low-Voltage Current (lecturer M. Plohl) in the academic year 1936/37. After the tragic deathofprofessorPlohlinlate1939, Anton Dolenc took over the duty of part-time lecturer in the subjects High-Voltage Techniques and Theory and Manufacturing of Electric Machines and Transformers.

From the very beginning to the 2nd World War, the whole burden of teaching and scientific work in the field was carried by professors Lončar, Plohl and Horvat. Teaching and research work was organised within the Laboratory of Electrical Measurements founded in 1924, which in the academic year 1936/37 became the Laboratory of Electrical Engineering Fundamentals, and three institutes:

- Department of Electrical Engineering,
- Department of High Voltage (founded in the academic year 1934/35),
- Department of Low-Current Techniques (founded in the academic year 1938/39).

In the Laboratory of Electrical Engineering Fundamentals, professor Lončar (in the academic year 1934/35 appointed assistant professor and in the academic year 1937/38 full professor), thanks to his extraordinary persistence and interest, collected a considerable number of precise devices and instruments, which helped with scientific work and were also used for laboratory exercises by students. In such an environment, electrical engineers were educated according to world standards and did not lag behind their colleagues in other countries.

Zagreb soon became known by its international events in the field of electrical engineering. In 1930, Professor Lončar was the first to make the reception of television pictures from London possible in Zagreb. In the same year, he wrote about it in the London Television and the Berlin Fernsehen magazines. As the author of the book About Modern Television, published in Zagreb in 1937, professor Lončar is considered a pioneer of television in Croatia. The first TV-broadcast in Zagreb and Croatia took place in 1939, when there were only two TV-stations in

The building in Savska street 16 where the Dean's Office and three departments of the Faculty of Electrical Engineering were located from 1959 to 1963.

Europe: London and Berlin -the first television station in general having been installed in London in 1936. Also, Josip Slišković, a world known designer of radio and TV-receivers, made possible the first test reception of a London television broadcast in Vienna in 1930.

After the 2nd World War, the Council of the College of Engineering (all departments) comprised 14 full and associate professors, among whom Dr. Josip Lončar, also a full professor. Other lecturers were suspended or their appointments were annulled, because they had been appointed during the war. The Section of Electrical Engineering of the Department of Mechanical Engineering was consequently left with only a few lecturers, and everything had to start again from the very beginning at a time when a large number of students entered University and when the need of the country for engineers was rapidly increasing. Lecturers of other departments held general subjects and mechanical engineering subjects for students of electrical engineering. In that period enormous results were achieved in lecturing and scientific work, particularly in the development of electrical and radio industry.

The first electrical engineer graduated in the academic year 1927/28 and from that time up to the establishment of the Faculty of Electrical Engineering in 1956 a total of 750 electrical engineers graduated from the University of Zagreb.

Today's Vukovar Avenue in mid 60-ies.

Construction of the Faculty's "D"-building in late 80-ies.

3. Study programs at the Faculty of Electrical Engineering and Computing of the University of Zagreb

STUDY PROGRAM SCHEME

<table>
<tr><td rowspan="3">First cycle study programs</td><td>1</td><td colspan="2">Study programs:
• Electrical Engineering and Information Technology
• Computing
(common 1st year for both study programs)</td></tr>
<tr><td>2</td><td>Study program: Electrical Engineering and Information Technology</td><td>Study program: Computing</td></tr>
<tr><td>3</td><td>Specializations:
• Wireless Communications
• Electronics
• Electronic and Computer Engineering
• Control Engineering and Automation
• Electrical Power Engineering</td><td>Specializations:
• Software Engineering
• Computer Engineering
• Telecommunications and Informatics
• Computer Science
• Information Processing and Multimedia Systems</td></tr>
<tr><td rowspan="2">Second cycle study programs</td><td>4</td><td rowspan="2">Study program: Electrical Engineering and Information Technology

Profiles:
• Control Engineering and Automation
• Electrical Engineering Systems and Technology
• Electrical Power Engineering
• Electronic and Computer Engineering
• Electronics</td><td rowspan="2">Study program: Information and Communication Technology

Profiles:
• Information Processing
• Telecommunications and Informatics
• Wireless Technologies</td><td rowspan="2">Study program: Computing

Profiles:
• Software Engineering and Information Systems
• Computer Engineering
• Computer Science</td></tr>
<tr><td>5</td></tr>
<tr><td rowspan="4">Postgraduate study programs</td><td>6</td><td>Postgraduate doctoral study program (electrical engineering / computing)</td><td>Postgraduate specialist study in transformers</td></tr>
<tr><td rowspan="2">7</td><td rowspan="3">Research fields:

<u>Electrical Engineering</u>

• Automatic Control
• Electrical Measurements and Measurement Techniques
• Electronics
• Electric Machines
• Electric Power Engineering
• Wireless Communications
• Telecommunications and Information Technology

<u>Computing</u></td><td>Multidisciplinary postgraduate specialist study in electronic communications regulation</td></tr>
<tr><td>Postgraduate specialist study in information security</td></tr>
<tr><td>8</td><td></td></tr>
</table>

The study of electrical engineering and information technology as well as the study of computing are classified into studies within the area of engineering sciences. These studies prepare experts and potential young scientists for important areas that have a dominant role in technological and social development. Nowadays, advances in engineering are not achieved only by ingenious inventions, but in most cases are a result of sustainable effort in research and development.

University of Zagreb, Faculty of Electrical Engineering has been offering the university curriculum in the area of electrical engineering for more than fifty years. Computing topics had been introduced into the curriculum by the development of computing and the faculty changed its name to the Faculty of Electrical Engineering and Computing in 1995. At the present time, all areas of electrical engineering are intertwined with information and communication technology as well as with computing.

3.1. First cycle study programs

Common objectives of two first cycle study programs are: to educate students for a broad range of professional careers, provide the basis for life-long learning, and prepare students for advanced studies at the graduate level.

All study programs at FER are taught according to the prerequisite system. For every study program, the set of mandatory and the set of elective courses are defined. The student can enrol all courses for which prerequisites have been completed, amounting to around 30 ECTS points per semester. The students are obliged to be present at all forms of teaching. One of the main goals of this study-program reform is the switch from teaching to learning, so the students will have around 20 lecture hours per week. All courses are graded through continuous assessment, consisting of homework, periodical tests, mid-term exams and the final exam.

The first cycle study ends when all mandatory courses are completed and 180 ECTS points are collected. The work on the bachelor thesis, which must be publicly defended, contributes with 12 ECTS points.

The first year of study is common to both study programs, the study of Electrical Engineering and Information Technology and the study of Computing. This first year gives the students the fundamental knowledge of mathematics, physics, electrical engineering and computing. Also, this first year teaches the student to communicate effectively and acquaints them with general principles of engineering. In the second year students broaden the knowledge in mathematics and electrical engineering or computing, but also introduces students to quality management and principles of economy. To emphasize individual work, they conduct and present a seminar.

In the third year, especially in the 6th semester, slight specializations are introduced by corresponding mandatory and elective courses, which give some practical knowledge for students who will not continue to the second level study. Some knowledge on ecology and law is also given. In the 5th semester, to increase project management and teamwork competences, they complete a project in groups of 6-8 students. The study finishes after the bachelor thesis is successfully completed and publicly defended.

First cycle study program - Electrical Engineering and Information Technology

Electrical Engineering covers the application of physical laws about electromagnetic phenomena in development of products and services that provide a benefit to the mankind. Information technology, which uses computers, computer networks, communication systems and technology to sense, process, store and display the information, today has a significant impact

on electrical engineering. Nowadays, it is almost impossible to come across an activity within electrical engineering that is not interconnected with information technology. Thus, these areas have been joined into the first cycle study program of Electrical Engineering and Information Technology. This program develops the competencies to analyze and solve engineering problems of medium complexity, to work as an efficient member of a team, and to contribute to design of systems and processes in the area of electrical engineering and information technology. The fundamental knowledge of mathematics, physics, electrical engineering and information technology, backed up with usage of contemporary computer tools, is utilized.

Within the study program of Electrical Engineering and Information Technology, a student can slightly specialize in one among several offered specializations. This specialization is achieved by selecting appropriate group of courses during the third year of study.

Specialization in **Wireless Communications** is based on electromagnetism as essential wireless communication tool and on widely applied radio systems. Let's mention only the principal topics: electromagnetic wave properties, propagation, wireless communication phenomenon, basic communication system units, signal processing for communication purposes, mobile wireless systems (public and private), optical communication technologies, multimedia and radio navigation, and wireless systems applications.

Electronics encompasses analysis, design and implementation of electronic systems that contain electronic devices and electronic circuits. The students acquire theoretical and practical knowledge needed for modelling, simulation, design and production of electronic circuits and systems in the fields of microelectronics, radiofrequency and microwave electronics, power electronics, electroacoustics, audio electronics, biomedicine, electronic measurement and testing, as well as other areas in electronics.

Electronic and computer engineering prepares students for employment and advancement in development, design and realization of systems

based on analog and digital circuits, computers, systems on a chip and development of corresponding software. The program develops a knowledge base in electronic circuits, process monitoring and control, communications, instrumentation and intelligent systems. It comprises measurement of physical quantities, their conversion into electrical signals, analog and digital processing, application of embedded systems and networks for processing, storage, transmission, analysis and display of information. The emphasis of the program is in integration of multidisciplinary knowledge on circuits, algorithms and software in order to enable students to solve sophisticated problems in planning, management and control of research and development projects in modern enterprises, scientific organizations and services of a contemporary information society.

Control Engineering and Automation as multidisciplinary technological and engineering fields comprise the following knowledge: determination of requirements and criteria for control systems design related to flow of matter, energy and information; implementation of methods for information processing hardware and software for control and automation and data acquisition in the control and automation systems. Control Engineering and Automation systems; implementation of methods for system syllabus qualifies students for design, implementation analysis and design; design and implementation of and commissioning of the less complex systems in the following fields: process automation, automation of manufacturing plants; computer-controlled systems; electromechanical systems, and process measurements and actuators.

Electrical Power Engineering is the branch of engineering science that studies the uses of electricity and the equipment for power generation and. Covers electric power system components, electricity consumption, generation (thermo, hydro, nuclear, renewable), transmission, distribution, electric utility operation, electric power system control, power system protection, power system reliability, government regulation, market operations, risk management etc.

ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY
STUDY PROGRAM SCHEME

Semester	Course	ECTS points	Lecture hours per week	Lab hours per week
I	Mathematics 1	7	6+1	
	Fundamentals of Electrical Engineering	7	6	1
	Digital Logic	6	4	1
	Programming and Software Engineering	6	4	1
	Skills of Communication	3	2	
	Laboratory and Skills - Mathematica	1		1
	Physical Education 1			2
		30	23	
II	Mathematics 2	7	6+1	
	Physics 1	6	5	1
	Algorithms and Data Structures	6	4	1
	Computer Architecture 1	6	4	1
	Management in Engineering	3	2	
	Laboratory and Skills - Autocad	2		1
	Physical Education 2			2
		30	22	
III	Mathematics 3E	5	4+1	
	Physics 2	6	5	1
	Electronics 1	7	5	1
	Electrical Circuits	7	5	1
	Quality Management	3	2	
	Laboratory and Skills - Matlab	2		1
	Physical Education 3			2
		30	22	
IV	Probability and Statistics	5	4	
	Signals and Systems	6	4	1
	Energy Technology	6	4+1	
	Electromagnetic Fields	6	5	1
	Economics and Managerial Decision Making	4	3	
	Seminar	3	2	
	Physical Education 4			2
		30	23	
V	Automatic Control	5	4	1
	Communication Systems	5	4	1
	Information Theory	4	3	1
	Specialization course	4	3	1
	Specialization course	4	3	1
	Sustainable Development and Environment	2	2	
	Project	6		
		30	19	
VI	Specialization course	4	3	1
	Elective course	4	3	
	Elective course	4	3	
	Elective course	4	3	
	Commercial Law	2	2	
	B.Sc. Thesis	12		
		30	14	

First cycle study program - Computing

The principal object of study in Computing is the computer as a universal data processing machine, together with the methods of its application in diverse areas. The holistic approach to hardware, software, and hardware-software dependencies is used. Computing encompasses the theory, methods of analysis and synthesis, design and construction, application and operation of computer systems. This first cycle study program develops the competencies to analyze and solve engineering problems of medium complexity, to work as an efficient member of a team, and to contribute to design of systems and processes in the area of computing. The fundamental knowledge of mathematics, physics and electrical engineering, backed up with usage of contemporary computer tools, is utilized. Within the study program of Computing, a student can slightly specialize in one among several offered specializations. This specialization is achieved by selecting appropriate group of courses during the third year of study.

Software Engineering curriculum combines theoretical knowledge with practical work and experience, developing professional competences in the field of programming, abstraction and conceptual skills in the field of computing. It provides multidisciplinary knowledge in the field of information systems, computer science and management. Focused on application and management of information technology helping to approve efficiency of operations in different kind of businesses, it unites technological knowledge with organizational environments. The graduates can work in the field of information systems management, programming analysis, systems analysis, systems programming, system integration, user requirements analysis, e-business and information technology application.

Computer Engineering program embodies research, design and implementation of computers, computer systems and related software. It includes theory and practical aspects of the design and implementation of computers, computer based systems, mobile and embedded computers, communication systems and other systems that incorporate computers as well as software design with emphasis on applications that provide knowledge and understanding of the complete system. Computer engineering program provides system based approach to the design of computers and software as a whole. This program offers combination of core and advanced knowledge from both computing and electrical engineering required to understand, to design and to be able to envision future complex computers, computer based systems and applications running on those platforms.

Telecommunications and Informatics specialization provides knowledge and skills required for contribution to the design and implementation of networks, systems and services, especially identification, formulation and solution of intermediate engineering problems in the area of communication networks and information services. Besides general computing topics, information representation, logic and languages for specification and modelling are studied, as well as architecture of telecommunication networks and systems, and multimedia services. Elective courses cover concepts, techniques and tools related to local area networks, public mobile network, computer-telephony integration, network programming, basics of virtual environments and others, that will give qualifications and capabilities for development, production and usage of new information and communication technology.

Computer Science brings together scientific and engineering principles, theoretical analysis and computing experience to provide students with solid foundation of the discipline. The computer science module develops a high-level understanding of systems as a whole.This understanding encompasses an appreciation for the structure of computer systems and the processes involved in their construction and analysis. Students recognize many recurring themes such as abstraction, complexity, and evolutionary change and apply them to a broad range of applications as a team member in industry, utility sector and maintaining the skills as the field evolves. government institutions. Students of computer science are capable to understand and apply essential concepts, principles and practices in the context of well-defined scenarios.

Information processing and Multimedia Systems - Information processing is an important ingredient of showing judgment in the selection and application modern multimedia systems. The study profile provides of tools and techniques. They also demonstrate the knowledge in hardware and software components for ability to work as an individual under guidance and processing, storage, coding, transfer, and analysis of various types of multimedia information (signals, speech, data, images, and video). Information processing has applications in communication networks, mobile ubiquitous systems, man-machine interaction, multimedia, medical informatics, security systems, biometrics, bioinformatics, and other areas of modern information society.

COMPUTING STUDY PROGRAM SCHEME

Semester	Course	ECTS points	Lecture hours per week	Lab hours per week
I	Mathematics 1	7	6+1	
	Fundamentals of Electrical Engineering	7	6	1
	Digital Logic	6	4	1
	Programming and Software Engineering	6	4	1
	Skills of Communication	3	2	
	Laboratory and Skills - Mathematica	1		1
	Physical Education 1			2
		30	23	
II	Mathematics 2	7	6+1	
	Physics 1	6	5	1
	Algorithms and Data Structures	6	4	1
	Computer Architecture 1	6	4	1
	Management in Engineering	3	2	
	Laboratory and Skills - Autocad	2		2
	Physical Education 2			2
		30	22	
III	Mathematics 3C	5	4+1	
	Physics 2	6	5	1
	Electronics 1	7	5	1
	Operating Systems	7	5	1
	Quality Management	3	2	
	Laboratory and Skills - Matlab	2		2
	Physical Education 3			2
		30	22	
IV	Probability and Statistics	5	4	
	Introduction to Theoretical Computer Science	6	3+1	1
	Signals and Systems	6	4	1
	Databases	6	4	1
	Economics and Managerial Decision Making	4	3	
	Seminar	3	2	
	Physical Education 4			2
		30	21	
V	Software Design	8	4	4
	Communication Networks	4	3	1
	Information Theory	4	3	1
	Specialization course	4	3	1
	Sustainable Development and Environment	2	2	
	Software Project	8		
		30	15	
VI	Specialization course	4	3	1
	Specialization course	4	3	1
	Elective course	4	3	
	Elective course	4	3	
	Commercial Law	2	2	
	B.Sc. Thesis	12		
		30	14	

3.2. Second cycle study programs

From the academic year 2008/2009 FER offers three study programs at the master lever. The study programs are:

- Electrical engineering and information technology
- Information and communication technology
- Computing

The common objectives of the three second cycle study programs are to educate students for a broad range of professional careers and provide the basis for life-long learning. Recognizing the changing professional environment that students will encounter, the programs aim to develop engineers who possess a strong foundation in mathematics, science and engineering and are able to link science and engineering principles to identify, formulate and solve complex engineering problems in professional practice and research and development contexts.

Upon enrolment, a student immediately chooses the study program and decides for a profile, which is a specialization within a chosen study program. All study programs at FER are taught according to the prerequisite system. For every profile, the following sets of courses are defined:

- Theoretical courses – the courses which comprise theory specific to one or more profiles (e.g. courses which could have the word theory in the title).
- Specialization courses – the courses which further specialise a student within a profile.
- Elective courses – all other courses in the fields of Electrical engineering, Information technology or Computing, or other fields within student's interest.
- Mathematics and science courses – courses offered at FER or other faculties within University of Zagreb, with mathematical and science content.
- Humanistic or social courses – courses offered at FER or other faculties within University of Zagreb, with humanistic or social content.

During the second cycle study program, a student must enroll at least:

- Theoretical courses – 25 ECTS points.
- Specialization courses – 20 ECTS points.
- Elective courses – 12 ECTS points.
- Mathematics and science courses – 8 ECTS points.
- Humanistic or social courses – 6 ECTS points.

In addition, a student must enroll two laboratories, which give practical knowledge specific to the chosen profile. Further, a student must successfully complete a seminar, where all participating students prepare and present individual presentations. Finally, a project must be completed, where students, in groups of 6 to 8, increase their project management, collaboration and team competences.

At the end, a graduation thesis must be completed and defended, which contributes with 30 ECTS points.

All courses will be graded through continuous assessment, consisting of homework, periodical tests, mid-term exams and the final exam. One of the main goals of this study-program reform is the switch from teaching to learning, so the students will have around 16 lecture hours per week. All courses can be taught in English. The second cycle study ends when all mandatory courses are completed and 120 ECTS points are collected.

Next table contains the recommended study scheme and the list of courses. The students can choose other paths through the study.

Second cycle study program - Electrical Engineering and Information Technology

Electrical engineering covers the application of physical laws about electromagnetic phenomena in development of products and services that provide a benefit to the mankind. Information technology, which uses computers, computer networks, communication systems and technology to sense, process, store and display the information, today has a significant impact on electrical engineering. Nowadays, it is almost impossible to come across an activity within electrical engineering that is not interconnected with information technology. Thus, these areas have been joined into the second cycle study program of Electrical engineering and information technology. This program enables a student to acquire the competencies to solve difficult engineering problems, to design complex systems, to

SECOND CYCLE STUDY PROGRAM SCHEME

Semester	Course	ECTS points	Lecture hours per week	Lab hours per week
VII	Theoretical course	5	3	
	Theoretical course	5	3	
	Theoretical course	5	3	
	Mathematics and science	4	3	
	Specialization course	4	2	
	Humanistic or social course	2	2	
	Laboratory of the profile, 1	5		60
		30	16	60
VIII	Theoretical course	5	3	
	Theoretical course	5	3	
	Mathematics and science	4	3	
	Specialization course	4	2	
	Specialization course	4	2	
	Humanistic or social course	2	2	
	Seminar	3	2	
	Laboratory of the profile, 2	3		30
		30	17	30
IX	Specialization course	4	2	
	Specialization course	4	2	
	Elective course	4	2	
	Elective course	4	2	
	Elective course	4	2	
	Humanistic or social course	2	2	
	Project	8		
		30	12	
X	Graduation thesis	30		
		30		

act as a leader of a team and to conduct research and development in one of five profiles.

Within the study program, a student immediately decides for a profile. The profile determines the list of theoretical and specialization courses to choose from.

Control Engineering and Automation as a multidisciplinary scientific and technological field comprises the following knowledge: determination of requirements and criteria for control systems design related to flow of matter, energy and information; research, development and implementation of methods for information processing and data acquisition in the control systems; research, development and implementation of methods for the system analysis, the system design and the system optimization; development, design and implementation of hardware and software for computer control of systems; research, development and design of control algorithms for robots and robotized systems in industry, services and households.

Electrical Engineering Systems and Technology encompasses a wide area of electrical engineering closely related to the application of novel electrical engineering and information technologies. The concept of the curriculum is based on a systematic approach to solving engineering and research tasks. The systematic approach comprises the knowledge and the achievements in electrotechnics, power electronics, digital technology, applied mechanics, electromechanical energy conversion, contemporary measurement techniques and means of transportation. The topics on electrical drives, mechatronic systems, modelling and construction of power electronic systems, design methodologies and diagnostics of electrical machines and devices, contemporary measurement systems, intelligent sensors and actuators are

studied in detail. The multidisciplinary character of the profile includes the knowledge of applied computer systems for real-time operation, signal acquisition and processing, industrial communication networks, and system control via internet.

Electrical Power Engineering is a professional and scientific field of electrical engineering and power systems. It studies and promotes areas of power generation, transmission and distribution of electric energy as well as electric usage and energy management. By studying power systems engineering, students gain knowledge of fundamentals and applications of electrical power engineering in a wide range of topics: theory of power systems control; optimization methods applied to power systems; energy efficiency methods; reactive power control; electric facilities automation; reliability theory; expert systems; environmental protection; efficient use of energy and energy conservation; economic analysis; disturbances and transient phenomena in power systems; power system protection; 2 transmission and distribution networks network planning; development, stability, availability, reliability and operational safety of electric power system subsystems; mathematical modelling of power plants components and subsystems; deterministic and reliability analysis of operational safety; development modelling and analysis of environmental impact of electric power systems; establishment of open market environment, risk management and electrical energy trading; economy modelling, business and human resources management ,microeconomics, marketing, etc. Besides education, research is a crucial factor determining the power systems engineering progress with emphasis on the development of new power system technologies.

Electronic and Computer Engineering gives competences in development, design and implementation of electronic systems based on analog and digital circuits, computers and systems on chip, including software development. Application areas are electronic systems, measurement and instrumentation, process control, communication and intelligent systems. The profile covers measurement and acquisition of physical quantities, transform to electrical signals, analog and digital preprocessing, embedded system and networks for digital signal processing, transmission, analysis, storage and display of data. It gives strong emphasis on integration of multidisciplinary knowledge, as well as hardware, algorithms and software design to achieve complete solutions in a wide spectrum of applications.

Electronics deals with electronic devices and electronic circuits as the basic components of electronic products that are used in all areas of human activities, thereby having a very pronounced position in the modern society. The students in the Electronics study profile acquire theoretical and practical knowledge needed for the analysis, modelling, simulation, design and production of electronic circuits and systems. The students obtain the knowledge in the field of micro- and nanoelectronics, radiofrequency and microwave electronics, optoelectronics, power electronics, audioelectronics, electroacoustics, architectural acoustics, ultrasound, biomedicine, electronic measurement and testing, as well as other areas in electronics.

Second cycle study program - Information and Communication Technology

Information and communication technology enables the transfer and utilization of all kinds of information, therefore presenting the most penetrating contemporary generic technology. As such, it is the foundation of economy and society in the 21st century. This technology generates changes in all spheres of the society. It is applicable in all branches of economy and all areas of science, and it is the background for successful entrepreneurship, as well as for all social and governmental structures. This second cycle study program enables a student to acquire the competencies to solve difficult engineering problems, to design complex systems, to act as a leader of a team and to conduct research and development in one of three profiles. Within the study program, a student immediately decides for a profile. The profile determines the list of theoretical and specialization courses to choose from.

Information Processing (IP) is an important ingredient of modern information and communication systems. IP study profile includes hardware and software components for processing, storage, coding, transfer, and analysis of various types of information (signals, speech, data, images, video). Students gain knowledge in theory and applications of communications, compression techniques, information security, and real-time signal processing. Information processing has applications in communication networks, mobile ubiquitous systems, man-machine interaction, multimedia, medical informatics, security systems, biometrics, bioinformatics, and other areas of modern information society. IP study profile opens carrier paths into a wide spectrum of IT companies, industrial sector, financial and service sector, and any other area where there is a need for processing, analysis, and transfer of information. Skills include design and development of algorithms, hardware and software systems, system testing, integration, and consulting.

Telecommunications and Informatics is based on information theory and information network theory, as well as switching algebra and automata theory. It is focused on the analysis and synthesis of multimedia information and communication in networks, as well as design and implementation of various communication systems and services. Models of local, access, and core networks are studied, including multi-service, intelligent, broadband networks and Internet, as well as planning and optimization of networks and information flows, and

network management. Information transmission and routing, including photonic technology are studied, as well as information and communication services, manageable, and testable systems and networks structures with adequate performance. Knowledge is acquired in the areas of distributed systems, programming, specification and modelling languages, data processing and management in networked systems, telematic services, e-business, and systems with learning capability. Related to that communication protocols, multimedia communications, virtual reality and virtual environments, mobility in networks, mobile networks and software agents are studied. Software engineering is focused on telecommunication systems, while project management as well as research and development management are oriented towards telecom market. Acquired competencies are suitable for, but not limited to the following employment opportunities and positions: research and development of software products for networks and services in telecommunication industry; planning, implementation, testing and management of public fixed and mobile telecommunication networks, Internet and related services; design and operation of corporate and private networks and associated information systems and e-business systems with information rich contents; fundamental and applied research and high education.

Wireless Technologies comprise the scientific and professional area related to the principles of electromagnetic waves generation, transmission, propagation and reception in the area of radio- and optical frequencies; devices and software characteristics and design for the above mentioned purposes; wireless and optical networks and systems architecture which apply the methods of sound, picture and data processing and transmission; electromagnetic compatibility; wireless networks and systems planning and design (mobile communication networks, optical networks, broadcasting systems, terrestrial and satellite communication systems, wireless access, metropolitan, local networks, navigation and radar systems. Students are educated to work in the telecommunication industry, with public mobile wireless networks operators, broadcasting companies, transmitting and communications service providers, companies with private networks, small and medium enterprise companies which design, install and maintain wireless systems, with government administration on frequency planning, regulations and radio spectrum monitoring, in education and research.

Second cycle study program - Computing

The principal object of study in Computing is the computer as a universal data processing machine, together with the methods of its application in diverse areas. The holistic approach to hardware, software, and hardware-software dependencies is used. Computing encompasses the theory, methods of analysis and synthesis, design and construction, application and operation of computer systems. This second cycle study program enables a student to acquire the competencies to solve difficult engineering problems, to design complex systems, to act as a leader of a team and to conduct research and development in one of three profiles. Within the study program Computing, a student immediately decides for a profile. The profile

SMOTRA
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PRIZNANJE

FAKULTETU ELEKTROTEHNIKE I RAČUNARSTVA
SVEUČILIŠTA U ZAGREBU

u kategoriji

Originalnost u predstavljanju na 15. smotri

Klasa: 602-04/10-20/13
Urbroj: 380-08/22-10-5
Zagreb, 6. studenoga 2010.

REKTOR
Prof. dr. sc. Aleksa Bjelis

determines the list of theoretical and specialization courses to choose from.

Software Engineering and Information Systems is a profile where the software development is studied in a systematic, controllable and efficient way. The program focuses on the analysis and evaluation, specification, design and development of software products. Students will learn about project management, quality assurance processes and standardization. They will be encouraged to work in teams and to express their creativity. Information systems are focused on using computer hardware, communication and software technology to fulfill the needs of information and to advance almost every aspect of human activities. Technical, mathematical and other interdisciplinary knowledge is applied to analysis and restructuring of systems that include a human being as a user and a key subject. Such systems might be business systems, production or governmental systems. Complex software systems are designed, developed and implemented to serve as the basis of all the activities within the enterprises and to enhance their competitiveness.

Computer Engineering program embodies research, design and implementation of computers, computer systems and related software. It includes in-depth knowledge of theory and practical aspects of the design and implementation of computers, computer based systems, mobile and embedded devices/computers, communication systems and other systems that incorporate computers as well as software design with emphasis on applications that require knowledge of the complete system. Computer engineering program provides system based approach to the design of computers, communication system and software as a whole. This program offers core, advanced and forefront knowledge required to creatively envision, conceptualize and design innovative, from simple to complex computers, computer based systems and applications running on those platforms.

Computer Science is the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society. Computer science has scientific and mathematical, as well as practical, dimensions integrated into a distinct program study. Understanding of this integration transcends the implementation details of various components to encompass an appreciation for the complex structure of computer systems and their predictive behaviour. Computer science gives student competences for the most challenging tasks, from the infrastructural system programming to new application domains, as well as practical skills needed by the potential leaders of a group of programmers guiding them towards the most advanced problem solving paradigms.

3.3. Postgraduate study programs

Postgraduate studies at the Faculty of Electrical Engineering and Computing are organized as doctoral study and specialist studies.

Postgraduate doctoral study leads to PhD academic degree in the scientific field of Electrical Engineering and the scientific field of Computing. The study is open to applicants who have completed undergraduate study (dipl. ing.) or Master of Science study at the Faculty of Electrical Engineering and Computing, or other electrical engineering and/or computing studies, with excellent or very good marks. The field and branch of undergraduate study do not limit these applicants in choosing the field of postgraduate study. Applicants will be expected to acquire additional knowledge on their own, if necessary.

Applicants who have graduated at another relevant study with excellent or very good marks will be required to pass differential exams. Other university undergraduate studies relevant for admission to the

postgraduate doctoral study are mathematics, physics and informatics.

Every applicant designs his/her programme of study by choosing the number of courses as determined by the postgraduate study plan. The mentor appointed to student should endorse the student's selection of courses. The final choice of courses and the appointment of mentor is approved by the Faculty Council. To obtain PhD, the student must collect altogether 480 ECTS credits (including credits from previous high education) by publishing research results, and enrolling courses and passing examination. The students complete postgraduate study by preparing and defending PhD thesis.

By the academic year 2010/2011, 2176 candidates were awarded the Master of Science degree and 705 were awarded the Doctor of Science degree. Former Master of Science study that has been closed in the academic year 2004/2005, is in the academic year 2008/2009 replaced by the new second cycle study programs leading to the Master degree.

In the academic year 2006/2007 postgraduate specialist study in Transformers has been introduced. The essential of this study is the education of specialists for transformer production and usage in order to improve research, development, design, production and usage of transformers by inclusion of latest findings from different transformer-related areas.

In the academic year 2009/2010 multidisciplinary postgraduate specialist study in Electronic Communications Regulation has been introduced. Besides Faculty of Electrical Engineering and Computing of the University of Zagreb as hosting institution, in lectures/courses participate Faculty of Economics and Business and Faculty of Law of the University of Zagreb. The aim of the study is to gain knowledge related to economic, law and technical aspects of electronic communications regulation and to gain skills for applying regulatory framework and solving regulatory problems on the electronic communications market.

In the academic year 2010/2011 postgraduate specialist study in Information Security has been introduced. The objective of the study is to enable students to gain knowledge in analytical methods and improve their technical and management skills in order to become leading experts in the field of information system security in business and government sector. The acquired knowledge and skills are comparable to those in internationally acknowledged standards in the field of education, research, project management and best practices in the area of information security.

Number of postgraduate students by academic year:

	2009/2010	2010/2011
Ph.D. study - students	290	229
Ph.D. degree awarded	38	34
M.Sc. degree awarded	22	52
Specialist study in Transformers - students	23	42
Specialist in Transformers degree awarded	1	4
Multidisciplinary postgraduate specialist study in Electronic Communications Regulation - students	23	36
Specialist study in Information Security - students	---	18

4. Student Activities

SPORT ACTIVITIES

In the last two seasons 2009/2010 and 2010/2011, FER has competed in 19 out of 20 sports whose championships are organized by the University of Zagreb. In the competition of 33 universities of Zagreb, FER took 1st place in the season 2009/2010 in swimming, volleyball and beach volleyball, karate and in the season 2010/2011 FER took 1st place in swimming, beach volleyball, and 2nd place in chess, volleyball, cross running and futsal. In the total ranking of both of these seasons FER managed to keep 1st place in the competition of 33 universities.

Our students participated in international sport tournament that was organised in Konstanz, Germany. In the competition of universities of Europe and Asia FER took first place in football and basketball, and second place in handball. Zagreb was the host of university futsal championship of Europe. Zagreb university team won the 1st place. University selection was mostly formed from FER students (6 out of 12).

STUDENT UNION

Student union is a student association, elected by all students on Faculty, which protect students' interests, participate in Faculty boards and council work and represent students in high education system.

Union count 28 members of students on bachelor, master and postgraduate program. In the last period Student union organized tribunes, discussion groups and other events which help students to process important administrative information.

Presidents: 2010/2011 - Petar Mostarac, M.Sc.
2011/2012 - Boško Milešević, M.Sc.

SS FER

SS FER is a voluntary student union consisting mainly of students from the Faculty of Electrical Engineering and Computing of the University of Zagreb, and its goal is organizing students' free time in a creative and educational manner. During past years, SS FER was involved in many different projects, workshops and events for the student community.

One of SS FER's main projects is the Club for Students of Electrical Engineering (KSET). Members of this club work intensively on promoting underground and urban culture and have hosted different kinds of artists from many different areas, such as music, theatre and photography, from around the world as well as from Croatia. The club is mostly famous for its concert program with around 100 concerts per year and 30 disco listening sessions. Also, in the past couple of years the club has hosted an impressive amount of festivals and organized many workshops and job fairs. Last "JobFair" was a two day event in May 2011. Through presentations by 23 participants (mostly IT companies), a large number of students got information on job opportunities, possibilities of starting their own business or proceeding their education in scientific research. JobFair 2011 also got the support of the Croatian Chamber of Economy and Croatian Employers' Association.

SS FER tries hard to provide students with some educational courses and workshops. Regarding sound management, the union organizes two courses

annually: the Course on sound equipment and stage setup and Sound engineering workshop dealing with sound setup and operating the sound mixers.

Members of the photo section have also been organizing their photo course for years, since 2006, when the staff from the Faculty of Electrical Engineering and Computing of the University of Zagreb recognized the quality of their work and turned the course into a class offered to FER's students. Two classes are held: Basics of analog and digital photography and Applied photography basics. Both classes have theoretical and applied lectures. In the end students prepare their own exhibition that's held in KSET gallery. The biggest project photo section has been working on is called Monography which was published in 2009. Its goal is to introduce the public to the Union's work.

The computer section is also involved with different kinds of courses whose goals are to familiarize students with rarely used technologies and to give them practical knowledge from the field of computers and networks. Also, one of the projects is maintaining the complete network and web system, so all members and interested parties can learn as much from these areas as they desire. Members of the computer section are currently organizing two courses opened to FER's students (Linux Basics and Linux Advanced).

In conclusion we would just like to point out that we try as hard as possible to provide an entertaining, as well as an educational environment in science and art, and that any student interested in helping our cause is more than welcome to join.

SRK

SRK - Studentski računarski klub (*Student Computer Club*) is a student organization which was founded more than ten years ago (on June 9th 1995) by group of student enthusiasts. Although computer science has changed dramatically over the years, SRK's programs and goals remained the same - promoting computer science, Unix-like operating systems, open source software, and student collaboration on various projects. Its main server "fly.srk.fer.hr" hosts all member accounts (almost 2500 of them) and most of services. SRK is open to all FER students, which become members by enlisting for a shell account on server.

IEEE

The IEEE is a non-profit organization and the world's leading professional association for the advancement of technology. The IEEE name was originally an acronym for the Institute of Electrical and Electronics Engineers, Inc. Today, the organization's scope of interest has expanded into so many related fields, that it is simply referred to by the letters I-E-E-E (pronounced Eye-triple-E). In 2009, IEEE celebrated its 125th Anniversary. To foster an interest in the engineering profession, the IEEE also serves student members in colleges and universities around the world.

The IEEE has:

- more than 385,000 members, including 80,000 students, in over 160 countries,
- over 330 sections in ten geographic regions worldwide,
- about 1,900 chapters that unite local members with similar technical interests,
- more than 1,800 student branches at colleges and universities in 80 countries,
- 45 societies and technical councils representing the wide range of technical interests,
- more than 900 conferences worldwide each year,
- about 900 active IEEE standards and more than 400 in development.

IEEE Student Branch at the University of Zagreb was founded in 1994 at the Faculty of Electrical Engineering and Computing. Currently it counts over 200 members. Student Branch office is located in the basement of the Faculty's C building.

Following IEEE's goal to advance global prosperity by fostering technological innovation, IEEE Student Branch Zagreb finds its mission to create a consciousness about possibilities in making careers in technology. IEEE Student Branch Zagreb is taking various activities to assure metamorphosis of a student into a qualified expert with a promising career.

Becoming a member, student gets combination of various resources for work, and an opportunity to network with colleagues and at the same time acquiring skills to participate on knowledge market. Students are being profiled as superior individuals with experience on different projects. We provide this seemingly small but significant advantage which can be major turnover in achieving personal goals.

One of the prime goals of the IEEE Student Branch Zagreb is creating and promoting a professional environment among students of electrical engineering, electronics, computer science and information science and nurturing friendships among students of these technical sectors. The Branch serves as a communication channel among students and employees at the University of Zagreb, and provides information vital to the future career of the student. The Branch promotes linking with the world of professional technology within and outside institutions in which they are studying.

Since we are not a student association in the common sense of the word, but one of almost 2.000 branches which our colleagues make stronger every day, on every continent of the world, we can say we are really promoting the global community of knowledge. Student Branch Zagreb has close and friendly relationships with many student branches around Europe and even some common projects.

To see what we have done so far, we are inviting you to visit www.fer.hr/ieee. A short list of successfully completed projects is provided hereafter:

- numerous lectures (Obtaining Master Degree Abroad, Technological Challenges and Power Systems, How to Develop New Products and Become an Entrepreneur, Scientific Research and Student Practice in EDF R&D...);
- participation at the IEEE Region 8 Student Branch and GOLD Congress 2010 in Leuven, Belgium and at the IEEE Central European Student Branch Congress 2011 in Linz, Austria;
- organisation of the several Student Transition and Elevation Partnership workshops in the collaboration with the Croatia Section GOLD affinity group;
- organisation of the Croatian Student Branch and GOLD Congress 2011 in the collaboration with the Croatia Section GOLD affinity group;
- organization of movie nights (scientific movies);
- company visit;
- participation in the 24h global programming challenge IEEEXtreme each year;

- helping to form two new student branches in Croatia at the Josip Juraj Strossmayer University of Osijek and at the University of Split;
- actively helping IEEE Croatia Section in numerous activities.

eSTUDENT

During academic years 2009/2010 and 2010/2011, similar to previous years, eSTUDENT continued its mission of providing students with additional practical and theoretical knowledge through various forms of extracurricular education. By forming a network of the best students and connecting them with the best employers in Croatia as a network of excellence, eSTUDENT aims to develop students' leadership abilities and encourage them in taking on responsibilities thus helping them to become competitive in multinational, multicultural, global society. Active on four faculties of the University of Zagreb, eSTUDENT today offers multiple projects and initiatives that offer an opportunity to develop soft skills, multidisciplinary work experience and project management experience. A selection of the most prominent activities of eSTUDENT's FER branch in the targeted time-frame follows:

Lectures and workshops - eSTUDENT's FER branch organized multiple lectures with academic and cultural content. Those include a lecture by Prof. Ivan Đikić, held in the fall of 2010, who discussed advances in molecular biology and the opportunities for scientifically-inclined students of FER to participate in such research in front of a packed crowd of more then 300. In the spring of 2011, the project "Half-month of culture" was launched by the FER branch, during which, in cooperation with other eSTUDENT branches, a series of lectures by prominent artists, actors and sportsmen was held to uplift and fulfill the cultural sensitivities of students. Recordings of some of those lectures can be found at http://vimeo.com/album/1611577. During the two-year period, a number of workshops for developing soft-skills (presentation skills, time management, interview behavior, CV writing and similar) were held with high attendance and interest.

e!Dynamics - a series of workshops that provide students with an opportunity to combine their current knowledge within the economic and IT areas with concrete examples from business practice, and thus gain the necessary knowledge to use and customize popular ERP and CRM solutions. One series of workshops was held in the 2009/2010 academic year, and a new series of workshops was prepared in 2010/2011 to be provided to students in the fall of 2011.

Web Start Contest - WSC's goal was to provide potential young web entrepreneurs an outlet to develop their ideas into projects with a business plan and prototype. Students worked in teams and were supervised by a team of mentors and judges drawn from Faculty professors and assistants, and experts from the investor, business and developer communities. The educational component of the Contest was realized through business and technology skills workshops. The Contest was organized four times, with significant growth happening in 2009/2010 and 2010/2011. It was recognized by the Faculty in 2010/2011 by being formalized into a complementary elective (*vještina*) carrying 4 ECTS points. Two of the projects from that edition of WSC are currently undergoing commercialization. In 2011/2012, the project will receive its first major revision, transforming itself into the App Start Contest, with an additional focus on the emerging mobile computing market.

Case Study Competition - a competition in solving real-world business cases set by renowned companies from Croatia. Students work in teams, mentored by the companies themselves as well as professors and assistants from the University. Accordingly, students get a unique opportunity to implement the knowledge gained throughout their studying into practice and develop communication and analytical skills, as well as experience everyday business problems and challenges before they finish their studies. In 2009/2010 a strong presence and results of FER students was noted in the Competition, and as such in the 2010/2011 edition of the Competition, two cases (by Ericsson Nikola Tesla and Končar) were especially targeted towards students of FER. A number of solutions devised during CSC were implemented, with the participation of their authors, by the companies that offered the cases.

BEST

Board of European Students of Technology (BEST) is a non profit and non political student organisation present in over 30 countries in Europe. Over 3500 members from 90 Local BEST Groups form an innovative, growing and powerful student network. BEST Zagreb was founded in 1999 and has evolved into a recognized and well respected student organisation with a solid base of 50 memebers, from almost all technical faculties, and an alumnae network consisting of 168 engineers. Our goals include providing students with complementary education, helping them connect with their future employers as well as raising awareness on important educational issues. We strive to help students to become more internationally minded through academic and non academic courses held across Europe. During last two years, BEST Zagreb has delivered over 10 projects and hosted more than 120 foreign students in Zagreb. In the same time we have enabled over 100 Croatian students to attend courses all over Europe. We would like to point out some of our projects:

BEST Company Day - A four day event that gathers top companies in Croatia and local students with technical background.

- **Best company day**

By informing themselves at the stands, students can get necessary information about the companies through promotional materials or through direct contact with company employees, getting from them solid and reliable answers to questions and useful advice.

- **Best training day**

BEST Zagreb wants to, through workshops and trainings, teach students how to write a quality CV for job applications, scholarships and competitions. Knowing the importance of proper etiquette in a business environment, we will hold a training on communication with employers, professors and colleagues.

- **Local engineering competition**

What is the goal of the engineering competition? We want to motivate students to utilise their skills and knowledge. There are two categories of competition; Case Study and Team Design. Students are divided into four member teams. Through that, we both promote and develop teamwork in students which they will benefit from later, in a working environment.

Summer course - academic course lasting from 7-14 days with 25 participants from all over Europe. Academic part covers a hot topic in engineering and is taught by local professors. We have organised two courses, one on biomedical electronics and the other on implementation of Bologna process. Apart from the academic part, participants were introduced to Croatian culture and natural heritage. Both courses

were held at the Faculty of electrical engineering and computing.

Cultural exchange - a leisure event between two Local BEST Groups that get together with a goal of experiencing other culture, people and traditions. We have had our cultural exchange with Local BEST Group Naples from Italy. In last 12 years we had 9 cultural exchanges. In our annual plans is cultural exchange for 2012.

Best code challenge - BEST Code Challenge is a computing competition in today's most popular technologies. Participants are students from University of Zagreb and they are solving the task from their homes in one week period. Main objective of BEST organisation is to connect students, universities and companies. This project gathers all the best student programmers and companies, and it also provides promotion of computing science between students.

EBEC (European BEST Engineering Competition) - European final where teams of 4 students compete in 2 categories. The first one called Team Design is related to building a device that will fulfill the requirements of the task. The other one, Case Study**,** is referring to solving business cases usually provided by companies. The 3nd edition of EBEC gathered 84 local rounds and 13 national and regional competitions. In total more than **5000 students** took part in the first level of the competition and over **600** students participated on the national and regional competitions. In the end, the best **104** finalists were present in Istanbul(Turkey) during the 1st-11th of August 2010. 4th edition will happen between **1st and 8th August 2012 in Zagreb**.

RM (Regional Meeting) - This fall, from 27th to the 30th October of 2011, BEST Zagreb is organising a Regional meeting for the south region of BEST in Europe. Over 60 students from 7 south region countries will be attending, and several guests from other European countries. The goal of this regional meeting is to prepare BEST Zagreb for the organisation of its other projects, including EBEC (European BEST Engineering Challenge) which will be held in Zagreb in 2012, and also to contribute to other local BEST

groups by organising project management and team building trainings led by BEST trainers. The meeting is of extreme **importance** for BEST because the organisation members are all students and there are only a few of them with long-time experience, which is why it is necessary to transfer knowledge and experiences.

EESTEC LC Zagreb

EESTEC (Electrical engineering students' association) is a non-political, non-profit organization of and for Electrical Engineering and Computer Science (EECS) students at universities, institutes and technical schools in Europe awarding an engineering degree. EESTEC has more than 2500 members in 28 European countries. The aim is to promote and develop international contacts and the exchange of ideas among the students of EECS. The association achieves its aim through improving technical knowledge of EECS students, introducing them to the industry and the educational system of other countries.

EESTEC LC (local committee) Zagreb was founded in 2007. Since 2010 this LC has organized 3 main events:

"Nuclear technology - power your future!" (March 2010) - International workshop for 22 students from Europe and 20 students from FER. The academic part was realized in cooperation with prof. dr. sc. Nenad Debrecin. It consisted of lectures by professors from Department of Power Systems as well as visiting lecturers. They also visited nuclear power plant Krško while the non-academic part was trip to surrounding of Zagreb and Istria. For this workshop we got the annual **"Hrvoje Požar" award** from the Croatian Energy Association.

"CISCO open days" (October 2010) - local workshop for students from FER where they could learn more about CISCO technology. During the two days students attended lectures by visiting lecturers and laboratory exercises.

"Modern telecommunications - Linking people everywhere" (May 2011) - International workshop for 18 European students and 18 students from FER. The workshop was realized in cooperation with prof. dr. sc. Maja Matijašević and professors from Department of Telecommunications. During the workshop students had the opportunity to learn more about the future technology and development of mobile networks and internet. In addition, they went to University Computing Centre (SRCE) where they saw direct application of what they learned. They also explored the beauty of Croatia through visits to castle of Trakoščan, Varaždin and Pula.

LC Zagreb also organizes events at the local level. We have organized motivational team building weekends for our members (mountain Strmec and eco-village Gradunje) and humanitarian fundraising events "Belot tournament" (October 2010) and "Sweeten your day and fulfill someone's Christmas dream" (December 2010). For more information please visit www.eestec-zg.hr

5.

Departments

5.1. Department of Applied Physics

Faculty and staff

Professors

Tomislav Petković – experimental particle and hypernuclear physics; philosophy and history of science

Dubravko Pevec – reactor physics, nuclear engineering

Vladimir Knapp – nuclear physics and engineering (distinguished professor; retired)

Višnja Henč-Bartolić – atomic physics, lasers (retired in 2004)

Founded in 1945

Head of Department:
Prof. **Lahorija Bistričić**, Ph.D.

Phone: + 385 1 6129 670
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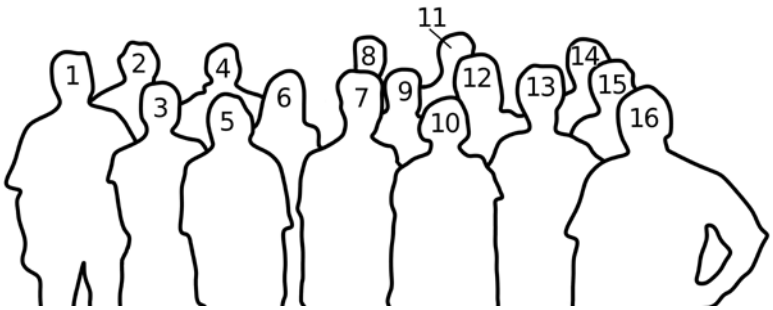
E-mail: pf@fer.hr
Web: www.zpf.fer.hr



1 Tomislav Petković 2 Dubravko Pevec
3 Vesna Popović 4 Zoran Narančić
5 Danijela Grozdanić 6 Ana Holjak
7 Snježana Božić 8 Mario Matijević
9 Anja Marunović 10 Lahorija Bistričić
11 Krešimir Trontl 12 Sanda Pleslić
13 Vesna Borjanović 14 Saša Ilijić
15 Dubravko Horvat 16 Radomir Ječmenica

Associate Professors

Lahorija Bistričić – molecular and laser physics, spectroscopy of nanohybrid polymers

Vesna Borjanović – experimental solid state physics; investigations of nanostructured materials (quantum dots, nanorods, hybrid materials)

Dubravko Horvat – gravitation, cosmology and elementary particle structures and symmetries

Mile Baće – nuclear engineering and non-conventional energy sources (retired in 2008)

Assistant professors

Zoran Narančić – elementary particle structures and symmetries

Saša Ilijić – high energy physics: gravitation and cosmology; stochastic dynamics of complex systems

Sanda Pleslić – atomic and plasma physics, knowledge management

Krešimir Trontl – nuclear engineering, renewable energy sources, programming

Assistants

Vesna Mikšić Trontl

Researcher assistants

Anja Marunović

Mario Matijević

Affiliates

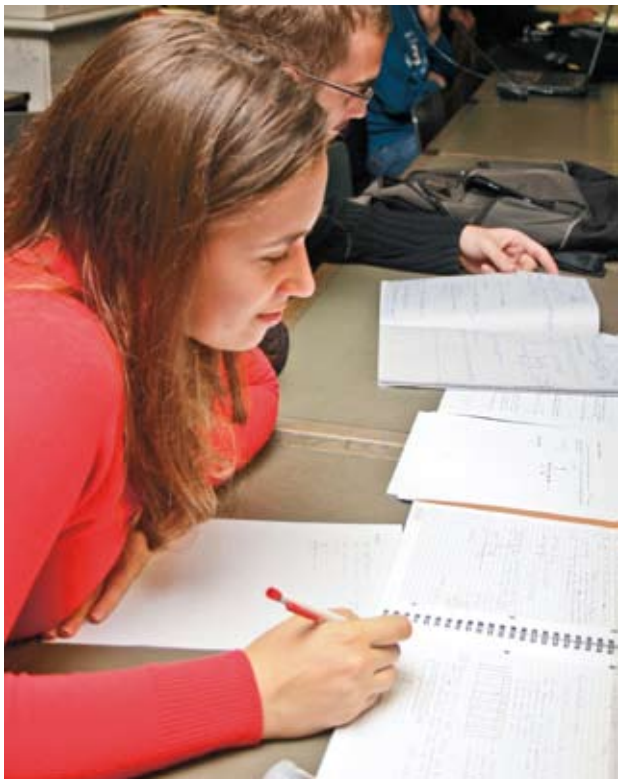
Danijela Grozdanić

Radomir Ječmenica

Administrative staff

Snježana Božić

Ana Holjak



Laboratory support

Vjeran Gomzi

Educational activities

Lectures in general and modern physics: General physics and introduction to quantum mechanics. Electrical, optical, and magnetic properties of materials. Laser physics. Principles and applications of superconductivity. Introductory nuclear physics. Nuclear instrumentation and detectors for particles and radiation.

Lectures on the physical basis of new energy technologies. Selected topics in energy physics. Interactions and detection of nuclear radiation. Shielding and radiation protection. Nuclear fuel cycles and materials. Nuclear safety and regulation. New energy sources. Energy conversion and storage.

First cycle study

Mandatory Courses

- Physics 1
- Physics 2

Elective Courses

- Computing Methods of Modern Physics
- Modern Methods of Physics for Electrical Engineering and Information Technology

Second cycle study

Mathematics and Science

- Fundamentals of Nuclear Physics
- Fundamentals of Plasma Physics
- Introduction to Nanoscience
- Laser Physics
- Physics of Materials
- Quantum Computers

Recommended elective courses

- Radiation Effects and Radiation Protection

Humanistic or Social courses

- Introduction to knowledge management

Specialization courses

- Nuclear Fuel Cycles and Reactor Materials
- Renewable Sources and Advanced Technology

Postgraduate doctoral study

- Detectors and electronic instrumentation for particle physic
- Experimental techniques of nano- and materials sciences
- Laser physics and electro-optics
- New Energy Sources
- Nuclear Reactor Theory
- Pulsed plasma physics with applications
- Quantum mechanics - Selected Topics
- Selected Topics in Nuclear Physics and Nuclear Engineering

Research and development

Gravitational physics: classical and quantum physics of gravitational field. Physics of compact structures: black holes, gravastars, neutron stars, quark and strange stars.

Advanced, inherently safe, small power nuclear reactor (IRIS); Optimal fuel management of the standard PWR reactor; advanced fuel cycles and long term nuclear energy strategies; Radiation shielding. Renewable energy resources and applications.

The HKS – HES research group carried out lambda (Λ) hypernuclear spectroscopic experiment at Jefferson Lab in 2009, where T. Petković have participated twice for the periods of June 25 – July 22 (installation of the experiment), and October 1 – 25 (shifts). Data were taken for targets ^{7}Li, ^{9}Be, ^{10}B, ^{12}C and ^{52}Cr in the wide-mass region, as well as with those of CH_2 and H_2O for the mass scale calibration. Experimental setup consists of the third generation of two spectrometers (for scattered electrons and for kaons), both optimised to reach *sub*MeV resolution. We are now in data analysis phase, and only preliminary results may be shown. In order to achieve designed energy resolution (400 keV) and accuracy (100 keV), further improvement of more accurate calibration procedure is needed. At the *Rutherford Centennial Conference on Nuclear Physics* at the University of Manchester in August 2011, T. Petković gave poster presentation of the title: 'A Development of Hypernuclear Precision Spectroscopy by the HKS – HES Experiment at the JLab'.

Study of structure and vibrational dynamics of molecular systems (crystals, polymer films, nanohybrids) with application in different fields such as optoelectronics, shape-memory materials, conducting polymers and biotechnology.

Investigation of the new materials, with desired properties: nanostructured materials, quantum dots, nanorods, and hybrid materials. Characterization of the material with different experimental techniques and developing the device structures based on new nano-materials.

Properties of laser-produced plasma from Al, Mg, Si, Nb and Mo, Cu aloy have been investigated and compared. Plasma radiation produced by ablative capillary discharge has been investigated as a radiation source for extreme ultraviolet lithography. Polyvinylchloride with additives (Sn, Zn and C) and polyacetal were used as materials for capillary production. Optimisation of working conditions was also performed.

Study of structural and electronic properties of low dimensional systems: surfaces and ultra thin metallic films by scanning tunnelling microscopy (STM) and photoemission spectroscopy.

The investigation of structural changes occurring in thin amorphous silicon during thermal treatments by EPR, GIXRD and GISAXS.

Projects

Classical and Quantum Theory of Nonlinear Fields and Structures (Project 036-0982930-3144, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Dubravko Horvat, 2007-)

Fuel Management of Standard and Advanced Nuclear Reactors (Project 036-0361590-1579, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Dubravko Pevec, 2007-)

Macrocyclic Ligands, Structural Changes of Solutions and Molecular Spectroscopy (Project 098-0982904-2927, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Goran Baranović, Institute Ruđer Bošković; Project collaborator: Lahorija Bistričić, 2007-)

Vibrational Dynamics and Structure of Multifunctional Polymer Systems (Project 125-1252971-2868, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Vesna Volovšek, Faculty of Chemical Engineering and Technology, University of Zagreb; Project collaborator: Lahorija Bistričić, 2007-)

Ion Beam Interactions and Nanostructures (Project 098-1191005-2876, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Milko Jakšić, Institute Ruđer Bošković; Project collaborator: Vesna Borjanović, 2007-)

Electron and Crystal Structure of Supported Selforganized Nano-systems (Project 035-352828-2840, Ministry of Science Education and Sports, Republic of Croatia, Principal investigator: Petar Pervan, Institue od physics; Project collaborator: Vesna Mikšić Trontl, 2007-)

Electromagnetic Metamaterials and Nano-electromagnetics (Project 036-0361566-1571, Ministry of Science, Education and Sport, Republic of Croatia, Principal investigator: Silvio Hrabar, Project collaborator: Višnja Henč-Bartolić, 2007-)

International links

Brookhaven National Laboratory (BNL), Upton, New York, USA

Gesellschaft für Reaktor Sicherheit (GRS), Garsching, Germany

International Atomic Energy Agency (IAEA), Vienna, Austria

International Centre for Theoretical Physics (ICTP), Trieste, Italy

Paul Scherer Institut, Villigen, Switzerland

Rheinland Westfallische Technische Hochschule Aachen, Aachen, Germany

Ruhr Universität Bochum, Institut für Experimentalphysik, Bochum, Germany

Universität Stuttgart, Institut für Kernenergetik und Energiesysteme, Stuttgart, Germany

5.2. Department of Applied Mathematics

Faculty and staff

Professors

Vladimir Ćepulić – finite groups, finite mathematics (distinguished professor; retired)

Neven Elezović – mathematical analysis

Ivan Ivanšić – topology (distinguished professor; retired)

Ljubo Marangunić – finite mathematics, mathematical analysis (retired)

Founded in 1919

Head of Department:
Prof. **Vesna Županović**, Ph.D.

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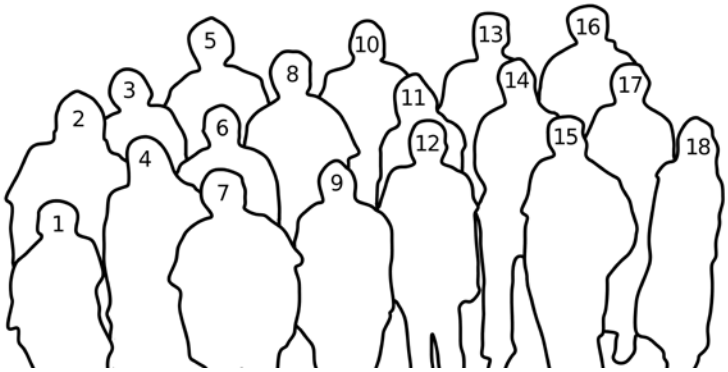
Web: www.fer.hr/zpm

Mervan Pašić – differential equations

Darko Žubrinić – nonlinear elliptic PDE-s, fractal analysis



1 Luka Korkut 2 Siniša Miličić
3 Tomislav Šikić 4 Vesna Županović
5 Domagoj Vlah 6 Goran Radunović
7 Mervan Pašić 8 Neven Elezović
9 Zdenka Komerički 10 Mario Krnić
11 Anamari Nakić 12 Tomislav Burić
13 Domagoj Kovačević
14 Andrea Aglić Aljinović
15 Mario Osvin Pavčević 16 Ilko Brnetić
17 Darko Žubrinić 18 Maja Resman

Associate professors

Andrea Aglić Aljinović – mathematical analysis

Ilko Brnetić – mathematical analysis

Luka Korkut – partial differential equations

Mario Krnić – mathematical analysis

Mario Osvin Pavčević – discrete mathematics

Vesna Županović – dynamical systems

Assistant professors

Josipa-Pina Milišić – mathematical modeling of semiconductors

Tomislav Šikić – representation theory of affine Lie algebras

Igor Velčić – theory of elasticity, nonlinear analysis

Assistants

Domagoj Kovačević

Research assistants

Tomislav Burić

Lana Horvat Dmitrović

Ana Žgaljić Keko

Marijana Greblički

Siniša Miličić

Anamari Nakić

Goran Radunović

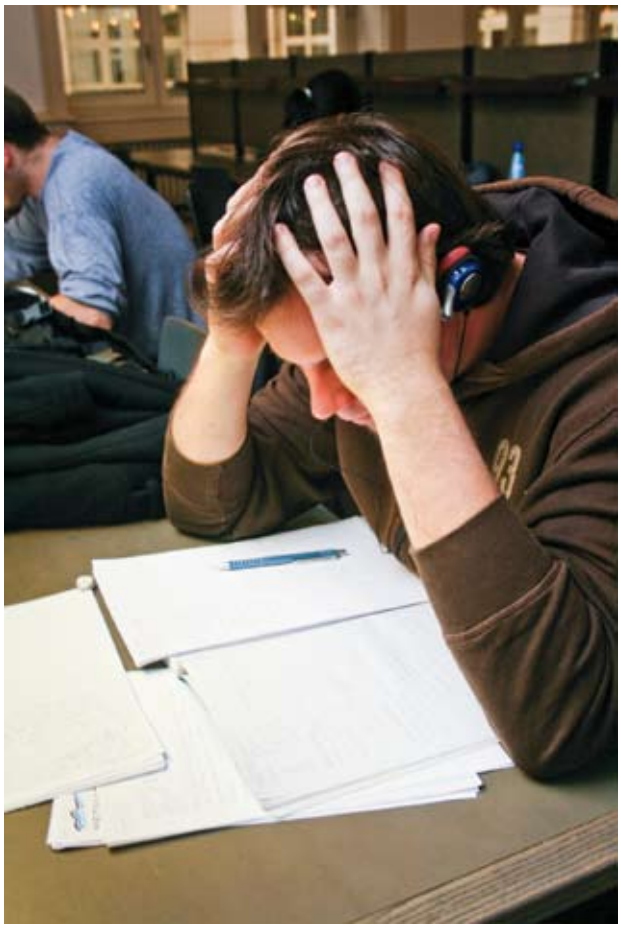
Maja Resman

Domagoj Vlah

Administrative staff

Zdenka Komerički

Department of Applied Mathematics is the oldest one at the Faculty of Electrical Engineering and Computing, founded in 1919. Members of the Department are working in various fields of mathematics. Some of our past professors had been originally trained in electrical engineering. Such was the case for example with the academician Danilo Blanuša, a past dean of the Faculty, whose results concerning isometric imbeddings of hyperbolic spaces into Euclidean spaces obtained international acclaim (cited among others by John Nash), as well as his correction of Max Planck's formulae from relativistic phenomenological thermodynamics, and his graph now



called Blanuša's graph or Blanuša's snark (adopted as the logo of the Croatian Mathematical Society). Above the main entrance of the Department there is a nice rectangular marble plaque with an inscription cited from Plato's school: *Medeis ageometretos eisito* (in Greek), that is, «Those who do not know geometry cannot enter». For a more detailed information about the history of the Department of Applied Mathematics you are invited to consult a survey article written by professor Ivan Ivanšić, available at the web address www.zpm.fer.hr/~darko/zavod_pov (in Croatian). See also his related journal paper in Section 1.1.4. below published by *Glasnik matematički* in 2008.

In 2009, when the Department of Applied Mathematics celebrated 90 years of existence, a new professional mathematical journal *Differential Equations and Applications* (DEA) has been successfully launched in Croatia upon the initiative of Professor Neven Elezović, managing editor of the journal. It is published at the pace of four issues yearly by the Element Publishing House in Zagreb and the Department of Applied Mathematics of the Faculty of Electrical Engineering and Computing. Among three editors in chief of DEA is Professor Mervan Pašić, along with Professors Mats Gyllenberg from Finland and Jean-Michel Rakotoson from France, while the associate editor is Professor Vesna Županović. You are invited to visit the web pages of DEA at the following address: dea.ele-math.com

Educational activities

Basic calculus. Vector analysis. Linear algebra. Differential equations. Functions of a complex variable. Fourier series. Laplace transform. Discrete mathematics. Graph theory. Numerical methods in applied mathematics. Probability and stochastic processes. Croatian and international mathematical competitions.

First cycle study

Mandatory Courses

- Laboratory and Skills - Mathematica
- Mathematics 1
- Mathematics 2
- Mathematics 3 - C
- Mathematics 3 - EE
- Probability and Statistics

Effective Courses

- Mathematical Modeling with Mathematica

Second cycle study

Mathematics and Science

- Complex Analysis
- Computational Mathematics
- Differential Equations and Stability Theory
- Discrete Mathematics
- Extremal combinatorics
- Financial Mathematics
- Fourier Analysis
- Graph Theory
- Introduction to Mathematical Chaos Theory for Engineers
- Linear Algebra
- Mathematical Logic and Computability
- Stochastic Processes

Postgraduate doctoral study

- Applied Functional Analysis
- Combinatorial algorithms
- Differential Equations and Dynamical Systems
- Discrete Stochastic Processes
- Integral and Discrete Transformations with Wavelet Theory
- Mathematical Methods in Control Theory

- Mathematics of Codes
- Nonlinear Optimization
- Stochastic Processes and Filters

Research and development

Mathematical structures in mathematical models and numerical algorithms. Construction of combinatorial structures. Symmetric block designs. Group theory. Nonlinear and quasi-linear elliptic equations. Ordinary differential equations. Dynamical systems. Fractal analysis. Inequalities in analysis and applications. Representation theory.

Projects

Combinatorial designs and finite geometry (Project 036-0372785-2964, Ministry of Science, Education and Sports, Principal investigator: Mario Osvin Pavčević, 2007-)

Estimates of sums, integrals and integral transformations (Project 036-1170889-1054, Ministry of Science, Education and Sports, Principal investigator: Neven Elezović, 2007-)

Fractional derivatives and higher transcendental functions (Project HMP Croatia-Macedonia, National coordinator: Neven Elezović, 2007-)

Nonlinear analysis of differential equations and dynamical systems (Project 036-0361621-1291, Ministry of Science, Education and Sports, Principal investigator: Mervan Pašić, 2007-)

Investigation of finite groups and their applications in combinatorics (Project 036-0000000-3223, Ministry of Science, Education and Sports, Principal investigators: Vladimir Ćepulić, 2008-2009, Mirjana Garapić, 2009-2010)

Analyse Fractale de l'application de Poincaré aux voisinages des polycycles Programme (PHC COGITO 2011 Project No. 24710UJ, Principal investigators: Vesna Zupanovic and Pavao Mardesic, 2011-2012)

International links

American Mathematical Society, Providence, USA

Hirschleber & Partner, Hamburg, Germany

INFORMIX GmbH, Ismanning, Germany

International Institute of Informatics and Systemics, Orlando, FL, USA

Johannes Gutenberg Universität, Mainz, Germany

Karl Franzes Universität, Graz, Austria

Universite de Bourgogne, Laboratorie de Topologie, Dijon, France

Universite de Versailles, Mathematiquie Appliqués, Pariz, France

University of Glasgow, Department of Mathematics, Glasgow, United Kingdom

University of Kiev, Kiev, Ukraine

University of Oklahoma, Norman, USA

5.3. Department of Applied Computing

Faculty and staff

Professors

Krešimir Fertalj – information systems, software engineering, project management

Damir Kalpić – information systems, operational research

Vedran Mornar – information systems, programming paradigms, e-learning

Founded in 2005

Head of Department:
Prof. **Mirta Baranović**, Ph.D.

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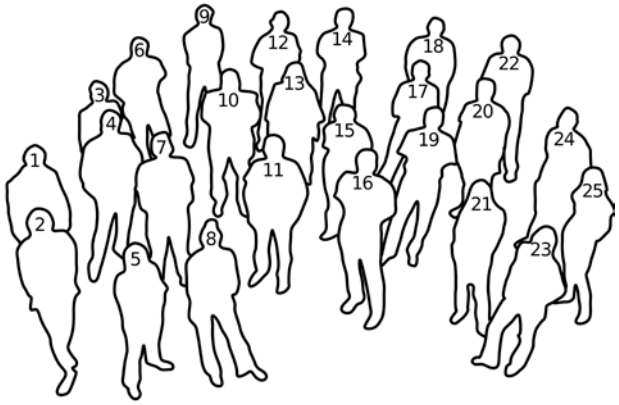
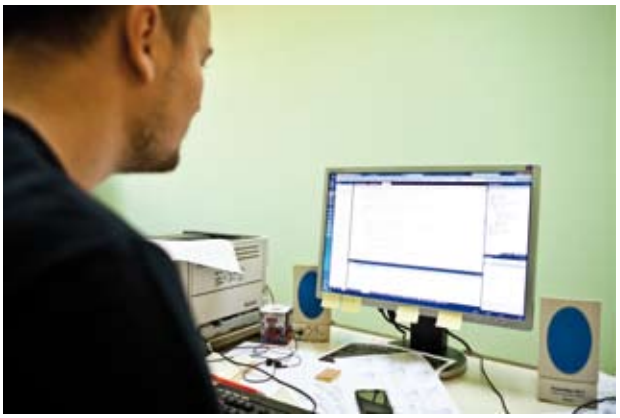
Web: www.zpr.fer.hr



1 Ivan Budišćak 2 Sonja Majstorović 3 Marija Katić
4 Danijel Mlinarić 5 Lidija Rovan 6 Mario Brčić
7 Fran Tonković 8 Ivana Nižetić Kosović
9 Nikša Stanović 10 Vedran Mornar
11 Tomislav Rajnović 12 Krešimir Križanović
13 Mirta Baranović 14 Krešimir Fertalj 15 Damir Kalpić
16 Tomislav Jagušt 17 Boris Milašinović
18 Ivica Botički 19 Nikica Hlupić 20 Boris Vrdoljak
21 Jasenka Anzil 22 Nikola Hadjina
23 Dubravka Pukljak Zoković 24 Gordan Gledec
25 Ljiljana Brkić



Associate professors

Mirta Baranović – databases, information systems, data warehousing, business intelligence, semantic web

Marijan Đurek – computer ergonomics, computer forensics

Gordan Gledec – networks and Internet, web technologies

Boris Vrdoljak – database systems, data warehousing, business intelligence

Assistant professors

Nikica Hlupić – system identification and optimization, algorithm design

Slaven Zakošek – database systems

Assistants

Jasenka Anzil
Ljiljana Brkić
Dubravka Pukljak Zoković

Research assistants

Ivica Botički
Mario Brčić
Ivan Budišćak
Mirjana Domazet-Lošo
Boris Milašinović
Ivana Nižetić Kosović
Marija Katić
Lidia Rovan

Associates

Tomislav Jagušt
Krešimir Križanović
Igor Mekterović
Danijel Mlinarić
Tomislav Rajnović
Nikša Stanović
Fran Tonković

Administrative staff

Sonja Majstorović

Educational activities

Programming, Software engineering, Algorithms and data structures, Programming paradigms and languages, Databases, Data Warehousing, Business Intelligence, Operational research, Object-oriented programming, Information systems design, Information systems security, Hardware and software ergonomics, Electronic business, Risk analysis, System Identification and Optimization.

First cycle study

Mandatory Courses

- Algorithms and Data Structures
- Databases
- Development of Software Applications
- Programming and Software Engineering
- Programming Paradigms and Languages
- Software Design Project

Elective courses

- Ergonomics in Computing

Skills

- Applied basics of photography
- Basics of analogue and digital photography
- Competitive programming


Posebno priznanje

Second cycle study

Mandatory Courses

- Laboratory of Software Engineering and Information Systems 1
- Laboratory of Software Engineering and Information Systems 2

Theoretical courses

- Advanced Algorithms and Data Structures
- Advanced Databases
- Data Management
- Database Systems
- Development of Information Systems
- Object-oriented Design

Skills

- Applied basics of photography
- Basics of analogue and digital photography
- Competitive programming

Specialization courses

- Business Intelligence
- E-Business Technologies
- Geospatial Databases
- Internet Security
- Operations Research
- Project Management
- Protection and Security of Information Systems

Postgraduate doctoral study

- Algorithms in Bioinformatics
- Application of numerical methods
- Communication Protocols-Selected Topics
- Computer Systems Evaluation
- Data structures and algorithms
- Data Warehouse Design
- Databases
- Electronic Business
- Information Systems Management
- Operational research
- Quantitative methods in risk management
- Selected Topics in WWW Technologies & Applications
- Software development methods and techniques
- Spatio-temporal databases and data streams
- Statistical Modeling and Identification

Research and development

Motivated by the topics and problems emerging in the processes of knowledge and technology transfer and while developing applications aimed for enterprises, educational and other institutions, the researchers are participating in a wide area of research in the field of Computing. Research concerning e-education encompasses computer supported education, collaborative computer-supported learning, blended learning, mobile learning and administrative applications to support the administration in education of courses and the registration of students' study-related activities.

Intensive research has been performed in the area of geospatial and spatio-temporal databases, data streams and moving objects, resulting in the development of new data types and operations for spatio-temporal data streams and management of moving objects in the context of spatio-temporal data streams. Software architecture research is concerned with the service-oriented architecture and models, composite web service development, software

maintenance, reengineering and aspect oriented software. In the area of data warehousing and business intelligence, the main research topics are the improvement of the ETL processes and data quality procedures, integration testing of ETL procedures and ontology based data warehouse design. Semantic web research is concerned with data integration issues, categorization of semantic web applications, defining semantic web development process and semantically enhanced web personalization. Within the Linking Open Data project, a dataset in linked data format, describing study programmes has been published. Research in the area of bioinformatics resulted in algorithms for alignment-free detection of local similarities among genomes, algorithms for estimating mutation distances and pairwise distances between genomes.

Projects

Optimisation and risk management in information systems (Project 036-0361983-3137, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Damir Kalpić, 2007-)

Sustainable development of information systems (Project 036-0361983-2022, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Krešimir Fertalj, 2007-)

Semantic integration of heterogeneous data sources (Project 036-0361983-2012, Ministry of Science, Education and Sports, Republic of Croatia, Project leader: Mirta Baranović, 2007-)

Computer supported education (Project 036-0361983-2019, Ministry of Science, Education and Sports, Republic of Croatia, Project leader: Vedran Mornar, 2007-)

Geospatial Sensors and Moving Objects Databases (Project 036-0361983-2020, Ministry of Science, Education and Sports, Republic of Croatia, Project leader: Zdravko Galić, 2007-)

Information System for Higher Education in Croatia - ISVU (Ministry of Science, Education and Sports, Republic of Croatia, Project leader: Mirta Baranović, 2000-)

A group of studies related to standardisation in e-Business (Croatian Ministry of Economy, Labour and Entrepreneurship, Project leader: Damir Kalpić, 2008-2009)

Standardisation study for e-Business

Methodological evaluation manual

Plan for drafting the standards and the accompanying documentation

Standards draft

Educational materials

Final report

MILE: Mobile and interactive learning environment (Ivica Botički, 2008-2009)

Croatian army soldier nutrition in the 21st century (software for Croatian army nutrition planning, (Ivica Botički, 2008-2009)

International links

Humboldt Universität, Berlin, Germany

Information Resources Management Association (IRMA), Hershey, PA, USA

Deutsche Telekom AG, University of Applied Sciences, Leipzig , Germany

University of Mostar, Bosnia and Herzegovina

University of Tuzla, Tuzla, Bosnia and Herzegovina

National Institute of Education, Nanyang Technological University, Singapore

Chinese American Scholars Association (CASA), New York, USA

VRIJE University Brussels, Belgium

Max Planck Institute for Evolutionary Biology, Plön, Germany

5.4. Department of Electrical Engineering Fundamentals and Measurements

Faculty and staff

Professors

Sead Berberović – numerical field calculations, CAD

Mladen Boršić – telemetric data acquisition systems, metrology infrastructure (retired in 2008)

Zijad Haznadar – professor emeritus

Founded in 1924

Head of Department: Prof. **Damir Ilić**, Ph.D.

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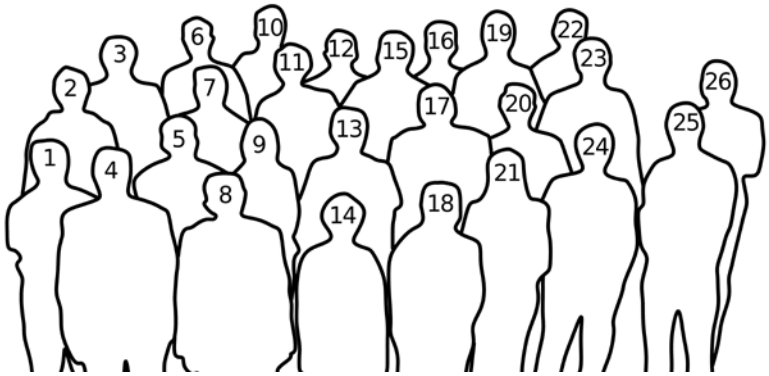
E-mail: oem@fer.hr
Web: www.fer.hr/zavod/oem



1 Sead Berberović 2 Davor Kotur
3 Sanja Ferković Živković 4 Damir Ilić
5 Armin Pavić 6 Luka Ferković
7 Petar Knežević 8 Zijad Haznadar
9 Kristina Ferković 10 Roman Malarić
11 Martin Dadić 12 Ivan Leniček
13 Ruža Vukelić 14 Marija Čukelj
15 Ivica Kunšt 16 Hrvoje Hegeduš
17 Zoran Skočir 18 Jasenka Haladin
19 Marko Jurčević 20 Marko Banek
21 Mihaela Vranić 22 Frano Škopljanac-Mačina 23 Tomislav Župan
24 Damir Pintar 25 Bojan Trkulja
26 Damir Jurić

Damir Ilić – precise electromagnetic measurements, calibration of standards, virtual instruments, measurement technique

Petar Knežević – telematic services, performance of computer systems

Roman Malarić – automated data acquisition systems, electromagnetic measurements, calibration of standards

Armin Pavić – EM fields measurement and protection, computer-aided learning

Zoran Skočir – database design, information system development, networked economy, electronic business

Željko Štih – numerical field calculations, CIM and management

Associate professors

Bruno Blašković – model checking, formal description methods, protocol synthesis

Martin Dadić – computational and applied electromagnetics

Šandor Dembitz – natural language processing, expert systems

Božidar Ferković – precise measurements of electromagnetic quantities (retired in 2002)

Dušan Vujević – precise measurement of voltage and magnetic quantities (retired in 1997)

Assistant professors

Marko Banek – ontology engineering, natural language processing

Luka Ferković – precise measurement of high AC and DC current, non conventional measuring transducers

Ivan Leniček – precise electromagnetic measurements, calibration of standards

Mirko Randić – distributed object-oriented software design, network and system management

Bojan Trkulja – computational electromagnetics, boundary element methods

Assistants

Hrvoje Hegeduš

Research assistants

Kristina Ferković

Marko Jurčević

Damir Jurić

Petar Mostarac

Jakov Pavlek

Damir Pintar

Alan Šala

Mihaela Vranić

Tomislav Župan

Associates

Luka Humski

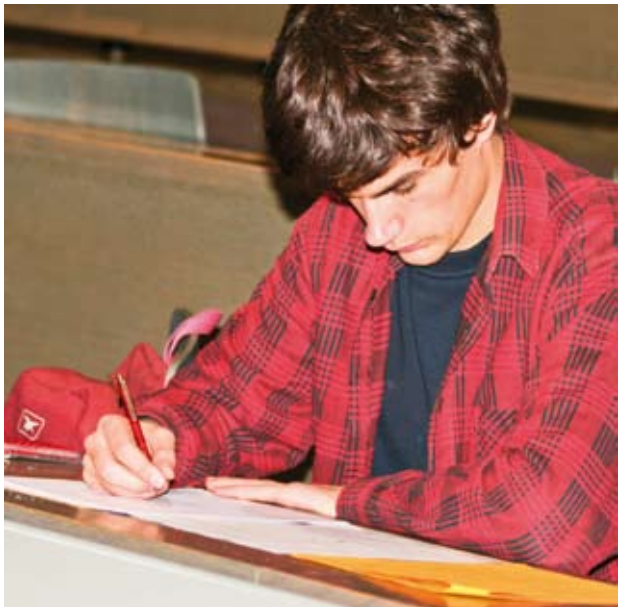
Affiliates

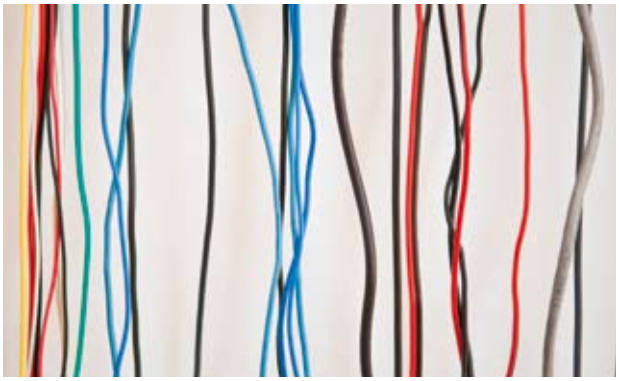
Frano Škopljanac-Mačina

Administrative staff

Sanja Ferković Živković

Jasenka Haladin





Laboratory support

Dražen Franolić

Davor Kotur

Ivica Kunšt

Educational activities

Fundamentals of electrical engineering - theory and practice. Electrostatic and electromagnetic phenomena. Basic circuits and field theory. Electrical and non-electrical measurements, elements, methods, instruments and laboratory equipment. Metrology and absolute electromagnetic measurements. Measurement error theory, measurement technique, analysis of the measurement results. Measuring systems and virtual instruments. Metrology infrastructure, calibration and testing services. Quality management and laboratory accreditation. Telemetric data acquisition systems and automated measurement systems. Process testing and industrial measurements of magnetic material properties, isolation and earthing. Electromagnetic field theory. Electromagnetic waves and wave propagation. Numerical methods and electromagnetic field calculation. Elements of design theory and design processing. Computational electromagnetic compatibility. Electromagnetic pollution. Data processing. Data management. Databases. Data Warehousing. Data mining. E-Business. Business Intelligence.

First cycle study

Mandatory Courses

- Databases
- Electromagnetic Fields
- Engineering Economics
- Fundamentals of Electrical Engineering
- Information, Logic and Languages
- Management in Engineering
- Quality Management

Elective Courses

- Methods of Measurement
- Metrology Fundamentals

Skills

- Advanced LabVIEW
- Introduction into Fault finding
- LabVIEW

Second cycle study

Mandatory Courses

- Laboratory of Electrical Engineering Systems and Technology 2

Theoretical Course

- Data Management
- Formal Methods in System Design
- Measurement Theory

Recommended elective courses

- Computational Electromagnetism
- Electrotechnical Measurements
- Natural Language Processing

Skills

- Advanced LabVIEW

Specialization courses

- E-Business Technologies
- Measurement Technique
- Measurements in Technology Systems
- Network and Service Management

Postgraduate doctoral courses

- Analysis and Synthesis of Real-Time Systems
- Computational Electromagnetic Compatibility
- Computer Aided Analysis in Electromagnetic Theory
- Computer Aided Design
- Data Warehouse Design
- Digital measuring instruments and measuring systems
- Distributed Information Systems
- Electrical measurement of nonelectric quantities
- Electromagnetic pollution
- Inteligent Control and Automata Games
- International measurement traceability
- Measurements in electric-power networks
- Metrology and precise measurements
- Quality Control and Metrology
- Selected Topics on Data Processing
- Telecommunication Networks Management
- Validation of laboratory measurement methods and software

Research and development

Development and permanent improvement of precise measurements of electromagnetic quantities in Croatia. Internationally accredited Primary Electromagnetic Laboratory. Development of standards, measuring devices, instruments and procedures of high accuracy. Maintenance and comparison of voltage, resistance and capacitance standards. Interlaboratory comparison of quantum JAVS voltage standard. Automation of measuring procedures. Research and development of telemetric data acquisition systems, especially in collecting data from electric power plants and system, and transmitting them through public telephone network to the central monitoring station. Measurement of the quality of electrical energy in the Croatian distribution system. Methods of calibration of high-class wattmeters and power-meters. Organisation of metrology, certification and standardisation services in Croatia harmonised with WECC, ILAC and other requirements. Research in the area of numerical calculation of electromagnetic fields, development of software packages for numerical

field calculation applicable to electromagnetic compatibility problems as well as to analysis of human exposure to low-frequency electromagnetic fields. Research and development of ship's shaft generator. EM field influence of power lines on surrounding metallic objects. Computation, measurement, and analysis of EM fields for various sources of electromagnetic pollution. Application of complex numerical computation of electromagnetic fields to design of electrical apparatus and machines in order to achieve better quality and market competitiveness. Application of software packages in the development of new designs of electromagnetic devices, to be incorporated into usual design and developing procedures. The development of the methodology and the tools for analysis of electromagnetic environment of power engineering systems and for protection of undesired electromagnetic fields. Initiation of further development and new approach to the integral solution of the problem relating to protection, control and management in the electric-power supply systems. Laboratory for Electromagnetic Fields. Measurement of electromagnetic pollution. Development of the magnetic field National Standard. Object-relational database design, data mining, information system development, data warehousing design, networked economy, applications for electronic business.

Projects

Development of conditions for realization of the national magnetic field standard (Project 036-0363081-1652, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Armin Pavić, 2007-).

Internet enabled calibrations and measurement (Project 036-0363081-1648, Ministry of Science, Education and Sports, Republic of Croatia, Principal Investigator: Roman Malarić, 2007-).

Measurement of electromagnetic quantities at the level of standards (Project 0036-0363081-1650, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Damir Ilić, 2007-).

Networked economy (Project 0036-0362027-1638, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Zoran Skočir, 2007-).

Numerical calculation of electromagnetic fields in transformers (Project 0036-0362321-2326, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Željko Štih, 2007-).

Participation in Broadband Society (COST-298 Action, Šandor Dembitz became a member of Management Committee; 2007-2010).

Remote laboratory (Project 0036-0363081-1653, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Mladen Boršić, 2007-2009, Petar Knežević 2009-).

Business Intelligence and Electronic Commerce (Agrokor, Project coordinators: Mirko Laušić, Mate Krpan, Ivo Pejaković, Ignac Lovrek, Zoran Skočir, Project leader: Zoran Skočir, 2005-).

Creation of the third cycle studies-doctoral studies in metrology - D.S.M. (TEMPUS JEP project; Project coordinator: Ljupčo Arsov, Macedonia; Croatian partner: Roman Malarić; 2010-2013).

Extracting electric energy from human body for supplying autonomous biomedical devices and new PVDF transducer optimization (Bilateral project; International partner: Aimé Lay-Ekuakille, Italy; Croatian partner: Roman Malarić; 2010-2012).

International links

Bureau International des poids et Mesures, Pavillon de Breteuil, Sevres, France

Mechanical & Manufacturing Engineering, De Monfort University, Leicester, United Kingdom

National Institute of Standards and Technology, Gaithersburg, Maryland, USA

National Physical Laboratory, Middlessex, Teddington, United Kingdom

Physikalisch Technische Bundesanstalt, Braunschweig, Germany

Saga University, Faculty of Science and Engineering, Saga, Japan

Technische Universität Graz, Institut für Grundlagen und Theorie der Elektrotechnik, Graz, Austria

University of Tokyo, Faculty of Engineering, Nuclear Engineering Research Laboratory, Tokyo, Japan

5.5. Department of Electric Machines, Drives and Automation

Faculty and staff

Professors

Drago Ban – electrical machines and drives (retired)

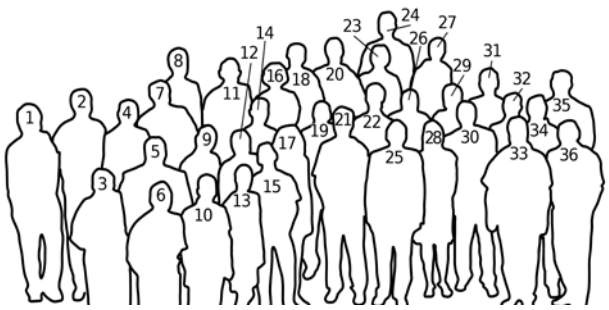
Zvonko Benčić – power electronics, semiconductor power devices (retired)

Ivan Gašparac – electrical machines, industrial plants

Founded in 1925

Head of Department:
Asst. Prof. **Mario Vražić**, Ph.D.

Phone: + 385 1 6129 770
Fax: + 385 1 6129 705
E-mail: esa@fer.hr
Web: www.esa.fer.hr



1 Zdenko Štifter 2 Viktor Šunde 3 Zvonko Benčić 4 Boris Miletić 5 Mario Vražić 6 Fetah Kolonić 7 Željko Jakopović 8 Igor Erceg 9 Damir Sumina 10 Šandor Ileš 11 Marinko Miletić 12 Zlatko Hanić 13 Tanja Vešić 14 Jadranko Matuško 15 Goran Rovišan 16 Vera Čukelj 17 Martina Kutija 18 Velimir Josip Pavlaković 19 Ivan Gašparac 20 Davor Kukolja 21 Drago Ban 22 Damir Žarko 23 Branka Rihtarić 24 Branimir Dropuljić 25 Zlatko Maljković 26 Mirko Cettolo 27 Spomenka Perkušić 28 Tena Baranašić 29 Ivan Ilić 30 Krešimir Ćosić 31 Marinko Kovačić 32 Stjepan Stipetić 33 Marko Horvat 34 Mladen Šverko 35 Ivan Mrčela 36 Nikola Švigir

Krešimir Ćosić – interactive simulation systems, strategic planning (retired)

Ivan Ilić – retired, professor emeritus, electrical machines and drives (retired)

Željko Jakopović – power electronics, semiconductor power devices

Fetah Kolonić – control of drives, mechatronic systems

Zlatko Maljković – electrical machines

Zvonimir Sirotić – retired distinguished professor, electrical machines (retired)

Associate professors

Viktor Šunde – power electronics, semiconductor power devices, technology of electrical materials

Damir Žarko – electrical machines and drives

Assistant professors

Jadranko Matuško - control of mechatronic systems

Damir Sumina – control of electrical machines and drives

Nikola Švigir – technical mechanics

Mario Vražić – electrical machines, industrial plants

Assistants

Igor Erceg

Šandor Ileš

Marinko Kovačić

Martina Kutija

Goran Rovišan

Research assistants

Branimir Dropuljić

Marko Horvat

Davor Kukolja

Ivan Mrčela

Tanja Poljugan

Siniša Popović

Stjepan Stipetić

Associates

Ivan Fabek

Zlatko Hanić

Bernard Kovač

Danko Sirotić

Mladen Šverko

Affiliates

Vitomir Blagojević

Administrative staff

Snježana Krleža

Spomenka Perkušić

Laboratory support

Marinko Miletić

Velimir Josip Pavlaković

Zdenko Štifter

Educational activities

Fundamentals of electrical machinery. Direct current and electronically commutated motors, induction and synchronous machines. Small and special electric machines. Transformers. General theory of electromechanical conversion. Design in electromechanical engineering. Power electronics and electrical drives, control of electrical machines and drives. Mechatronic systems. Testing and diagnostics of electrical machines and drives. Applied mechanics in electrical engineering. Electric switches. Switching arrangements. Industrial plants and automation of industrial plants. Electrical traction. Electric vehicle drive and energy distribution. Interactive and real-time simulation systems based on virtual reality: simulator based training and selection, numerical methods, 3D modelling and visualization, multimedia stimuli generation, emotional state estimation.

Research and development of methods for the analysis, design and testing of electrical machines, transformers and other electrical devices, and for their implementation in various industrial, electrical, transportation and other technical systems. Modelling, simulation and identification of parameters of electrical machines and power electronics converters. Analysis of small and special machines (step motors, linear motors, electronically commutated motors) for general and special purpose. Electrical motor drives in normal and specific working conditions. Design, testing and commissioning. Reconstruction, retrofit and modernisation of high power electrical machines and drives in electrical, industrial, mining and other plants. Research, development, design and implementation of different power electronic converters. Research, development and application of the methods for automatic control of AC and DC electrical drives in industry, mining, transport, shipbuilding and elsewhere. Design, modelling and application of mechatronic systems. Reconstruction and modernisation of controlled electrical drives, automation of electrical drives and protection systems, especially in rolling mills, mining and other similar industrial plants. Design and modernisation of industrial and electrical plants. Diagnostics of electrical motors and drives. Fundamentals of mechanical, electrical and magnetic properties of materials in electrical and electronic products

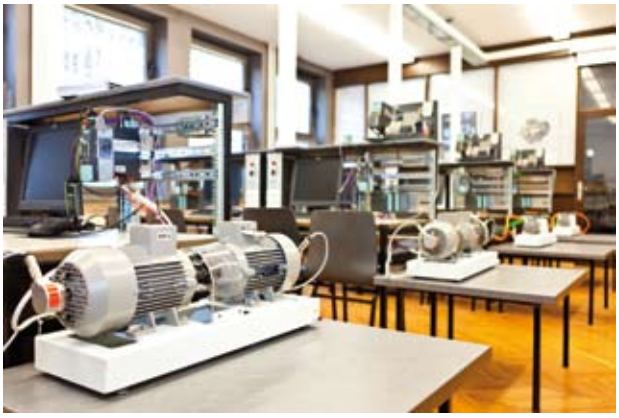
First cycle study

Mandatory Courses

- Electromechanical and Electrical Conversion
- Electromechanical Systems
- Laboratory and Skills - Autocad
- Laboratory and Skills - Matlab
- Physical Education 1
- Physical Education 2

Elective courses

- Electrical Actuators
- Electrical Drives
- Electrical Machines Control Practicum
- Fundamentals of Intelligent Control Systems
- Fundamentals of Mechatronics
- Power Electronics Practicum



Second cycle study

Mandatory Courses

- Laboratory of Control Engineering and Automation 1
- Laboratory of Electrical Engineering Systems and Technology 1
- Laboratory of Electrical Engineering Systems and Technology 2

Theoretical Course

- Control of Electrical Drives
- Electrical Machines and Transformers Theory
- Industrial System Dynamics
- Power Electronics

Recommended elective courses

- Control of Power Converters
- Defense Systems and Technologies
- Development of Electrical Products
- Interactive simulation systems
- Materials in Electrical Products
- Mechatronic Systems
- Technical Mechanics

Humanistic or Social courses

- Organization Design

Specialization courses

- Design and Automatization of Industrial Plants
- Design of Electric Machinery
- Diagnostic and Monitoring of Machines and Drives
- Synchronous Machines and Excitation Systems

Postgraduate doctoral study

- Automated testing of electrical machines
- Contemporary methods for design of electrical equipment
- Control of Electromechanical Systems
- Control Systems of Electrical Drives
- Disturbances and Protection of Synchronous Machines

- Dynamics of Alternative Current Machines
- Electric traction
- Intelligent Systems in Industrial Plants
- Interactive simulation systems - Selected topics
- Power Electronics Systems
- Special electrical drives
- Synergistic integration in mechatronics systems
- Theory of Power Circuit Breakers
- Transformers

Research and development

Electrical machines: Finite Element Method based analysis of synchronous generators, both hydrogenerators and turbogenerators, as well as transformers have been introduced. New advances in computing technology (hardware and software) have enabled more accurate determination of magnetic field distribution and basic machine parameters. The numerical tools are used for design of new generators and refurbishment of the existing ones. A method for accurate calculation and analysis of turbogenerator electromagnetic parameters has been developed. An analytical method based on conformal mapping has been developed for fast and reliable calculation of magnetic field and torque in surface permanent-magnet motors. Computerised on-line diagnostics for determining the state of induction motor cage rotor was investigated and applied in a large number of industrial facilities. The computerised method for on-site testing of low-voltage and high-voltage motor insulation systems has been developed and applied in power plants, chemical plants and cement industry.

Control of AC electrical drives: Research and development of digital control systems for AC electrical drives and synchronous generator excitation. Intelligent control systems and their applications in various plants. Development of a new DSP control system for electrical machines. Sensorless speed control system for slip-ring AC motor has been developed. Actual speed information is realised via rotor voltage frequency estimation (RVFE). Using line frequency as a reference, the fundamental component of the rotor frequency gives information on the slip of the motor, which in turn yields information on the speed in a digital form. The measurement of line currents and voltages for the estimation of the actual motor torque has also been realised. This torque estimation technique has replaced the mechanical torque sensor.

Power electronics: Introducing the new concept of teaching Power electronics. Development of multimedia laboratory for Power electronics enabling integration of different teaching methodologies. Evaluation of simple power semiconductor thermal model applied in a commercial circuit simulator. The obtained results corrected the existing electrothermal model. The transient thermal impedance measurement

method for MOS-gated power semiconductors has been developed and tested, enabling fast and accurate on-site measurement.

Industry automation: Research and development of PROFIBUS (Industrial communication network) application in automated systems for testing of electrical machines. Coupling of an intelligent automation with soft computing related to industrial site applications. Design and build systems, which exhibit high level of intelligence, support sufficient user application flexibility related to cost effective product. Introduction of engineering tools, which represent a holistic approach to control engineering, covering all disciplines and activities required to the process automation system. Presentation and introduction of different types of modern high-level PLC programming languages. These languages are function-block-based and have been specially developed for industrial automation process control. Study of different types of application projects represented by a hierarchical and multifaceted engineering database, which contains all the data needed to fully describe the design and function of the plant. Information about selected database, which stores data without redundancy, i.e. without duplication, despite the fact that data items may have multiple usages. General information about high-speed communication links used as a backbone for the process automation control system. Study of a Fieldbus Foundation system architecture, which provides a framework for industrial application as a distributed system composed of digital devices and control/monitoring equipment. Research and development of mechatronic systems and electric vehicle systems.

Interactive simulation: Training simulators for complex missions and tasks, based on virtual reality and 3D modeling. Generic technology for multimedia generation of stimuli with potential applications in training of emotional and cognitive control under stressful conditions.

Projects

Adaptive Control of Scenarios in VR Therapy of PTSD (Project 036-0000000-2029, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Krešimir Ćosić, 2007-)

Control of Complex Electromechanical Systems for Manipulations in Transport (Project 036-0363078-1629, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Fetah Kolonić, 2007-)

Refurbishment and Operation of Hydro-generators (Project 036-0361616-1617, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Zlatko Maljković; 2007-)

Research Methodology for Determination PQ Diagram of a Synchronous Generator (Project 036-0361616-1618 Ministry of Science and Technology, Republic of Croatia, Principal investigator: Ivan Gašparac; 2007-)

Control of the Power Unit With Respect to the Demands of Electrical Power System (Project 036-0361621-1626, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Gorislav Erceg; 2007-)

Optimization of Electric Motors and Drives for Special Conditions of Exploitation (Project 036-0361616-1619, Ministry of Science and Technology, Republic of Croatia, Principal investigators: Drago Ban; 2007-)

Power Converters with Enhanced Efficiency as Interface Between Renewable Energy Source and Grid (Project 036-0362978-2314, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Željko Jakopović; 2007-)

Converters for Tram and Electrical Drive in Train (Project 036-0362978-1574 Ministry of Science and Technology, Republic of Croatia, Principal investigator: Zvonko Benčić; 2007-)

Industrial System for Testing of Electrical Machines (BICRO/PoC project, Principal investigator: Damir Žarko, 2010-2011)

International links

ABB - Industrial Systems AB, Sweden

Budapest Technical University, Budapest, Hungary

Fakulta elektrotechniky a informatiky Slovenskej Technickej Univerzity v Bratislave, Slovakia

SIMEC GmbH&Co. KG, Chemnitz, Germany

Technische Universität München, Institute of Electrical Drives, München, Germany

University “St. Kiril & Metodij”, Faculty of Electrical Engineering, Skopje, Macedonia

University of Connecticut, Department of Mechanical Engineering, Connecticut, USA

Univerza v Ljubljani, Fakulteta za elektrotehniko, Ljubljana, Slovenia

Univerza v Mariboru, Fakulteta za elektrotehniko, računalništvo i informatiko, Maribor, Slovenia

5.6. Department of Power Systems

Faculty and staff

Professors

Danilo Feretić – professor emeritus

Nikola Čavlina – nuclear power plant safety and control

Nenad Debrecin – nuclear power plants, renewable energy sources, energy efficiency

Zdravko Hebel – transmission networks, power system analysis

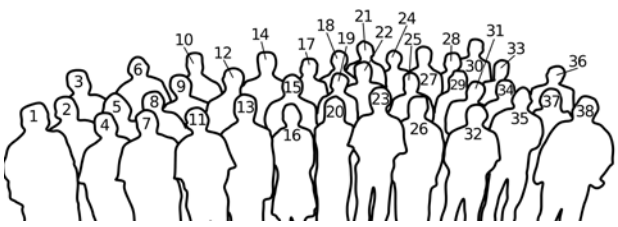
Founded in 1934

Head of Department:
Prof. **Tomislav Tomiša**, Ph.D.

Phone: + 385 1 6129 907
Fax: + 385 1 6129 890
E-mail: zvne@fer.hr
Web: www.fer.hr/zvne

Slavko Krajcar – electrical facility design, distribution networks, energy market design

Ante Marušić – power system protection and local control



1 Ivo Uglešić 2 Juraj Havelka 3 Matija Zidar
4 Davor Grgić 5 Vesna Benčik 6 Nikola Čavlina
7 Željko Tomšić 8 Tomislav Fancev 9 Radoslav Zelić
10 Darjan Bošnjak 11 Sejid Tešnjak 12 Zdenko Šimić
13 Tomislav Tomiša 14 Hrvoje Pandžić
15 Slavko Krajcar 16 Slavica Robić 17 Igor Vuković
18 Boško Milešević 19 Ivica Pavić 20 Vesna Bukarica
21 Ivan Gašić 22 Davor Klarin 23 Nenad Debrecin
24 Siniša Šadek 25 Miroslav Šturlan
26 Ante Marušić 27 Frano Tomašević 28 Ivan Rajšl
29 Jasna Hemen 30 Davor Rašeta 31 Milivoj Mandić
32 Davor Škrlec 33 Bojan Franc 34 Ankica Turkalj
35 Tomislav Dragičević 36 Viktor Milardić
37 Neda Šimara 38 Ivica Berislavić

Vladimir Mikuličić – energy conversion, electrical power system reliability

Davor Škrlec – electrical distribution systems, geographical information systems

Sejid Tešnjak – electric power system, electric power system regulation and dynamics

Tomislav Tomiša – power system automation and control

Ivo Uglešić – high voltage engineering

Associate professors

Davor Grgić – nuclear power plants, reactor safety

Igor Kuzle – power system dynamics and control, equipment maintenance, electricity markets

Ivica Pavić – transmission networks, power system analysis and control

Zdenko Šimić – renewable energy sources, programming

Željko Tomšić – energy efficiency, energy management, power system planning

Assistant professors

Marko Delimar – power system analysis, operation and control

Juraj Havelka – relay protection for power systems; SCADA system design for power facilities

Viktor Milardić – high voltage engineering

Assistants

Vesna Bukarica

Research assistants

Darjan Bošnjak

Tomislav Capuder

Tomislav Dragičević

Ivan Gašić

Luka Lugarić

Milivoj Mandić

Boško Milešević

Hrvoje Pandžić

Ivan Rajšl

Davor Rašeta

Frano Tomašević

Siniša Šadek

Igor Vuković

Associates

Vesna Benčik

Tomislav Fancev

Bojan Franc

Slavica Robić

Miroslav Šturlan

Matija Zidar

Administrative staff

Jasna Hemen

Neda Šimara

Laboratory support

Ivica Berislavić

Božidar Filipović Grčić

Davor Klarin

Radoslav Zelić

Educational activities

Electric power engineering. Energy conversion technologies. Fluid mechanics. Heat transfer. Power system planning and construction. Operation, control and dynamics of the power system. Power system protection, automation and control. Open market of electric energy. Ancillary services. Maintenance of power system devices. Power facilities. Distribution networks planning and design. Low-voltage distribution networks and consumer installations. Power system analysis. High voltage engineering. Nuclear physics reactor theory. Nuclear and thermal power plants. Fuel cycles and reactors materials. Engineering reliability and safety. Energy and environment. Geographic information systems. Energy systems economics. Energy efficiency. Energy and environment management. Renewable energy sources.

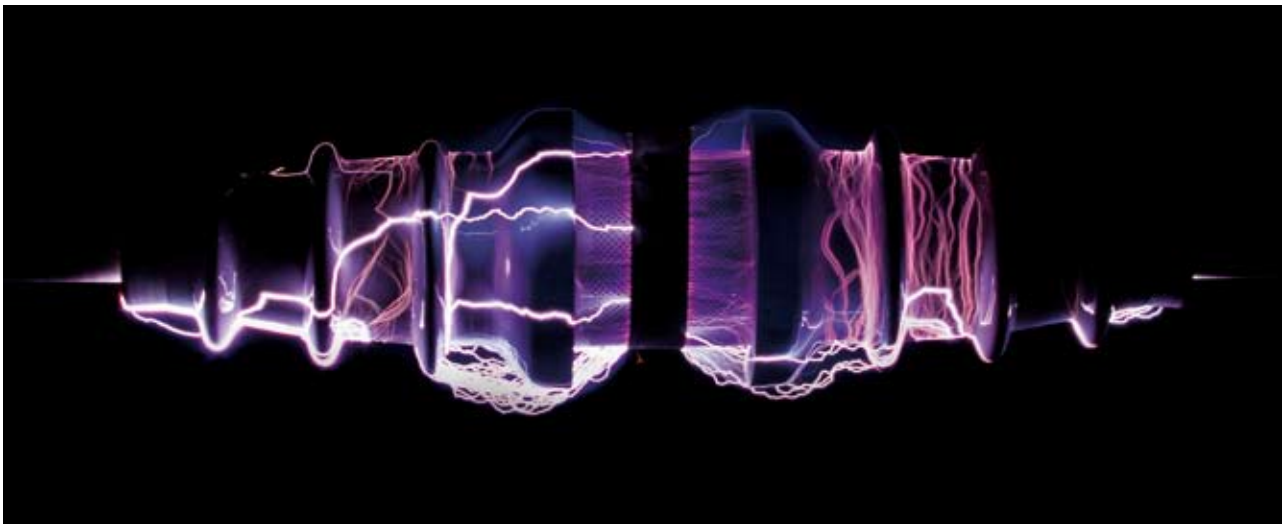
First cycle study

Mandatory Courses

- Economics and Managerial Decision Making
- Electric Facilities
- Energy Technology
- Management in Engineering
- Sustainable Development and Environment
- Transmission and Distribution of Electric Power

Elective Courses

- Electric Facilities Design
- Electromagnetic Transients and Electromagnetic Compatibility
- Energy Efficiency Audit and Energy Management Programme



- Low-voltage Power Systems
- Power Plants
- Process Measurements and Diagnostic in Power Plants
- Technical Standardization and Legislative

Skills

- Advanced LabVIEW
- LabVIEW

Second cycle study

Mandatory Courses

- Laboratory of Electrical Power Engineering 1
- Laboratory of Electrical Power Engineering 2

Theoretical Course

- Economics of Energy
- Energy Conversion
- High Voltage Engineering

- Power System Dynamics and Control
- Power Systems Analysis

Recommended elective courses

- Electrical Lighting
- Electrotechnical Measurements
- Energy, Environment and Sustainable Development
- Geoinformation Systems
- Power Quality
- Power System Maintenance
- Risk Assessment
- Risk Management

Skills

- Advanced LabVIEW

Specialiation courses

- Distribution Networks and Distribution Generation
- Electric Facilities Automation
- Electric Power Market
- Electric Power Network Operation and Control
- Electric Power Networks
- Electric Power System Operation and Planning
- Electric Traction Power Supply
- Energy Management and Energy Efficiency
- Energy-Economy Models for Developing of Energy Systems
- Geospatial Databases
- Mass and Heat Transfer
- Nuclear Engineering
- Nuclear Safety
- Numerical Methods in Electric Power Systems

- Overhead Lines and Cables
- Overvoltage Protection
- Power System Modeling and Simulation
- Power System Protection
- Power System Supervision and Remote Control
- Reliability and Availability Assessment Methods
- Renewable Resources and Advanced Technology
- Special Protection Systems
- Switching and Protection Devices

Postgraduate doctoral study

- Availability Evaluation of Electric Power System Subsystems
- Control Techniques in Electrical Engineering
- Disturbances and Protection of Synchronous Machines
- Dyagnostics in Electric Power Elements Maintenance
- Dynamics of Power Plants Operation
- Electric Railways
- Environmental Impact of Electric Power Systems
- Flexible power transmission
- Geoinformation Systems
- High-voltage network analysis
- Innovative Nuclear Systems for Sustainable Development
- Intelligent Systems in Electric Power Engineering
- Long-Term Electricity Planning under Uncertainty
- Modeling of Electricity Market
- Nuclear power plant safety analyses
- Optimization Principles of the Electric Power Networks
- Overhead lines and cables
- Overvoltages in Power System
- Power Distribution System
- Power Network calculations
- Power System Operation
- Power System Relaying
- Probabilistic Assessment of Technological Risk
- Quality of electric power supply
- Risk analysis

Research and development

Power Systems Engineering: The research is focused to development of both fundamental knowledge and applications of electrical power engineering. Studies on scientific projects include collaboration with industry, national institutions, electric utilities, and many foreign universities. The research is generally directed to increasing the availability and the reliability of a power system with an emphasis on the adjustment to the open market environment. Specific goals include: improving models and methodologies for power system analysis, operation and control; development, production and application of models and methodologies for power systems planning, maintenance and development; application of soft-computing (artificial intelligence, meta-heuristics, etc.), information technologies (web-oriented technologies, geographic information systems, enterprise IT solutions, etc.) and operational research in improving processes of planning, development, exploitation and control of power systems; investigation on applications for coordinated control of power system devices and exploring the power system stability, security and economic operation; integration of intelligent devices and agents in energy management systems and distribution management systems equipment and software; advanced modelling of dynamics, disturbances and transient phenomena in transmission and distribution networks (in particular regarding distributed generation); advances in fault detection, restoration and outage management. At time of global changes in the energy sector, with emphasis on sustainable development, and in view of Croatia's application for joining EU, significant efforts are devoted to elimination of technical and administrative inadequacies in relation to EU legislation and directives. In particular, this implies liberalization efforts, utilities restructuring, facilities revitalization, improved legislation and adoption of new standards.

Power Technologies: General objective of the research is to develop methodologies for reliable assessment of nuclear power plants operational safety and for quantitative assessment of the environmental impact of applicable energy technologies (electric power producing plants and their technology chains), as a base for estimating optimal long-term development strategy of the Croatian power system. Research work includes new strategies of energy sector and power system development for Republic of Croatia; preparing medium and long-term electricity generation expansion plan for power system; comparison of energy, economic and environmental characteristics of different options for electric power generation; studies for rational use of energy and energy savings, assuming a centralized structure of the electricity market. Research work also includes renewable energy sources and its role in Croatian power sector, as well as electricity production considering cap on CO2 emissions. Recent research covers development of new models for power system generation optimization and planning under uncertainties of the open electricity market. The goal of

that research is to create analytical and software tools which will enable a successful transition to liberalized electricity market in Croatia and ensure healthy and efficient power system operation in compliance with environmental requirements. In the nuclear energy field the specific analysis and calculations of transients and consequences of potential accidents in NPP Krško have recently been updated with some 3D models and extended to severe power plant accidents.

Projects

Classification of European Biomass Potential for Bioenergy Using Terrestrial and Earth Observations (FP7, Nenad Debrecin; 2008-2010)

Intelligent information system for monitoring and verification of energy management in cities - ISEMIC (SEE-ERA.NET Plus; Željko Tomšić; 2010-2012)

Control of Electric Power Systems in the Open Market Environment (MZOS, Sejid Tešnjak; 2007-)

Development of Electricity Market Analysis Tools (MZOS, Slavko Krajcar; 2007-)

Development of power quality measuring and analyzing system (MZOS, Tomislav Tomiša; 2007-)

Energy Security and Climate Change (MZOS, Nenad Debrecin; 2007-)

Fulfilment of Environmental Requirements in High Voltage System (MZOS, Ivo Uglešić; 2007-)

Nuclear power plants for sustainable energy generation (MZOS, Danilo Feretić; 2007-)

Planning and Operation of Active Distribution Networks and Microgrids (MZOS, Davor Škrlec; 2007-)

Embedding Renewable Energy Sources into an Active Distribution Network (Bilateral project; Marko Delimar; Vladimir Katić, University of Novi Sad; 2010-2011)

International links

Gesellschaft für Reaktor Sicherheit (GRS), Garsching, Germany

Gesellschaft für Technische Zusammenarbeit (GTZ), Eschborn, Germany

International Atomic Energy Agency (IAEA), Vienna, Austria

Ruhr Universität Bochum, Fakultät für Maschinenbau, Bochum, Germany

Ruhr Universität Bochum, Institut für Energietechnik, Bochum, Germany

Technische Universität Graz, Institut für Hochspannungstechnik, Graz, Austria

The Netherlands Agency for Energy and Environment (NOVEM), Sittard, The Netherlands

UNIDO, Wien, Austria

University of Pisa, Pisa, Italy

World Bank, Washington, USA

Électricité de France (EDF), Pariz, France

Doshisha University, Kyoto, Japan

5.7. Department of Telecommunications

Faculty and staff

Founded in 1951

Head of Department:
Prof. **Miljenko Mikuc**, Ph.D.

Phone: + 385 1 6129 810
Fax: + 385 1 6129 832
E-mail: tel@fer.hr
Web: www.tel.fer.hr

Professors

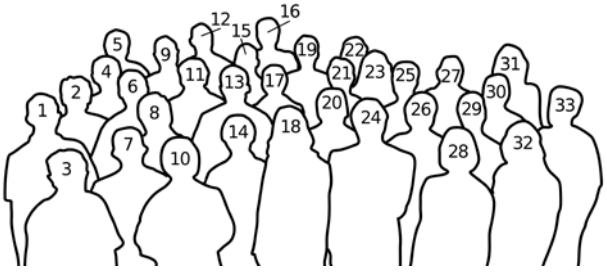
Alen Bažant – data communications, local area networks, broadband access networks and technologies

Dragan Jevtić – computer telephony integration, Petri and neural nets, intelligent agents

Mladen Kos – network optimisation, performance analysis

Marijan Kunštić – information, logic and languages, switching systems

Ignac Lovrek – telecommunication system architecture, call/service modelling and processing, mobile agents and multi-agent systems



1 Miljenko Mikuc 2 Dragan Jevtić
3 Vjekoslav Sinković 4 Ignac Lovrek 5 Tomislav Grgić
6 Gordan Ježić 7 Aleksandar Antonić 8 Branko Mikac
9 Ognjen Dobrijević 10 Jasna Slavinić 11 Mladen Kos
12 Igor Sunday Pandžić 13 Matija Džanko
14 Ivana Podnar Žarko 15 Marko Zec
16 Krešimir Pripužić 17 Iva Bojić 18 Ana Petrić
19 Mirko Sužnjević 20 Mario Kušek
21 Krunoslav Ivešić 22 Željka Car 23 Maja Matijašević
24 Vedran Podobnik 25 Darko Štriga
26 Damjan Katušić 27 Marin Vuković 28 Marija Furdek
29 Valter Vasić 30 Miroslav Frljak 31 Marina Ivić
32 Gordana Ožvald 33 Nenad Markuš

Maja Matijašević – converged IP-based networks and IMS, multimedia communication, Quality of Service

Branko Mikac – reliability, transmission systems

Igor S. Pandžić – virtual characters, virtual environments, multimedia

Mladen Tkalić – automata theory, logical design (retired in 2008)

Vjekoslav Sinković – information theory, information networks (retired in 2008)

Associate professors

Gordan Ježić – agent technology, mobile networks and services, mobile computation

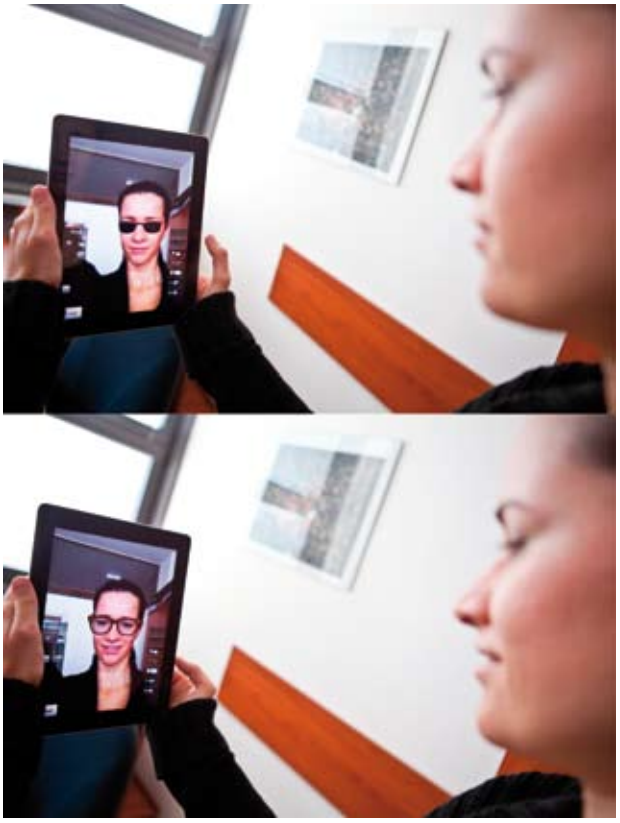
Miljenko Mikuc – logical design, application of formal methods in telecommunication system design, network simulation systems

Assistant professors

Željka Car – software engineering, software process modelling and simulation, project management

Željko Ilić – high-performance digital transmission, medium access control protocols for broadband access networks, information theory

Mario Kušek – mobile service programming, mobile software agents, software development



Ivana Podnar Žarko - large-scale distributed systems, services in next-generation networks

Vedran Podobnik – social networks, multi-agent systems, electronic markets

Krešimir Pripužić – distributed information systems, information retrieval and filtering, data stream processing

Nina Skorin-Kapov – network optimization and planning; WDM optical networks

Lea Skorin-Kapov – quality of experience of multimedia services, signaling and resource allocation in next generation networks

Assistants

Marija Furdek

Research assistants

Agata Brajdić

Marina Bagić Babac

Tomaž Beriša

Aleksandra Čereković

Ognjen Dobrijević

Matija Džanko

Tomislav Grgić

Nenad Markuš

Marin Vuković

Ana Petrić

Mirko Sužnjević

Associates

Aleksandar Antonić

Iva Bojić

Miroslav Frljak

Krunoslav Ivešić

Marina Ivić

Damjan Katušić

Darian Škarica

Darko Štriga

Valter Vasić

Marko Zec

Administrative staff

Jasna Slavinić

Laboratory support

Krešimir Gjurin

Educational activities

Information theory and information networks. Automata theory and logical design. Telecommunication networks, Internet. Languages and algorithms. Teletraffic theory. Digital transmission and switching, all-optical networks. Data communications. Local and access networks. Communication protocols. Hardware and software architectures of telecommunication systems, processors and programming languages. Mobile agents and multi-agent systems. Formal methods and techniques. Network planning, control and management. Information and telematic services. Broadband and intelligent networks. Multimedia communications, virtual reality. Mobility. System reliability. Performance evaluation and network optimisation, quality of service. Software processes. Project management.

First cycle study

Mandatory courses

- Communication Networks
- Digital Logic
- Information Theory
- Information, Logic and Languages
- Management in Engineering

Specialiation courses

- Multimedia Services
- Telecommunication Systems and Networks

Elective Courses

- Computer-Telephony Integration
- Introduction to Virtual Environments
- Local Area Networks
- Network Programming
- Public Mobile Network

Skills

- Web Start Contest

Second cycle study

Mandatory Courses

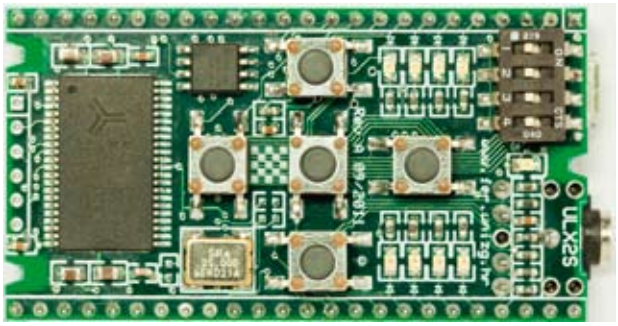
- Information Networks
- Laboratory of Information Processing 2
- Laboratory of Telecommunications and Informatics 1
- Laboratory of Telecommunications and Informatics 2

Theoretical Course

- Communication Protocols
- Distributed Systems
- Multimedia Communications
- Photonic Telecommunication Networks
- Telecommunication Network Reliability
- Teletraffic Theory

Recommended elective courses

- Heuristic Optimization Methods
- Internet Security
- Project Management
- Virtual Environments



Skills

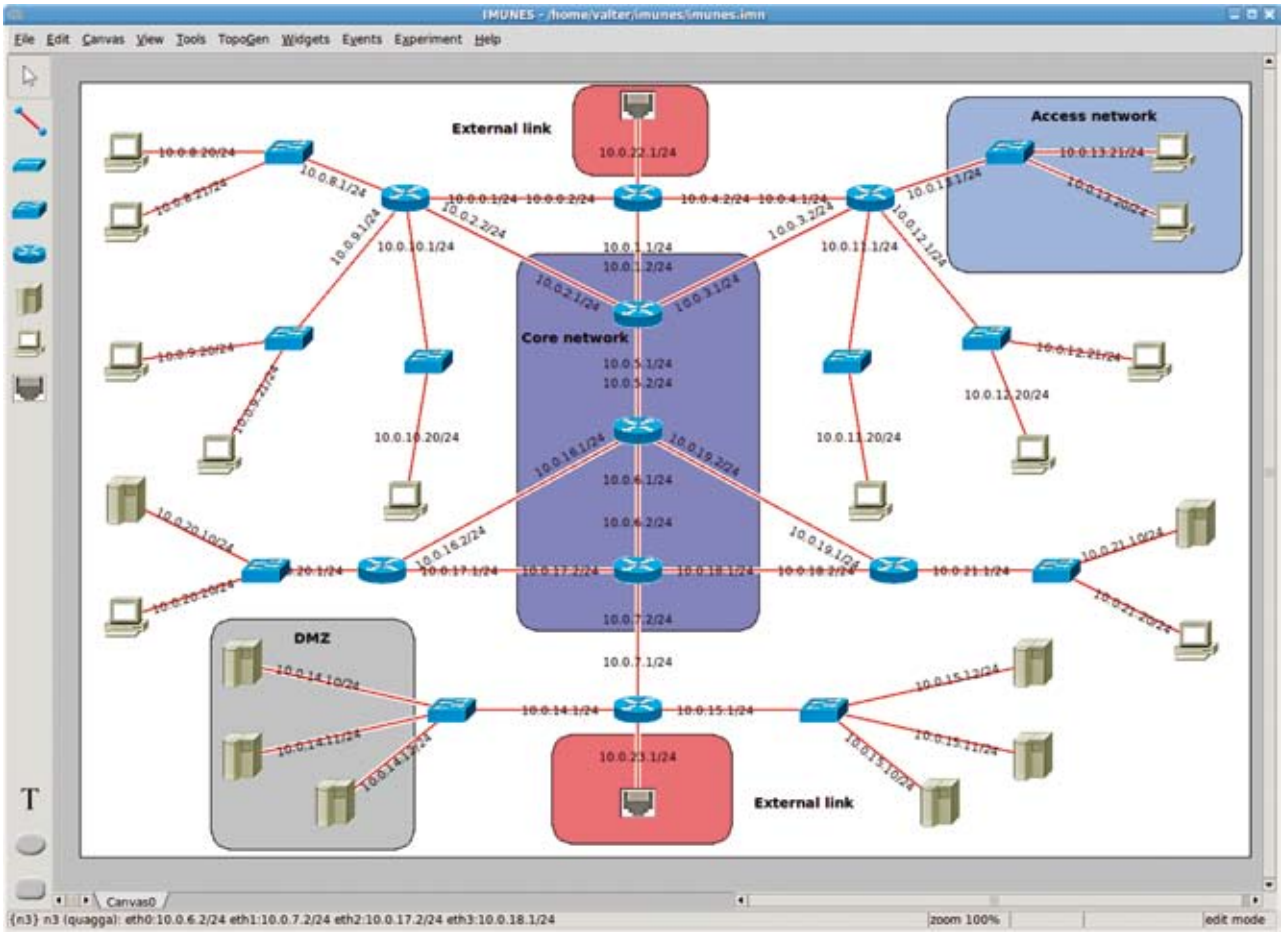
- Web Start Contest

Specialiation courses

- Concurrent Programming
- Content Networking
- Data Transmission
- Forecasting and Marketing of Telecommunication Services
- High Speed Communication Networks
- Learning Automata
- Mobile Software Agents
- Mobility in Networks
- Network and Service Management
- Photonic Communication Technologies
- Telecommunication Software Development

Postgraduate doctoral study

- Broadband Networks
- Communication Protocols-Selected Topics
- Communications in Virtual Environments
- Concurrent Systems
- Formalisms in Telecommunications
- Information and Communications
- Intelligent Control and Automata Games
- Methods and Models in Automata Theory
- Network Availability
- Optical Transmission Network
- Optimization Methods for Telecommunications
- Petri Nets and Distributed Systems
- Selected Topics in Distributed Systems
- Selected Topics in WWW Technologies & Applications
- Software agents for electronic market
- Software Processes
- Telecommunication Networks Management
- Telecommunications market and mobile market



Research and development

Information and communication technology. Information flows and teletraffic, analytical models and simulation of information sources and flows in broadband networks. Information channel capacity in multi-user wireless systems. Performance analyses of access network technologies. Network modelling and optimisation, network planning, performance evaluation, high-speed network dynamics. Queuing network theory and applications. Logic, relation between information, knowledge and communication. Learning automata theory and applications. Software design: models, methods, languages and tools for telecommunications. Call and service conceptual modelling, concurrent programming and distributed processing. Communication and signalling protocols, formal specification and verification. Reliability and availability of telecommunication systems and network, reliability models of all-optical transmission network and its components. Comparative analysis of different protection/restoration scenarios. Fault testing and diagnosis, maintenance of telecommunication systems. Integrated communication systems, computer telephony integration. Multimedia and virtual reality, virtual characters. Mobility of users and services, mobile agents and multi-agent systems. Internet services and applications, e-business technology. Network evolution.

Projects

Building the Future Optical Network in Europe - BONE (EU Seventh Framework Programme, Network of Excellence, WP02 leader: Branko Mikac, 2008-2010)

Wireless Networking for Moving Objects (COST Action IC0906 - Cooperation in Science and Technology, European Commission, MC member: Maja Matijašević, 2010-2014)

Agreement Technologies (Multilateral project; Project coordinator: Sascha Ossowski, Universidad Rey Juan Carlos - CETINIA; Croatian partner: Gordan Ježić; 2008-2012)

Data Traffic Monitoring and Analysis: Theory, Techniques, Tools and Applications for the Future Networks (COST Action IC0703 - Cooperation in Science and Technology, European Commission, MC member: Maja Matijašević, 2008-2012, Lea Skorin-Kapov, 2011-2012)

Cross-Modal Analysis of Verbal and Non-verbal Communication (COST Action 2102 - Cooperation in Science and Technology, European Commission, MC member: Igor S. Pandžić, 2006-2010)

Technologies for simulating and animating human faces on the computer (Visage Technologies AB and FER; Igor S. Pandžić; 2004-2012)

Content Delivery and Mobility of Users and Services in New Generation Networks (Project 036-0362027-1639, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Maja Matijašević, 2007-)

Embodied Conversational Agents as Interface for Networked and Mobile Services (Project 036-0362027-2028, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Igor S. Pandžić, 2007-)

Knowledge-Based Network and Service Management (Project 036-0362027-1640, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Dragan Jevtić, 2007-)

Performance Analysis and Design of Broadband Networks (Project 036-0362027-1641, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Alen Bažant, 2007-)

WWW.HR - Croatian Home Page (CARnet - Croatian Academic and Research Network, Project leader: Marin Vuković)

Looking to the Future (Croatian Post and Electronic Communications Agency; Project leader: Gordan Ježić)

SAFE: A Security Planning Framework for Optical Networks (Unity through Knowledge Fund, Project leader: Nina Skorin-Kapov, 2009-2011)

Network eXperimentation Infrastructure eXecutive (NXIX) (Boeing Defense, Space & Security; Project leader: Marko Zec)

Extended IMUNES for Ericsson (E-IMUNES) (Ericsson Nikola Tesla, Project leader: Miljenko Mikuc)

Character animation and Facial Features Tracking (Coordinator: Igor S. Pandžić; 2004-); Long-term R&D collaboration project with Visage Technologies AB, Linkoping, Sweden, covering a broad range of topics in character animation and facial features tracking.

BETE Lab Visualization (Coordinator: Igor S. Pandžić; 2011); Industrial project for Ericsson Nikola

Tesla, involving advanced visualisation techniques applied to presentation of a laboratory.

New Generation Embodied Conversational Agents, Bilateral project with Kyoto University, Graduate School of Informatics, Dept. of Intelligence Science and Technology, Group of Applied Intelligence Information Processing; 2005-

Platform for Free-created short-lived Digital Content for Telecommunication Services (Technology Research and Development Project, Croatian Institute of Technology, Principal investigator: Dragan Jevtić; 2007-2009)

European Network on Quality of Experience in Multimedia Systems and Services (COST Action IC1003, Cooperation in Science and Technology, European Commission, MC member: Lea Skorin-Kapov, 2011-2014)

International links

AGH University of Science and Technology, Krakow, Poland

AIT – Athens Information Technology, Greece

The Boeing Company, Anaheim, California, USA

Center for Advanced Computer Studies, University of Louisiana at Lafayette, USA

Center for Global Computing, École Polytechnique Fédérale de Lausanne, Switzerland

Department of Intelligence Science and Technology, Kyoto University, Japan

Department of Telecommunications, Budapest University of Technology and Economics, Hungary

DERI – Digital Enterprise Research Institute, Galway, Ireland

Distributed Information Systems Laboratory, École Polytechnique Fédérale de Lausanne, Switzerland

Fakulteta za elektrotehniko, računalništvo in informatiko, Univerza v Mariboru, Slovenia

Fakulteta za elektrotehniko, Univerza v Ljubljani, Slovenia

Fakulteta za računalništvo in informatiko, Univerza v Ljubljani, Slovenia

France Telecom R&D, Lanninon, France

FreeBSD Foundation, Boulder, Colorado, USA

FTW – Forschungszentrum Telekommunikation Wien, Beč, Austria

Information Systems Institute, Technische Universität Wien, Austria

Institut für Angewandte Informationsverarbeitung und Kommunikationstechnologie, Technische Universität Graz, Austria

Institut für Breitbandkomunikation, Technische Universität Wien, Austria

Institut für Nachrichtentechnik und Wellenausbreitung, Technische Universität Graz, Austria

Instituto de Telecomunicações, Aveiro, Portugal

International Computer Science Institute, University of California, Berkeley, USA

ISCOM – Istituto Superiore delle Comunicazioni e delle Tecnologie dell'Informazione, Rim, Italy

KES International, UK

Knowledge-Based Intelligent Engineering Systems Centre, University of South Australia, Adelaide, Australia

KTH - Kungliga Tekniska Högskolan, Stockholm, Sweden

Mälardalen University, Västerås, Sweden

Scuola Superiore Sant'Anna, Pisa, Italy

Universidad Politécnica de Cartagena, Spain

Université de Mons, Belgium

University of Applied Sciences, Leipzig, Germany

University of Essex, Colchester, UK

University of Oslo, Norway

University of South Florida, Tampa, USA

Visage Technologies, Linköping, Sweden

5.8. Department of Electronic Systems and Information Processing

Faculty and staff

Professors

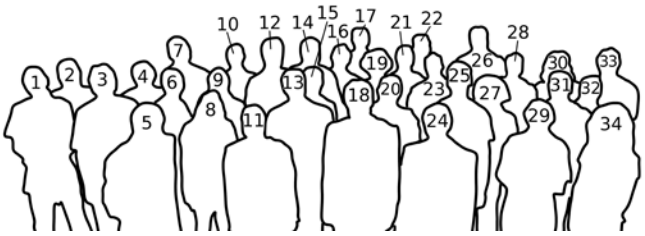
Hrvoje Babić – member of the Croatian Academy of Science and Arts (professor emeritus)

Vedran Bilas – electronic instrumentation and measurements, biomedical engineering

Founded in 1943

Head of Department:
Prof. **Ratko Magjarević**, Ph.D.

Phone: + 385 1 6129 911
Fax: + 385 1 6129 652
E-mail: zesoi@fer.hr
Web: www.zesoi.fer.hr



1 Saša Mrvoš 2 Siniša Sovilj 3 Neven Mijat
4 Stanko Tonković 5 Branko Jeren 6 Damir Seršić
7 Igor Brkić 8 Sandra Šoštarić 9 Jasmina Zorko
10 Tihomir Marjanović 11 Ratko Magjarević
12 Hrvoje Džapo 13 Sven Lončarić 14 Dražen Jurišić
15 Vedran Bilas 16 Goran Živković 17 Marko Subašić
18 Mladen Vučić 19 Marijan Kuri 20 Tomislav Pribanić
21 Marko Martinjak 22 Zvonko Kostanjčar
23 Goran Ličina 24 Mario Cifrek 25 Goran Molnar
26 Marko Butorac 27 Aleksandra Cesarik
28 Dinko Oletić 29 Hrvoje Babić 30 Vana Jeličić
31 Igor Lacković 32 Željka Lučev 33 Tomislav Petković
34 Ana Sović

Mario Cifrek – electronic instrumentation and measurements, biomedical engineering

Branko Jeren – network and system theory, signal processing

Sven Lončarić – signal and image processing, computer vision, intelligent systems

Ratko Magjarević – electronic and computerised instrumentation, biomedical engineering, minimally invasive methods and devices

Neven Mijat – electrical network, system theory and signal processing

Vladimir Naglić – distinguished professor (retired)

Davor Petrinović – digital signal and speech analysis and processing

Stanko Tonković – electronic instrumentation and measurements, biomedical engineering

Mladen Vučić – analogue and digital signal processing, digital system design

Associate professors

Dražen Jurišić – analog signal processing and filtering

Damir Seršić – digital signal and image processing

Zoran Stare – electronic instrumentation and measurements, biomedical engineering (retired)

Assistant professors

Hrvoje Džapo – electronic instrumentation and measurements, embedded systems

Igor Lacković – electronic instrumentation and measurements, biomedical engineering

Tomislav Pribanić – computer vision, image processing and analysis, motion analysis

Marko Subašić – digital image processing and analysis, image segmentation

Mile Šikić – bioinformatics and computational biology

Assistants

Zvonko Kostanjčar

Research assistants

Goran Molnar
Tomislav Petković
Siniša Sovilj
Darko Vasić
Tihomir Marjanović
Vedrana Baličević
Marko Butorac
Luka Celić
Ivan Dokmanić
Hrvoje Kalinić
Željka Lučev
Dinko Oletić
Juraj Petrović
Ana Sović

Associates

Predrag Pale
Bruno Arsenali
Igor Brkić
Adam Heđi
Goran Ličina
Ivica Medved
Ivica Vukoja
Goran Živković
Vesna Kezdorf

Affiliates

Saša Mrvoš

Administrative staff

Jasmina Zorko

Aleksandra Cesarik

Laboratory support

Marijan Kuri

Technical staff

Stipo Periša

Vlado Torbica

Educational activities

Electronic measurement and instrumentation. Measurement systems. Transducers and sensors. Smart sensor systems. Electronic equipment design. Computerized instrumentation. Biomedical engineering and electronics. Biomedical informatics. Computers in medicine. ICT in health care and medicine. Health informatics. Signal and systems theory. Network theory. Digital signal processing. Digital speech processing. Systems for signal processing. Linear and nonlinear electric networks. Telemetry systems. Electrical filters. Numerical methods in electric network and systems design. Embedded system design. Advanced tools for digital system design. Data multimedia transmission and computer networks. Digital image processing. Neural networks. Random processes in systems. Entrepreneurship for engineers.

First cycle study

Mandatory Courses

- Electrical Circuits
- Embedded Systems
- Fundamentals of Electronic Measurements and Instrumentation
- Information Processing
- Management in Engineering
- Multimedia Technologies
- Signals and Systems

Specialization courses

- Electronic Equipment Design

Elective Courses

- Computer Aided Design of Electronic Systems

Second cycle study

Mandatory Courses

- Laboratory of Electronic and Computer Engineering 1
- Laboratory of Electronic and Computer Engineering 2
- Laboratory of Electronics 1
- Laboratory of Information Processing 1
- Laboratory of Information Processing 2

Theoretical Course

- Analog and Mixed Signal Processing
- Digital Signal Processing

- Electronic Instrumentation
- Random Processes in Systems
- Signal Processing in Communications

Recommended elective courses

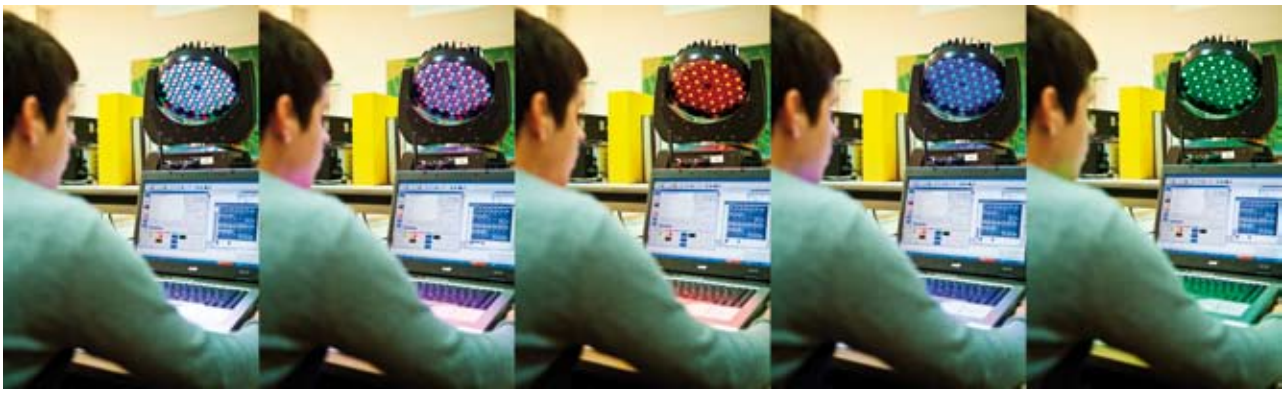
- Advanced Digital Signal Processing Methods
- Biomedical Informatics
- Biomedical Instrumentation
- Biomedical Signals and Systems
- Computer Modeling of Physiological Systems
- Digital Signal Processing Software Design
- Digital Speech Processing
- Electronic Equipment Power Supplies
- Neural Networks
- Sensor Technology

Humanistic or Social courses

- Entrepreneurship and export in high-technologies

Specialization courses

- Digital Image Processing and Analysis
- Electronic Measurements and Components
- Embedded System Design
- Measurement and Process Control Systems
- Networked Sensor Systems
- Programming Industrial Embedded Systems
- Tools for Digital Design



Postgraduate doctoral study

- Biomonitoring systems
- Blind signal separation and Independent component analysis
- Digital Image Analysis
- Digital signal processing and applicating
- Digital Signal Processor Architectures
- Electrical filters - selected topics
- Electrical filters in power systems
- Electrical Instrumentation in Environmental Protection
- Measuring Amplifiers
- Medical Instrumentation for 2-D Imaging
- Selected Topics in Digital Image Processing
- Signal Theory
- Smart sensor networks
- Synthesis of systems based on optimization methods
- Systems for Measurement Nonelectrical Values
- Use of Computers in Medicine

Research and development

Analogue and digital signal processing in different fields. Digital multi-channel instrumentation systems. Intelligent electronic instrumentation. Pulsed eddy current nondestructive measurement. Distributed systems for analog and mixed signal processing. Design of analog active filters with low sensitivity, low power, low noise and tuneability of filter parameters. Embedded systems. Digital system design. Speech processing. Adaptive multidimensional signal processing. Digital image processing. Computer vision. Pattern recognition. Intelligent systems for 3-D medical image analysis. 3-D volume visualisation. Virtual reality and applications in medicine, geography, and education. Information systems and technologies. Computer networks and multimedia. Numerical methods in electrical network and filter design. Bioinformatics. Computational biology. Protein-protein interactions. Biomedical instrumentation design. Bioelectric signal analysis. Bioelectrical impedance measurement and modeling. Bioelectromagnetics. Biomonitoring. Body sensor networks. Health informatics. Non-invasive and minimally invasive measurement methods and instrumentation in medicine. Electrical stimulation and cardiac pacing. Human motion and gait analysis. Diffuse infrared biotelemetry. Health technology assessment. Standardisation and safety of electromedical equipment.

Projects

Virtual Physiological Human, (FP7 Network of Excellence, FER – General Member, Coordinator: Sven Lončarić, 2009-2013)

Noninvasive Measurements and Procedures in Biomedicine (Project 036-0362979-1554, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Stanko Tonković; 2007-)

Intelligent systems for measurement of difficult-to-measure variables (Project 036-0362979-1625, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Vedran Bilas; 2007-)

Complex System Modelling (Project 036-0362979-1987, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Branko Jeren; 2007-)

Intelligent Methods for Image Processing and Analysis (Project 036-0362979-1989, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Sven Lončarić; 2007-)

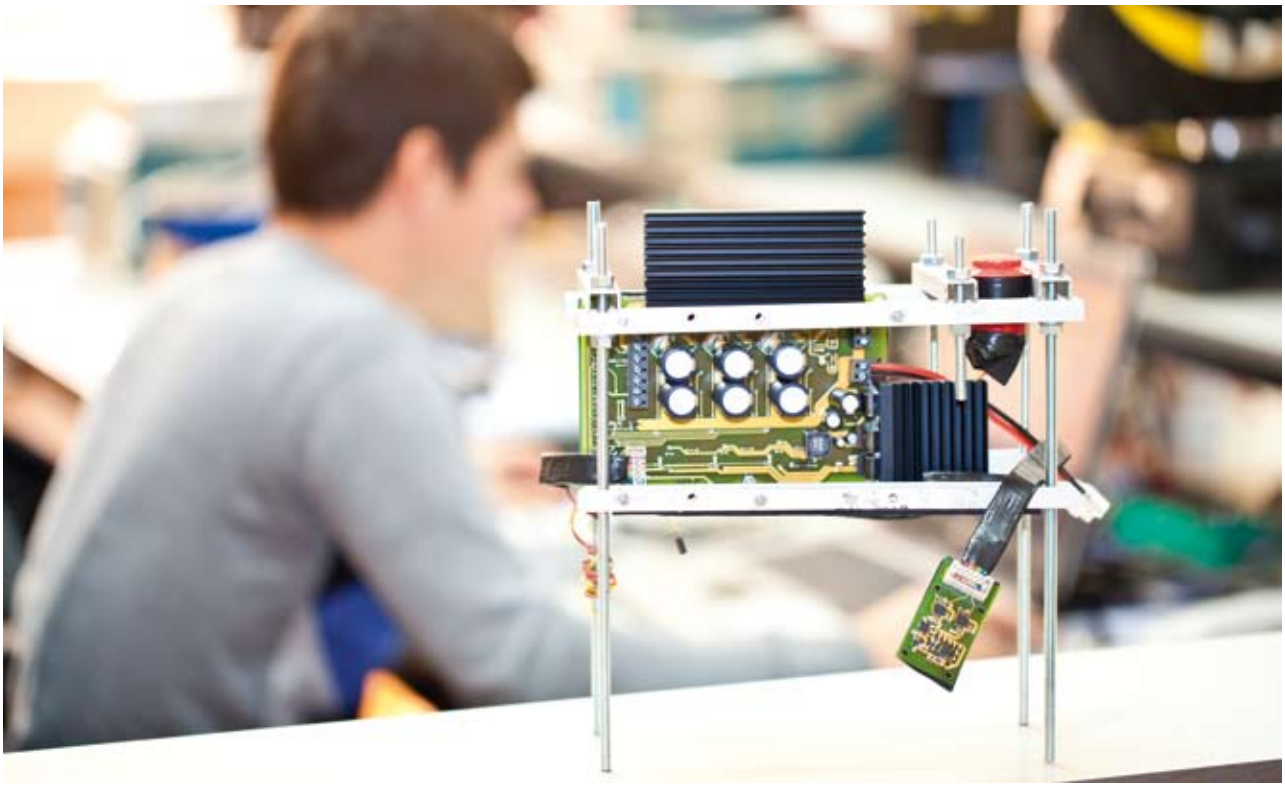
Systems for Analog and Mixed Signal Processing (Project 036-0362979-2316, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Neven Mijat; 2007-)

Design and Implementation of Efficient Methods for Digital Signal Processing (Project 036-0362979-2217, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Mladen Vučić; 2007-)

Advanced Methods for the Estimation of Human Brain Activity and Connectivity (NEUROMATH) COST Action, 2006-2010. (CRO partner: Ratko Magjarević)

Numerical Modelling of Electric Field Distribution in Electrochemotherapy of Esophagus Malignant Tumors Bilateral Croatian-Slovenian project, 2009-2010 (Croatian partner: Ratko Magjarević)

Curricula Reformation and Harmonisation in the field of Biomedical Engineering TEMPUS IV, 2009-2011 (Ratko Magjarević)



Algebric methods of detection of characteristic segments of bioelectric signals, Croatian French bilateral project Cogito, 2011-2012, (Croatian partner: Ratko Magjarević)

International links

Eidgenössische Technische Hochschule (ETH), Zürich, Switzerland

Bar-Ilan University, Ramat-Gan, Israel

Polytechnic University of Madrid, Spain

Royal Institute of Technology, Stockholm, Sweden

Star Bioinformatics Institute, Singapore

Technische Universität Graz, Graz, Austria

The Chinese University of Hong Kong, China

University of Girona, Spain

University of Technology and Economics, Budapest, Hungary

University of Javeriana, Bogota, Colombia

University of California, Berkeley, USA

University of California, Los Angeles, USA

University of California, Santa Barbara, USA

University of Cincinnati, Cincinnati, USA

University of Patras, Greece

University of Szeged, Szeged, Hungary

Univerza v Ljubljani, Ljubljana, Slovenia

Universite de Reims Champagne Ardenne, UFR des Sciences Exactes et Naturelles, France

5.9. Department of Control and Computer Engineering

Founded in 1954

Head of the department:
Prof. **Ivan Petrović**, Ph.D.

Phone: + 385 1 6129 795
Fax: + 385 1 6129 809 / 6129 785
E-mail: zari@fer.hr
Web: www.fer.hr/zari

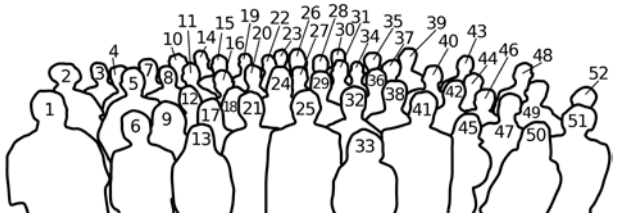
Faculty and staff

Professors

Gabro Smiljanić – professor emeritus (retired)

Ljubomir Kuljača – distinguished professor (retired)

Danko Basch – programming language design, modelling and simulation of computer architectures, hardware description languages



1 Zoran Vukić 2 Mario Vašak 3 Edouard Ivanjko
4 Alan Mutka 5 Stjepan Bogdan 6 Snježana Poljak
7 Matko Orsag 8 Goran Vasiljević 9 Zrinka Plodinec
10 Damjan Miklić 11 Nikola Mišković
12 Vedrana Spudić 13 Ana Petričić 14 Kristijan Brkić
15 Bruno Borović 16 Tomislav Pavlović
17 Tamara Petrović 18 Željkica Šikuten 19 Toni Bjažić
20 Ivan Marković 21 Danko Basch 22 Matko Barišić
23 Đula Nađ 24 Mato Baotić 25 Nedjeljko Perić
26 Vlaho Petrović 27 Marin Orlić 28 Luka Lednicki
29 Ivan Petrović 30 Antonio Vasilijević 31 Martin Žagar
32 Mario Žagar 33 Blanka Gott 34 Daniel Hofman 35 Tomislav Lugarić 36 Srećko Jurić-Kavelj
37 Ivan Maurović 38 Damir Josić 39 Zdenko Kovačić
40 Hrvoje Mlinarić 41 Željko Ban 42 Branko Mihaljević
43 Vedran Bobanac 44 Igor Čavrak 45 Ivana Bosnić
46 Andreja Kitanov 47 Tamara Hadjina
48 Josip Knezović 49 Mišel Brezak 50 Martina Marinković Plehati 51 Vinko Lešić 52 Marija Đakulović

Stjepan Bogdan – discrete event systems, flexible manufacturing automation, intelligent control, supervisory control, multi-agent formation control

Mario Kovač – computer architectures, multimedia algorithms and architectures, large scale information systems, medical information systems, smart card applications

Zdenko Kovačić – intelligent and adaptive control, industrial and mobile robotics, artificial intelligence-based control, electrical drives and servo systems, virtual reality-based systems

Nedjeljko Perić – estimation and system identification, advanced control strategies, plant and process automation, servo drives and servo systems, control of renewable energy sources

Ivan Petrović – advanced control, optimal estimation, autonomous mobile robots, networked robotic systems, intelligent space

Zoran Vukić – adaptive and robust control, fault tolerant and intelligent control, non-linear and stochastic control, guidance and control of marine vehicles

Mario Žagar – microcomputer architectures, real-time microcomputer systems, distributed computing (ubiquitous, pervasive) and distributed measurements/control, design automation, open computing, e-learning

Associate professors

Željko Ban – modeling and simulation, intelligent and model reference adaptive control, optimization of control algorithm parameters, control of the fuel cell and photo voltaic based energy sources, alarm systems

Mato Baotić – mathematical programming, hybrid systems, optimal control, model predictive control

Assistant professors

Igor Čavrak – distributed intelligent systems, pervasive computing, software engineering

Nikola Mišković – nonlinear control systems; guidance, navigation and control of marine vehicles; marine systems and technologies

Hrvoje Mlinarić – computer architectures, embedded system design, programmable logic, system on chip

Mario Vašak – predictive control, renewable energy systems control, energy-efficient buildings control, energy management systems

Research assistants

Toni Bjažić

Vedran Bobanac

Ivana Bosnić

Mišel Brezak

Marija Đakulović

Tamara Hadjina

Daniel Hofman

Nikola Hure

Srećko Jurić-Kavelj

Andreja Kitanov

Josip Knezović

Luka Lednicki

Vinko Lešić

Branko Mihaljević

Martina Marinković Plehati

Ivan Marković

Ivan Maurović

Damjan Miklić

Alan Mutka

Marin Orlić

Matko Orsag

Tomislav Pavlović

Ana Petričić
Tamara Petrović
Vlaho Petrović
Vedrana Spudić
Maja Varga
Martin Žagar

Associates

Matko Barišić
Bruno Borović
Igor Cvišić
Karlo Griparić
Marko Gulin
Domagoj Herceg
Tomislav Lugarić
Đula Nađ
Antonio Vasilijević
Goran Vasiljević

Affiliates

Mirjana Stjepanović

Administrative staff

Blanka Gott
Snježana Poljak

Laboratory support

Damir Josić

Educational activities

Theory of automatic control. Non-linear and optimal control. Adaptive and robust control. System identification and state estimation. Computer controlled systems. Neural and fuzzy control. Predictive control. Process identification. Mathematical modelling and simulation. Fault tolerant systems. Process automation. Servo systems. Robotics and flexible manufacturing systems. Service robotics. Ship automation. Security and alarm systems. Intelligent measurement in control systems. Digital computer and advanced computer concepts. Microcomputers. Real-time operation of digital computers. Computer architecture. Computer networks. Computer aided design. Multimedia systems and applications. Embedded and smart card systems. Computer programming languages and operating systems. Software engineering. Open systems. Open computing. E-learning. Wireless sensor networks.

First cycle study

Mandatory Courses

- Automatic Control
- Computer Architecture 1
- Computer-Controlled Systems
- Control System Elements
- Embedded Systems
- Laboratory and Skills - Matlab
- Multimedia Technologies
- Open Computing

Elective Courses

- Alarm Systems
- Automation Practicum
- Fundamentals of Intelligent Control Systems
- Robotics Practicum

Sveučilište u Zagrebu

Na temelju odredbi Pravilnika o dodjeli nagrade za najbolji e-kolegij, na prijedlog Ocjenjivačkoga suda za dodjelu nagrade za najbolji e-kolegij, Povjerenstvo za e-učenje Sveučilišta u Zagrebu na sjednici održanoj 25. listopada 2010. donijelo je odluku da se

I. NAGRADA

ZA NAJBOLJI E- KOLEGIJ
NA SVEUČILIŠTU U ZAGREBU
U AKADEMSKOJ GODINI 2009./2010.

dodijeli za kolegij

OTVORENO RAČUNARSTVO

Autori: prof. dr. sc. Mario Žagar (nositelj kolegija),
doc. dr. sc. Ivan Čavrak,
dr. sc. Branko Mihaljević,
mr. sc. Marin Orlić i
Ivana Bosnić, dipl. ing.
s Fakulteta elektrotehnike i računarstva

Klasa 602-04/10-10/36
Ur. broj 380-03/13-10-7
Zagreb, 3. studenoga 2010.

PREDSJEDNIK POVJERENSTVA
ZA E-UČENJE SVEUČILIŠTA U ZAGREBU

PROF. DR. SC.
KRISTIAN VLAHOVIČEK

REKTOR

PROF. DR. SC.
ALEKSA BJELIŠ

Second cycle study

Mandatory Courses

- Laboratory of Computer Engineering 1
- Laboratory of Control Engineering and Automation 1
- Laboratory of Control Engineering and Automation 2

Theoretical Course

- Computers and Processes
- Control of Electrical Drives
- Estimation Theory
- Fundamentals of Robotics
- Linear Control Systems Design
- Multimedia Architecture and Systems
- Nonlinear Control Systems

Recommended elective courses

- Design and Automatization of Industrial Plants
- Guidance and Control of Marine Vehicles
- Intelligent Control Systems
- Process Automation
- Robotic Systems Control

Specialization courses

- Adaptive and Robust Control
- Design and Implementation of Programming Languages
- Discrete Event Systems
- Distributed Software Development
- Mobile Robotics
- Systems Modeling and Simulation

Postgraduate doctoral study

- Adaptive and Robust Control - Selected topics
- Applied estimation technigues
- Control of autonomous systems
- Control of Electromechanical Systems
- Control of Renewable Energy Sources
- Control of robotized plants
- Discrete Event Control Systems
- Model Predictive and Optimal Control
- Modeling and Simulation-Selected Topics
- Multimedia Computer Systems
- Nonlinear Control Systems
- The reference model adaptive control methods

Research and development

Optimal, adaptive and robust control strategies and their applications to control complex technical systems. Application of fuzzy logic, neural networks and genetic algorithms in control systems. Modelling and control of hybrid systems. Cooperative and decentralised control strategies. System identification and optimal estimation. Signal and image processing and sensor fusion. Failure detection, isolation and accommodation in complex technical systems. Automation of systems with discrete events and flexible manufacturing systems. Supervisory control and teleoperation. Vision and virtual reality based motion control. Navigation, guidance and control of autonomous unmanned sensory-based systems: underwater and surface marine vehicles, ground mobile robots and vehicles and aerial vehicles. Distributed control systems and traffic management systems for rail vehicles. Control of renewable energy systems: wind turbines and wind farms, solar energy systems, fuel cell stacks, ocean energy systems, microgrids. Energy-efficient buildings control. Development of embedded systems, application-specific computer architectures, and microprocessor architecture design. Bio-inspired systems in ubiquitous computing. Artificial immune systems. Scenario-based modelling of multi-agent systems. Modelling and verification of

component-based software systems. Research of multimedia system architectures and algorithms for parallel processor architectures. Data compression. Visual data processing in medical applications. Smart card and information systems based on smart card technology. Development of hardware description languages for digital system design. Development of computer-aided design tools. Methods for modelling and simulation of computer systems. Data encryption methods and applications. Remote data acquisition and measurement systems. Fast volume rendering and compression. Medical information systems. Telemedicine. European education connectivity solutions. Interactive databases. Development of advanced e-learning services to integrate content and increase its availability. Recommender systems for technology enhanced learning.

Projects

ACROSS - Centre of Research Excellence for Advanced Cooperative Systems (EU FP7 SSA project, SP4-Capacities, Project No.: 285939, Project Coordinator: Ivan Petrović, 2011-2015)

EC-SAFEMOBIL - Estimation and Control for Safe Wireless High Mobility Cooperative Industrial Systems (EU FP7 IP project, ICT, Project No.: 288082, FER Project leader: Zdenko Kovačić, 2011-2015)

ThermalMapper - Thermal 3D Modeling of Indoor Environments for Saving Energy (SEE-ERA.net PLUS, FER Project leader: Ivan Petrović, 2010-2012)

MONGS - Monitoring of Wind Turbine Generator Systems (SEE-ERA.net PLUS, FER Project leader: Mario Vašak, 2010-2012)

AEOLUS - Distributed control of large-scale offshore wind farms (EU FP7 Cooperation, STREP project, FP7-ICT-2007-2, Project No.: 224548, FER Project leader: Nedjeljko Perić, 2008-2011)

CURE - Developing the Croatian underwater robotics research potential (EU FP7 Research Potential, Support Action project, FP7-ICT-2007-2, Project No.: 229553, Project coordinator: Zoran Vukić, 2009-2012)

EECS - European education connectivity solution (EU FP7 Co-operative Research, Research for SMEs, Project No.: 232324, FER Project leader: Mario Kovač, 2009-2011)

Electronic differential for small electric car (HRZZ project - Croatian Science Foundation, Project leader: Stjepan Bogdan, 2010-2012)

Advanced control and estimation strategies in complex systems (project 036-0361621-3012, Ministry of Science Education and Sports, Republic of Croatia, Principal investigator: Nedjeljko Perić, 2007)

Architectures of integrated computer and communication systems and services (project 036-0361959-1971, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Mario Kovač, 2007-)

Control of mobile robots and vehicles in unknown and dynamic environments (project 036-0363078-3018, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Ivan Petrović, 2007-)

Control system of the fuel cells energy source with the cogeneration (project 036-1201837-3020, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Željko Ban, 2007-)

Design and implementation of special purpose programming languages (project 036-0361959-1979, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Danko Basch, 2007-)

Integrated control of robotic systems in complex environments (project 036-0363078-3017, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Zdenko Kovačić, 2007-)

RoboMarSec - Underwater robotics in sub-sea protection and maritime security (project 036-0362975-2999 , Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Zoran Vukić, 2007-2010)

Software engineering in ubiquitous computing (project 036-0361959-1965, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Mario Žagar; 2007-)

Task planning & scheduling in robotic and autonomous systems (project 036-0363078-3016, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Stjepan Bogdan, 2007-)

DSD - Distributed software development (Swedish-Croatian bilateral project, Mälardalen University, School of Innovation, Design and Engineering, and University of Zagreb Faculty of

Electrical Engineering and Computing, Project leaders: Ivica Crnković, Mario Žagar, 2003-2013)

DICES - Distributed component-based embedded software systems (Unity Through Knowledge Fund, Research Cooperability Programme, UKF 1A Grant Agreement No. 03/07, Project leaders: Ivica Crnković, Mario Žagar, 2008-2011)

Exploration robot for fire fighting units (National Foundation for Science, Croatia, and Hrid d.o.o. Zagreb, Croatia, Partnership in basic research, Principal investigator: Zdenko Kovačić, 2008-2010)

Multi criteria wind turbine control (National Foundation for Science, Croatia, and Končar Electrical Industries Inc. Zagreb, Croatia, Partnership in basic research, Principal investigator: Nedjeljko Perić, 2008-2011)

Competence center for software engineering in open systems (establishment funded through EU Tempus project Collaborative internationalisation of software engineering in Croatia, Center head: Mario Žagar, 2009-)

Control of a robot for hydrodynamic processing of concrete and metal surfaces (Inteco d.o.o, Zagreb and Government Agency BICRO – IRCRO, Project Leader: Zdenko Kovačić, 2009-2010)

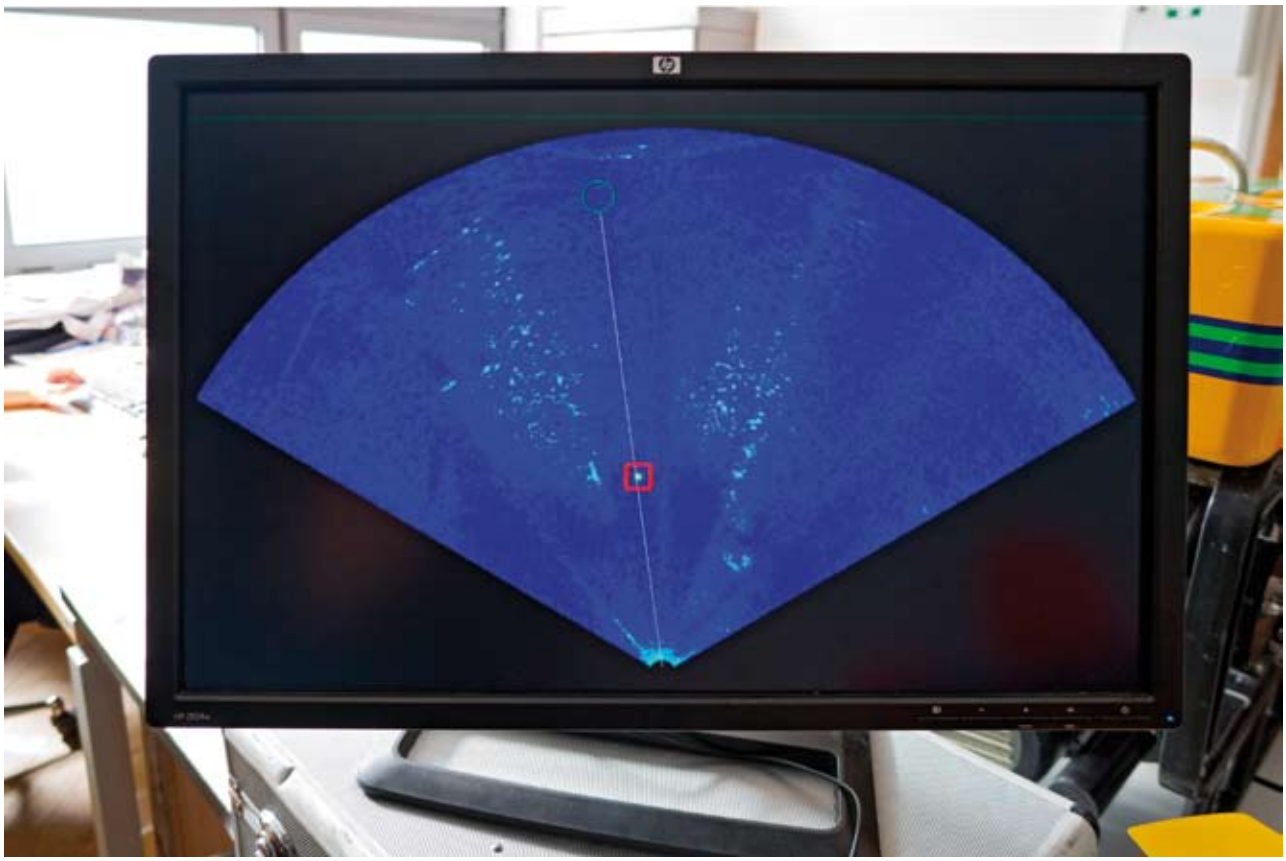
e-Learning now! : Development of advanced e-learning services to integrate available content (e-Učenje sad!, iProjekt, Ministry of science education and sports, Republic of Croatia, Project leader: Mario Žagar, 2008-)

eSpis Rollout: Support to court administration and case management improvement (IBM/ EuropeAid, FER Project leader: Mario Kovač, 2009-2010)

Referal centre for MATLAB (project MATLAB, Ministry of Science education and sports, Republic of Croatia, Project leader: Ivan Petrović, 2002-)

System architecture of a new national student smart card in Croatia (Project by Ministry of Science, Education and Sports, Republic of Croatia, Project leader: Mario Kovač, 2005-)

Supervision of implementation of Croatian primary health care information system (Ministry of Health and Social Care, Project leader: Mario Kovač, 2009-2010)



International links

The University of Texas, The Automation and Robotics Research Institute, Arlington, USA

The University of New Mexico, MARSHES Lab, Albuquerque, USA

The Virginia Polytechnic Institute and State University, The Bradley Department of electrical Engineering, Blacksburg, USA

Eidgenössische Techniche Hochschule Zürich (ETH), Institut für Automatik, and Autonomous Systems Lab, Switzerland

Technische Universität München, Institut für Automatisierungstechnik und Autonome Systeme, Munich, Germany

Anglia Polytechnic University, Department of Design and Technology, Cambridge, United Kingdom

Technical University of Crete - A.B.E.A. - Anatoli S.A., Chania, Greece

Budapest University of Technology and Economics, The department of Mechatronics, Optics and Engineering Informatics, Budapest, Hungary

University of Tokyo, Institute of Industrial Sciences, Tokyo, Japan

University of Paderborn, Paderborn, Germany

United Technologies Research Center (UTRC) Hartford, Connecticut, USA

Aalborg University, The Faculties of Engineering, Science and Medicine, Denmark

Lund University, Department of Automatic Control, Lund Institute of Technology, Sweden

Industrial Systems and Control, Glasgow, Scotland, United Kingdom

Energy research Centre of the Netherlands (ECN), Vestas Wind Systems, Denmark

China University of Mining&Technology, College of Information and Electrical Engineerig, Xuzhou, China

Universität Rostock, Fachbereich Elektrotechnik, Institut für Automatisierungstechnik, Rostock, Germany

Univerza v Mariboru, Fakulteta za elektrotehniko, računalništvo in informatiko, Maribor, Slovenia

Univerza v Ljubljani, Fakulteta za elektrotehniko, Ljubljana, Slovenia

Sveučilište u Mostaru, Fakultet strojarstva i računarstva, Mostar, Bosnia and Herzegovina

Mälardalen University (MdH), Department of Computer Science and Engineering, Västerås, Sweden

Ford Motor Company, Scientific Research Laboratory, Dearborn, Michigan, USA

IFAC – International Federation of Automatic Control

Technische Universität Wien (Vienna University of Technology), Faculty of Electrical Engineering and Information Technology, Vienna, Austria

University of Montenegro, Faculty of Electrical Engineering, Podgorica, Montenegro

Wroclaw University of Technology, Institute of Electrical Machines, Drives and Measurements, Wroclaw, Poland

Vestas Wind Systems A/S, Denmark

Aurora Trust, Key Largo, Florida, USA

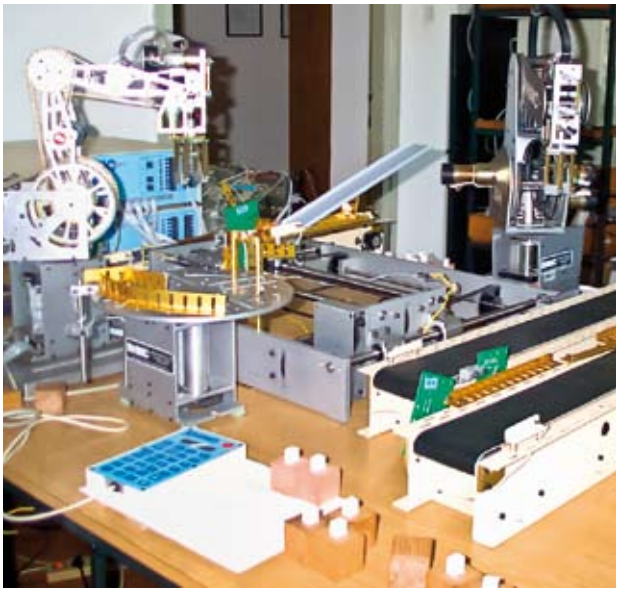
NATO Undersea Research Centre, La Spezia, Italy

Consiglio Nazionale delle Ricerche - Istituto di Studi sui Sistemi Intelligenti per l'Automazione, Genova, Italy

University of Limerick, Mobile Marine Robotics Research Centre, Limerick, Ireland

Instituto Superior Tecnico, Institute for Systems and Robotics, Dynamical Systems and Ocean, Robotics Lab, Lisboa, Portugal

University of Girona, Girona, Spain



Università politecnica delle Marche, Ancona, Italy

Albert-Ludwigs-Universität Freiburg, Institut für Informatik, Autonome Intelligente Systeme, Germany

Kungliga Tekniska Högskolan (The Royal Institute of Technology), Centre for Autonomous Systems, Stockholm, Sweden

Eindhoven University of Technology, Department of Electrical Engineering – Control Systems, the Netherlands

Politecnico di Bari, Dipartimento di Elettrotecnica ed Elettronica, Italy

Politecnico di Milano, Dipartimento di Ingegneria Aerospaziale, Italy

University of Seville, Dpto. Ingeniería de Sistemas y Automática, Spain

Shanghai Jiao Tong University, Shanghai, PR China

5.10. Department of Electroacoustics

Faculty and staff

Professors

Bojan Ivančević – electroacoustics, general acoustics, psychoacoustics, digital audiotechnique, ultrasound, hydroacoustics, architectural acoustics

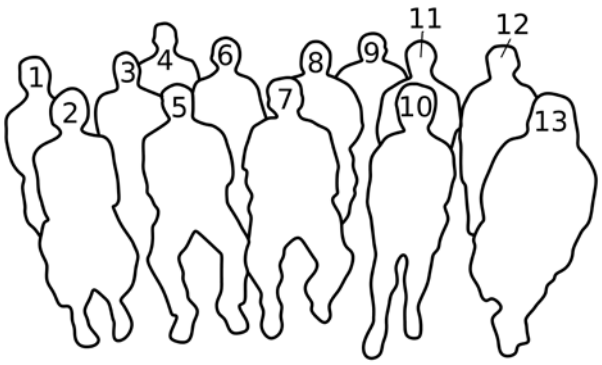
Ivan Jelenčić – distinguished professor (retired)

Branko Somek – distinguished professor (retired)

Founded in 1954

Head of Department:
Prof. **Siniša Fajt**, Ph.D.

Phone: + 385 1 6129 640
Fax: + 385 1 6129 680
E-mail: ea@fer.hr
Web: www.zea.fer.hr



1 Darko Gašparović 2 Sanja Grubeša 3 Marko Horvat
4 Ivan Đurek 5 Bojan Ivančević 6 Miljenko Krhen
7 Ivan Jelenčić 8 Hrvoje Domitrović 9 Siniša Fajt
10 Ljiljana Mišerić 11 Kristian Jambrošić
12 Antonio Petošić 13 Ljubica Konjević

Associate professors

Hrvoje Domitrović – audio technique, sound reinforcement, loudspeakers, acoustical designing, sound recording and editing, broadcasting systems, audio in multimedia

Siniša Fajt – electroacoustics, digital sound processing, speech and hearing, acoustical measurements, architectural acoustics, professional audio technique

Assistant professors

Ivan Đurek – audio equipment, transducers, audio signal processing

Kristian Jambrošić – architectural acoustics, psychoacoustics, acoustic measurements, electroacoustics

Antonio Petošić – electromechanical characterization of ultrasound systems used in medicine and industry, nonlinear time series analysis, numerical modelling in acoustics

Assistants

Miljenko Krhen

Research assistants

Sanja Grubeša

Marko Horvat

Mia Suhanek

Administrative staff

Ljubica Konjević

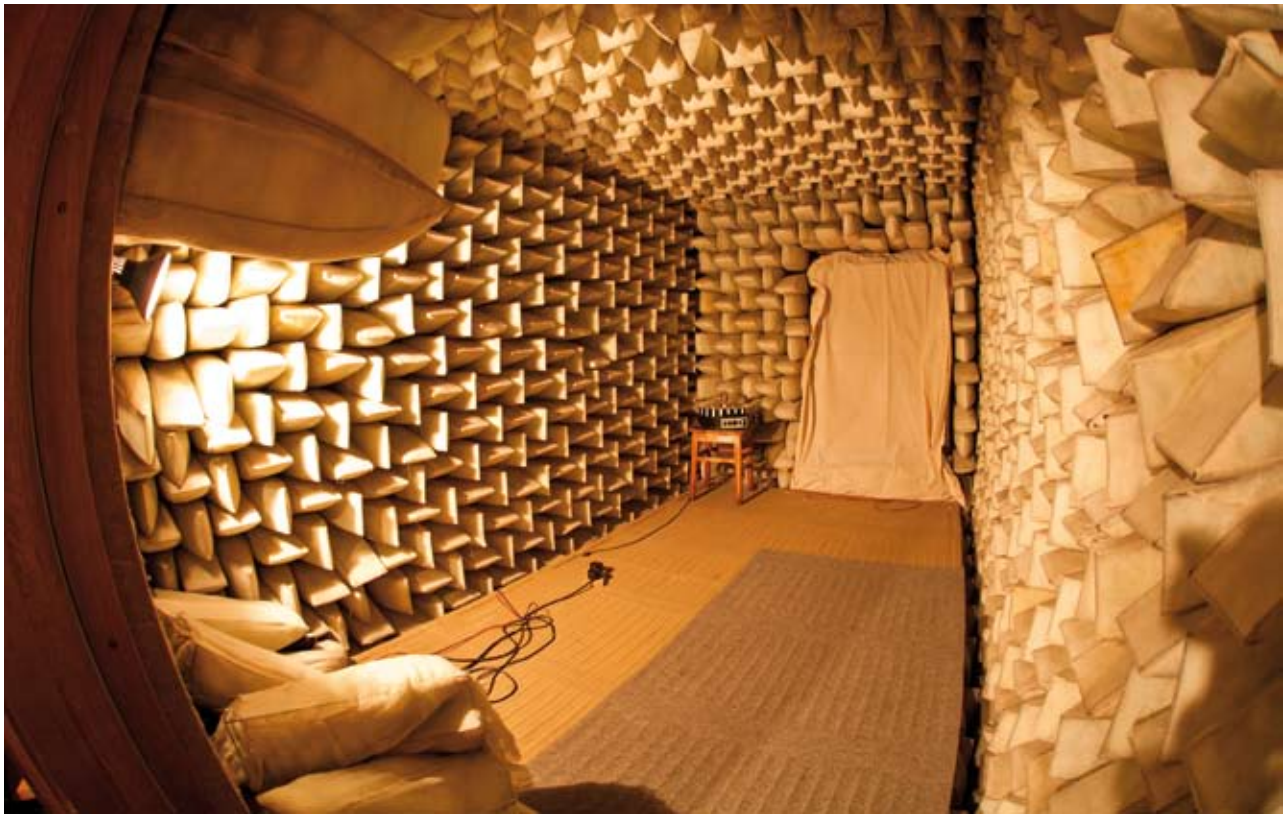
Laboratory support

Darko Gašparović

Educational activities

Acoustics: physical acoustics, hearing acoustics, speech and musical acoustics, speech recognition, architectural and building acoustics, control of noise and vibrations, infrasound and ultrasound in industry and medicine, prediction and measurement of noise pollution, audiology and audiometry, analysis and synthesis of speech and music, acoustical measurements.

Electroacoustics: electro-mechano-acoustical analogies, microphones, loudspeakers and enclosures, headphones, analogue and digital sound



recording and reproduction, sound reinforcement in closed and open spaces, audio and data signal processing, sound systems, audio measurements.

Multimedia communications: digital audio broadcasting, radio receiver techniques, communication receivers and measurements, surround sound, multichannel recording and reproduction, movie and TV sound, Internet audio, broadband transmission of sound with GSM, sound broadcasting systems and facilities.

First cycle study

Specialization Courses

- Audiotechnics
- Electroacoustics

Elective Courses

- Audio and Computers
- Sound and Environment
- Transmission of Audio

Skills

- Basics of sound recording and processing

Second cycle study

Mandatory Courses

- Laboratory of Electronics 1

Recommended elective courses

- Communication Acoustics
- Professional Audio Devices
- Room Acoustics
- Sound Reinforcement
- Speech and Musical Acoustic
- Ultrasound in Technique and Medicine

Skills

- Basics of sound recording and processing

Specialization courses

- Analysis and Processing of Audio Information

Theoretical Course

- Audiosystems

Specialization courses

- Digital Audio Technique
- Sound Quality in Broadcasting

Postgraduate doctoral study

- Acoustical Design
- Audio Forensics
- Audiocommunications
- Electroacoustical measurements
- Hearing Acoustics
- Noise and vibration
- Sound in architecture
- Sound in Multimedia Systems
- Ultrasonic Systems

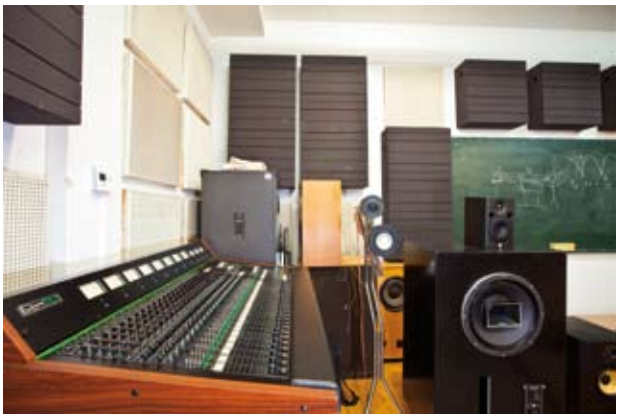
Research and development

Investigation of problems in acoustics, electroacoustics and audiotechnics. Physical and physiological acoustics, surface acoustics waves, acoustical optics, hearing, speech intelligibility, audiology and audiometry, radiation of sound, architectural acoustics, problems of noise and noise control, hydroacoustics, ultrasound applications in medicine, pharmacy and industry, control rooms, sound studios and public address systems. Techniques of high fidelity, sound reproduction systems, analogue and digital processing of sound, audio amplifiers. Problems of communication, consumer receivers and receiver system planning. Digital audio signal processing in radiocommunications. Digital audio transmission and receiving. Engineering of components, equipment and systems in audio and radio receivers and radio broadcasting. Psychoacoustical models of the hearing process and their application in the recording, transmission, editing and reproducing of audio signal. Sound processing in multimedia. Development and measurement of acoustical components, equipment and spaces. Measurement and estimation of sound quality.

Projects

COST Action TU0901: Integrating and Harmonizing Sound Insulation Aspects in Sustainable Urban Housing Constructions (FER project partner: Marko Horvat, Ivan Đurek 2009-2013)

Analysis and synthesis of ultrasound field for application on tissue (Project 036-1080231-1646, Ministry of Science, Education and Sports, Republic



of Croatia, Principal investigator: Bojan Ivančević, 2007-)

Estimation, monitoring and noise control (Project 036-0361630-1633, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Hrvoje Domitrović, 2007-)

Acoustic characteristics of composite elements in civil engineering (Project 036-0821504-2319, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Kristian Jambrošić, 2007-)

Soundscape of European Cities and Landscapes - COST TD0804 (MC Members: Kristian Jambrošić, Hrvoje Domitrović, 2008-2012)

International links

Audio Engineering Society (AES), New York, USA

European Acoustical Society (EAA), Madrid, Spain

International Institute for Acoustics and Vibration (IIAV), USA

Acoustical Society of America (ASA), New York, USA

Austrian Acoustics Association (AAA), Vienna, Austria

DEGA, University of Oldenburg, Germany

Slovenian Acoustical Society (SAS), Ljubljana, Slovenia

Akustik Buero Oldenburg, Germany

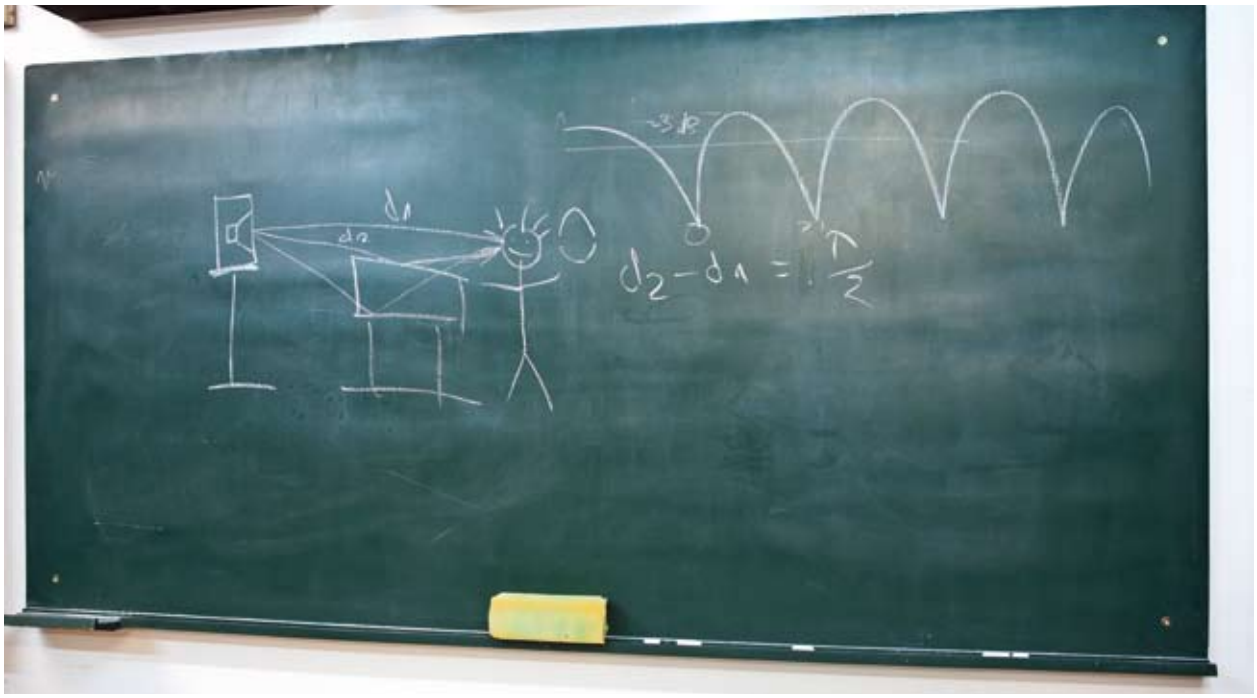
Institut für technische Akustik der RWTH, Aachen, Germany

Institut für allg. Elektrotehnik und Akustik, Bochum, Germany

Institut für Allgemeine Physik, TU Vienna, Austria

IT University of Goteborg, Sweden

Queen Mary University, London, UK




K·55
STEREO HEADPHONES

5.11. Department of Electronics, Microelectronics, Computer and Intelligent Systems

Faculty and staff

Professors

Adrijan Barić – modelling of electronic devices, integrated circuits, passive components and interconnect

Petar Biljanović – electronic devices, solid state circuits, microelectronics (retired)

Founded in 1943

Head of Department:
Prof. **Julijana Divković-Pukšec**, Ph.D.

Phone: + 385 1 6129 935
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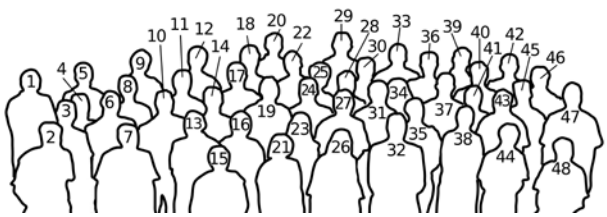
E-mail: zemris@fer.hr
Web: www.zemris.fer.hr



1 Zvonimir Jakopović 2 Aleksandar Szabo
3 Domagoj Jakobović 4 Zdenka Dandić
5 Klemo Vladimir 6 Leonardo Jelenković
7 Slobodan Ribarić 8 Biljana Geratović Reich
9 Igor Krois 10 Marin Golub 11 Igor Grudenić
12 Tomislav Suligoj 13 Nikola Bogunović
14 Zoran Kalafatić 15 Đurđica Dandić
16 Željko Butković 17 Siniša Šegvić 18 Artur Šilić
19 Marko Čupić 20 Darijan Marčetić
21 Dubravka Bernat 22 Vladimir Čeperić
23 Sanja Žonja 24 Tomislav Hrkać 25 Goran Glavaš
26 Julijana Divković Pukšec 27 Branko Filipčić
28 Marin Šilić 29 Niko Bako 30 Mirko Poljak
31 Branko Samaržija 32 Vlado Glavinić
33 Marko Koričić 34 Raul Blečić
35 Marija Marčetić 36 Mario Križan 37 Danko Ivošević
38 Željka Mihajlović 39 Zvonimir Pavlić 40 Josip Žilak
41 Goran Karan 42 Ivan Žužak 43 Ivan Fratrić
44 Marijo Maračić 45 Frane Šarić 46 Tihomir Knežević
47 Dejan Škvorc 48 Ivan Budiselić

Leo Budin – member of the Croatian Academy of Science and Arts (professor emeritus)

Nikola Bogunović - formal methods in system design, model based design, model based reasoning, knowledge based systems, knowledge discovery

Željko Butković – electronic devices and circuits, microelectronic analog and digital circuits, CAD in microelectronics

Bojana Dalbelo Bašić – artificial intelligence, machine learning, data and text mining, natural language processing, information retrieval

Vlado Glavinić – e-learning and m-learning systems, human-computer interaction, mobile applications and interfaces, Semantic Web.

Uroš Peruško – distinguished professor (retired)

Slobodan Ribarić – computer architecture, digital system design, pattern recognition, biometrics, computer vision, artificial intelligence, intelligent systems, autonomy oriented computing

Siniša Srbljić – Web and cloud computing; widget-oriented and service-oriented architectures; crowdsourcing and collective intelligence, consumer programming; programming language translation; theory of computing.

Dalibor Vrsalović – design tools for complex systems based on computers; modeling and verification of complex systems and their components.

Associate professors

Julijana Divković-Pukšec - electronic devices, solid state circuits, VLSI physical design

Marin Golub – operating systems, computer security, evolutionary computation

Zoran Kalafatić – computer vision, pattern recognition

Željka Mihajlović – computer graphics, visualization, animation, virtual reality

Vlado Sruk – software and hardware reliability, design methodologies, embedded systems and information technology, storage systems

Tomislav Suligoj – advanced electron devices, semiconductor fabrication technology, simulation modeling and characterization, solid state circuit design

Siniša Šegvić – computer vision, autonomous navigation, software design, computer architecture

Assistant professors

Stjepan Groš – computer networks and internet, operating systems, security

Tomislav Hrkać – computer architecture, computer vision, intelligent systems

Domagoj Jakobović – evolutionary computation, parallel and distributed computation

Leonardo Jelenković – operating systems, embedded operating systems

Igor Krois – analog design

Jan Šnajder – natural language processing, text mining, information retrieval

Marko Koričić – advanced semiconductor devices and structures; integration of bipolar and CMOS technologies; characterization and numerical simulation of electron devices

Assistants

Vladimir Čeperić
Tvrtko Mandić
Alan Jović
Tihomir Knežević
Zvonimir Pavlić
Branko Samaržija
Klemo Vladimir

Research assistants

Marko Čupić
Ivan Fratrić
Igor Grudenić
Dejan Škvorc
Ivan Budiselić
Goran Delač

Danko Ivošević
Mario Križan
Marijo Maračić
Darijan Marčetić
Marija Marčetić
Mirko Poljak
Miroslav Popović
Frane Šarić
Artur Šilić
Marin Šilić
Josip Žilak
Sanja Žonja
Ivan Žužak

Associates

Niko Bako
Raul Blečić
Goran Glavaš
Mladen Karan
Davorin Gordan Keserica
Jurica Kundrata

Administrative staff

Dubravka Bernat
Biljana Geratović Reich

Laboratory support

Branko Filipčić
Zvonimir Jakopović

Educational activities

Electronic devices. Analogue electronics. Microelectronic technology, devices and circuits. Microelectronic standard circuits, ASIC and SoC design. Computer-based circuit analysis. Integrated circuit physical design and verification.

Digital logic design. Computer and communication networks. Internet technologies. E-learning and m-learning. Mobile applications. Web computing. Service-oriented architectures. Network security. Semantic Web. Computer graphics. Visualization. Programming language translation. Theory of computing. Parallel programming. Software and hardware reliability. Embedded systems. Storage systems.

First cycle study

Mandatory Course

- Artificial Intelligence
- Communication Networks
- Computer Architecture 2
- Digital Logic
- Electronics 1
- Electronics 2
- Interactive Computer Graphics
- Introduction to Theoretical Computer Science
- Operating Systems
- Programming Language Translation
- Software Design

Elective Courses

- Design Patterns in Software Design
- Introduction to Pattern Recognition
- Scripting Languages

Skills

- Advanced use of Linux operating system
- Basic use of Linux operating system
- Introduction to Java programming language
- PHP application development basics
- Programming in Haskell
- Solving optimization problems using evolutionary computation algorithms in Java

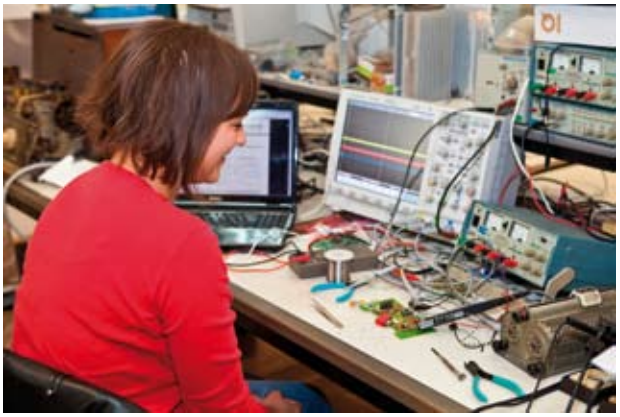
Second cycle study

Mandatory Course

- Laboratory of Computer Engineering 2
- Laboratory of Computer Science 1
- Laboratory of Computer Science 2
- Laboratory of Electronics 2
- Laboratory of Software Engineering and Information Systems 2

Theoretical Course

- Advanced Operating Systems
- Computer Aided Analysis and Design



- Computer Systems Reliability
- Digital Microelectronic Circuits
- Digital System Design
- Distributed Systems
- Formal Methods in System Design
- Machine Learning
- Pattern Recognition
- Real-Time Systems

Recommended elective courses

- CAD Procedures in Physical Integrated Circuit Design
- Computer Graphics
- Computer Vision
- Design of Radio-frequency and Microwave Integrated Circuits
- Electronic Equipment Power Supplies
- Expert Systems
- Fuzzy, Evolutionary and Neuro-computing
- Memory Systems
- VLSI technology

Skills

- Basic use of Linux operating system
- Introduction to Java programming language
- PHP application development basics

- Programming in Haskell
- Solving optimization problems using evolutionary computation algorithms in Java

Specialization courses

- Advanced Computer Networks
- Analog and Mixed-signal Integrated Circuits
- Computer Animation
- Human-Computer Interaction
- Microelectronic Devices
- Networked Systems Middleware
- Operating Systems for Embedded Computers
- Parallel Programming
- Service-Oriented Computing
- System Level Integration

Postgraduate doctoral study

- Advanced and Intelligent Networking Technologies
- Algorithms in Embedded Computer Systems
- Biometric-based Security Systems
- Computer and Robot Vision
- Computer Graphics
- Computer System Security
- Distributed Computing Systems
- Dynamic Scene Analysis
- High Speed Integrated Circuits
- Human Computer Interaction
- Knowledge Discovery in Data Sets
- Knowledge Representation in Information Systems
- Microelectronics Circuit Design
- Microelectronics for Computing and Communication Systems
- Multiprocessors and Parallel Systems
- Processes in Computer Systems
- Programmable Logic Systems
- Programming Language Translation in Distributed Systems
- Reliability and Fault-tolerance of Computer Systems
- Scheduling Algorithms
- Statistical Methods for Data Mining
- Storage Systems
- Visualization

Research and development

Electronics and microelectronics:

Semiconductor material applications in non-standard fields. New semiconductor heating elements

and temperature sensors. Modern homojunction and heterojunction transistor structures. New horizontal current bipolar transistor (HCBT). Development of semiconductor device models. Modelling of passive devices. Development of simulation methods and their application in microelectronics. Development of topology design methods for VLSI/ULSI circuits. Analysis and design of bipolar, CMOS, BiCMOS and GaAs analogue and digital integrated circuits. Physical layout and verification of microprocessor integrated circuits. On chip DC and RF measurements.

Computing:

Digital system design. Computer systems hardware and software co-design and development. Formal methods in the design of computing systems. Software and hardware reliability. Embedded systems. Real-time systems.

Distributed systems, clusters and grids. Dependable systems design and development. Computer systems and network security. Computer graphics, animation and visualization. Human-computer interaction.

Internet computing. Web and cloud computing. Widget-oriented and service-oriented architectures. Consumer programming. Autonomy-oriented computing. Multi-agent systems. Semantic Web and ontologies. Mapping data to ontologies. Office automation. Electronic document management systems. Mobile applications and interaction.

Intelligent information systems. Crowdsourcing and collective intelligence. Evolutionary computation. Expert and other knowledge based systems. Data, text and signal mining. Machine learning. Pattern recognition. Computer vision. Biometrics. E-learning, m-learning and u-learning.

Projects

IMOLA - Intelligent light Management for OLED on foil Applications (EU FP7 STREP project, ICT, FER project partner: Adrijan Barić, 2011-2014)

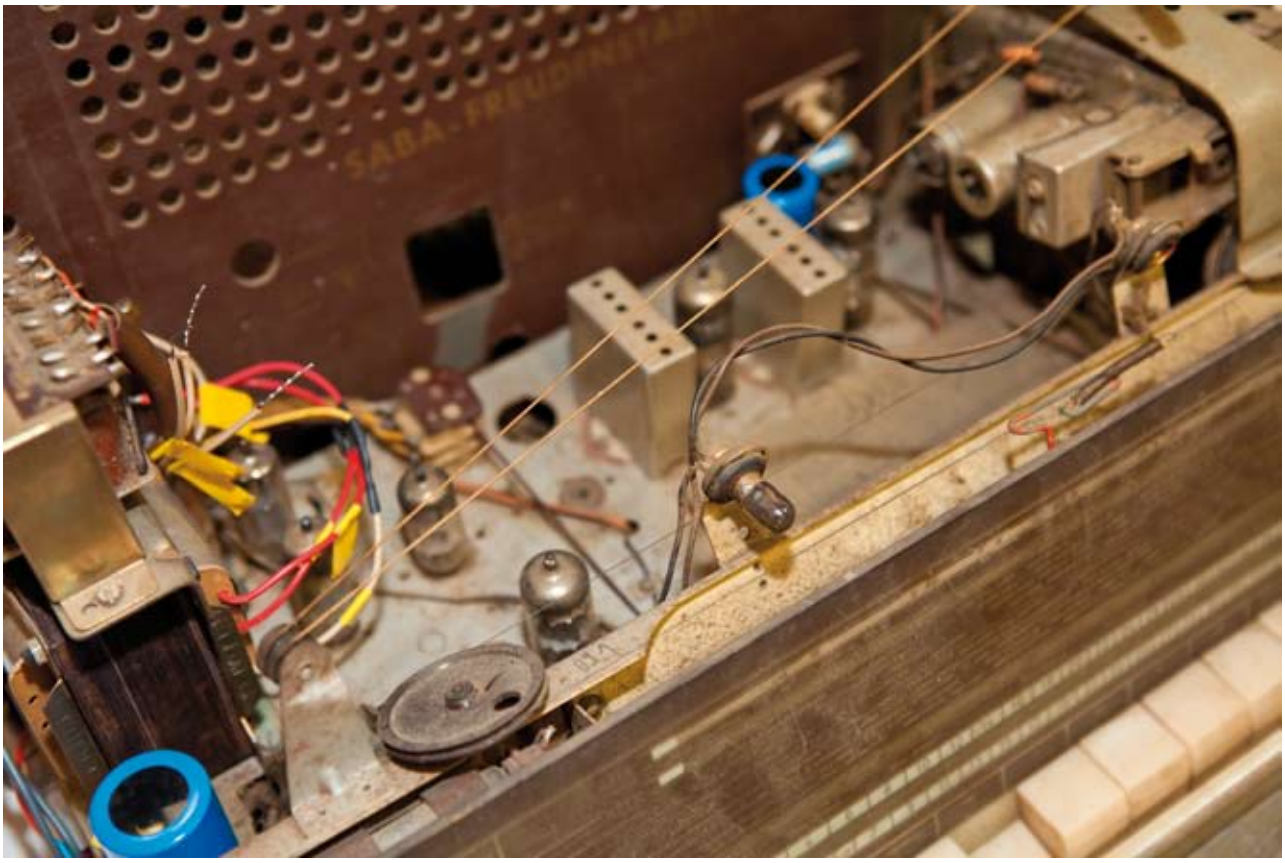
MASTIF - Mapping and Assessing the State of Traffic Infrastructure (HRZZ project - Croatian Science Foundation, Project leader: Siniša Šegvić, 2008-2011)

BILDET - Model based traffic sign detection (Bilateral Croatian-Austrian project, Croatian partner: Siniša Šegvić, 2010-2011)

ITA - Intelligent Text Analyser (HIT project - Croatian Institute of Technology, Principal investigator: Bojana Dalbelo Bašić, 2011-2012)

Computing Environments for Ubiquitous Distributed Systems (Scientific project 036-0362980-1921, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Siniša Srbljić, 2007-)

Universal Middleware Platform for e-Learning Systems (Project 036-0361994-1995, Ministry of



Science, Education and Sport, Republic of Croatia, Principal investigator: Vlado Glavinić, 2007-)

Signal Integrity of Mixed-Signal Integrated Circuits (Project 036-0361621-1622, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Adrijan Barić, 2007-)

Knowledge discovery in textual data (036-1300646-1986, Croatian Ministry of Science, Education and Sports, principal investigator: Bojana Dalbelo Bašić, 2007-)

Sophisticated semiconductor structures for communication technology (Project 036-0361566-1642 Ministry of Science and Technology, Republic of Croatia, Principal investigator: Petar Biljanović 2007-2009, Vladimir Jovanović 2009-2011, Marko Koričić 2011-)

Design Environments for Embedded Systems (Project 036-0362980-1929 , Ministry of Science and Technology, Republic of Croatia, Principal investigator: Daniel Gajski, 2007-)

Nanometric electron devices and circuit applications (Project 036-0361566-1567 Ministry of Science and Technology, Republic of Croatia, Principal investigator: Tomislav Suligoj, 2007-)

User-oriented scheduling heuristics (Applied information technology project 2008-050, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Domagoj Jakobović, 2009-2010).

Automatization of constructing and processing of paper-based assessments (Project 2008-078 Ministry of Science, Education and Sports, Republic of Croatia, Project leader: Marko Čupić, 2009-2010)

COST Action 2101 Biometrics for Identity Documents and Smart cards (**BIDS,** coordinator: Slobodan Ribarić; 2006-2009)

Application-Oriented Embedded System Technology (Unity Through Knowledge Fund, University of California, Irvine, USA, Principal Investigator: Daniel D. Gajski, Co-Principal Investigator: Vlado Sruk, 2007-2010)

End-User Tool for Gadget Composition (Google Research Award, Google Inc., CA, USA,Principal investigator: Siniša Srbljić, 2008-2010)

Unified Translation Memory (Google Research Award, Google Inc., CA, USA,Principal investigator: Siniša Srbljić, 2008-2010)

A New Horizontal Current Bipolar Transistor (HCBT) for 0.18μm BiCMOS Integration (Asahi Kasei EMD Corp. Principal investigator: Tomislav Suligoj, 2006-)

Autonomy-Oriented Computing Structures (036-0361935-1954, Project leader: Slobodan Ribarić; 2007-)

Bilateral Croatian-Slovenian project **Personal recognition from Video Sequences Obtained Under Unsupervised Conditions (VIDO,** Project leader: Slobodan Ribarić; 2009-2010).

Automatic news classification and keyword extraction (HINA, Croatian News Agency, Project coordinator: Prof. Bojana Dalbelo Bašić, 2008-2010).

International links

Agilent, Santa Rosa, California, USA

AMI Semiconductor, Oudenaarde, Belgium

Cadence Design Systems GmbH, Feldkirchen, Germany

Cambridge Semiconductor, United Kingdom

Cisco Systems Inc., San Jose, California, USA

Delft University of Technology, The Neatherlands,

Dipartimento di Elettrotecnica ed Elettronica, Politecnico di Bari, Bari, Italy

Ecole Polytechnique Federale de Lausanne, EPFL-STI-IMM, Switzerland

Fakulteta za računalništvo in informatiko, Univerza v Ljubljani, Slovenia

Faculty of Electrical Engineering, University of Ljubljana, Slovenia

Faculty of electrical engineering, mechanical engineering, and naval architecture, University of Split, Croatia

Faculty of Information Science and Engineering, Northeastern University, Shenyang, China

Friedrich-Alexander Universität Erlangen-Nürnberg, Institut für Matematishe Maschinen und Datenverarbeitung, Lehrstuhl für Mustererkennung, Erlangen, Germany

Ghent University, INTEC, Ghent, Belgium

Google Inc., Mountain View, California, USA

Graz University of Technology, Graz, Austria

Group Lagadic, IRISA/INRIA Rennes, France

Hong Kong University of Science and Technology, China

Inter-university MicroElectronics Center, Belgium

Institut "Jožef Stefan", Knowledge technologies department, Slovenia

Institute of Electrical Measurement and Measurement Signal Processing, TU Graz, Austria

IRISA, Universite de Rennes 1, Rennes, France

Katholieke Universiteit Leuven, Computer science department, Leuven, Belgium

Katholieke Universiteit Leuven, ESAT, Belgium

Medical University Graz , Institute of Medical Informatics, Statistics and Documentation.

Pictorial Computing Laboratory (PCL), Rome, Italy

Politecnico di Bari, Dipartimento di Elettrotecnica ed Elettronica, Bari, Italy

Portland State University, Portland, Oregon, USA

Robert Bosch GmbH, Automotive Electronics Division, Germany

TriQuint Semiconductor, Inc., Oregon, USA

Università degli Studi di Roma 1 La Sapienza, Dipartimento di Scienze dell'Informazione, , Pictorial Computing Laboratory (PCL), Rome, Italy.

University of California Irvine, California, USA

University of California, Los Angeles, USA

University of Cambridge, United Kingdom

University of German Federal Armed Forces, Munich, Germany

University of Toronto, Toronto, Ontario, Canada

Univerza v Mariboru, Fakulteta za elektrotehniko, racunalnistvo in informatiko, Maribor, Slovenia

5.12. Department of Wireless Communications

Faculty and staff

Professors

Juraj Bartolić – electromagnetic wave theory, microwave engineering, antennas and propagation, remote sensing, EMCEMI

Davor Bonefačić – microwave engineering, active antennas, radar systems

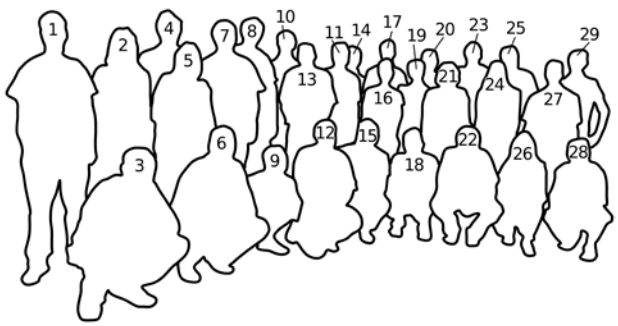
Sonja Grgić – video signal processing and communications, picture quality assessment, digital video broadcasting

Founded in 1954

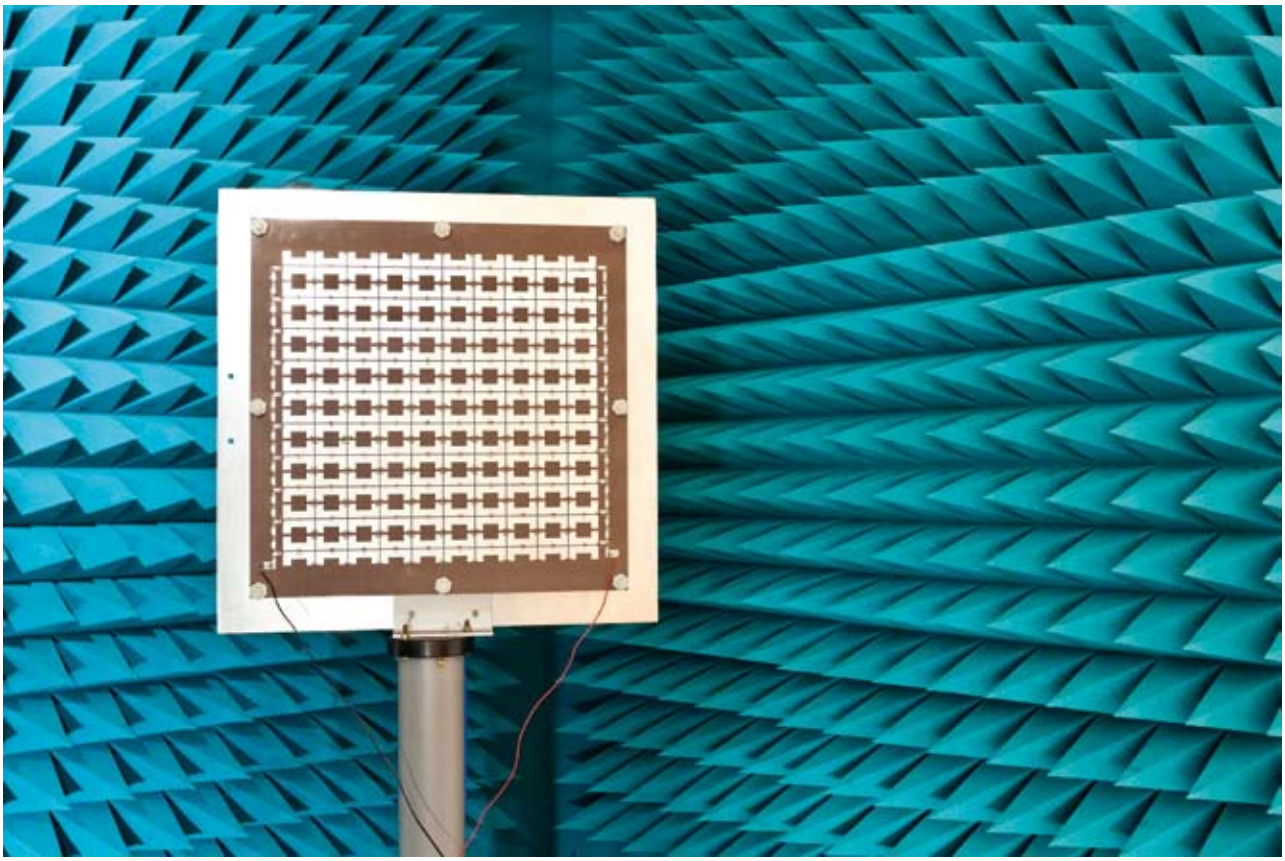
Head of Department:
Prof. **Zvonimir Šipuš,** Ph.D.

Phone: + 385 1 6129 857
Fax: + 385 1 6129 717
E-mail: rc@fer.hr
Web: www.rc.fer.hr

Mislav Grgić – digital mammography, computer-aided detection and diagnosis (CAD) for breast cancer, face recognition, biometrics, image and video compression, multimedia communications



1 Emil Dumić 2 Dina Šimunić 3 Branimir Ivšić
4 Zvonimir Šipuš 5 Iva Bačić 6 Mario Cvitković
7 Davor Bonefačić 8 Tomislav Debogović
9 Damir Muha 10 Josip Vuković 11 Mislav Grgić
12 Damir Petričević 13 Juraj Bartolić 14 Davor Zaluški
15 Tin Komljenović 16 Josipa Baček
17 Radovan Zentner 18 Siniša Škokić 19 Ljerka Nuić
20 Borivoj Modlic 21 Sonja Grgić 22 Dario Bojanjac
23 Gordan Šišul 24 Dijana Tralić 25 Robert Nađ
26 Jelena Božek 27 Tomislav Kos 28 Marko Bosiljevac
29 Krešimir Malarić



Silvio Hrabar – electromagnetic wave theory, application of microwaves, antennas, optoelectronic circuits

Tomislav Kos – radio positioning and navigation, television, cable television systems, broadband networks

Boris Kviz – distinguished professor - optical communication systems, radio telemetry, radiolocation and navigation (retired)

Krešimir Malarić – electromagnetic wave theory, microwave communications, satellite communications, EMC, biomedical effects of electromagnetic fields

Borivoj Modlic – broadcasting, wireless access networks, EMC

Robert Nađ – mobile and wireless communications, RF and microwave small signal amplifiers, circuits and communication system weak nonlinearities problems

Dina Šimunić – wireless communications, biomedical effects of electromagnetic fields, green communications, intelligent transport systems

Zvonimir Šipuš – optical communication systems, computational electromagnetics, antennas

Ervin Zentner – distinguished professor - antennas and propagation, mobile communications, microwave circuits, electromagnetic compatibility, radar systems (retired)

Branka Zovko-Cihlar – distinguished professor - digital television, multimedia communications, television broadcasting, broadband network mobile communication (retired)

Assistant professors

Gordan Šišul – wireless access networks, mobile communications, digital communications, propagation

Radovan Zentner – radio channel modelling, wireless communication, MIMO systems, antennas, propagation

Assistants

Mario Cvitković

Research assistants

Iva Bačić
Dario Bojanjac
Marko Bosiljevac
Jelena Božek
Tomislav Debogović
Emil Dumić
Branimir Ivšić
Tin Komljenović
Damir Muha

Mario Muštra
Pavel Najman
Dijana Tralić
Josip Vuković
Davor Zaluški
Siniša Škokić
Damir Zrno

Administrative staff

Ljerka Nuić

Laboratory support

Damir Petričević

Educational activities

Active Antennas, Advanced Electromagnetic Engineering, Antennas, Application of Microwaves in Industry and Science, Biomedical Effects of Electromagnetic Fields, Broadband Networks for Television Signal Distribution, Digital Television, Digital Video, Video Communication Technologies, Frequency and Signal Synthesis, Microwave Communications, Microwave Engineering, Microwave Measurements, Microwave Receivers, Microwave Semiconductor Electronics, Mobile Communication, Modulation Methods, Modulations and Modulators, Noise Analysis in Communication System, Noise in Radio Communications, Numerical Analysis of Antennas and Guiding Structures, Optical Communication Systems, Optical Communications, Optical Sensors and Components, Optoelectronic Circuits, Mobile Internet, Picture Quality in Digital Video Communications, Protection of Wireless Communication Systems, Radar Systems, Navigation Systems, Wireless Communication Systems, Radio-Frequency Amplifier Design, Radio Frequency Electronics, Satellite Communications, Spread Spectrum Systems, Television, Theory of Communication Systems, Theory of Electromagnetic Waves, Wireless Access Networks, Wireless Circuits Design.

First cycle study

Mandatory Courses

- Applied Electromagnetics
- Electronic Communications
- Mobile Communications
- Multimedia Technologies

Elective Courses

- Digital Video
- Optical Communication Technology
- Public Mobile Network
- Radio Navigation
- Technical Standardization and Legislative

Skills

- Chess

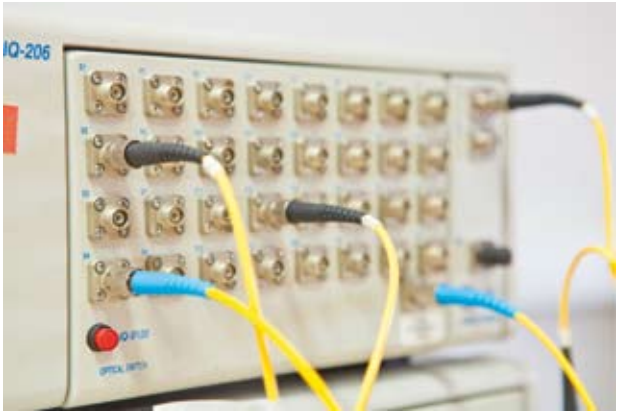
Second cycle study

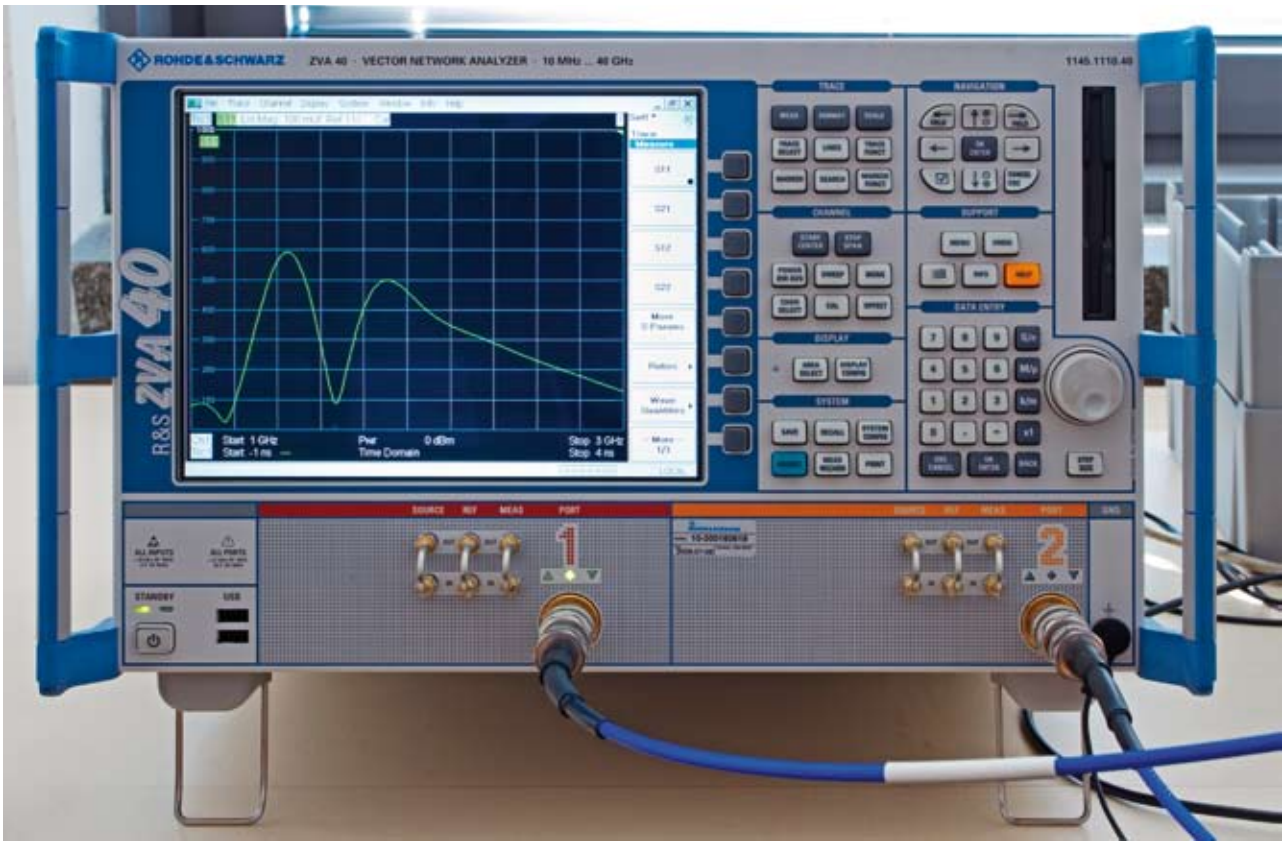
Mandatory Courses

- Laboratory of Electronics 1
- Laboratory of Electronics 2
- Laboratory of Information Processing 1
- Laboratory of Wireless Technologies 1
- Laboratory of Wireless Technologies 2

Theoretical Course

- Antennas and Propagation
- Microwave Engineering
- Optical Communication Systems





- Radio-Frequency Electronics
- Radio-Frequency Systems
- Video Communication Technologies

Recommended elective courses

- Cable Networks for Interactive Communications
- Design of Radio-frequency and Microwave Integrated Circuits
- Economy and Ecology of wireless systems
- EMI Protection of Communication Systems
- Innovative Electromagnetic Systems - from Idea to Practical Realization
- Mobile Internet
- Radar Systems
- Radio-Frequency Amplifiers
- Remote Sensing and Radiometry

Skills

- Chess

Specialization courses

- Digital Broadcasting
- Mobile Systems Planning
- Optical Networks
- Radio-Frequency and Microwave Measurements
- Satellite Communication Technology
- Wireless Access Networks

Postgraduate doctoral study

- Active Antennas
- Advanced Electromagnetic Engineering
- Advanced Modulation Methods
- Biomedical Effects of Electromagnetic Fields
- Broadband Networks for Television Signal Distribution
- Communications for Multimedia Services
- Electronic Tracking Systems
- Microwave Instrumentation and Measuring Methods
- MIMO in Mobile Communication Systems
- Multimedia Content Retrieval
- Navigation Systems
- Optical Fiber Communication and Sensor Systems
- Picture Quality in Digital Video Communications
- Quality of Service in Wireless Networks
- Radiofrequency System Design
- Satellite Communication Systems
- Signal Equalization in Wireless Transmission
- Spread Spectrum Systems
- Theory of Wireless Communications Systems

Research and development

Smart antennas for communication and radar systems. Self-oscillating push-pull phased arrays of modified rectangular and circular patches with electronic beam scanning and quasi-optical power combining capabilities. Planar and quasi-planar small antennas for mobile base station and terminal applications. Numerical methods in electromagnetic wave scattering and antenna analysis. Conformal antennas - microstrip arrays on general convex structures. Broadband microstrip radiating elements: stacked patch antennas on planar and cylindrical structures. Introduction of genetic algorithms into the analysis of complex antenna problems. Highly sensitive fully automatic phase noise measurement system. Land and satellite mobile radio communication spectrum efficiency. Electromagnetic compatibility of wireless systems. Multimedia communications and services. Digital image and video compression algorithms. Multimedia transmission over broadband and wireless networks. Quality of service for video communications. Subjective assessment of picture quality. The effect of bit errors and packet loss on compressed video. Variable bit rate video coding and quality control. Theoretical and experimental study of TEM and GTEM cells. Electromagnetic field measurements. Biomedical effects of electromagnetic fields. High precision RF and microwave measurements. Dosimetry and densitometry of electromagnetic fields. Optical sensors. Numerical modelling of multilayer fibers. Meta-materials. New structures with metamaterials. Multi-frequency radar systems. Ionospheric and tropospheric propagation impact on satellite positioning performance.

Projects

CARE - Coordinating the Antenna Research in Europe (EU FP7 CA project, ICT, FER project partner: Juraj Bartolić, 2010-2012).

TRANSMIT - Training Research and Applications Network to Support the Mitigation of Ionospheric Threats (EU FP7 Marie Curie project, FER project partner: Tomislav Kos, 2011-2015).

CylCloak - Metamaterial-Based Cylinders Used for Invisible Cloak Realization (Multilateral project, EOARD - European Office of Aerospace Research and Development, Croatian partner: Zvonimir Šipuš, 2010-2011).

NEWFOCUS - New frontiers in millimetre / sub-millimetre waves integrated dielectric focusing systems (Multilateral project, ESF Research Networking Programme, Croatian partner: Zvonimir Šipuš, 2010-2015).

LAFMOT - Luneberg Antenna For Multimedia On Train (Multilateral project, EUREKA, Croatian partner: Zvonimir Šipuš, 2008-2010).

COST-TERRA - Techno-Economic Regulatory Framework for Radio Spectrum Access for Cognitive Radio/Software Defined Radio (COST Action IC0905, Cooperation in Science and Technology, European Commission, MC member and national coordinator: Mislav Grgić, 2010-2014).

EURO-TELEPATH - Telepathology Network in Europe (COST Action IC0604, Cooperation in Science and Technology, European Commission, MC member and national coordinator: Mislav Grgić, 2007-2011).

COST C1004 - Cooperative Radio Communications for Green Smart Environments (COST Action C1004, Cooperation in Science and Technology, European Commission, MC member and national coordinator: Radovan Zentner, 2011-2015).

COST TD 1001 OFSeSa - Novel and Reliable Optical Fibre Sensor Systems for Future Security and Safety Applications (COST TD 1001, Cooperation in Science and Technology, European Commission, MC member and national coordinator: Zvonimir Šipuš, 2011-2014).

Investigation of Backward-wave Metamaterials based on Anisotropic Plasmalike Structures (Bilateral project between Croatia and Germany funded by Deutscher Aakademischer Austauschdienst and Croatian Ministry of Science, Principal investigator: Silvio Hrabar, 2007-2010).

Averaging mirrors for passive optical networks based on self-seeded semiconductor optical amplifiers (BICRO project, Project leader: Zvonimir Šipuš, 2011).

Intelligent Image Features Extraction in Knowledge Discovery Systems, (Ministry of Science, Education and Sport, Principal investigator: Mislav Grgić, 2007-).

Picture Quality Management in Digital Video Broadcasting, (Ministry of Science, Education and Sport, Principal investigator: Sonja Grgić, 2007-).

Electromagnetic effects and structures in communication systems (Ministry of Science, Education and Sport, Principal investigator: Zvonimir Šipuš, 2007-).

Multifunctional Antennas in Communication and Radar Systems (Ministry of Science, Education and Sport, Principal investigator: Juraj Bartolić, 2007).

Laboratory for electromagnetic compatibility and biological effects of EM fields (Ministry of Science, Education and Sport, Principal investigator: Krešimir Malarić, 2007-).

Environment for satellite positioning (Ministry of Science, Education and Sport, Principal investigator: Tomislav Kos, 2007-).

Electromagnetic Metamaterials and Nanoelectromagnetics (Ministry of Science, Education and Sport, Principal investigator: Silvio Hrabar, 2007-).

Efficiency increase of wireless communications systems (Ministry of Science, Education and Sport, Principal investigator: Dina Šimunić, 2007-).

Electromagnetic Compatibility-Environmental Protection (Ministry of Science, Education and Sport, Principal investigator: Borivoj Modlic, 2007-).

COST BM0704: Emerging EMF Technologies and Health Risk Management, Cooperation in Science and Technology, European Commission, MC member and national coordinator: Dina Šimunić, 2008-2012

COST IC0806: Intelligent Monitoring, Control and Security of Critical Infrastructure Systems, Cooperation in Science and Technology, European Commission, MC member and national coordinator: Dina Šimunić, 2009-2013

COST IC0902: Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless Networks, Cooperation in Science and Technology, European Commission, MC member and national coordinator: Dina Šimunić, 2009-2013

Erasmus Mundus Mobility for Life, European Commission, core group member, Dina Šimunić, 2009-2013

B**roadband Epsilon-Near-Zero (ENZ) and Mu-Near-Zero (MNZ) Active Metamaterial, EOARD, FA8655-10-1-3030, 2010-2011,** Project leader: Silvio Hrabar

International links

Air Force Research Laboratory, Hanscom AFB, USA

Brunel University, Department of Systems Engineering, United Kingdom

Chalmers University of Technology, Department of Electromagnetics, Goeteborg, Sweden

Motorola, Electromagnetics Research Laboratory, Florida, USA

Pacific Northwest National Laboratory, USA

Slovak University of Technology in Bratislava, Slovakia

Swiss Federal Institute of Technology, Department of Electrical Engineering, Zuerich, Switzerland

Technical University of Budapest, Department of Microwave Telecommunications, Hungary

Technische Universität Graz, Institut fur Elektro- and Biomedizinische Technik, Austria

Third University of Rome, Department of Electrical Engineering, Italy

University of Mining and Metallurgy, Telecommunications Department, Krakow, Poland

University of Essex, Department of Electronics Systems Engineering, United Kingdom

University of Gent, Department of Information Technology, Belgium

University of Maribor, Faculty of Electrical Engineering and Computer Science, Slovenia

University of Massachusetts Amherst, Department of Electrical and Computer Engineering, USA

University of Utah, Electrical Engineering Department, Salt Lake City, Utah, USA

University of Bologna, Department of Electronics, Computer Sciences and Systems, Bologna, Italy

Ecole Polytechnique Fédérale de Lausanne (EPFL), Laboratory of Electromagnetics and Acoustics (LEMA), Switzerland

University of Siena, Department of Information Engineering, Italy

University of Florence, Department of Electronics and Telecommunication, Italy

Université de Rennes 1, Institut d'Electronique et de Télécommunications de Rennes (IETR), France

6.
Management, Administration and Support

6.1. Dean and Vice Deans

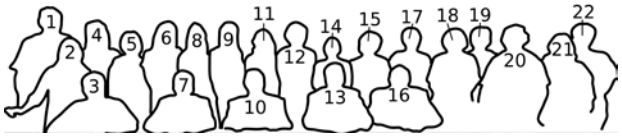
Nedjeljko Perić – Dean
Davor Petrinović – Vice Dean
Hrvoje Domitrović – Vice Dean
Mislav Grgić – Vice Dean

Phone: + 385 1 6129 642
Fax: + 385 1 6170 007
E-mail: fer@fer.hr

1 Davor Petrinović
2 Nedjeljko Perić
3 Hrvoje Domitrović
4 Mislav Grgić

6.2. Management and Administration

Phone: + 385 1 6129 642
Fax: + 385 1 6170 007
E-mail: fer@fer.hr



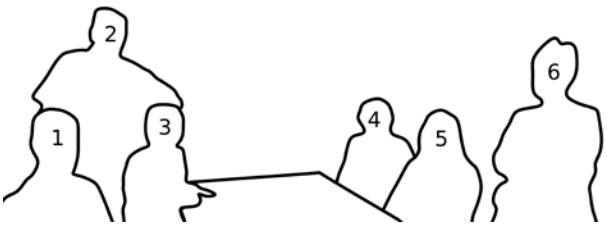
1 Srećko Papac 2 Anka Jurić 3 Vladimir Malarić
4 Mara Mihaljević 5 Gordana Gluščević
6 Jasna Matijević 7 Davor Petrinović 8 Ana Zelić
9 Ivana Borilović 10 Nedjeljko Perić
11 Martina Petrović 12 Olga Županić 13 Mislav Grgić
14 Branka Filipović 15 Mira Silov 16 Hrvoje Domitrović
17 Dijana Bontempo 18 Gordana Šincek
19 Renata Peček 20 Marija Kovačević
21 Jožica Poslon 22 Mihaela Lehner

6.3. Secretary's Office

Vladimir Malarić – Head of Office
Marija Rumac – Head of Dean's Office
Ana Zelić – Vice Deans' Office
Đurdica Jelić – Head of Registry Department
Nikolina Miljan
Marija Kovačević – Head of Office for General Affairs
Jožica Poslon
Jadranka Matleković – Head of Human Resources Office

Phone: + 385 1 6129 642
Fax: + 385 1 6170 007
E-mail: fer@fer.hr

Renata Peček
Miroslav Šladarec
Srećko Papac



1 Vladimir Malarić
2 Srećko Papac
3 Renata Peček
4 Marija Kovačević
5 Jožica Poslon
6 Nikolina Miljan

6.4. Finance Department

Olga Županić – Head of Finance Department

Phone: + 385 1 6129 722
Fax: + 385 1 6170 007
E-mail: olga.zupanic@fer.hr

Dijana Bontempo
Ivana Borilović
Branka Filipović
Gordana Gluščević
Anka Jurić
Jasna Matijević
Mara Mihaljević
Martina Petrović
Mira Silov
Gordana Šincek

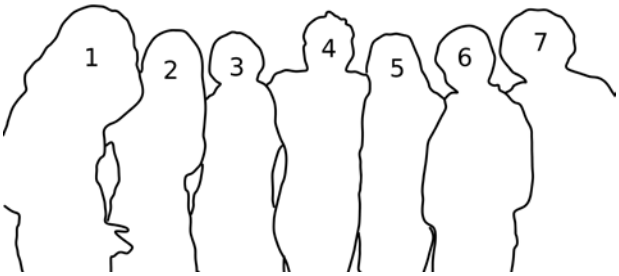
1 Anka Jurić 2 Ivana Borilović 3 Martina Petrović
4 Jasna Matijević 5 Branka Filipović 6 Olga Županić
7 Mira Silov 8 Dijana Bontempo 9 Gordana Gluščević
10 Mara Mihaljević 11 Gordana Šincek

6.5. Student Administration Office

Includes admission of students, enrolment in academic year, keeping examination records, providing certificates and transcripts for earning all sorts of student rights-scholarships, organizing accommodation in student dorms, student meal discount, public transportation, and organization of promotions of graduate engineers.

Phone: + 385 1 6129 520
Fax: + 385 1 6129 530
E-mail: stuslu@fer.hr

Petra Lukina – Head of Student Administration Office
Željka Bratić Odobašić
Mirjana Grubiša
Sanja Horvat
Silvija Jurić-Bubić
Monika Karlović
Vasilija Tovarloža
Smiljanka Turkalj



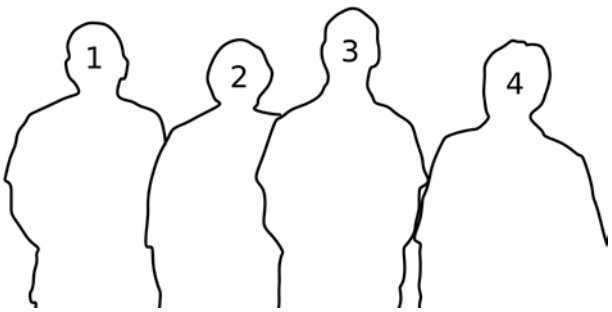
1 Željka Bratić Odobašić
2 Monika Karlović
3 Vasilija Tovarloža
4 Petra Lukina
5 Silvija Jurić-Bubić
6 Smiljanka Turkalj
7 Mirjana Grubiša

6.6. FER Central Library

Jadranka Lisek – Head of Central Library
Branka Marijanović – Librarian
Ivan Jelić – Librarian
Stjepan Šimara – Librarian
Zora Žitnik – Assistant Librarian

Phone: + 385 1 6129 886
Fax: + 385 1 6129 888
E-mail: ferlib@fer.hr
Web: www.fer.hr/knjiznica

FER Central Library, as an organizational unit of the Faculty, finds its calling and mission in providing a high-quality support to research and teaching procedure, as an active partner in enhancing the quality of the learning outcomes.
By the usage of the Library holdings, and the skills of information retrieving, and searching the available online databases, the Library staff recommends literature to the Faculty students, as well as to graduating students, postgraduates, high-school students, Faculty employees, and all who need help in finding necessary technical-scientific publications (approximately 5,000 users).
For the purposes of entry and processing of data related to the service of literature search on demand, a database was developed in the Library, as well



1 Stjepan Šimara
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as an interlibrary loan database. On the basis of the above mentioned databases, two web-forms for communicating with the Library users were also developed.
The FER Central Library acts as a support in lecturing a humanities class called Research, Publication and Responsibility in Science at the graduate study program, and the Library staff is a part of the organizing committee of the annual conference of the Croatian academic and scientific libraries, which, for the 9th time in a row, takes place at the Faculty.
Central library has begun process of redefining itself by the means of implementing new technologies and new means of communication with its patrons. Implementation of new open source integrated library management software Koha has been one of the crucial steps towards library 2.0; also we communicate with our patrons through social networks (Facebook page, Twitter, Meebo) acknowledging high reception of that kind of communication.
Recognizing information needs for new generations of students and scientists has become primary goal as it is necessary for transformation of Central library into digital library for 21st century study needs.
The Library staff also participates in a scientific project financed by the Ministry of Science, Education and Sports of the Republic of Croatia (MZOŠ).

Projects

Evaluation of Library Services: Academic and Public Libraries (122-1221210-0759) (Project leader: Kornelija Petr Balog, Faculty of Philosophy, Osijek)

6.7. Information Support Centre

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The main purpose of the Information Support Centre (ISC) is to provide IT support for the Faculty. This includes:

- planning and procuring network equipment, computer equipment and software;
- planning, developing and maintaining the central web, intranet and e-learning services;
- managing faculty-wide IT security, networking infrastructure, various information services.

The ISC is constantly expanding and upgrading: the networking infrastructure including numerous switches and wireless access points, various UNIX/Linux/Windows servers, more than 250 PC workstations in various laboratories, various operating systems and application software and IT services.

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6 Kristijan Zimmer 7 Damir Kirasić 8 Krešimir Kroflin
9 Vlatka Paunović 10 Vedran Klasić 11 Siniša Tomić

In the last two years, the ISC has continued introducing modern solutions at all levels of information technology - from infrastructure to software and services. Virtualization of new servers for the education needs of the Faculty has been completed, and steps have been made toward developing a cloud infrastructure for more efficient sharing of resources by teaching staff and students. Experts from the ISC have actively been involved in the research project "Open source private cloud", under the contract between the Faculty and T-Com.

FER's content management system "Quilt CMS", which serves as a public website and intranet, as well as basis for application integration, improved the set of its core modules which are now in the version 2.0. New modules have been developed to facilitate the distribution of themes of the final and graduate level thesis' and apart from the enrolment to the graduate level programme, a module has been developed which enables the enrolment of students to semesters of the undergraduate and graduate programmes. New modules for input and presentation of the execution plan and the information package have been developed, such as presentation of Faculty's international projects, payment management of course demonstrators, tracking student debt and creating lecture list for the University of Zagreb and the ASIIN accreditation. An application to store and display various prize winners of the Faculty since its establishment, has been developed as well.

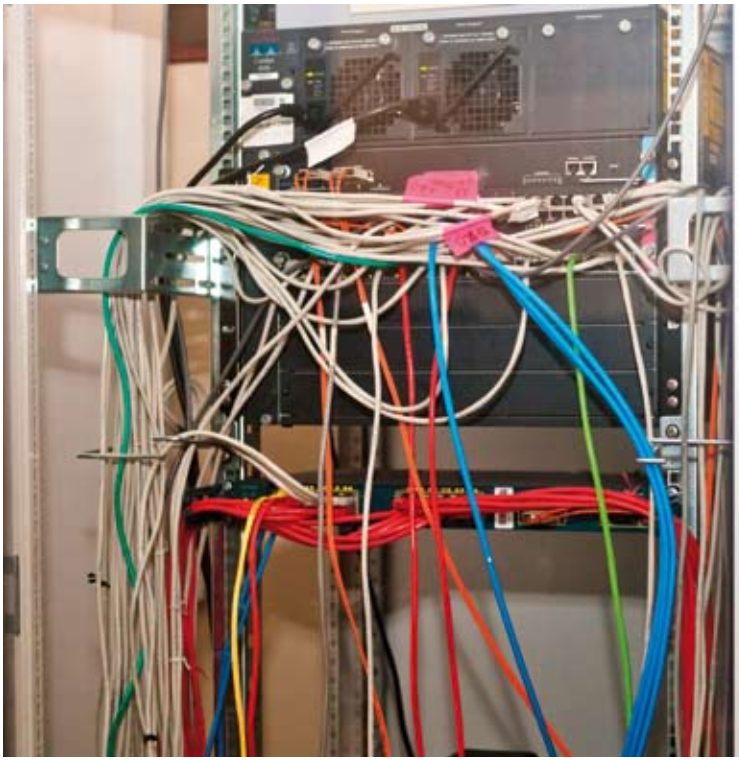
The database of Faculty's Quilt CMS system has been expanded to support a comprehensive data on former students of the Faculty and members of Faculties' alumni (AMAC).

The Quilt CMS system has been implemented at several other Croatian faculties, government and local government bodies. As part of the bilateral scientific cooperation with the Estonian national e-learning development centre, repositories of learning objects and learning materials, application for improvement of quality of e-courses and the centralized authentication system for e-learning in Estonia, have been developed.

Almost all of the Faculty's departments are now using centrally hosted Quilt CMS, as well as the email system based on Microsoft Exchange and Microsoft's Active Directory. The ISC has continued to provide support for other centrally hosted and managed systems such as Microsoft SharePoint and Microsoft Project Server, as well as enterprise resource planning (ERP) system SAP.

The ISC has been actively involved in the organization of the "The best student computer program" competition, as its initiator.

In collaboration with the Faculty's Central library, the new information library system (ILS) "Koha", based on open source, which supports all current library standards for the exchange of, records (MARC, Z39.50, OAI-PMH) and the exchange of information about users (SAML, LDAP , SIP2) has been introduced. End users of the new system are provided with the



advanced search of the library materials, can access the current list of books and borrowing history, book collections and can automatically receive notifications when a book is ready for renting. Users can create and preserve public and private lists of relevant titles in the catalogue. They can also make tags, connect user comments for each title and access previous searches. Librarians can easily retrieve data of library holdings, insights into the current state of books and perform the audit of library materials.

A new antivirus / antimalware system McAfee has been purchased and put into use for 5,000 users - Faculty staff and students of all levels of study, and to protect computers in PC laboratories.

The Faculty has extended the MSDN AA membership, which allows teaching staff and students to use various Microsoft programs, and supported the adoption of new version of Mathematica.

The new IT network of the Faculty, with backbone speeds of 10 Gbps and access speeds of 1 Gbps per port has been designed. The active network equipment has been procured, which includes more than 130 next generation distribution and access switches manufactured by Cisco and Extreme, and 100 wireless access points manufactured by CISCO and compliant with the IEEE 802.11n standard.

PC laboratories A101, A109, A110 and A210 have been equipped with a total of 84 new computers, classrooms with a total of 15 new computers. New computers and equipment have also been installed at Faculty's departments, with a total of 30 new computers for department's secretaries. 48 PCs in the PC lab A102 and PC lab 3, which had had 2 GB of RAM memory, have been upgraded to 4 GB of RAM. Installing of the PC laboratories is now partially centralized by using the "FOG" tool.

An ISC employee, Ivan Voras, Ph.D, has completed a certification course for the information systems security auditor, according to the ISO 27002 standard, and has created a proposal for security policy and backup of key parts of the Faculty IT and data infrastructure.

The readiness of the server infrastructure for the use of the IPv6 protocol, during the IPv6 world day, has been tested.

6.8. Technical Support and Maintenance

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