UNIVERSITY OF ZAGREB

FACULTY OF ELECTRICAL ENGINEERING
AND COMPUTING

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R E P O R T

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UNIVERSITY OF ZAGREB

FACULTY OF
ELECTRICAL ENGINEERING AND COMPUTING

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Dean's preface

Education and research are crucial forces that govern the economic and social progress of the modern world. It becomes even more so in the digital age, when new generations of creators, researchers and entrepreneurs play an active role in the knowledge society, in the environment where quantity of scientific and engineering knowledge, according to some sources, doubles every 10 years. Such circumstances inevitably altered the role of universities, which must act as pillars of education, providing transfer of technology and knowledge through life-long learning, research and development. In the era of Google, when all kinds of information are just a mouse click away, this task is all but easy.

Faculty of Electrical Engineering and Computing (in Croatian: Fakultet elektrotehnike i računarstva - FER) fits perfectly in the above scheme. It is the largest technical faculty and leading educational and R&D institution in the fields of electrical engineering, information and communication technology and computing in the Republic of Croatia.

Being a constituent of the University of Zagreb, FER has its roots in the Technical Faculty, founded in 1919. In 1956, the departments of Technical Faculty grew into four new faculties, Faculty of Electrical Engineering being one of them. Recognizing the progress in the fields of computer science and information technology, but also appreciating the indivisibility between new and existing fields in the scope of engineering, the Faculty changed the name into the Faculty of Electrical Engineering and Computing in 1994.

Since 1956, almost 15000 students graduated at the engineer's degree level (Dipl.-Ing.), more than 2000 completed additional two years and a master's thesis to obtain the *Magister* degree, and almost 600 students obtained the doctorate. To terminate this rather confusing academic degree scheme, at least for the English speaking community which has been continuously asking if our Dipl.-Ing. is a bachelor or master (the answer is 'no' on both accounts), the country adopted the standardized European system of academic degrees in 2005. The Faculty grasped the opportunity given by the reformation process, not only to redesign the curriculum, but also to completely refurbish the course of the study, pioneering the continuous assessment model in the country. Those efforts were awarded by the ASIIN accreditation in 2006.

The Faculty also offers a broad spectrum of services to business and industry, from research and consultancy to conference facilities, training and postgraduate recruitment.

We are also an integral part of the community, making a major contribution to the economic, social and cultural life of the city and region.

FER extends a warm welcome to those discovering our institution through this Progress Report and hopes that the association with us, in whatever sphere of activity, will be enjoyable and profitable.

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. Vedran Mornar, PhD
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 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 m^2.

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)

Lecture hall

White hall

The present research and educational staff comprises more than 135 professors and 220 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 71 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 4 technological and 13 information projects for the Ministry, as well as the leaders of a number of industrial projects and projects with other partners.

Department of Applied Computing (2005)

Department of Fundamentals of Electrical Engineering 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 in Automation (1954)

Department of Electroacoustics (1954)

Department of Electronics, Microelectronics, Computer and Intelligent Systems (1943)

Department of Radiocommunications and Microwave Electronics (1954)

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 academic years 2005/2006 and 2006/2007 reached 47 projects, 11 of which are FP6 projects, which makes Faculty of Electrical Engineering and Computing one of the most internationally active institutions in Croatia.

Research staff of the Faculty of Electrical Engineering and Computing	
Professors and lecturers	
Full professors	58
Associate professors	42
Assistant professors	33
Lecturers	3
Assistants	27
Junior researchers	130
Researchers	66

Aula

Nowadays, FER counts around 2600 students at the bachelor level, 1800 students at the old Dipl.-Ing. Level and 278 PhD 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 and 23 March 2007 by a decision of the Accreditation Commission and is valid until the 30 September 2011.

Management and administration

2. Historical Overview

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.

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 Jelačić*, 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 (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.

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

The first building of the Technical College

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. In 1910, *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 Kučera, *Stanko Plivelić* and *Juraj Božićević* 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,

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

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 Lončar 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

Professor Muljević (1913 - 2007), one of the doyens of the Faculty of Electrical Engineering and Computing, and his colleagues (Prof. Muljević is in the middle, photo taken in 2006).

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 death of professor Plohl in late 1939, *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

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.

and Croatia took place in 1939, when there were only two TV-stations in 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.

3. Study programs at Faculty of Electrical Engineering and Computing

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
• Telecommunication 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="3">Postgraduate study programs</td>
<td>6</td>
<td rowspan="3">Postgraduate PhD study programs

Fields and branches:

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

Computing</td>
<td rowspan="3">Specialist study Transformers</td>
</tr>
<tr>
<td>7</td>
</tr>
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<td>8</td>
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</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, two 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.
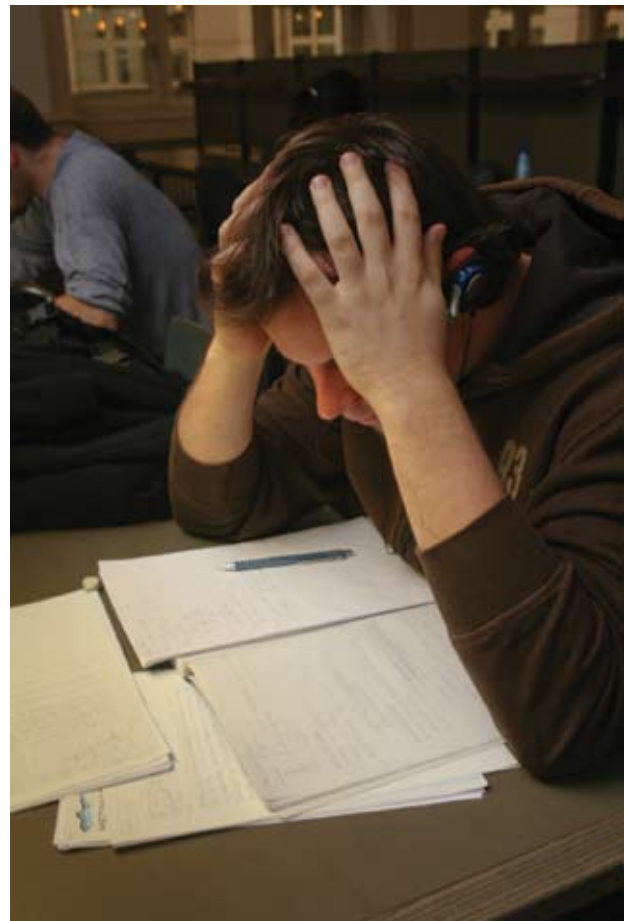
3

▼ 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 and data acquisition in the control and automation systems; implementation of methods for system analysis and design; design and implementation of hardware and software for control and automation systems. Control Engineering and Automation syllabus qualifies students for design, implementation and commissioning of the less complex systems in

ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY
STUDY PROGRAM SCHEME

Semester	Course	ECTS points	Lecture hours per week	Lab hours per semester
I	Mathematics 1	7	6	
	Fundamentals of Electrical Engineering	7	5	15
	Digital Logic	6	4	15
	Programming and Software Engineering	6	4	15
	Skills of Communication	3	2	
	Mathematica	1		20
		30	**21**	
II	Mathematics 2	7	6	
	Physics 1	6	5	15
	Algorithms and Data Structures	6	4	15
	Computer Architecture 1	6	4	15
	Management in Engineering	3	2	
	Autocad	2		30
		30	**21**	
III	Mathematics 3E	5	4	
	Physics 2	6	5	15
	Electronics 1	7	5	15
	Electrical Circuits	7	5	15
	Quality Management	3	2	
	Matlab	2		30
		30	**21**	
IV	Probability and Statistics	5	4	
	Signals and Systems	6	4	15
	Energy Technology	6	4	15
	Electromagnetic Fields	6	4	15
	Economics and Managerial Decision Making	4	3	
	Seminar	3	2	
		30	**21**	
V	Automatic Control	5	4	15
	Communication Systems	5	4	15
	Information Theory	4	3	15
	Specialization course	4	3	15
	Specialization course	4	3	15
	Sustainable Development and Environment	2	2	
	Project	6		15
		30	**19**	
VI	Specialization course	4	3	15
	Elective course	4	3	
	Elective course	4	3	
	Elective course	4	3	
	Commercial Law	2	2	
	BSc Thesis	12		
		30	**14**	

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.

▼ 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 maintaining the skills as the field evolves.

Students of computer science are capable to understand and apply essential concepts, principles, and practices in the context of well-defined scenarios, showing judgment in the selection and application of tools and techniques. They also demonstrate the ability to work as an individual under guidance and as a team member in industry, utility sector and government institutions.

Information Processing and Multimedia Systems - Information processing is an important ingredient of modern multimedia systems. The study profile provides knowledge in hardware and software components for processing, storage, coding, transfer, and analysis

COMPUTING STUDY PROGRAM SCHEME

Semester	Course	ECTS points	Lecture hours per week	Lab hours per semester
I	Mathematics 1	7	6	
	Fundamentals of Electrical Engineering	7	5	15
	Digital Logic	6	4	15
	Programming and Software Engineering	6	4	15
	Skills of Communications	3	2	
	Mathematica	1		20
		30	21	
II	Mathematics 2	7	6	
	Physics 1	6	5	15
	Algorithms and Data Structures	6	4	15
	Computer Architecture 1	6	4	15
	Management in Engineering	3	2	
	Autocad	2		30
		30	21	
III	Mathematics 3C	5	4	
	Physics 2	6	5	15
	Electronics 1	7	5	15
	Operating Systems	7	5	15
	Quality Management	3	2	
	Matlab	2		30
		30	21	
IV	Probability and Statistics	5	4	
	Introduction to Theoretical Computer Science	6	4	15
	Signals and Systems	6	4	15
	Databases	6	4	15
	Economics and Managerial Decision Making	4	3	
	Seminar	3	2	
		30	21	
V	Software Design	8	4	30
	Communication Networks	4	3	15
	Information Theory	4	3	15
	Specialization course	4	3	15
	Sustainable Development and Environment	2	2	
	Software Project	8		
		30	15	
VI	Specialization course	4	3	15
	Specialization course	4	3	15
	Elective course	4	3	
	Elective course	4	3	
	Commercial Law	2	2	
	BSc Thesis	12		
		30	14	

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.

3.2. Second cycle study programs

From the academic year 2008/2009 FER will offer 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 ore 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 enrol 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 enrol 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, two 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 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

SECOND CYCLE STUDY PROGRAM SCHEME

Semester	Course	ECTS	Lecture hours per week	Lab hours per semester
	Theoretical course	5	3	
	Theoretical course	5	3	
	Theoretical course	5	3	
VII	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
	Theoretical course	5	3	
	Theoretical course	5	3	
	Mathematics and science	4	3	
VIII	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
	Specialization course	4	2	
	Specialization course	4	2	
	Elective course	4	2	
IX	Elective course	4	2	
	Elective course	4	2	
	Humanistic or social course	2	2	
	Project	8		
		30	12	
X	Graduation thesis	30		
		30		

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;

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.

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 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 fulfil 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 infromatics.

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 altogeher 480 ECTS credits (including credits from previous high education) by publishing research results, and enrolling courses and passing examination. The students completes postgraduate study by preparing and defending PhD thesis.

By the academic year 2006/2007, 2015 candidates were awarded the Master of Science degree and 575 were awarded the Doctor of Science degree. The actual doctoral study program has been started in the year 2005/2006. Former Master of Science study that has been closed in the academic year 2004/2005, will be replaced by the the new second cycle study programs leading to the Master degree in the academic year 2008/2009.

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.

Number of postgraduate students by academic year

	2005/2006	2006/2007
PhD students	134	278
PhD degree awarded	21	17
MSc degree awarded	73	47
Specialist study in Transformers	-	19

4. Student Activities

IEEE

The IEEE (Institute of Electrical and Electronics Engineers), a non-profit organization, is the world's leading professional association for the advancement of technology. Members rely on the IEEE as a source of technical and professional information, resources and services. 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 365,000 members, including 68,000 students, in over 150 countries.
- 311 sections in ten geographic regions worldwide.
- about 1,570 chapters that unite local members with similar technical interests.
- more than 1,430 student branches at colleges and universities in 80 countries.
- 39 societies and 5 technical councils representing the wide range of technical interests.
- more than 300 conferences worldwide each year.
- about 900 active IEEE standards and more than 400 in development.

Goals of the IEEE Student Branch Zagreb are creating and promoting a professional enivornment 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 assocciation 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 that we are really promoting the global community of knowledge.

To see what we have done so far, we are inviting you to see www.fer.hr/ieee. A short list of successfully completed projects is provided hereafter:
- numerous lectures (Thesis dos and donts, 20 years of Chernobyl, Nikola Tesla...)
- participants at the Student Branch Congress of IEEE Region 8 in Paris
- forming of energy, computer and communication chapter within the Branch
- started a tradition of movie nights (scientific movies)
- participated with two teams in the 24h global programming challenge IEEEXtreme
- redesign of www.fer.hr/ieee - the branch web page
- completed work on the joint web of Section, GOLD and other student branches in Croatia
- actively helping IEEE Croatia section in their various activities.

SRK

SRK - Studentski računarski klub (eng. 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.

SS FER

SS FER is a volounteer student union which consists mainly of students from the Faculty of Electrical Engineering and Computing, Zagreb, and its goals are to organize students' free time in a creative and educational way. During the past two years, our student union called SS FER has been involved with a lot of different kinds of projects, workshops and events for the student community.
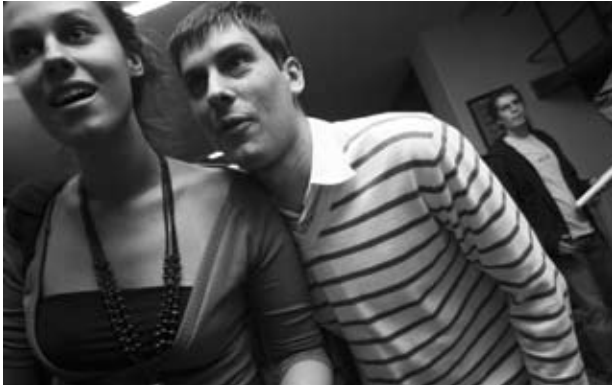
Starting with the events, we would like to point out two fairs called **Spika** which we organized in 2006. and 2007. It is a fair where different companies have an opportunitie to present future career options for students. We also organized the **Electromountaineering Rally** in 2006. and 2007., a hiking event including quizes and sports. Our union also organizes the **FER Freshmen Party** each year, which is a huge part of Zagreb's cultural scene.

Members of SS FER have participated in the **Underwater Robotics Workshop**, along with other student unions from Croatia, such as BIUS, Student Club of Archeologists, Zagreb, D.I.I.V. and more. Some of our members have also participated in the **Interdisciplinary Explorers' Camp "Lastovo Islands"**, organized by the student union BIUS.

MIPRO is a convention traditionally dedicated to information and communication technology, electronics and microelectronics. This year **MIPRO Junior** has been founded by SS FER's students, and its idea is to gather all graduate and post-graduate student in promoting their works, projects, and generally exchanging knowledge. It's a unique opportunity for students to show what they have done and what they know.

SS FER also tries hard to provide students with some educational courses and workshops. Regarding sound management, the union organizes three courses annually: **the course of sound equipment and stage setup**, **the sound engineering workshop** regarding the sound setup and work behind the mixing board, and **the sound producing workshop** regarding the editing and working with recorded music sessions.

Members of the photo section of the union have also been organizing their **photo course** for years, until 2006. when the people from the Faculty of Electrical Engineering and Computing recognized the quality of their work and made the course into a class being offered to FER's students. Also, the section had organized a workshop called **'Camera Obscura'** which idea is to make a primitive camera using a matchbox, take photos with it, and to use that to literally explain the way a camera actually works.

The computer section of SS FER is also doing a lot of different kinds of courses which goal is to familiarize students with not so frequently used technologies, and to give them practical knowledge in working with computers and networks. We would like to point out the **SQL workshop for beginners**, which explains the basics of databases and how to manage them. The **Install Fest** is an event where a Linux operating system is installed in a step by step manor to show the participants how to do it properly, and it has been recognized by Open.hr, the student branch of IEEE and the union Exchanging the Skills. Also, one of the projects is maintaining a complete network and web system, so all members and interested parties can learn as much in these areas as willing.

One of the main projects of the SS FER union is the club **KSET**. This club works intensively on promoting underground and urban culture and has hosted different kinds of artists in the area of 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. Also, in the past couple of years the club has hosted an impressive amount of festivals. In 2006. it organized the **Thirsty Ear Festival**, a festival of underground music, praised by the Ministry of Culture of Republic Croatia and the City's Department for Culture. KSET has also been the host of two **ZGEtno festivals**, the first one in full, and the other one in companionship with the Student Centre Zagreb. A festival of experimental music **MARS** was also organized in 2007. **Let them be heard** is the festival where young, demo bands have an opportunity to present their ideas and work. This year KSET is also going to co-host the **No Jazz Festival 2007.**

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, and that any student interested in helping our cause is more than welcome to join.

SPORT ACTIVITIES

Students of the Faculty of Electrical Engineering and Computing have been highly successful at sports

contests organized by the University of Zagreb, Croatian National Championship and throughout the international scene. At the official championship of the University of Zagreb, FER competes in 19 out of a total of 20 sports. In the seasons 2004/05 and 2005/06 FER won the 3rd place in the overall competition. In the 2006/07 season FER took the 1st place for the first time in history.

At the 1st European University Futsal Championship, that took place in Paralimni (Cyprus), September 17-25/2004 FER won the 2nd place. At the EuroESADE competition that took place in Barcelona (Spain), FER won the 1st place amongst 26 other European universities. In Novi Sad at the 3rd European University Futsal Championship FER won the 2nd place amongst 15 competing universities. FER also took the 2nd place at the 4th European University Futsal Championship. Apart from the competitive activities taking place at FER, students can satisfy their need for recreation and companionship in a number of clubs, eg. cycling, hiking, dance, etc.

Apart from competing in official competitions, the involvement and contribution of FER's students and teachers to the organization of the University championship must be emphasized.

The Croatian Academic Sport Association (CASA) SUBOS has been active at FER for seven years. In the past two years CASA SUBOS has become the largest student sports club in Croatia. Currently, there are around 1000 members. In this club, students can take part in 20 sports and dance classes. Every year the club organizes several competitions and other sports events at the university and national level.

CASA SUBOS is one of the founders of the Zagreb University Sports Federation and takes part in the organization of the official sports championship of the University of Zagreb.

eStudent

Business Plan Contest

(http://www.e-student.hr/bpc/)

In the academic years 2005/06 and 2006/07 in association with the Ministry of Science, Education and Sports, Faculty of Economics and Business and strategic partners, the Organization organized a Business Plan writing project. In each round up to 200 students applied for the project and were divided into teams. The main goal of this project was to provide students with additional education,

interesting lecturers, interactive lectures (at least three big lectures every year) and workshops (five to six workshops every year) which would in turn awaken their entrepreneurial spirit and teach them the basics of entrepreneuership.

Project Exchange

(www.burzaprojekata.com)

The Project Exchange team is involved in developing a portal that would introduce the faculty projects to the students, automate student applications for projects as well as the project announcements and student selection by the assistants/professors. During the academic year 2006/07 the portal was completed in the ASP.NET technology with a SQL data base. In June the documentation and official hiring of a host with a web address was completed. The official release to all students is expected in the near future.

Lectures and Workshops

During the academic year 2005/06 eSTUDENT organized two big lectures, visits to firms and three workshops, whilst in the academic year 2006/07, summer months not included, eSTUDENT organized seven lectures and three workshops.

Promotion/Organization of the Career Day and Promotion of Other Projects

In the academic years 2005/06 and 2006/07 eSTUDENT helped the portal MojPosao organize the 2nd, 3rd and 4th Croatian Career Days. It helped to promote and organize this significant job market fair which was held at the Boćarski dom Zrinjevac in Zagreb.

In addition, eSTUDENT participated in the promotion of a project in association with its partner company Agrokor on the project "Agrokor at FER" which started in June and ended in October 2007.

5.1. Department of Applied Physics

Faculty and staff

▼ Professors

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

Dubravko Pevec – reactor physics, nuclear engineering

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

Višnja Henč-Bartolić – atomic physics, lasers (retired by the 1st of June, 2004; engaged by the Project 0036019 by the fall of 2006)

▼ Associate professors

Mile Baće – nuclear engineering and non-conventional energy sources

Founded in 1945

Head of the department:
Prof. **Tomislav Petković**, PhD

Tel: +385 1 612 96 70
Fax: +385 1 612 96 05
E-mail: pf@fer.hr
URL: http://www.zpf.fer.hr/

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

▼ Assistant professors

Lahorija Bistričić – molecular and laser physics

Zoran Narančić – elementary particle structures and symmetries

Vesna Borjanović – experimental solid state physics; impurities and structural defects in semiconductor structures
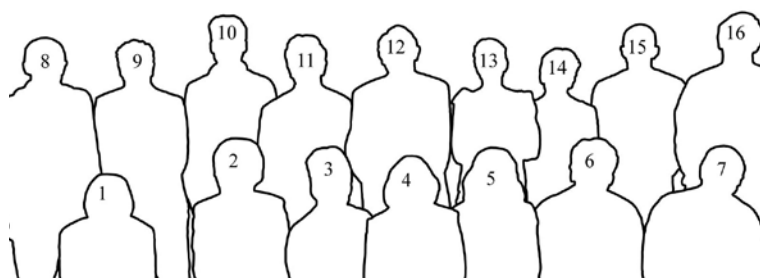
1 Danijela Grozdanić,   2 Sanda Pleslić,
3 Snježana Božić, 4 Lahorija Bistričić,
5 Ana Holjak, 6 Mario Matijević, 7 Mile Baće,
8 Dubravko Horvat, 9 Vladimir Knapp,
10 Saša Ilijić, 11 Tomislav Petković,
12 Dubravko Pevec, 13 Anja Marunović,
14 Vesna Popović, 15 Zoran Narančić,
16 Krešimir Trontl

▼ Assistants

Vesna Mikšić Trontl
Sanda Pleslić
Danijela Grozdanić

▼ Junior researchers

Saša Ilijić
Mario Matijević
Anja Marunović
Kristijan Gergeta

▼ Researchers

Radomir Ječmenica
Krešimir Trontl

▼ Administrative staff

Snježana Božić
Ana Holjak

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.

▼ Core undergraduate courses

- Physics I
- Physics II
- Physics of materials

- Laser physics
- Nuclear fuel cycles and reactor materials
- Radiation effects and radiation protection
- Renewable resources and advanced technology

▼ Elective courses

- Modern methods of physics for Electrical Engineering and Information Technology
- Computing methods of modern physics
- Quantum computers
- Fundamentals of nuclear physics
- Fundamentals of energy storage

▼ Postgraduate courses

- Foundations of superconductivity and its application
- Detectors and electronic instrumentation for particle physics
- Laser physics and electrooptics
- New energy sources
- Pulsed plasma physics with applications
- Quantum physics - selected topics
- Nuclear reactor theory
- Selected topics in nuclear physics and nuclear engineering
- Selected topics in semiconductor physics

Research and development

Gravitational physics: compact structures, classical and quantum fields.

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.

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

Experimental study of the light and medium-heavy mass hypernuclei based on the high resolution Λ spectroscopy, to be performed at the Jefferson Lab Hall C (Newport News, VA, USA). The technique is based on the electroproduction of Λ-hypernuclei by the $(e,e'K^+)$ reaction, provided by the 2nd generation High-resolution Kaon Spectrometer (HKS) and with a new High-resolution Electron Spectrometer (HES) under construction now. The best resolution of about 200 keV (FWHM) in the hypernuclear spectra is expected in the wide mass region, by the 3rd generation experiments with a new HKS-HES set-up.

Investigation of carbon-rich polycrystalline silicon obtained by edge-defined film-fed growth technique. New approach to blind image deconvolution, reconstruction of the original image from an observation degraded by spatially invariant blurring process and noise was investigated. Fabrication and characterization of new hybrid (polymer/ nanostructures) materials.

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

Properties of laser-produced plasma from Al, Mg, Si, Nb and Mo 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.

▼ 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 0982904-2927, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Goran Baranović, Institute Rugjer Boskovic; Project collaborator: Lahorija Bistričić, 2007 –)

Vibrational Dynamics and Structure of Multifunctional Polymer Systems (Project 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 –)

Overview of Nuclear Energy Status in EU and USA, and Suitability of Various Technologies for Croatia (Croatian Electricity 21438; 0114-24/37-2006, Project leader: Dubravko Pevec, 2006)

Development of the Detection Methods and Techniques for Hypernuclear Physics (Project 0036056, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Tomislav Petković, 2002 – 2006)

Classical and Quantum Theory of Nonlinear Fields (Project 0036038, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Dubravko Horvat, 2002 – 2006)

Creation of Pulsed Plasmas and Radiation Effects (Project 0036019, Ministry of Science, Education and Sports, Republic of Croatia. Principal investigator: Višnja Henč-Bartolić, 2002 – 2006)

Investigation of Defects in Polycrystaline Silicon (Project 0036037, Ministry of Science,

Education and Sports, Republic of Croatia, Principal investigator: Vesna Borjanović, 2002 – 2006)

Physical Properties of Partially Ordered Molecular Systems (Project 125007, 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, 2002 – 2006)

Neutronic Modelling of Advanced Nuclear Reactors and Fuel Cycles (Project 0036020, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Dubravko Pevec, 2002 – 2006)

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International links

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

Gesellschaft für Reaktorsicherheit (GRS), Garching, Germany

International Atomic Energy Agency (IAEA), Vienna, Austria

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

Paul Scherrer Institute, (PSI), Villigen, Switzerland

Rheinland Westfallische Technische Hochschule Aachen, Aachen, Germany

Ruhr-Universität, Institut für Experimentalphysik V, Bochum, Germany

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

Thomas Jefferson National Accelerator Facility (TJNAF), Newport News, Virginia, USA

Institut Jožef Štefan (IJS), Ljubljana, Slovenia

East Carolina University (ECU), Greenville, North Carolina, USA

Dipartimento di Lingue e Civiltà dell'Europa centro–orientale, Università degli studi di Udine, Udine, Italia

Tecnologie Avanzate e Nanoscienza (TASC) National Laboratory, Trieste, Italy

Elettra Synchrotron Light Laboratory, Trieste, Italy

Simon Fraser University, Vancouver/Burnaby, Canada

Universität Wien, Fakultät für Physik, Vienna, Austria

Doctor of science degree

Author: VESNA MIKŠIĆ TRONTL
Title: Electronic and structural properties of adsorbed metallic nanosystems
Date: 24 November, 2005
Mentor: Milorad Milun

Author: SAŠA ILIJIĆ
Title: Anisotropic Structures in General Theory of Relativity
Date: 20 February, 2007
Mentor: Dubravko Horvat

5.2. Department of Applied Mathematics

Faculty and staff

▼ Professors

Vladimir Ćepulić – finite groups, finite mathematics

Neven Elezović – mathematical analysis

Ivan Ivanšić (retired as distinguished professor) – topology

Ljubo Marangunić – finite mathematics, mathematical analysis

Darko Žubrinić – nonlinear elliptic PDE-s, fractal analysis

▼ Associate professors

Ilko Brnetić – mathematical analysis

Mervan Pašić – differential equations

Mario-Osvin Pavčević – discrete mathematics

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▼ Assistant professors

Andrea Aglić Aljinović – mathematical analysis

Luka Korkut – partial differential equations

Mario Krnić – mathematical analysis

Vesna Županović – dynamical systems

1 Siniša Miličić, 2 Josipa Pina Milišić, 3 Mario Krnić, 4 Anamari Nakić, 5 Tomislav Burić, 6 Vladimir Ćepulić, 7 Vesna Županović, 8 Neven Elezović, 9 Zdenka Komerički, 10 Darko Žubrinić, 11 Kristijan Tabak, 12 Neven Grbac, 13 Domagoj Vlah, 14 Ana Žgaljić, 15 Ilko Brnetić, 16 Mario Osvin Pavčević, 17 Luka Korkut, 18 Ljubo Marangunić

▼ Junior researchers

Neven Grbac
Marijana Greblički
Lana Horvat-Dmitrović
Josipa-Pina Milišić
Kristijan Tabak
Tomislav Burić
Siniša Miličić
Anamari Nakić
Domagoj Vlah
Ana Žgaljić

▼ Administrative staff

Zdenka Komerički

Department of Applied Mathematics, founded in 1919 by professor Marije Kiseljak, is the oldest one at the Faculty of Electrical Engineering and Computing. Members of the Department are working in various fileds 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: *Mideis ageometritos 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 we invite you to consult a survey article written by professor Ivan Ivanšić, available at the web address www.zpm.fer.hr/~darko/zavod_pov (in Croatian).

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.

▼ Core undergraduate courses

- Mathematics I
- Mathematics II
- Mathematics III E
- Mathematics III R
- Probability and statistics

▼ Elective courses

- Introduction to chaos theory for engineers
- Mathematical modelling using Wolfram's Mathematica
- Stochastic processes
- Graph theory

▼ Postgraduate courses

- Differential equations and dynamical systems
- Discrete mathematical models
- Integral and discrete transformations with wavelet theory
- Equations of mathematical physics
- Combinatorial algorithms
- Finite mathematics
- Linear algebra and applications
- Mathematical methods in control theory
- Selected topics of mathematical analysis
- Basics of the theory of strategic games
- Queuing theory

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.

▼ Projects

Combinatorial designs and related configurations (Project 0362964, Ministry of Science, Education and Sports, Prinicpal investigator: Mario-Osvin Pavečević, 2006-2008)

Inequalities and applications (Project 0361054, Ministry of Science, Education and Sports, Principal investigator: Neven Elezović, 2006-2008)

Fractional derivatives and higher transcendental functions (Project HMP Croatia-Macedonia, National coordinator: Neven Elezović, 2006-2008)

Nonlinear analysis of differential equations (Project 0361291, Ministry of Science, Education and Sports, Principal investigator: Mervan Pašić, 2006-2008)

Publications

▼ Books

Brnetić, Ilko; Županović, Vesna. *Multiple Integrals*. Mathematics 3. Ed. Sandra Gračan (ed.). Element, 2007. (in Croatian)

Brnetić, Ilko; Hanjš, Željko. *Mathematical Competitions in Croatia*. Ilko, Brnetić; Hanjš, Željko (ed.). Zagreb: Hrvatsko matematičko društvo, 2006.

Hanjš, Željko; Kovač, Vjekoslav; Krnić, Mario. *Mathematical Competitions in 2004./2005.* Zagreb: Element, 2006. (in Croatian)

Korkut, Luka; Krnić, Mario; Pašić, Mervan. *Vector Analysis*. Mathematics 3. Sandra Gračan (ed.). Element, 2007. (in Croatian)

Balagović, Martina; Hanjš, Željko; Krnić, Mario. *Mathematical Competitions in 2005./2006.* Zagreb: Element, 2007. (in Croatian)

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Elezović, Neven. *Statistics and Processes*. Probability and Statistics. Elezović, Neven (ed.), Zagreb: Element, 2007. (in Croatian)

Ivanšić I. (ed.). *Danilo Blanuša: Varying Electromagnetic Fields*. Sveučilište J.J. Strossmayer in Osijek, Department of mathematics. Osijek 2006 (159 + VIII pp. ISBN 953-6931-17-6), with a short biography of Danilo Blanuša by Ivan Ivanšić, I-II. (in Croatian)

Ivanšić, Ivan (ed.). *Danilo Blanuša: At the Crossroad of Mathematics, Physics and Electrotechnics*. Element 2005. (in Croatian)

Ivanšić I. (ed): Danilo Blanuša, *Selected Lectures in Mathematical Methods of Physics*, Školska knjiga, Zagreb 2005 (68 pp. ISBN 953-0-61427-6), with a Foreword by I. Ivanšić, pp. 7-9. (in Croatian)

Pavčević, Mario. *Introduction to Graph Theory*. Mathematics 3. Elezović, Neven (ed.). Zagreb: Element, 2007. (in Croatian)

Žubrinić, Darko. *Introduction to Discrete Mathematics*, Mathematics 3. Elezović, Neven (ed.). Zagreb: Element, 2007. (in Croatian)

Chapter in book

Grbac, Neven. **Correspondence between the Residual Spectra of Rank Two Split Classical Groups and their Inner Forms**, *Functional analysis IX* (Dubrovnik, 2005), Various Publ. Ser. 48, G. Muić, J. Hoffmann-Jörgensen (ed.). Univ. Aarhus, Aarhus, 2007. pp. 44-57.

Ivanšić, Ivan. **Blanušina biografija**. pp. 3-17. **Blanuša matematičar**. pp. 41-53. **Kronološki popis publikacija Danila Blanuše**. pp. 115-120. *Danilo Blanuša: na raskrižju matematike, fizike i elektrotehnike*. Element 2005.

Županović, Vesna; Žubrinić, Darko. **Fractal dimensions in dynamics**. *Encyclopedia of Mathematical Physics*; Vol 2, Francoise, Jean-Pierre; Naber, Gregora L. ; Tsun, Tsou Sheung (ed.). Oxford : Elsevier, 2006. pp. 394-402.

Županović, Vesna; Žubrinić, Darko. **Recent results on fractal analysis of trajectories of some dynamical systems**. *Proceedings of Conference in Functional Analysis IX in Dubrovnik 2005*, Aarhus 48, G. Muić, J. Hoffmann-Jörgensen (ed.). Aarhus, Denmark : University of Aarhus, Department of Mathematical Sciences, 2007. pp. 126-140.

Journal papers

Agarwal, R. P.; Elezović, N.; Pečarić, J. **On some inequalities for beta and gamma functions via some classical inequalities.** *J. Inequal. Appl.* (**2005),** no. 5, 593--613.

Aglić Aljinović, A.; Hoxha, R.; Pečarić, J. **Some Grüss type integral inequalities**. *Mat. Bilten* No. 29 (2005), 5-16.

Aglić Aljinović, A.; Matić, M.; Pečarić, J. **Improvements of some Ostrowski type inequalities**. *J. Comput. Anal. Appl.* 7 (2005), no. 3, 289-304.

Aglić Aljinović, A.; Pečarić, J.; Vukelić, A. **On some Ostrowski type inequalities via Montgomery identity and Taylor's formula. II**. *Tamkang J. Math.* 36 (2005), no. 4, 279-301.

Aglić Aljinović, A.; Marangunić, Lj.; Pečarić, J. **On Landau type inequalities via Ostrowski inequalities**. *Nonlinear Funct. Anal. Appl.* 10 (2005), no. 4, 565-579.

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Aglić Aljinović, A.; Marangunić, Lj.; Pečarić, J. **On Landau type inequalities via extension of Montgomery identity, Euler and Fink identities**. *Nonlinear Funct. Anal. Appl.* 10 (2005), no. 2, 273-283.

Bicheng, Yang; Brnetić, Ilko; Krnić, Mario; Pečarić, Josip. **Generalization of Hilbert's and Hardy-Hilbert's Integral Inequality**. *Mathematical inequalities & applications*. 8 (2005), 2; 259-272

Brnetić, Ilko; Krnić, Mario; Pečarić, Josip. **Multiple Hilbert and Hardy-Hilbert inequalities with non-conjugate parameters**. *Bull. Austral. Math. Soc.* 71 (2005), no. 3, 447-457.

Dranishnikov, D.A.; Ivanšić, I.; Keesling, J.E.; Ungar, Šime. **Introduction**, *Topology Appl.* 153(2005),171-173.

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Ivanšić, Ivan. **Profesor dr.sc. Pavle Papić, Antofagasta (Čile) 28.4.1919 - Zagreb 9.4.2005.** *Glasnik Matematički*. 40(60) (2005) ; 428-437. (in memoriam, in Croatian)

Ivanšić, Ivan. **Prilog Mariju za komemoraciju Dimitriju Ugrin-Šparac**. *Godišnjak za kulturu, umjetnost i društvena pitanja br. 22 za 2004. godinu, Ogranak Matice hrvatske Vinkovci*. Vinkovci 2005., 343-344.

Ivanšić I., L.R. Rubin. **A local to global selection theorem for simplex-valued maps**. *Glas. Mat. Ser. III.* 40(60)(2005), 343-349.

Krnić, Mario; Pečarić, Josip. **Hilbert's inequalities and their reverses**. *Publ. Math. Debrecen* 67 (2005), no. 3-4, 315-331.

Marangunić, Ljubo; Pečarić, Josip. **Some remarks on Hilbert's integral inequality**. *Rev. Anal. Numér. Théor. Approx.* 34 (2005), no. 1, 71-78.

Pavčević, Mario-Osvin. **Constructing a Multiple Series of Hadamard Designs**. *Bayreuther mathematische Schriften*. **74** (2005); 292-305

Brnetić, Ilko; Dragomir, Sever; Hoxha, Razim; Pečarić, Josip. **A reverse of the triangle inequality in inner product spaces and applications for polynomials**. *The Australian Journal of Mathematical Analysis and Applications*. 3 (2006.), 2; Article 9, pp. 1-8.

Ćepulić, Vladimir; Pyliavska, Olga. **A class of nonabelian nonmetacyclic finite 2-groups**. *Glasnik matematički*. 41 (2006.), No.1; 65-70.

Ćepulić, Vladimir; Pyliavska, Olga; Kovač Striko, Elizabeta. **Second-metacyclic finite p-groups for odd primes**. *Glas. Mat. Ser. III* 41(61) (2006), no. 2, 275-282.

I. Ivanšić i L. Neralić, **In memoriam Stjepan Skok (1943.-1986.)**. Glas. Mat. Ser. III. 41(61)(2006), 385-389.

Jüngel, Ansgar; Matthes, Daniel; Milišić, Josipa Pina. **Derivation of new quantum hydrodynamic equations using entropy minimization**. *SIAM J. Appl. Math.* 67 (2006), no. 1, 46-68.

Krnić, Mario; Pečarić, Josip. **Extension of Hilbert's inequality**. *J. Math. Anal. Appl.* 324 (2006), no. 1, 150-160.

Žubrinić, Darko; Županović, Vesna. **Fractal analysis of spiral trajectories of some vector fields in R³**. *Comptes rendus. Mathématique*. 342 (2006), 12; 959-963.

Žubrinić, Darko. **Analysis of Minkowski contents of fractal sets and applications**. *Real Analysis Exchange*. Vol 31 (2006), 2; 315-354.

Žubrinić, Darko. **Maximally singular functions in Besov spaces**. *Archiv der Mathematik*. 87 (2006.); 154-162.

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Aglić Aljinović, A.; Pečarić, J. **Extensions of Montgomery identity with applications for alpha-L-Hölder type functions**. *J. Concr. Appl. Math.* 5 (2007), no. 1, 9-24.

Elezović, Neven; Županović, Vesna; Žubrinić, Darko. **Box dimension of trajectories of some discrete dynamical systems**. *Chaos, Solitons & Fractals*. 34 (2007), 2; 244-252.

Hanjš, Željko; Žubrinić, Darko. **William Feller (Zagreb 1906. - New York 1970.) – on the occasion of hundred years since the birth of outstanding Croatian-American scientist** (in Croatian) *Matematičko-fizički list*. LVII (2006./2007.), 2; 82-87.

Horvat, Lana; Kraljević, Jadranka; Žubrinić, Darko; Županović, Vesna. **Positive solutions of polyharmonic equations with strong dependence on the gradient**. *Complex Variables and Elliptic Equations*. 52 (2007), 8; 693-707.

Ivanšić, I; Rubin, L.R. **Local characterization of absolute co-extensors**. *Glas. Mat. Ser. III.* 42(62)(2007), 83-87.

Ivanšić, I; Milutinović, U. **Closed embeddings into Lipscomb's universal space**. *Glas. Mat. Ser. III.* 42(62)(2007), 95-108.

Ivanšić, I.; Milutinović, U. **Closed embeddings into Lipscomb's universal space, Institute of Mathematics**. *Univ. of Ljubljana, Preprint series,* Vol. 44(2002), No. 1009.

Ivanšić, I.; Ungar, Š. **Happy 80-th birtday professor Mardešić**, *Glas. Mat. Ser. III.* 42(62)(2007), 1-2.

Jüngel, Ansgar; Milišić, Josipa Pina. **Physical and numerical viscosity for quantum hydrodynamics**. *Commun. Math. Sci.* 5 (2007), no. 2, 447-471.

Jüngel, Ansgar; Milišić, Josipa-Pina. **Macroscopic quantum models with and without collisions**. *Bull. Inst. Math. Acad. Sin. (N.S.)* 2 (2007), no. 2, 251-279.

Korkut, Luka; Pašić, Mervan. **On a class of nonlinear variational inequalities: high concentration of the graph of weak solution via its fractional dimension and Minkowski content**. *Electron. J. Differential Equations* (**2007),** No. 37, 21 pp.

Krnić, Mario; Pečarić, Josip. **A Hilbert inequality and an Euler-Maclaurin summation formula**. *ANZIAM J.* 48 (2007), no. 3, 419-431.

Žubrinić, Darko; Županović, Vesna. **Box dimension of spiral trajectories of some vector fields in R³**. *Qualitative Theory of Dynamical Systems*. **6** (2007.), 2; 203-222.

▼ Invited lectures

Pašić, Mervan. **(Un)rectifiability of solutions of the graph of p-Laplace equations**. Mathematical Department of the Czech Academy of Sciences (Matematicki ustav Česke Akademii ved). Prag, Czech Republic, 1-7 December 2005.

Žubrinić, Darko. **Hausdorff dimension of singular sets of Sobolev functions and maximally singular Sobolev functions.** Mathematical Department of the Czech Academy of Sciences (Matematicki ustav Česke Akademii ved). Prag, Czech Republic, 1-7 December 2005.

International links

Centro de Recerca Matematica, Barcelona, Catalonia, Spain

Nankai Universtiy, Tianjin, China

Universitz of Kiev-Mohyla Academy, Kyiv, Ukraine

Vinnits State Pedagogical Universtiy, Vinnitsa, Ukraine

Karl Franzes University, Graz, Austria

University of Oklahoma, Norman, USA

American Mathematical Society, Providence, RI, USA

Johannes Gutenberg-Universität, Mainz, Germany

Universität Bayreuth, Germany

Mathematics Department of the Czech Academy of Sciences, Prague, Czech Republic

Doctor of science degree

Author: NEVEN GRBAC
Title: The Residual Spectrum of Hermitian Quaternionic Inner Form of the Group SO_8 (in Croatian)
Date: 16 June 2007
Mentor: Goran Muić

Author: JOSIPA-PINA MILIŠIĆ
Title: Optimization of Horizontal Current Bipolar Transistor Structure
Date: 29 September 2007
Mentor: Ansgar Jüngel

Master of science degree

Author: LANA HORVAT
Title: Fractal Analysis of Dynamical Systems (in Croatian)
Date: 9 March 2006
Mentor: Vesna Županović

Author: MARIJANA IVANKOVIĆ
Title: Second-metacyclic 2-groups (in Croatian)
Date: 8 November 2005
Mentor: Vladimir Ćepulić

5.3. Department of Applied Computing

Faculty and staff

Damir Kalpić – information systems, operational research

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

Founded in 2005

Head of the department:
Prof. **Damir Kalpić,** PhD

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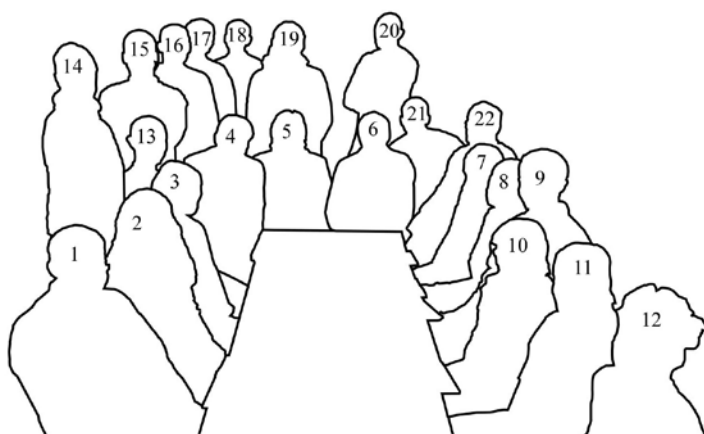
1 Ivica Botički, 2 Gorana Rubinić, 3 Jasenka Anzil, 4 Vedran Mornar, 5 Mirta Baranović, 6 Damir Kalpić, 7 Ljiljana Brkić, 8 Dubravka Pukljak Zoković, 9 Krešimir Križanović, 10 Lidia Rovan, 11 Ivana Nižetić, 12 Mirjana Domazet-Lošo, 13 Zvonimir Vanjak, 14 Sonja Majstorović, 15 Vlatko Malović, 16 Tomislav Rajnović, 17 Boris Milašinović, 18 Slaven Zakošek, 19 Krešimir Fertalj, 20 Gordan Gledec, 21 Boris Vrdoljak, 22 Marijan Đurek

▼ Associate professors

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

Marijan Đurek – computer ergonomics, computer forensics

Krešimir Fertalj – information systems, software engineering, project management

▼ Assistant professors

Gordan Gledec – networks and Internet, web technologies

Boris Vrdoljak – database systems

Slaven Zakošek – database systems

▼ Junior researchers

Ivica Botički
Ljiljana Brkić
Mirjana Domazet-Lošo
Krešimir Križanović
Igor Mekterović
Boris Milašinović
Ivana Nižetić
Dubravka Pukljak Zoković
Lidia Rovan
Zvonimir Vanjak

▼ Researchers

Kristina Andrić
Jasenka Anzil
Ivana Ilić
Vlatko Malović
Stjepan Pavlek
Tomislav Rajnović
Gorana Rubinić
Ivana Ujević
Vedran Vrbanić

▼ 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.

▼ Core undergraduate courses

- Algorithms and data structures
- Databases
- Introduction to databases
- Programming and software engineering

▼ Elective courses

- Data warehousing
- Development of applications
- Ergonomics in computing
- Information systems design
- Object oriented programming
- Operational research
- Programming paradigms and languages
- Protection and security of information systems

▼ Postgraduate courses

- Algorithms in bioinformatics
- Applied numerical methods
- Data structures and algorithms
- Databases
- Electronic business
- Management of information systems
- Methods and techniques for software development
- Operational research
- Quantitative methods in risk management
- Structured programming techniques

Research and development

Distance learning software has been further developed to support continuous assessment. Software for student administration has been upgraded to comply with the Bologna process. Strategy of computerisation for an insurance company is in its final stage. A data warehousing project and credit risk assessment project according to Basel II for a bank is under way.

▼ Projects

Software engineering: Education and research co-operation (DAAD project in the framework of the 'Stability Pact for South-Eastern Europe', National coordinator: Damir Kalpić, 2004-2008)

Information System for Higher Education in Croatia – ISVU (Ministry of Science, Education and Sports, Republic of Croatia, Project leader: Mirta Baranović, 2000-2007)

Optimisation and risk management in information systems (Project 036-0361983-3137,

Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Damir Kalpić, 2007-2012)

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)

System specification for Fauna-Croatica Database as part of the Nature Protection Information System (The State Institute for Nature Protection, Project leader: Krešimir Fertalj, 2007)

Development of data warehousing and business intelligence for banking (Project leader: Damir Kalpić, 2005-2007)

Strategy of computerisation in insurance (Croatia Insurance Company Ltd, Project leader: Damir Kalpić, 2007)

Expertise of critical issues in the realisation of the toll collecting system (Croatian Highways, Project leader: Damir Kalpić, 2007)

Publications

▼ Edited proceedings

Čišić, Dragan; Hutinski, Željko; Baranović, Mirta; Sandri, Roberto; *Proceedings of Conferences: Digital Economy -2nd e-business ALADIN, Information Systems Security, Business Intelligence Systems -* MIPRO 2006 29th International Convention. Rijeka: Croatian Society for Information and Communication Technology, Electronics and Microelectronics - MIPRO, 2006

Čišić, Dragan; Hutinski, Željko; Baranović, Mirta; Sandri, Roberto; *Proceedings of Conferences: Digital Economy -2nd e-business ALADIN, Information Systems Security, Business Intelligence Systems -* MIPRO 2007 28th International Convention. Rijeka : Croatian Society for Information and Communication Technology, Electronics and Microelectronics - MIPRO, 2007

▼ Chapter in book

Hoić-Božić, Nataša; Mornar, Vedran. Authoring of Adaptive Hypermedia Courseware Using AHyCo System, Advances in Web-Based Education: Personalized Learning Environments / Magoulas, George ; Chen, Sherry (ed.). Hershey, PA : IDEA Group Publishing, 2005. Str. 253-276.

▼ Journal papers

Hoić-Božić, Nataša; Mornar, Vedran. **AHyCo: a Web-Based Adaptive Hypermedia Courseware System**. *CIT. Journal of computing and information technology*. **13** (2005) , 3; 165-176

Fertalj, Krešimir; Milašinović, Boris; Kalpić, Damir. **Estimation of Feasibility for Business Information Systems**. *Journal of Computing and Information Technology - CIT*. **13** (2005), 4; 271-277

Gledec, Gordan; Matijašević, Maja; Jurić, Damir. **Improving search on WWW.HR web directory by introducing ontologies.** *Lecture notes in computer science*. 3682 (2005) , 2; 894-900

Fertalj, Krešimir; Hlupić, Nikica; Kalpić, Damir. **RUP and XP - A Modern Perspective**. *WSEAS Transactions on Information Science & Applications*. **3** (2006) , 8; 1573-1581

Fertalj, Krešimir; Jerković, Hrvoje; Hlupić, Nikica. **Comparison of E-Learning Management Systems**. *WSEAS Transactions on Advances in Engineering Education.* **3** (2006) , 9; 795-800

Fertalj, Krešimir; Vučetić, Nenad. **Knowledge Management System Implementation: From Theory to Practice**. *WSEAS Transactions on Information Science & Applications.* **3** (2006), 2; 245-252

Hlupić, Nikica; Basch, Danko; Fertalj, Krešimir. **Computational Issues of Signal Analysis in Time Domain**. *Transactions on Computers*. **5** (2006) , 12; 2929-2750

Kalpić, Damir; Rajnović, Tomislav; Mornar, Vedran. **Minimisation of Collisions in Scheduling of Lectures**. *WSEAS Transactions on Information Science and Applications*. **3** (2006) , 2; 365-371

▼ Invited lectures

Kalpić, Damir. **Reliance on Own Expertise vs. Imported Solutions - Case Study of a Small Medium Developed Country**, *The 3rd Conference on Documentation & Electronic Archiving "Knowledge Investment & Management for Decision Support"* / Qassen Sultan Al Bana (ed.). Dubai : Dubai Municipality, 2005. 1-25...

Conference papers

Kalpić, Damir; Mornar, Vedran; Kovač, Mario; Fertalj, Krešimir; Kos, Mladen. **An insight into efforts to establish computerization and e-services for public health in Croatia**, *Proceedings of the 2005 Networking and Electronic Commerce Research Conference (NAEC2005)* / Gavish, Bezalel (ed.). Dallas : Southern Methodist University, Dallas, USA, 2005. 75-91

Hoić-Božić**,** Nataša; Mornar, Vedran; Botički, Ivica. **An Approach to Online Collaborative Learning using AHyCo LMS**, ICAT 2005 - Proceedings / Salihbegović, Adnan et al. (ed.). Sarajevo : Faculty of Electrical Engineering, University of Sarajevo, 2005

Hoić-Božić, Nataša; Mornar, Vedran; Botički, Ivica. **Collaborative Learning in AHyCo Online Learning System**, Proceedings of the 27th International Conference on Information Technology Interfaces / Lužar - Stiffler, Vesna ; Hljuz Dobrić, Vesna (ed.). Zagreb : SRCE University Computing Centre, University of Zagreb, 2005. 247-252

Kalpić, Damir; Rajnović, Tomislav; Mornar, Vedran. **A Software Tool for Lectures Timetable**, *Proceedings of the 1st WSEAS / IASME Int. Conf. on EDUCATIONAL TECHNOLOGIES*. Puerto de la Cruz, Tenerife : WSEAS, 2006. 57-63

Fertalj, Krešimir; Vučetić, Nenad. **Challenge of Knowledge Management: From Theory to Practice**. *Proceedings of the 4th WSEAS / IASME International Conference on: System Science and Simulation in Engineering (ICOSSSE 2005)* / Thome, N. (ed.). Puerto de la Cruz, Tenerife : WSEAS, 2005. 204-210

Fertalj, Krešimir; Špundak, Mario.**Evaluation and Comparison of Creative Planning Techniques** *Proceedings of the 16th International Conference on Information and Intelligent Systems* / Aurer Boris and Bača, Miroslav (ed.). Varaždin : University of Zagreb, 2005. 235-242

Kalpić, Damir; Mornar, Vedran; Kovač, Mario; Fertalj, Krešimir; Kos, Mladen. **Establishment of computerization and e-services for public health in Croatia**, *3rd Croatian & International Congress on Telemedicine and e-Health* / Klapan I., Kovač M., Rakić M. (ed.). Hvar : Udruga za telemedicinu, 2006. 24-24

Botički, Ivica; Mornar, Vedran; Andrić, Kristina. **Supporting and enhancing teaching and learning with mobile devices**, Proceedings of the ICL2006. Villach, Austria, 2006.

Vrdoljak, Boris; Banek, Marko; Skočir, Zoran. **Integrating XML Sources into a Data Warehouse**. *Lecture Notes in Computer Science*. **4055** (2006) ; 133-142

Rovan, Lidia; Baranović Mirta. **Migrating Web-based Applications into Semantic Web**. Proceedings of the 28th International Conference on Information Technology Interfaces / Luzar-Stiffler, Vesna ; Hljuz-Dobric, Vesna (ed.). Zagreb : SRCE, 2006., 159 - 164

Magdalenić, Ivan; Vrdoljak, Boris; Skočir, Zoran. **Towards Dynamic Web Service Generation on Demand** . *Int'l Conference on Software, Telecommunications and Computer Networks SoftCOM 2006*, FESB, Sveučilište u Splitu, 2006.

Banek, Marko; Skočir, Zoran; Vrdoljak, Boris. **A Tool for Data Warehouse Design from XML Sources**. *Proc. of the 29th International Convention MIPRO 2006, Vol. 5 (DE & ISS & BIS)*, Croatian Society for Information and Communication Technology, Electronics and Microelectronics - MIPRO, 2006. 263-268

Fertalj, Krešimir; Hlupić, Nikica; Kalpić, Damir. **Permeation of RUP and XP on Small and Middle-Size Projects**, *Proceedings of the 5th WSEAS International Conference on Telecommunications and Informatics*. Istanbul : WSEAS, 2006. 98-104

Fertalj, Krešimir; Hlupić, Nikica; Rovan, Lidia. **Why (not) ORM**? *Proceedings of the 28th International Conference on Information Technology Interfaces* / Luzar-Stiffler, Vesna ; Hljuz-Dobric, Vesna (ed.). Zagreb : SRCE, 2006. 683-688

Fertalj, Krešimir; Jerković, Hrvoje; Hlupić, Nikica. **Comparison of E-Learning Management Systems** *Proceedings of the 5th WSEAS International Conference on E-Activities* / N. Mastorakis et.al (ed.). Venice : WSEAS, 2006. 189-194

Hlupić, Nikica; Basch, Danko; Fertalj, Krešimir. **Computational Issues of Sine Wave Estimation in Time Domain** *Proceedings Of The 6th WSEAS International Conference On Systems Theory And Scientific Computation (ISTASC'06)* / Lazakidou, A. ; Siassiakos, K. (ed.). Nikolaos, Crete Island, Greece : WSEAS, 2006. 208-213

Botički, Ivica; Mornar, Vedran; Hoić–Božić Nataša. I**ntroducing Location - Awareness into a Learning Environment Supported by Mobile Devices**, Proceedings of the 1st International Conference on Virtual Learning / Vlada, Marin ; Albenau Grigore ; Popovici Dorin Mircea (ed.). Bucharest : Bucharest University Press, 2006. 267-274

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Žufić, Janko; Kalpić, Damir. **Design Workshop for use of WebCT in Education of Teachers**, Knowledge Discovery in Education, Government, Industry and Busines, ITI / Vesna Luzar - Stiffler, Vesna Hljuz Dobric (ed.). SRCE University Computing Centre, University of Zagreb, J. Marohnića 5, 10000 Zagreb, Croatia, 2007. 393-3

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Gledec, Gordan. **Web Quality Model: An Application to Business Domain**, *Managing Worldwide Operations and Communications with Information Technology* / Khosrow-Pour, Mehdi. SAD : IGI Publishing, 2007.

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Banek, Marko; Vrdoljak, Boris; Tjoa, A Min; Skočir, Zoran. **Automating the Schema Matching Process for Heterogeneous Data Warehouses**. *Proc. of 9th Int'l Conference on Data Warehousing and Knowledge Discovery DaWaK 2007, Lecture Notes in Computer Science. 4654 (2007) ; 45-54.*

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Kovač, Mario; Mlinarić, Hrvoje; Čavrak, Igor; Knezović, Josip; Mornar, Vedran; Pukljak-Zoković, Dubravka. **System architecture of a new national student card in Croatia**, E-content Summit: scenarios for the future. Brijuni, Hrvatska, 2007

Kovač, Mario; Mornar, Vedran; Mlinarić, Hrvoje; Čavrak, Igor; Knezović, Josip; Pukljak-Zoković, Dubravka. **System architecture of a new national student card in Croatia**, European Campus Card Association conference 2007. Linz, Austria, 2007

International links

Humboldt Universität, Berlin, Germany

Università degli Studi del Sannio, Benevento, Italy

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

European Federation of National Maintenance Societies

University of Mostar, Bosnia and Herzegovina

University of Tuzla, Tuzla, Bosnia and Herzegovina

Doctor of science degree

Author: ZVONIMIR VANJAK
Title: Environment for Solving of Optimisation Problems
Date: 27 November 2006
Mentor: Vedran Mornar

Master of science degree

Author: MARIO PRANJIĆ
Title: Implementation Of Multilevel Secure Relational Data Model
Date: 22 March 2006
Mentor: Krešimir Fertalj

Author: BORIS MILAŠINOVIĆ
Title: Adaptable Workflow Management System
Date: 4 May 2006
Mentor: Krešimir Fertalj

Author: DUBRAVKO ČUNOVIĆ
Title: The role of Database Management Systems in Enterprise Resource Planning Systems
Date: 8 May 2006
Mentor: Mirta Baranović

Author: ŽELJANA BOŠNJAK CIHLAR
Title: Investigation of stock price behaviour patterns using data mining
Date: 26 June 2006
Mentor: Damir Kalpić

Author: MIRJANA DOMAZET-LOŠO
Title: Comparison of Data Mining Techniques Applied to Biological Data
Date: 13 June 2006
Mentor: Mirta Baranović

Author: DUBRAVKA PUKLJAK ZOKOVIĆ
Title: Adaptive system for standardized learning object creation
Date: 13 October 2006
Mentor: Vedran Mornar

Author: HRVOJE JERKOVIĆ
Title: Integration of Learning Management Systems
Date: 6 July 2007
Mentor: Krešimir Fertalj

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

Josip Butorac – absolute electromagnetic measurements, calibration of standards, precise instruments and transducers

Zijad Hazmadar – retired, professor emeritus

Founded in 1924

Head of Department:
Prof. **Zoran Skočir,** Ph.D.

Tel:	+ 385 1 612 98 65
Fax:	+ 385 1 612 96 16
E-mail:	oem@fer.hr
URL:	http://www.fer.hr/oem

Željko Štih – numerical field calculations, CIM and management

Petar Knežević - telematic services, performance of computer systems

1 Marko Banek, 2 Ivanka Šokota, 3 Jasenka Haladin, 4 Zijad Haznadar, 5 Mihaela Vranić, 6 Zoran Skočir, 7 Sead Berberović, 8 Ruža Vukelić, 9 Damir Jurić, 10 Petar Knežević, 11 Armin Pavić, 12 Šandor Dembitz, 13 Ivan Leniček, 14 Luka Ferković, 15 Marko Jurčević, 16 Damir Pintar, 17 Dražen Franolić, 18 Božidar Ferković, 19 Martin Dadić, 20 Jakov Pavlek, 21 Mirko Randić, 22 Roman Vulpe, 23 Dušan Vujević, 24 Sanja Ferković-Živković, 25 Ivica Kunšt, 26 Hrvoje Heteduš, 27 Drago Cmuk, 28 Petar Mostarac

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

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

▼ Associate professors

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

Šandor Dembitz - natural language processing, expert systems

Božidar Ferković – retired, precise measurements of electromagnetic quantities

Dušan Vujević – retired, precise measuring of voltage and magnetic quantities

▼ Assistant professors

Martin Dadić – computational and applied electromagnetics

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

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

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

▼ Assistants

Luka Ferković
Nikica Hlupić
Hrvoje Hegeduš

▼ Junior researchers

Marko Banek
Drago Cmuk
Marko Jurčević
Damir Jurić
Ivan Leniček
Nadža Milanović
Petar Mostarac
Jakov Pavlek
Damir Pintar
Alan Šala
Bojan Trkulja
Mihaela Vranić

▼ Administrative staff

Jasenka Haladin
Sanja Ferković- Živković

▼ Lab support

Ivan Felja
Davor Kotur
Ivica Kunšt
Dražen Franolić
Damir Matić

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, analysis and presentation of the measurement results. Metrology infrastructure, calibration and testing services. Quality management and the 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.

▼ Core undergraduate courses

- Databases
- Electrical measurements
- Electromagnetic fields
- Electromagnetic theory
- Fundamentals of electrical engineering
- Management in engineering
- Quality Management

▼ Elective courses

- Application of finite element method
- Data management
- Data processing
- Numerical procedures in design
- Process measurements
- Theory of electromagnetic fields
- Theory of electromagnetic fields

Postgraduate courses

- Computational electromagnetic compatibility
- Computer aided analysis in electromagnetic theory
- Computer aided design
- Data warehouse design
- Digital measuring instruments and systems
- Electrical measurement of non electric quantities
- Electromagnetic pollution
- International measuring traceability
- Metrology and precise measurements
- Quality control and metrology
- Selected topics from data processing
- Validation of the software

Research and development

Development and permanent improvement of highly accurate measurements in Croatia, primarily in the area of electromagnetic quantities. 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. 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, with a view to implement a system of management, surveillance and documentation compatible with the appropriate quality systems in the European Union, 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

Metrological Research and development of methods and procedures for measurement of electromagnetic quantities (Joint Croatian – Macedonian project for scientific and technological cooperation, Ministry of Science, Education and Sport, Republic of Croatia, and Ministry of Science and Education, Republic of Macedonia, principal Investigator: Roman Malarić (Croatia) and Marija Čundeva Blajer (Macedonia), 2007-2008)

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

Stima dell'intercezza nella misurazione dell'energia elettrica (Estimation of Uncertainty in Electrical Energy Measurement), Croatian-Italian project supported by the Italian Ministry of Education, University and Development (Ministero dell'Istruzione, dell'Università e della Ricerca), (Responsible person: Mladen Boršić., 2005-2007) TRAJANJE

Croatian Standard Basis for Electromagnetic Measurements (Project 0036042, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: 2002-2006)

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. -).

EM fields and interaction in power systems (Project 0036024, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Zijad Haznadar, 2002-2006)

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-)

Metrological Infrastructure (Project 0036 014, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Mladen Boršić, 2002-2006)

Networked Economy (Project 0036016, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Zoran Skočir, 2002.-2006.)

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 -)

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

Research and Development of Ship's Shaft Generator (Technological Project TP-03/03635, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Zijad Haznadar, 2004 - 2006)

System for Testing and Calibration of Electronic Electrical Energy Meters (Project TP-09, Ministry of Science, Education and Sport, Republic of Croatia, RIZ d.d. Company, Zagreb,

Croatia, Principal investigator: Nikica Hlupić, 2004-2007)

Analysis of Complex Grounding System – RP 110 kV Podsused (Croatian Electricity, Project manager: Željko Štih, 2006)

Business Intelligence and Electronic Business (Agrokor, Project co-ordination: Ignac Lovrek and Zoran Skočir, Project leader: Zoran Skočir, 2005.- …)

Computation of EM Fields – TS 110/35/10 kV Švarča (Croatian Electricity, Project manager: Željko Štih, 2006)

Computation of EM Fields – TS 220/110/35/10 kV Plat (Croatian Electricity, Project manager: Armin Pavić, 2007)

Study of Importance of Distribution Substations as the Sources of Electromagnetic Fields (Croatian Electricity, Project manager: Armin Pavić, 2005-2006.)

Study of Importance of Underground Cables as the Sources of Electromagnetic Fields (Croatian Electricity, Project manager: Armin Pavić, 2006-2007.)

Publications

▼ Books

Bažant, Alen; Car, Željka; Gledec, Gordan; Jevtić, Dragan; Ježić, Gordan; Kunštić, Marijan;

Lovrek, Ignac; Matijašević, Maja; Mikac, Branko; Skočir, Zoran. *Telecommunications – Technology and Market* (in Croatian), Lovrek, Ignac ; Gledec, Gordan (ed.). Zagreb : Element, 2007.

Malarić, Roman. *Measurements in electrical engineering* (in Croatian), Car, Tihomir (ed.), Varaždin, University of Applied Sciences Varaždin, 2006

▼ Journal papers

Banek, Marko; Vrdoljak, Boris; Tjoa, A Min; Skočir, Zoran. **Automating the Schema Matching Process for Heterogeneous Data Warehouses,** *Lecture Notes in Computer Science*. 4654 (2007); 45-54.

Banek, Marko; Tjoa, A Min; Stolba, Nevena: **Integrating Different Grain Levels in a Medical Data Warehouse Federation**, *Lecture Notes in Computer Science*, *4081* (2006); pp. 185-194

Banek, Marko; Jurić, Damir; Pejaković, Ivo; Skočir, Zoran. **Distributed Architecture for Association Rule Mining,** *Lecture Notes in Computer Science*. 4243 (2006); 237-246.

Butorac, Josip; Malarić, Roman; Leniček, Ivan. **Establishment of resistance traceability chain using digital voltmeters**, *Engineering Review*, Technical Faculty in Rijeka, 21-22 (2001-2002), pp. 35-43.

Butorac, Josip. **Untanebless of the personell system at the University in Zagreb,** *Strojarstvo* 47(2005), No. 5-6, (Sept.-Dec. 2005.), pp. 199-201.

Cmuk, Drago; Grimaldi, Domenico; Rapuano, Sergio. **Exploring the Mobile Devices as a New Frontier for the e-Learning in Instrumentation and Measurement**, *International Journal of Computing*, Special issue on Virtual instrumentation and Virtual Laboratories Termopil, Ukraine 2007.

Dadić, Martin; Zentner, Radovan. **A technique for elimination of reflected rays fromantenna measurements performed in echoic environment**, *AEU - International Journal of Electronics and Communications*. 61 (2007), 2; pp. 90-94.

Haznadar, Zijad; Jokić, Radovan; Berberović, Sead; Štih, Željko. **Numerical Computation of Ship´s Shaft Generator Characteristics**, *Przeglad Elektrotechniczny*. 82 (2006), 5; pp. 23-26.

Jurčević, Marko; Malarić, Roman; Boršić, Mladen: **Internet-enabled calibration services: aspects of laboratory information system security,** *Proceedings of the 23rd IEEE Instrumentation and Measurement Technology Conference*. 2006., pp. 1570-1574.

Malarić, Roman; Leniček, Ivan; Malarić, Krešimir. **Voltage ratio measurements using two digital voltmeters and resistive voltage divider**., *IEEE Transactions on Instrumentation and Measurement.* 55 (2006), 2, pp. 584-587.

Malarić, Krešimir; Bartolić, Juraj; Malarić, Roman. **Immunity measurements of TV and FM/AM receiver in GTEM-cell**, *Measurement,* Journal of the International Measurement Confederation (IMEKO), 38 (2005), 3, pp. 219-229.

Sabolić, Dubravko; Bažant, Alen; Malarić, Roman. **Signal Propagation Modeling in Power-Line Communication Networks**, *IEEE Transactions on Power delivery*. 20 (2005), 4; pp. 2429-2436.

Vrdoljak, Boris; Banek, Marko; Skočir, Zoran. **Integrating XML Sources into a Data Warehouse**, *Lecture Notes in Computer Science*. 4055 (2006); 133-142.

▼ Conference papers

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Banek, Marko; Vrdoljak, Boris; Tjoa, A Min: **Using Ontologies for Measuring Semantic Similarity in Data Warehouse Schema Matching Process,** *Proceedings of the 9th International Conference on Telecommunications (ConTEL 2007)*, Car, Željka; Kušek, Mario (eds.), Zagreb: University of Zagreb, Faculty of Electrical Engineering and Computing, 2007. pp. 227-234

Beč, Sonja; Pečar-Ilić, Jadranka; Skočir, Zoran: **Alarm Reporting in River Information System**, *Managing Environmental Knowledge, Proceedings of the 20th International Conference "Informatics for Environmental Protection",* Tochtermann, Klaus ; Scharl, Arno (ed.). Grac : Shaker Verlag, 2006. pp. 27-34.

Boršić, Mladen; Cmuk, Drago; Moisa, S.; Rapuano, Sergio: **Teaching Magnetic Measurements on Multilingual Base through a Remote Laboratory**, *Proceedings of the 19th International Metrology Symposium*, Ilić, Damir ; Boršić, Mladen ; Jurčević, Marko (ed.). Opatija : Metrology Consulting, 2005. pp. 50-54.

Boršić, Mladen; Cmuk, Drago; Daponte, Pasquale; De Capua, Claudio; Grimaldi, Domenico; Kilić, Tomislav; Mutapčić, Tarik; Riccio, Mariella: **Italian-Croatian Remote Laboratory Distributed on Geographical Network**, *Proc. of International Conference on Software, Telecommunications and Computer Networks,* SoftCOM 2006, September 29

– October 1, 2006, Split – Dubrovnik, Croatia, pp. 357-362.

Butorac, Josip; Ilić, Damir; Boršić, Mladen; Malarić, Roman; Leniček, Ivan: **Quality management - a part of the laboratory accreditation**, *Proceedings of the 19th International Metrology Symposium*, Ilić, Damir ; Boršić, Mladen ; Jurčević, Marko (ed.). Opatija : Metrology Consulting, 2005., pp. 122-125.

Car, Stjepan; Tomičić, Branko; Štih, Željko: **The Modelling of Transients in Synchronous Generators for Wind Turbine**, *Clean electrical power: renewable energy resources impact*, May 21-23, Capri, Italy, 2007., pp 370 - 376

Cmuk, Drago; Jurčević, Marko; Boršić, Mladen: **Design of an Internet-enabled calibration system**, *Proceedings of the 19th International Metrology Symposium*, Ilić, Damir ; Boršić, Mladen ; Jurčević, Marko (ed.). Opatija : Metrology Consulting, 2005., pp. 70-74.

Cmuk, Drago; Boršić, Mladen; Rapuano, Sergio: **A Novel Approach to Multilanguage Remote Teaching: Magnetic Measurement Experiment**, *IMTC 2006 – Instrumentation and Measurement Technology Conference*, Sorrento, Italy 24-27 April 2006, pp. 1840 -1849.

Cmuk, Drago; Boršić, Mladen; Zoino, Francesco: **Remote versus Classical Laboratory in Electronic Measurements teaching - effectiveness testing**, *IMEKO XVIII World congress*, Rio de Janeiro, Brazil, September 17 – 22, 2006, paper no. 00517 TC-001.

Cmuk, Drago; Malarić, Roman; Jurčević, Marko: **Classic versus virtual approach to electronic measurements teaching - challenges and prospects**, *Proceedings of the 19th International Metrology Symposium*, Boršić, Mladen; Ilić, Damir; Jurčević Marko (ed.). Opatija: Metrology Consulting, 2005. pp. 46-49.

Čelić, Kristina; Berberović, Sead; Pužar, Milica: **Optimizing Electric Parameters and Operation Range of Hydro-generator in Refurbising Transient Phenomena in Large Electric Power Systems,** *Internatonal CIGRE Symposium 2007 : Croatian National Committee of CIGRÉ,* April 18-21, 2007, Zagreb, Croatia, pp. 0703-0709.

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Dadić Martin; Sruk, Vlado; Somek, Branko: **Adaptive Design of Linear-Phase Maximally Flat Filters or Digital Audio**, *CD-ROM Proceedings of the Thirtheenth International Congress on Sound andV ibration (ICSV13)*, July 02'06, 2006, Vienna, Austria, 7p.

Dadić, Martin; **Zentner, Radovan: Application of Signal Processing in Removal of Disturbing Reflections while Performing Antenna Measurements**, (In Croatian), *Proceedings of EIS 2007 14th International „Electrical Engineering Symposium"*, May 03-05, 2007, Šibenik, Croatia, pp. 87-90.

Dembitz, Š.: **Hascheck's Traffic** (in Croatian), *Proc. KOM 2006*, Nov. 27-29, 2006, Opatija, Croatia, pp. 65-74.

Ferković, Luka; Ilić, Damir: **Dependence of Mutual Inductance of a Precise Rogowski Coil on the Primary Conductor Position**, *Proceedings of the 15th IMEKO TC 4 International Symposium* / Cretu, Mihail ; Sarmasanu, Constantin (ed.). Iasi: IMEKO, 2007. vol. I, pp. 29-32.

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Haznadar, Zijad; Berberović, Sead; Štih, Željko: **Electromagnetic interference between KDV 110 kV Osijek 3/Osijek 4 and near metallic objects,** (In Croatian), *7th HO CIGRE Conference,* October 06-10, 2005, Cavtat, Croatia, pp. 1-10.

Haznadar, Zijad; Jokić, Radovan; Berberović, Sead; Štih, Željko: **Numerical Analysis of the Ship's Shaft Generator**, *EDPE 2005 Proceedings*, September 26-28, 2005, Dubrovnik, Croatia, 2005, 6p.

Haznadar, Zijad; Trkulja, Bojan: **Contemporary Technological Challenges**, (In Croatian), *Proceedings of EIS 2007 14th International „Electrical Engineering Symposium"*, May 03-05, 2007, Šibenik, Croatia, pp. 1-6.

Hegeduš, Hrvoje; Ilić, Damir; Šala, Alan: **Comparison of measurement methods for vehicle acceleration**, *IMEKO XVIII World Congress proceedings* (on CD), Rio de Janeiro, Brazil, 2006, CD Proceedings, identification on page 47 in the Book of summaries.

Hegeduš, Hrvoje; Ilić, Damir: **Vehicle acceleration measurement**, *Proceedings of the 19th International Metrology Symposium*, Ilić, Damir ; Boršić, Mladen ; Jurčević, Marko (ed.). Opatija : Metrology Consulting, 2005., pp. 55-59.

Ilić, Damir; Butorac, Josip; Boršić, Mladen; Malarić, Roman: **How to teach the physics and technics aspects of metrology?**, *Proceedings of the XVIII IMEKO World Congress* (on CD). Rio de Janeiro : IMEKO, 2006., CD Proceedings, identification on page 9 in the Book of summaries.

Janić, Žarko; Valković, Zvonimir; Štih, Željko: **Stray Losses in Transformer Clamping Plate,** *ICEM 2006. XVII International Conference on*

Electrical Machines. September 02-05, 2006, Chania, Greece, pp. 320- 325

Jokić, R.; Štih, Željko; Berberović, Sead: Optimisation and Design of **Ship's Shaft Generator by Means of Numerical Simulations**, (In Croatian), *14th International „Electrical Engineering Symposium"*, May 03-05, 2007,   Šibenik, Croatia, May 3 – 5, 2007, pp. 69-73

Jurčević, Marko; Boršić, Mladen: **Internet-enabled calibration services: the remote control of instruments,** *Proceedings of the XVIII Imeko World Congress.*Rio de Janeiro, Sociedade Brasileira de Metrologia (SBM), 2006, CD Proceedings, identification on page 60 in the Book of summaries.

Jurčević, Marko; Malarić, Roman; Boršić, Mladen: **Internet-enabled calibration services: aspects of laboratory information system security,** *Proceedings of the 23rd IEEE Instrumentation and Measurement Technology Conference.* 2006., pp. 1570-1574.

Jurčević, Marko; Boršić, Mladen; Malarić, Roman: **Security Issues of Internet-Enabled Calibration Services**, *VI Semetro Anais Proceedings* / Gregory Kyriazis (ed.). Rio de Janeiro : Inmetro, 2005., pp. 110-112.

Jurčević, Marko; Malarić, Roman; Boršić, Mladen: **Designing a Public Key Infrastructure implementation for calibration laboratories**, *Proceedings of the 19th International Metrology Symposium*, Boršić, Mladen ; Ilić, Damir ; Jurčević Marko (ed.). Opatija : Metrology Consulting, 2005., pp. 113-118.

Jurčević, Marko; Malarić, Roman; Šala, Alan: **Web based platform for distance training on electrical measurements course**, *Conference proceedings of 5th international conference.* Smolenice, Slovakia, 2005., pp. 109-112.

Jurić, Damir; Skočir, Zoran: **Building OWL ontologies by analyzing relational database schema concepts and WordNet semantic relations**, *Proceedings of the 9th International Conference on Telecommunications ConTEL 2007*, Car, Željka; Kušek, Mario (edf.). Zagreb: FER, 2007., pp. 235-241.

Krasić, Ivan; Kraljević, Goran; Skočir, Zoran: **Using Data Warehouse for TelecomMarketing Support,** *MIPRO 2007 Proceedings Vol. II, CTI, Telecommunications & Information*, Golubić, Stjepan ; Mikac, Branko; Hudek, Vlasta (ed.). MIPRO, Rijeka 2007., pp. 41-46.

Leniček, Ivan; Ilić, Damir; Malarić, Roman: **Determination of digital voltmeter input parameters**, *Proceedings of the 2007 IEEE Instrumentation and Measurement Technology Conference*, Roman Morawski (ed.). Warsaw, Poland: IEEE, 2007, CD Proceedings, identification No. 7655.

Magdalenić, Ivan; Vrdoljak, Boris; Skočir, Zoran: **Towards Dynamic Web Service Generation on Demand**, *Proccedings of International Conference on Software, Telecommunications and Computer Networks SoftCOM 2006*, Rožić, Nikola ; Begušić, Dinko (ed.)., Split: FESB, University of Split, 2006., pp. 276-280.

Malarić, Roman; Ilić, Damir; Malarić, Krešimir: **Measurement of Electromagnetic Interference in the Primary Electromagnetic Laboratory**, *6th International Conference on Measurement, Measurement 2007*, Frollo, Ivan (ed.). Bratislava, Slovakia: Institute of Slovak Academy of Sciences, Slovak Academy of Sciences, 2007.,

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International links

BIPM – Bureau International des Poids et Mesures, Pavillon de Breteuil, Sèvres, France

DKD – Deutsche Kalibrierdienst, Berlin and Braunschweig, Germany

EUROMET – European Collaboration in Measurement Standards, EU

Facoltà di Ingegneria dell'Università degli Studi del Sannio, Benevento, Italy

Faculty of Electrical Engineering, University of Tuzla, Bosnia and Herzegovina

ILAC – International Laboratory Accreditation Cooperation

IMEKO – International Measurement Confederation

INRIA-Futurs, Institut National de Recherche en Informatique et en Automatique, France

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

NPL – National Physical Laboratory, Teddington, Middlesex, United Kingdom

NCSL International – National Conference of Standard Laboratories International

NMI (NMIA) – National Measurement Institute, Lindfield, Australia

PTB – Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

Ss. Cyril and Methodius University – Skopje, Macedonia

Techniche Universität Graz, Institut für Grundlagen und Theorie der Electrotechnik, Graz, Austria

University of Bihać, Faculty of Engineering, Bihać, Bosnia and Herzegovina

University of Bologna, DEIS, Bologna, Italy

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

Vienna University of Technology, Institute of Software Technology and Interactive Systems (ISIS), Vienna, Austria

Doctor of science degree

Author: IVAN LENIČEK
Title: Comparison of Resistance and Capacitance Standards using Hamon Divider and Electronic Differentiator
Date: 24 February 2006
Mentor: Damir Ilić

Author: ANTUN MIKULECKY
Title: Capacitance and Dielectric Dissipation Factor of Transformers Bushings
Date: 30 October 2006
Mentor: Josip Butorac

Master of science degree

Author: NINOSLAV ČERKEZ
Title: Performance Tuning of Database Management System
Date: 14 October 2005
Mentor: Zoran Skočir

Author: ALAN ŠALA
Title: Automated Resistance Scaling with Accurate Low-noise Current Source
Date: October 28, 2005
Mentor: Josip Butorac

Author: MARKO FABIJANIĆ
Title: Integrating Business Intelligence Module into Distance Learning System
Date: 6 February 2006
Mentor: Zoran Skočir

Author: NEVEN JOSIP HRŽINA
Title: Management of Information System Using Three Tiered Architecture
Date: 7 April 2006
Mentor: Zoran Skočir

Author: BRANKO MILEUSNIĆ
Title: Integration of Commercial Database into Switching System
Date: 12 May 2006
Mentor: Zoran Skočir

Author: SONJA BEČ
Title: Alarms Reporting in River Information System
Date: 17 September 2006
Mentor: Zoran Skočir

Author: IGOR MIHELIĆ
Title: Implementation and Permanent Control of the Quality System in an Organisation with Special Security Requirements
Date: 18 December 2006
Mentor: Josip Butorac

Author: DALIBOR GORENC
Title: Numerical Calculation of Temperature Rise in Three-Phase Metal-Enclosed Busbars
Date: 7 March 2007.
Mentor: Zijad Haznadar

Author: DAMIR JURIĆ
Title: Creating Ontology from Meta-data of Relational Database
Date: 5 July 2007
Mentor: Zoran Skočir

Author: MIHAELA VRANIĆ
Title: Application of Business Intelligence in Academic Environment
Date: 5 July 2007
Mentor: Zoran Skočir

5.5. Department of Electric Machines, Drives and Automation

Faculty and staff

Founded in 1925

Head of the department:
Asst. Prof. **Nikola Švigir,** PhD

Tel: +385 1 612 97 70
Fax: +385 1 612 97 05
E-mail: esa@fer.hr
URL: http://www.esa.fer.hr/

▼ Professors

Drago Ban – electrical machines and drives

Zvonko Benčić – power electronics, semiconductor power devices

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

Zlatko Maljković – electrical machines

Zvonimir Sirotić – retired distinguished professor

Ivan Gašparac – electrical machines, industrial plants

1 Željko Jakopović, 2 Nikola Švigir, 3 Ivan Gašparac, 4 Zlatko Maljković, 5 Drago Ban, 6 Zvonko Benčić, 7 Gorislav Erceg, 8 Fetah Kolonić, 9 Zdenko Štifter, 10 Davor Kukolja, 11 Zorica Livić, 12 Spomenka Perkušić, 13 Goran Rovišan, 14 Pavao Golubović, 15 Vera Čukelj, 16 Branka Rihtarić, 17 Snježana Krleža, 18 Dinko Vuina, 19 Toni Šimić, 20 Igor Erceg, 21 Damir Sumina, 22 Sven Zelić, 23 Damir Žarko, 24 Siniša Popović, 25 Mario Vražić, 26 Milutin Pavlica, 27 Neven Bulić, 28 Marinko Miletić, 29 Ivan Ilić

▼ Associate professors

Željko Jakopović – power electronics, semiconductor power devices

Fetah Kolonić – control of mechatronic systems

▼ Assistant professors

Alojz Slutej – control of electrical machines and drives

Nikola Švigir – control of mechatronic systems

▼ Assistants

Mirko Cettolo
Igor Erceg
Mario Vražić
Damir Žarko

▼ Junior Researchers

Neven Bulić
Davor Kukolja
Milijana Odavić
Alen Poljugan
Siniša Popović
Damir Sumina

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 electrical machinery. Power electronics and electrical drives, control of electrical machines and drives. Mechatronic systems. Testing of electrical machines and drives. Applied mechanics for electrical engineering. Electric switches. Switching arrangements. Industrial plants and automation of industrial plants. Electrical traction.

Research and development of methods to analyse rotational electrical machines, transformers and electrical devices, and to design, construct, test and implement them 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 purpose and particular usage. Electrical motor drives in normal and specific working conditions. Design, testing and commissioning. Reconstruction, retrofit and modernisation of large power electrical machines and drives in electrical, industrial, mining and other plants. Research, development, design, construction 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 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. Diagnostic of electrical motors and drives.

▼ Core undergraduate courses

- Automated Testing of Electrotechnical Devices
- Automation in Industrial Plants
- Automation Systems Design
- Control Engineering
- Control of Electric Drives
- Control of Power Converters
- Defense Systems and Technologies
- Design and Automatization Industrial Plants
- Design and Development of Interactive Simulation Systems
- Design of Electric Machinery
- Development of Electrical Products
- Diagnostic and Monitoring Machines and Drives
- Electrical Actuators
- Electrical Drives
- Electrical Machines
- Electrical Machine Controls Practicum
- Electrical Machines and Transformers
- Electrical Machines and Transformers Theory
- Electromechanical and Electrical Conversion
- Electromechanical and Electromagnetic Conversion
- Electromechanical Systems
- Electronics in Power Engineering
- Electrotechnical Materials and Technology
- Fundamentals of Mechatronics
- Fundamentals of Power Electronics
- Fundamentals of Mechatronics
- Graphics And Documentation For Engineers
- Industrial Plants Design
- Industrial System Dynamics
- Materials in Electrical Products
- Mechatronic Systems
- Physical Education
- Power Electronics
- Power Electronics Practicum
- Switching and Protection Devices
- Synchronous Machines and exitation systems
- Technical Mechanics

Elective courses

- Computer Aided Design
- Control of Synchronous Machines
- Croatian Culture
- Design and Construction in the Field of Electrical Machines
- Design and Development of Interactive Simulation Systems
- Dynamics and Modelling of Electromechanical Systems
- Electrical Traction
- Electronic Power Converters for Motor Drives
- Laboratory for Control of Electric Machines
- Management of Change and Human Resources
- Managerial Decision Making
- Methods and Presentation of Results in Scientific Research
- Organisational Psychology
- Power Electronics
- Power Electronics Laboratory
- Quality Assurance and Quality Management
- Selected Chapters of Transformers
- Small and Special Electric Machines
- Sustainable Growth and Environment Protection
- Switching and Protection Devices in Electrical Plants
- Synchronous Machines and Excitations
- Theological Study of the Bible

Postgraduate courses

- Automated Testing of Electrical Machines
- Control Systems of Electrical Drives
- Digital Real Time Simulations
- Disturbances and Protection of Synchronous Machines
- Dynamics of Alternating Current Machines
- Electrical Machines Design Methods
- Industrial Plants
- Integration of Intelligent Components in Highly Automated Mechatronic System
- Intelligent Systems in Industrial Plants
- Power Electronic Systems
- Special Electrical Drives
- Theory of Power Circuit Breakers
- Transformers

Research and development

Electric 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 existing ones. A method for accurate calculation and analysis of turbogenerator electromagnetic parameters has been developed. Computerised on-line diagnostics for 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 LV and HV motors insulation systems has been developed and applied in power plants, chemical 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 the slip of the motor, which determines the speed in digital form. Measurement of line currents and voltages for actual motor torque estimation has been realised also. This torque estimation technique replaced 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 commercial circuit simulator. Obtained results corrected existing electrothermal model. The transient thermal impedance measurement method for MOS-gated power semiconductors is developed and tested, enabling fast and accurate on-site measurement.

Industry automation: Research and development of PROFIBUS (Industrial communication network) application in automated electrical machines testing systems. Coupling of an intelligent automation with soft computing related to industrial site applications. Design and build systems, which exhibit high level of intelligence, support a sufficient users application flexibility related to cost effective product. Introduction of engineering tools, which represent a holistic approach to control engineering, covering all the disciplines and activities required to the process automation system. Presentation and introduction of a different type 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 a different type 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 usage. General information about high-speed communication links used as backbone for the process automation control system. Study 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.

▼ Projects

Advanced Control Structures in Industrial Plants (Project 0036026, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Gorislav Erceg)

Electromechanical Systems of Optimal Energy Conversion (Project 0036005, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Drago Ban)

Power Quality and Power Electronics Converters (Project 003039 Ministry of Science and Technology, Republic of Croatia, Principal investigator: Zvonko Benčić)

Advanced digital guidance & control methods of one class of anti tank missiles (Project 0036034 Ministry of Science and Technology, Republic of Croatia,

Principal investigator Krešimir Ćosić)

The research and optimisation of electric vehicle drive (Project 0036053, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Ivan Ilić)

Integration techniques in complex mechatronic systems (Project 0036032, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Fetah Kolonić)

Refurbishment and Operation of Synchronous Generators (Project 0036021, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Zlatko Maljković)

Electromagnetic Bistabil – Actuator for Switches, (TP-01/03613, Project leader: Gorislav Erceg)

Mehatronic Devices for Fitness Training, (TP-C64, Project leader: Gorislav Erceg)

Procedures of industrial controller optimization in natural gas process production, (Project 4976/04, Oil and gas company INA, Project leader: Fetah Kolonić).

Scientific and Continuous Education Consulting for The "Hrvatska Elektroprivreda, (Project leader: Ivan Ilić)

Marina Traffic and Gate Acces Control System, (Project leader: Krešimir Ćosić)

Whiplash Injury Integrated High-Tech Diagnostic System, (Project manager: Miroslav Slamić)

Digital Simulators for Anti-Armor and Anti-Aircraft Missile Systems, (Project manager: Miroslav Slamić)

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, 2007-2010)

Development of Simulator Prototype – SIMIG 2000 (Ministry of Defense, Republic of Croatia, Principal investigator: Gorislav Erceg, 2006-2007)

Development of Simulation System – SIMIG 2000 (Ministry of Defense, Republic of Croatia, Principal investigator: Gorislav Erceg, 2007-2008)

Electronic Licence Plate for Vessels – ERP2 (Ministry of Interior, Republic of Croatia, Principal investigator: Nikola Švigir, 2007-2008)

Optimalni izbor permanentnih magneta za elektromagnetske uređaje (Ministarstvo znanosti, obrazovanja i športa Republike Hrvatske i Agencija za raziskovalno dejavnost Republike Slovenije, bilateralni projekt Zavoda za elektrostrojarstvo i automatizaciju, FER i Laboratorija za energetiko, Fakulteta za elektrotehniko, računalništvo in informatiko, Univerza v Mariboru), voditelj, 2007. – 2008.

Integration Techniques in Complex Mechatronic Systems (Project 0036032, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Fetah Kolonić, 2002-2006)

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, 2006-2009)

Electrical Power Generation Systems (Programm Ministry of Science and Technology, Republic of Croatia, Principal investigator, Zlatko Maljković)

Refurbishment and Operation of Hydro-generators (Project 036-0361616-1617, Ministry

of Science and Technology, Republic of Croatia, Principal investigator: Zlatko Maljković)

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

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)

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

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)

Converters for tram and electrical drive.in train (Project 036-0362978-1574 Ministry of Science and Technology, Republic of Croatia, Principal investigator: Zvonko Benčić

Publications

▼ Journal papers

Ban Drago; Žarko, Damir**;** T. A. Lipo. **Analytical Calculation of Magnetic Field Distribution in the Slotted Air Gap of a Surface Permanent-Magnet Motor Using Complex Relative Air-Gap Permeance**, IEEE Transactions on Magnetics, Vol. 42, No. 7, pp. 1828-1837, July 2006.

Ćosić, Krešimir; Popović, Siniša; Kukolja, Davor; Slamić, Miroslav. **Physiology-Driven Adaptive VR System: Technology and Rationale for PTSD Treatment**. *Annual Review of CyberTherapy and Telemedicine.* In press 2007.

Ilić Ivan, Maljković Zlatko, Gašparac Ivan, Pavlica Milutin, Ilić-Zubovič Dubravka, Jarić V., Višković A., Belobrajić R.: **Methodology for determining the actual PQ diagram of a hydrogenerator**, Energija, Vol. 56. pp. 144-181, 02/07.

Ilić Ivan, Maljković Zlatko, Gašparac Ivan, Pavlica Milutin, Ilić-Zubović Dubravka, Jarić V., Višković A., Belobrajić R.: **An example applyng algorithm to create the APQ of a hydrogenerator-turbine unit,** Energija, Vol. 56, pp.456-489, 04/07.

Kolonić, Fetah; Poljugan, Alen; Idžotić, Tomislav: **Development of AC Slip-Ring Motor Based Advanced Crane Industrial Controller**, *Automatika*. **3-4** (2005) ; 165-172.

Kolonić, Fetah; Poljugan, Alen; Petrović, Ivan: **Tensor Product Model Transformation-based Controller Design for Gantry Crane Control System – An Application Approach,** *Acta Polytechnica Hungarica*. **3** (2006) , 4; 95-112.

Korondi, Péter; Zsíros, Péter; Kolonić, Fetah: **Humanoid Type Hand Moved by Shape Memory Alloy**, *Communications-Scientific Letters*. **1** (2007) ; 17-23.

Maljković Zlatko; Gašparac Ivan; Žarko Damir; Magić,D. ''**Oscilatiile unui hidroagregat de tip bulb**', Producerea, transportul si distributia energiei electrice si termice, Vol. 1, No 11-12, pp. 20-23, 2005.

Odavić, Milijana; Jakopović, Željko; Kolonić, Fetah: **Sinusoidal Active Front End under the Condition of Supply Distortion**, *Automatika*. **3-4** (2005) ; 135-141.

Žarko, Damir**;** Ban, Drago; I. Klarić. **Finite Element Approach to Calculation of Parameters of an Interior Permanent Magnet Motor**, Automatika, Vol. 46, No 3-4, pp. 113-122, 2005.

▼ Invited lectures

Ćosić, Krešimir. **Interdisciplinary Joint Approach to Suicide Prevention of Warfighters**. NATO Advanced Research Workshop "Wounds of War: Lowering Suicide Risk in Returning Troops", Hotel Amerika-Holzer, Klopeiner See, Austria, October 2007.

Jakopović Željko, Benčić Zvonko, Šunde Viktor. **Integration of Different Tools and Methods into Education of Power Electronics – – Lectures and Laboratory**, *CD* Proceedings of Power Electronics Educational Workshop PESC 2007 Rashid, Muhammad (ur.). Orlando : IEEE, 2007. 1-5.

Jakopović, Željko; Šunde, Viktor; Kolonić, Fetah: **Integration of Measurement and Simulation in Power Electronics Laboratory**, Proceedings of the 12th International Power Electronics and Motion

Electric machines laboratory

Control Conference, EPE-PEMC 2006. Jezernik, Karel (ur.).Portorož, Slovenia : IEEE, 2006. 2124-2129.

Slutej, Alojz; Kolonić, Fetah: **Advances in Control and Sensors Technology Enabling Unmanned Operation of Containers Cranes,** EDPE 2005. Abstract and Proceedings Program. CD-ROM Zvonko Benčić (ur.). Zagreb : Korema, 2005. 1-12 (pozvano predavanje, znanstveni rad)..

▼ Conference papers

Ban Drago, Žarko D., Mađerčić M., Čulig Z., Petrinić M., Tomičić B., Študir J., **Generator Technology for Wind Turbines, Trends in Application and Production in Croatia**", (invited paper), 5th MAKO CIGRE Conference, October 7-9, Ohrid, Macedonia

Bjažić, Toni; Kolonić, Fetah; Crnošija, Petar: **Experimental Identification of Natural Gas Cooling Process,** IECON2006, The 32nd Annual Conference of the IEEE Industrial Electronics Society, 2006. 1-6.

Čihak Tihomir; Jakopović Željko: **Educational IGBT Power Switch Module,** CD Proceedings of MIPRO 2007. Zagreb : MIPRO, 2007. 1-6.

Ćosić Krešimir, Slamić Miroslav, Popović Siniša, Kukolja Davor; Fuštin Jakov: **Optimal VR Stimulation in Functional Assessment of Whiplash Injuries,** *Proc. of the 29th International Convention MIPRO 2006: Computers in Technical Systems*, May 22-26, 2006, Opatija, Croatia, pp. 88-93.

Crnogorac, Mislav; Kolonić, Fetah; Poljugan, Alen: **Identification of the Planar Gantry Crane System Using Artificial Neural Networks**, Proceedings of the 3th Joint Slovak-Croatian Conference on Electrical Drives and Power Electronics. 2007. 1-7.

Crnošija, Petar; Bjažić, Toni; Kolonić, Fetah: **Determination of Dynamic Model of Natural Gas Cooler in CPS Molve III Using Computer**, Proceedings of the 29th International Convention MIPRO 2006. CTS&CIS - Computers in Technical Systems, Intelligent Systems Budin, Leo ; Ribarić, Slobodan (ur.). Rijeka : MIPRO, 2006. 21-26.

Crnošija, Petar; Bjažić, Toni; Kolonić, Fetah: **Identification of Natural Gas Cooling Process Using Manual Mode of Controller Operation**, MIPRO 2007 : 30th Jubilee International Convention : Computers in Technical Systems : Intelligent Systems : proceedings = 30. Jubilarni međunarodni skup : Računala u tehničkim sustavima : Inteligentni sustavi : zbornik radova. Vol. III Budin, Leo ; Ribarić, Slobodan (ur.). Rijeka : MIPRO, 2007. 40-45.

Gavranić I., Ban Dragi, Žarko Damir: **Electrical Drives for Explosive Atmospheres - Motor Selection and Risk Assessment**, Proceedings of

the International Conference on Electrical Drives and Power Electronics (EDPE 2007), (CD-ROM), The High Tatras, Slovakia, 24-26 September 2007.

Jovanović Tanja, Popović Siniša, Kozarić-Kovačić Dragica: **Psychophysiological Responses to Trauma-Related Stimuli in PTSD: Potential for Scenario Adaptation in VR Exposure Therapy,** *Novel Approaches to the Diagnosis and Treatment of Posttraumatic Stress Disorder*, Roy, Michael J. (ed.), Amsterdam: IOS Press, 2006. 87-98, ISBN 1-58603-590-8.

Kolonić, Fetah; Poljugan, Alen: **Experimental Control Design by TP Model Transformation**, Proceedings of the IEEE 3th International Conference on Mechatronics. Budapest, Hungary, 2006. 666-671.

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International links

ABB – Industrial Systems, Vasteras, Sweden

Budapest University of Technology and Economics, Hungary

EPE–PEMC Council-Secretariat in Budapest, Hungary

Fakulta elektrotechniky a informatiky Slovenskey Technickej Univerzity v Bratislave, Bratislava, Slovakia

SIMEC GmbH&Co. KG, Chemnitz, Germany

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

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University of Sarajevo, Faculty of Electrical Engineering, Sarajevo, Republic of Bosnia and Herzegovina

University of Wisconsin, Madison, USA

University of Leoben, Austria

Doctor of science degree

Author: MARIJA MIROŠEVIĆ
Title: "Influence of cross-saturation on dynamics of synchronous generator in autonomous operation"
Date: 22 December 2005
Mentor: Zlatko Maljković

Author: MATO MIŠKOVIĆ
Title: "Extending Synchronous Generator Operation Region Using neural Network Based Adaptive Control"
Date: 27 February 2007
Mentor: Gorislav Erceg

Master of science degree

Author: NEVEN BULIĆ
Title: "Neural network based excitation control of synchronous generator"
Date: 21 November 2005
Mentor: Gorislav Erceg

Author: SINIŠA POPOVIĆ
Title: "Adaptive Control of Complex Scenarios in Virtual Enviroments"
Date: 13 July 2006
Mentor: Miroslav Slamić

Author: ŽELJKO ZEBIĆ
Title: "Electromechanical Oscillation of Bulb Type Hydropower units "
Date: 10 October 2006
Mentor: Zlatko Maljković

5.6. Department of Power Systems

Faculty and staff

▼ Professors

Danilo Feretić - professor emeritus

Nikola Čavlina - nuclear power plant safety and control

Zdravko Hebel - transmission networks, power system analysis

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

Vladimir Mikuličić - energy conversion, electrical power system reliability

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

Ivo Uglešić - high voltage engineering

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▼ Associate professors

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

Ante Marušić - power system protection and local control

Ivica Pavić - transmission networks, power system analysis and control

DEPARTMENT OF POWER SYSTEMS

5.6.

1 Davor Škrlec, 2 Tomislav Tomiša, 3 Sejid Tešnjak, 4 Ivo Uglešić, 5 Nikola Čavlina, 6 Slavko Krajcar, 7 Danilo Feretić, 8 Nenad Debrecin, 9 Ante Marušić, 10 Zdravko Hebel, 11 Vladimir Mikuličić, 12 Zdenko Šimić, 13 Tomislav Fancev, 14 Neda Šimara, 15 Ankica Turkalj, 16 Davor Grgić, 17 Igor Vuković, 18 Ivan Rajšl, 19 Luka Lugarić, 20 Vesna Benčik, 21 Vesna Bukarica, 22 Ivica Berislavić, 23 Igor Kuzle, 24 Branka Marjanović, 25 Domagoj Peharda, 26 Nenad Mijatović, 27 Srđan Špalj, 28 Davor Klarin, 29 Robert Pašičko, 30 Hrvoje Pandžić, 31 Davor Rašeta, 32 Božidar Filipović-Grčić, 33 Milivoj Mandić, 34 Viktor Milardić, 35 Radoslav Zelić, 36 Srđan Skok, 37 Tomislav Bajs, 38 Ivica Pavić

Davor Škrlec - electrical distribution systems, geographical information systems

Tomislav Tomiša - power system automation and control

▼ Assistant professors

Davor Grgić - nuclear power plants, reactor safety

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

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

Zdenko Šimić – renewable energy sources, programming

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Radoslav Zelić
Zlatko Zmijarević

▼ Administrative staff

Branka Marjanović
Jasna Hemen
Neda Šimara
Ankica Turkalj

▼ Lab support

Ivica Berislavić
Klarin Davor

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.

▼ Core undergraduate courses

- Electric Facilities
- Electric Power Distribution Systems
- Electric Power Engineering
- Electric Power Networks
- Electric Power Plants
- Electric Power Transmission
- Energy and Environment
- Energy Processes
- Heat Transfer
- High Voltage Engineering
- Introduction to Nuclear Engineering
- Nuclear Power Plant Safety
- Nuclear Power Plants
- Numerical Methods in Electric Power System Analysis
- Power System Automatic Control
- Power System Control
- Power System Protection and Local Control
- Electrical Machines and Transformers
- Fundamentals of Power Electronics

▼ Elective courses

- Electricity Markets
- Electric Facilities Automation
- Electric Power Facilities Protection
- Electric Power System Dynamics
- Electric Power System Reliability
- Electric Power Systems Planning on Open Markets
- Electrical Lighting
- Energy Management
- Energy Resources
- Geographic Information Systems
- MV and LV Networks
- Nuclear Power Plant Control
- Power System Economics
- Power Systems Maintenance
- Selected Chapters of High Voltage Engineering
- Switching and Protection Equipment in Electric Power Facilities
- Transmission Networks Planning and Evolution
- Transmission System Control
- Uninterruptible Power Supplies
- Transients and Electromagnetic Compatibility in Electric Power System

▼ Postgraduate courses

- Disturbance Inhibition and Protection of Synchronous Machines

- Electric Facilities
- Geoinformation Systems
- Electrical Power Facilities Engineering
- Nuclear Power Plants Concepts
- Overhead Lines and Power Cables
- Optimization in Electric Power Networks
- Construction Planning of Electrical Power Production Units in Uncertainty Conditions
- Distribution Networks Planning
- Power Systems Operations
- Dynamics of Power Plants Operation
- Reliability Modeling in Electric Power System Subsystems
- Overvoltages in Power System
- Risk Assessment and Management
- Electrical Power Network Measurements
- Control Techniques in Electrical Engineering
- Power System Protection
- Nuclear Power Plant Operational Safety
- Environmental Impact of Electric Power Systems
- Lines and Power Supply of Electric Traction
- High-Voltage Networks Analysis
- Risk Analyzing
- Quality of Power Supply
- Modeling Relations on Electricity Markets
- Relay Protection
- Transformers
- Diagnostics in Power System Maintenance

- Advanced Nuclear Reactors in Sustainable Development
- Electrical Power Network Calculation
- Stochastic Assessment of Technological Risk

Research and development

Power Systems Engineering: The research aim is to advance both fundamental knowledge and the applications of electrical power engineering across a broad front by working on fundamental scientific project, in partnership with industry, transnational institutions, electric utilities and other university groups. The research work is generally concerned with increasing the availability and the reliability of a power system with an emphasis on the adjustment to an 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 program 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 the process of planning, development, exploitation and control of power systems; investigation on applications for coordinated control of power system devices and exploring the 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, restructuring of utilities, revitalization of facilities, new legislation and adoption of new standards.

Power Technologies: General objective of the research is to develop databases and methodologies for reliable assessment of operational safety of nuclear power plants 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 energy system. Research work included 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 generating; studies for rational use of energy and energy savings, assuming a centralized structure of the electricity market. Research work regarding renewable energy sources and its role in Croatian power sector, and electricity production considering cap on CO_2 emissions. Recent research covers development of new models for power system generation optimization and planning under uncertainties on open electricity market. The goal of that research is to create analytical and software tools which will enable a smooth transition to liberalized electricity market in Croatia, and ensure healthy and efficient power system operation, in compliance with environmental requirements with the best support mechanisms for renewable energy sources. In the nuclear energy field the specific analyses and calculations of transients and consequences of potential accidents in NPP Krško have recently been updated with some 3D models and extended to power plant severe accidents.

▼ Projects

An Expert Support in Synchronous Generators Excitation System Maintenance (HEP, Project Leader: Sejid Tešnjak)

Analysis and Determination of Baselines for Green Energy Marketing Campaign in Croatian Power Utility, (HEP, Project Leader: Nenad Debrecin)

Analysis Of Thermal And Mechanical Properties Of NPP Krsko Core (URSJV, Project leader: Davor Grgic)

Analysis of Severe Accident Consequences to Decrease or Eliminate Emergency Planing Zone for IRIS Reactor, (HEP, Project leader: Nenad Debrecin)

Analyze of TSS Zaprešić Impact on Transmission and Distribution Network (HŽ, Project Leader: Ivo Uglešić)

Analyze and Choice of TSS Connection on 110 kV Transmission Network (HŽ, Project Leader: Ivo Uglešić)

Automatic Secondary Voltage and Reactive Power Regulation in Croatian Power System (HEP, Project Leader: Sejid Tešnjak)

Barriers in Regional Cooperation and Coordination in the Electricity Sector in Central and Eastern Europe Central Eastern European Energy Market Project (C3EM), (Corvinus University Budapest, REKK. Project Leader: Slavko Krajcar)

Calculation of Electric Power Supply on Traction Podsused Tvornica - Samobor - Bregana (HŽ, Project Leader: Ivo Uglešić)

Calculation of Electric Power Supply on Main Traction M301 – D.G. – Beli Manastir – Osijek I i M302 – Osijek – Đakovo – Strizivojna - Vrpolje (HŽ, Project Leader: Ivo Uglešić)

Calculation of Electric Power Supply on Tractions Oštarije - Knin - Split, Knin - Zadar i Perkovići - Šibenik (HŽ, Project Leader: Ivo Uglešić)

Calculation of 400(800) kV Tesla Coil (Tehnika, Project Leader: Viktor Milardić)

Connecting GPP Velika Ciglena to the power grid (Elektra Bjelovar, Project Leader: Igor Kuzle)

Connecting wind plants of up to 20 MW power to the grid on locations near Zadar and Split. (HEP, Project Leader: Davor Škrlec)

Croatian electricity market analysis by simulator use. (HEP, Project Leader: Slavko Krajcar)

Development of the 110 kV and 20 kV grid on the location Križ in 2006-2026. and Transition from 110/35/10(20) kV to 110/20 kV Program (HEP, Project Leader: Sejid Tešnjak)

Development of distribution network in DP Elektrojug in the area between Slano and Prevlaka. (HEP, Project Leader: Slavko Krajcar)

Earthing and Lighting Conductor Characteristics Inspection in RHPP Velebit, HPP Đale and HPPs on the Krka River (HEP, Project Leader: Igor Kuzle)

Earthing System Primary Analysis in HPP Dubrava (HEP, Project Leader: Sejid Tešnjak)

Earthing System Primary Analysis in HPP Čakovec (HEP, Project Leader: Sejid Tešnjak)

Earthing System Primary Inspections in HPP Varaždin, HPP Čakovec and HPP Dubrava (HEP, Project Leader: Igor Kuzle)

Electric Field and Magnetic Induction Calculation of MTC of SS 110/35-35/10(20) kV Krasica (Ravel, Project Leader: Ivo Uglešić)

Electric Field and Magnetic Induction Calculation of SS 110/35 kV Buje (Ravel, Project Leader: Ivo Uglešić)

Electric Field and Magnetic Induction Calculation of SS 110/10(20) kV Turnić (Ravel, Project Leader: Ivo Uglešić)

Electric Field and Magnetic Induction Calculation of TSS 110/10(20) kV Zaprešić (Končar, Project Leader: Ivo Uglešić)

Electrical Measurements on Earthing System of the TS 35/10 kV Donji Lapac (HEP, Project Leader: Igor Kuzle)

Electrical Measurements on Earthing System of the TS 35/10 kV Srb (HEP, Project Leader: Igor Kuzle)

Electrical Measurements on Earthing System of the TS 35/10 kV Licko Lesce (HEP, Project Leader: Igor Kuzle)

Electromagnetic Compatibility of Secondary Circuit in SS 110/35-35/10(20) kV Krasica (Ravel, Project Leader: Ivo Uglešić)

Electromagnetic Compatibility of Secondary Circuit in SS 110/20(10) kV Turnić (Ravel, Project Leader: Ivo Uglešić)

Electromagnetic Compatibility of Secondary Circuit in SS 110/35 kV Buje (Ravel, Project Leader: Ivo Uglešić)

Electromagnetic Compatibility of Secondary Circuit in SS 110/20 kV Karlobag (Ravel, Project Leader: Ivo Uglešić)

EMC Problems in the Design of New HV Test Laboratory (EXOR, Project Leader: Ivo Uglešić)

Energy Security and Climate Change, (MZOS, Project Leader: Nenad Debrecin)

Energy Audits in Croatian Industry, (FZOEU, Project Leader: Nenad Debrecin)

Engineering Support Activities - Safety Analyses, (NEK, Project leader: Nenad Debrecin)

Evaluation of Accident Sequences in IRIS Relevant for Revising the Need for Relocation and Evacuation Measures Unique to NPPs for Innovative SMRs, (IAEA, Project leader: Nikola Čavilna)

Feasibility study for energy efficiency programme in the communal company of the city of Zagreb, (Zagrebački holding d.o.o., Project Leader: Slavko Krajcar)

Feasibility Study for Energy Efficiency Project in the Public Lighting System in the town of Sisak, (UNDP, Project Leader: Nenad Debrecin)

Feasibility Study for Energy Efficiency Project in the buildings of Ministry of Economy, labour and Entrepreneurship, (HEP ESCO, Project Leader: Nenad Debrecin)

Foundations with Guidelines for Creation of Set of Rules about Maintenance of Thermal Power Plants (HEP, Project Leader: Sejid Tešnjak)

Foundations for the Development of the New Book of Regulations on Technical Normatives for the Power Facilities with Rated Voltage Above 1000 V (HEP, Project Leader: Sejid Tešnjak)

Fullfilment of Environmental Requirements in High Voltage System (MZOS, Project Leader: Ivo Uglešić)

Influence of automatic reclosing System on HPP Varazdin synchronous generators stablility (HEP, Project Leader: Igor Kuzle)

Inspection and Analyze of SS Earthing on Highway Krapina - Macelj (Dalekovod, Project Leader: Ivo Uglešić)

Inspection of Earthing, Touch Voltage and Metal Points Connection in SS 35(10(20) kV Knin (HELB, Project Leader: Ivo Uglešić)

Inspection of Earthing, Touch Voltage and Metal Points Connection in TSS 35(10(20) kV Koprivnica (HŽ, Project Leader: Ivo Uglešić)

Inspection and Analyze of SS Earthing on Highway Dugopolje - Bisko (Dalekovod, Project Leader: Ivo Uglešić)

Inspection and Analyze of Earthing of Poles with Disconnector on Distribution Line 10(20) kV Prančevići - PUO Kotlenice (Dalekovod, Project Leader: Ivo Uglešić)

Inspection and Analyze of Earthing of Poles with Disconnector on Distribution Line 10(20) kV Klis - PUO Kotlenice (Dalekovod, Project Leader: Ivo Uglešić)

Inspection and Analyze of Earthing of Poles with Disconnector on DL 10(20) kV Zaradičje - Putišići and DL 10(20) kV SS Srijane 1 (Radovići) - SS Trnbusi 1 (Škola) (Dalekovod, Project Leader: Ivo Uglešić)

Inspection and Analyze of Earthing of Poles with Disconnector on DL 10(20) kV SS Kraljevac - SS Kreševo polje 1, DL 10(20) kV SS Omial - SS Kreševo polje 1 i DL 10(20) kV SS Trnbusi 1 (Škola) - SS Omial (Dalekovod, Project Leader: Ivo Uglešić)

Inspection and Analyze of Earthing of SS 10(20)/0.4 kV SS Tunel Crna Brda and SS 10(20)/0.4 kV Tunel Stražina (Dalekovod, Project Leader: Ivo Uglešić)

Inspection of Earthing, Touch Voltage and Metal Points Connection in HPP Vinodol (HELB, Project Leader: Ivo Uglešić)

Inspection of Earthing and Touch Voltage in PHPP Fužine and PHPP Lepenica (HELB, Project Leader: Ivo Uglešić)

Inspection of Earthing and Touch Voltage in HPP Zeleni Vir (HELB, Project Leader: Ivo Uglešić)

Inspection of Power Transformer in SS Blato (Zagrebtrans, Project Leader: Ivo Uglešić)

Instruction for Tesla Coil (Tehnika, Project Leader: Viktor Milardić)

Investment grade study: Implementation of eenrgy efficiency measure in public lighting system in town of Rovinj, (HEP ESCO, Project Leader: Nenad Debrecin)

IRIS Prelicensing Safety Analyses, (IRIS, Project leader: Nikola Čavlina)

Maintenance and the Technical Monitoring of the Transmission Grid in Open Market Environment (HEP, Project Leader: Sejid Tešnjak)

Master in Efficiency Programme. (IFE Norway – FER. Fakultet mašinstva Univerziteta u Beogradu, Project Leader: Nenad Debrecin)

Methodology for determining land-use fee in electricity facilities construction. (HEP, Project Leader: Slavko Krajcar)

Norwegian-Croatian Project on Education in Energy Efficiency and Environmental Protection: Post Graduate Studies in Energy Efficiency and Environment at the University of Zagreb, (Norwegian Centre for International Cooperation in Higher Education (SIU) - Cooperation Programme with South-east Europe (CPSEE), Institute for Energy Technology, Norway, Project leaders: Thor Henning Gulbrandsen and Nenad Debrecin)

Phase to Earth Short Circuit Analysis in the Distributive Location Gospić (Elektrolika, Project Leader: Igor Kuzle)

Ph.D programme: Sustainable Energy and Environment in Western Balkan, joint project of the Norwegian University of Science and Technology (NTNU) in Trondheim, University of Belgrade, Serbia, University of East Sarajevo, Bosnia and Herzegovina and University of Zagreb (Project Leader: Slavko Krajcar)

Plan of Tariff System for Natural Gas Supply, with Exception of Privileged Buyers, Without Tariff Rates and Tariff System for Natural Gas Distribution Without Tariff Rates and Study of Applicability Aspects of Tariff System for Natural Gas Supply, Without Tariff Rates and Tariff System for Natural Gas Distribution Without Tariff Rates (HERA, Project Leader: Sejid Tešnjak)

Possibility of Third unit Connection in TPP Plomin to Electrical Power System (HEP, Project Leader: Sejid Tešnjak)

Power System Planning and Control in the Market Environment, (MZOS, Project Leader: Sejid Tešnjak)

Reconstruction of the Control Part of the MUP Vukovarska-Savska Zagreb Power Facility (MUP, Project Leader: Tomislav Tomiša)

Removal of Barriers for Energy Efficiency in Croatia - Market evaluation and consumer awareness analysis related to compact fluorescent lamps (CFL) and other energy efficient products and materials in Croatia, (UNDP, Project Leader: Slavko Krajcar)

Surge Arresters Selection for 220 kV and 35 kV Switchgear of Hydroelectric Power Plant Čapljina (IE, Project Leader: Ivo Uglešić)

Surge Protection of SS 220/110/30/10 kV Bilice (HEP, Project Leader: Ivo Uglešić)

Switching Overvoltage on Transmission Line 2x400 kV Beričevo-Krško (IMV, Project Leader: Ivo Uglešić)

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International links

AA Sitard, Netherlands

ABB Transmission & Distribution University, Ludvika, Sweden

Argonne National Laboratory, Chicago, USA

Centre for Renewable Energy Sources, Pikermi, Greece

Comillas University, Madrid, Spain

DMS Group LTD, Novi Sad, Serbia

Eidgenössische Technische Hochschule, Zürich, Switzerland

Electric Utility Portugal, Rede Electra Nacional S.A. Porto, Portugal

Faculty of Electrical Engineering, Belgrade, Serbia

Geselscahft für Reaktor Sicherheit Garching, Garching, Germany

Institut für Hochspannungstechnik, TU Graz, Austria

Institute for Energy Technology (IFE), Energy System Department, Kjeller, Norway

Intrade Energy, Sarajevo, Bosnia and Herzegovina

International Atomic Energy Agency (IAEA), Vienna, Austria

Joanneum Research, Graz, Austria

Jožef Stefan Institute, Ljubljana, Slovenia

Kema Consulting, Bonn, Germany

Kungliga Tekniska Hoegskolan - Institutionene för Elkraftteknik, Stockholm, Sweden

National Technical University of Athens, Athens, Greece

Norwegian Research Council, Norwegian Council for Higher Education, Centre for International University Cooperation, Oslo, Norway

Norwegian University of Science and Technology (NTNU), Trondheim, Norway

NOVEM, The Netherlands Agency for Energy and Environment, Netherlands

Nuclear Regulatory Commission, Washington, USA

Nuclear Power Plant Krško, Krško, Slovenia

Powel Group, Norway

Ruhr - Universtät Bochum, Fakultät für Maschinenbau - Lehrstuhl fuer Steuerungstechnik; Institut fuer Energietechnik - Lehrstuhl für Nukleare und Neue

Energiesysteme, Germany

Ss. Cyril and Methodius University in Skopje, Skopje, Macedonia

Technical University of Sofia, Sofia, Bulgaria

University of Ljubljana, Ljubljana, Slovenia

University of Maribor, Maribor, Slovenia

University "Politehnica" of Bucharest, Bucharest, Bulgaria

University of Tuzla, Tuzla, Bosnia and Herzegovina

Doctor of science degree

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Title: Disturbance Recognition in Operation of Synchronous Generator Using Numerical Algorithms
Date: 27.10.2006
Mentor: Ante Marušić

Author: FADIL NADAREVIĆ
Title: Interactions between Power System and Power Plants
Date: 07.07.2006
Mentor: Sejid Tešnjak

Author: NEDŽMIJA DEMIROVIĆ
Title: Multiperiod Optimal Power Flow
Date: 16.02.2007
Mentor: Sejid Tešnjak

Author: MARKO DELIMAR
Title: Static Security Assessment of Power Networks
Date: 27.10.2005
Mentor: Zdravko Hebel

Author: ZORAN STANIĆ
Title: Sustainable Development of Power System in Liberalized Electricity Market
Date: 07.05.2007
Mentor: Danilo Feretić

Author: VIKTOR MILARDIĆ
Title: Method of Surge Protective Devices Selection in Low-Voltage Systems
Date: 25.11.2005
Mentor: Ivo Uglešić

Author: HELENA BOŽIĆ
Title: Upgrading of Long Term Energy System Development Planning
Date: 22.12.2005
Mentor: Vladimir Mikuličić

Author: SULEJMAN MEŠALIĆ
Title: Impact of Open Electricity Market on Maintenance of Thermal Power Plant
Date: 21.12.2005
Mentor: Sejid Tešnjak

Master of science degree

Author: MARKO AUNEDI
Title: Optimal Unit Commitment of Distributed Generation in the Open Electricity Market
Date: 30.10.2006
Mentor: Davor Škrlec

Author: VESNA BUKARICA
Title: Key Elements for Energy Management Programme Development and Implementation
Date: 21.01.2006
Mentor: Željko Tomšić

Author: ALEN KATIĆ
Title: The Impact of Distributed Generation on the Planning of Electrical Distribution Networks
Date: 16.03.2006
Mentor: Davor Škrlec

Author: JOSIP POPOVIĆ
Title: Analysis of Protection Selectivity in Low Voltage Distribution Network
Date: 21.12.2006
Mentor: Ante Marušić

Author: KREŠIMIR ŠKELJO
Title: Life-Age Evaluation for Power Cables with Extruded Insulation
Date: 07.07.2006
Mentor: Ivica Pavić

Author: SANJIN JUREŠIĆ
Title: Setting of Interconnection Protection System of Large Industrial Network
Date: 15.12.2005
Mentor: Ante Marušić

Author: ZLATAN KOS
Title: Analysis of Preventive Diagnostic Test Results Considering Power Transformers Maintenance
Date: 18.10.2005.
Mentor: Ante Marušić

Author: IVONA ŠTRITOF
Title: Preconditions for Implementation of Model of Incentive Regulation in Transmission of Electricity
Date: 17.11.2005.
Mentor: Slavko Krajcar

Author: MARIO KECO
Title: Applicability Analysis of Relap5/Gothic Coupled Code For Calculation of Main Steam Line Break in Nuclear Power Plant
Date: 29.11.2005.
Mentor: Nenad Debrecin

Author: KRISTIJAN FRLAN
Title: Analysis of Influence of Intermediate In-Feeds and Fault Resistance upon Distance Protection Functionality
Date: 20.12.2006.
Mentor: Ante Marušić

Author: MILIVOJ MANDIĆ
Title: Calculation of Power Supply for 25 Kv, 50 Hz Electric Railway System
Date: 25.05.2006.
Mentor: Ivo Uglešić

Author: MILAN FILIPOVIĆ
Title: Protection Relay Co-Ordination in Distribution Network Assurance Criteria
Date: 31.05.2006.
Mentor: Ante Marušić

Author: DUBRAVKA ŠKRLEC
Title: Quota Obligation System as a Renewable Electricity Production Support Scheme
Date: 19.03.2007.
Mentor: Slavko Krajcar

Author: FILIP MUŽINIĆ
Title: Risk Analysis and Modeling For Wind Power Plant Projects
Date: 21.12.2006.
Mentor: Davor Škrlec

Author: MIHOVIL IVAS
Title: Fault Localisation In Electrical Distribution Networks
Date: 05.07.2007.
Mentor: Ante Marušić

Author: PETAR SPRČIĆ
Title: Managing Price Risk In Energy Companies
Date: 10.07.2007.
Mentor: Slavko Krajcar

Author: NIKŠA VRKIĆ
Title: Condition Monitoring and Diagnostics of Hydro-Electric Generating Units
Date: 06.07.2007.
Mentor: Ante Marušić

5.7. Department of Telecommunications

Faculty and staff

▼ Professors

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

Branko Mikac – reliability, transmission systems

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Vjekoslav Sinković – information theory, information networks

Mladen Tkalić – automata theory, logical design

1 Dragan Jevtić, 2 Miljenko Mikuc, 3 Branko Mikac, 4 Vjekoslav Sinković, 5 Alen Bažant, 6 Ignac Lovrek, 7 Marijan Kunštić, 8 Marko Zec, 9 Mario Kušek, 10 Maja Matijašević, 11 Gordan Ježić, 12 Igor Ljubi, 13 Kristina Stanković, 14 Tomislav Pejša, 15 Ana Kukec, 16 Ana Petrić, 17 Jasna Slavinić, 18 Ognjen Dobrijević, 19 Marin Vuković, 20 Tomaž Beriša, 21 Josip Gracin, 22 Krešimir Jurasović, 23 Mirko Sužnjević, 24 Aleksandra Čereković, 25 Matko Ugrin, 26 Vedran Mikac, 27 Maroje Puh, 28 Krešimir Pripužić, 29 Vedran Podobnik, 30 Zrinka Puljiz, 31 Hrvoje Belani, 32 Tomislav Grgić

▼ Associate professors

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

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

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

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

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

▼ Assistant professors

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

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

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

▼ Assistants

Josip Gracin
Željko Ilić
Robert Inkret
Ivana Podnar
Matko Ugrin

▼ Junior Researchers

Marina Bagić
Aleksandra Čereković
Ognjen Dobrijević
Gordan Gledec
Tomislav Grgić
Marije Ljolje
Tomislav Marenić
Domagoj Mikac
Matija Mikac
Ana Petrić
Krešimir Pripužić
Vedran Podobnik
Zrinka Puljiz
Nina Skorin-Kapov
Marko Topolnik
Danko Vilendečić
Zdenko Vrdoljak
Goranka Zorić

▼ Researchers

Hrvoje Belani
Krešimir Jurasović
Ana Kukec
Igor Ljubi
Viktor Matić
Vedran Mikac
Maroje Puh
Mirko Sužnjević
Marin Vuković
Marko Zec

▼ Administrative staff

Jasna Slavinić

▼ Lab 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.

▼ Core undergraduate courses

- Communication networks
- Communication protocols
- Digital automata
- Digital logic
- Information networks
- Information theory
- Information, logic and languages
- Logical design and switching algebra
- Management in engineering
- Multimedia communications
- Reliability of telecommunication systems
- Switching systems

- Telecommunication networks
- Telematic services
- Teletraffic theory
- Transmission systems

▼ Elective courses

- Algorithms and optimisation methods
- Concurrent programming
- Computer telephony integration
- Data transmission
- Diagnostics and reliability
- Formal methods in synthesis of telecommunication systems
- Fundamentals of network management
- Fundamentals of virtual environments
- Introduction to virtual environments
- Learning automata
- Local and access networks
- Mobile software agents
- Mobility in networks
- Organisation of telecommunication network
- Photonic communication technology
- Project management
- Telecommunication software development
- Virtual environments

▼ Postgraduate courses

- Analysis of information processes
- Broadband networks
- Communications in virtual environments
- Communication protocols - selected topics
- Concurrent systems
- Distributed information systems
- Formalisms in telecommunications
- Information and communication
- Intelligent control and automata games
- Methods and models in automata theory
- Network availability
- Network management
- Open network architectures
- Optical transmission network
- Optimisation methods for telecommunications
- Petri nets and distributed systems
- Software processes
- Telecommunication system design

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

e-Photon/ONe, Optical Networks: Towards Bandwidth Manageability and Cost Efficiency (EU Sixth Framework Programme, Network of Excellence, WP12 leader: Branko Mikac, 2004-2006)

e-Photon/ONe+, Optical Networks: Towards Bandwidth Manageability and Cost Efficiency (EU Sixth Framework Programme, Network of Excellence, WP-T leader: Branko Mikac, 2006-2008)

HUMAINE: Human-Machine Interaction Network on Emotion (EU Sixth Framework Programme, Network of Excellence, FER co-ordinator: Igor S. Pandžić, 2003-2007)

PEACH: Presence research in action (EU Sixth Framework Programme, Coordination Action, FER co-ordinator: Igor S. Pandžić, 2006-2009)

SIMILAR: The European research taskforce creating human-machine interfaces SIMILAR to human-human communication (EU Sixth Framework Programme, Network of Excellence, FER co-ordinator: Igor S. Pandžić, 2003-2007)

Cross-Modal Analysis of Verbal and Non-verbal Communication (COST 2102, Co-operation in Science and Technology, European Commission, Management committee member and national co-ordinator: Igor S. Pandžić, 2006-2010)

Towards Digital Optical Network (COST 291, Co-operation in Science and Technology, European Commission, Management committee member and national co-ordinator: Branko Mikac, 2003-2008)

Wi-QoST: Traffic and QoS Management in Wireless Multimedia Networks (Project COST 290 – Cooperation in Science and Technology, European Commission, FER delegate: Maja Matijašević, 2007–)

Embodied conversational agent for services in networked and mobile systems (Project 0036060, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Igor S. Pandžić, 2004-2006)

Mobility of users and services in new generation networks (Project 0036030, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Ignac Lovrek, 2002-2006)

New telecommunication networks architectures (Project 0036009, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Mladen Kos, 2002-2006)

Telecommunication infrastructure for knowledge networking (Project 0036004, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Marijan Kunštić, 2002-2006)

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–)

Agent-based Service Telecom Operations Management (Ericsson Nikola Tesla, R&D Centre, Principal investigator: Gordan Ježić, 2005-2006)

Agent-based Service & Telecom Operations Management (Ericsson Nikola Tesla, R&D Centre, Principal investigator: Gordan Ježić, 2006-2007)

Billing system in telecommunication networks (Siemens d.d., Principal investigator: Alen Bažant, 2006)

Business Intelligence and Electronic Commerce (Agrokor, Project coordinators: Mirko Laušić, Marina Šimunić, Ignac Lovrek, Zoran Skočir, 2004–)

Development of telecommunication network planning tools (Ericsson Nikola Tesla d.d., Principal investigator: Alen Bažant, 2005)

Development of tools and methods for design and optimization of telecommunication networks (Ericsson Nikola Tesla d.d., Principal investigator: Alen Bažant, 2006-2007)

Information intensive services (Research Project, KATE-KOM and Faculty of Electrical Engineering and Computing, Department of Telecommunications, Zagreb, Principal investigator: Željka Car, 2005-2007)

Networked Virtual Reality in IMS (Ericsson Nikola Tesla, R&D Centre, Principal investigator: Maja Matijašević, 2005-2006)

Parameters for broadband network deployment and service provisioning in suburban and rural areas based on FLASH-OFDM wireless access (Odašiljači i veze, Principal investigator: Maja Matijašević, 2006)

Performances of broadband services transport over access network (HT – Hrvatske telekomunikacije d.d., Principal investigator: Alen Bažant, 2006–)

Planning of asymmetrical digital subscriber lines (ELKA kabeli d.o.o., Principal investigator: prof. dr.sc. Alen Bažant, 2005-2006)

Session-level Signaling for Advanced Multimedia (Ericsson Nikola Tesla, R&D Centre, Principal investigator: Maja Matijašević, 2006-2007)

SIP Solutions (Siemens d.d., Principal investigator: Marko Topolnik, 2005-2006)

SIP Solutions (Siemens d.d., Principal investigator: Josip Gracin, 2006-2007)

Strategy for development of broadband access in the Republic of Croatia (Ministry of Sea, Tourism, Transport and Development, Principal investigator: Alen Bažant, 2005)

Telecommunications – technology and market (HT – Hrvatske telekomunikacije d.d., Seminar coordinators: Vlasta Hudek, Gordan Gledec, 2006–)

WWW.HR - Croatian Home Page (CARnet – Croatian Academic and Research Network, Project leader: Gordan Gledec)

Publications

Books

Bažant, Alen; Car, Željka; Gledec, Gordan; Jevtić, Dragan; Ježić, Gordan; Kunštić, Marijan; Lovrek, Ignac; Matijašević, Maja; Mikac, Branko; Skočir, Zoran. *Telekomunikacije – tehnologija i tržište*, Zagreb: Element, 2007. (in Croatian)

Pandžić, Igor S.; Bažant, Alen; Ilić, Željko; Vrdoljak, Zdenko; Sinković, Vjekoslav. *Uvod u teoriju informacije i kodiranje*, Zagreb: Element, 2007. (in Croatian)

Edited proceedings

Mikac, Branko; Ljolje, Marije. *e-Photon/ONe+ Summer Scholl 2006: Optical Grid and Optical Network Resilience*, Mikac, Branko; Ljolje, Marije (Eds.). Zagreb: University of Zagreb, FER, 2006.

Car, Željka; Kušek Mario. *Proc. 9th International Conference on Telecommunications, ConTEL 2007*, Car, Željka; Kušek Mario (Eds.). Zagreb: University of Zagreb, FER, 2007.

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Bažant, Alen. *Širokopojasni pristup.* **Telekomunikacije - tehnologija i tržište**, Lovrek, Ignac; Gledec, Gordan (ed.), Zagreb: Element, 2007. 133-168 (in Croatian)

Gledec, Gordan; Matijašević, Maja. *Internet i IP mreža*. **Telekomunikacije - tehnologija i tržište**, Lovrek, Ignac; Gledec, Gordan (ed.), Zagreb: Element, 2007. 73-108 (in Croatian)

Ježić, Gordan; Matijašević, Maja. *Tržište pokretne mreže i usluga*. **Telekomunikacije - tehnologija i tržište**, Lovrek, Ignac; Gledec, Gordan (ed.), Zagreb: Element, 2007. 73-108 (in Croatian)

Ježić, Gordan; Matijašević, Maja. *Tržište pokretne mreže i usluga*. **Telekomunikacije - tehnologija i tržište**, Lovrek, Ignac; Gledec, Gordan (ed.), Zagreb: Element, 2007. 73-108 (in Croatian)

Lovrek, Ignac. *Telekomunikacijska tehnologija i specifičnosti telekomunikacijskog tržišta.* **Telekomunikacije - tehnologija i tržište**, Lovrek, Ignac; Gledec, Gordan (ed.), Zagreb: Element, 2007. 1-36 (in Croatian)

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Ilić, Željko; Bažant, Alen. **A Data Rate Maximization Algorithm for Multiuser OFDM Systems**. *Journal of Communications Software and Systems*, 2 (2005); 101-106.

Jevtić, Dragan; Kunštić, Marijan; Oužecki, Denis. **The Effect of Alteration in Service Environments with Distributed Intelligent Agents**. *Lecture notes in computer science*, 3 (2005); 16-22.

Kušek, Mario; Lovrek, Ignac; Sinković, Vjekoslav. **Agent team coordination in the mobile agent network**. *Lecture notes in computer science*. **3681** (2005), I; 240-246.

Lakić, Dražen; Pilja, Velibor; Jevtić, Dragan. **Programska implementacija pravnog segmenta poslovnog procesa**. *Elektro: stručni časopis za elektrotehniku*. 3 (2005); 40-44. (in Croatian)

Sabolić, Dubravko; Bažant, Alen; Malarić, Roman. **Signal Propagation Modeling in Power-Line Communication Networks**. *IEEE Transactions on Power Delivery*, 4 (2005); 2429-2437.

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Mošmondor, Miran; Komerički, Hrvoje; Pandžić, Igor. **3D Visualization on mobile devices**. *Telecommunication Systems.* 32 (2006), 2/3; 181-191.

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Podobnik, Vedran; Petrić, Ana; Ježić, Gordan. **The CrocodileAgent: Research for Efficient Agent-Based Cross-Enterprise Processes**. *Lecture Notes in Computer Science*. 4277 (2006); 752-762.

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Svoboda, Petra; Car, Željka; Krušlin, Cornelia. **Database Development Process Model within RUP Framework.** *WSEAS Transactions on Communications*, March 2006, 5 (2006), 3; 466-473.

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International links

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

Ecole Nationale Supérieure des Télécommunications (ENST), Paris, France

Ecole Polytechnique Fédérale de Lausanne (EPFL), Distributed Information Systems Laboratory, Lausanne, Switzerland

Graz University of Technology, Department of Communications and Wave Propagation, Graz, Austria

Graz University of Technology, Institute for Applied Information Processing and Communications, Graz, Austria

INRIA-Futurs, Institut National de Recherche en Informatique et en Automatique, France

International Computer Science Institute, Berkeley, California, USA

Kyoto University, Japan, Graduate School of Informatics, Dept. of Intelligence Science and Technology, Group of Applied Intelligence Information Processing

Mälardalen University, Västerås, Sweden

University of Brighton, Brighton, UK

University of Essex, Department of Electronic System Engineering, Colchester, UK

University of Ghent, Belgium

University of Ljubljana, Faculty of Computer and Information Science, Ljubljana, Slovenia

University of Ljubljana, Faculty of Electrical Engineering, Ljubljana, Slovenia

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

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

University of Oslo, Norway

University of South Australia, Adelaide, Australia

Vienna University of Technology, Information System Institute, Vienna, Austria

Vienna University of Technology, Institute of Communication Networks, Vienna, Austria

Virginia Tech, USA

Doctor of science degree

Author: SAŠA DEŠIĆ
Title: Load Balancing Management using Intelligent Mobile Agents
Date: 2 April 2004
Mentor: Ignac Lovrek

Author: IVANA PODNAR
Title: Service Architecture for Content Dissemination to Mobile Users
Date: 7 May 2004
Mentors: Ignac Lovrek and Mehdi Jazayeri, Technische Universität Wien, Austria

Author: ROBERT INKRET
Title: Availability modeling of multi-service all-optical transmission network
Date: 07 June 2004
Mentors: Branko Mikac and Michael J. O'Mahony, University of Essex, UK

Author: GORDAN GLEDEC
Title: Metrics for Web Site Usability Evaluation
Date: 9 July 2004
Mentor: Vjekoslav Sinković

Author: DUBRAVKO SABOLIĆ
Title: Analysis of Distribution Network as Broadband Medium
Date: 29 September 2004
Mentor: Alen Bažant

Author: ŽELJKO ILIĆ
Title: Algorithms for Information Channel Capacity Estimation in Multiuser Environment
Date: 10 December 2004
Mentor: Alen Bažant

Author: SAMRA MUJADŽIĆ
Title: Distance Learning System based on Hypermedia Model
Date: 22 December 2004
Mentor: Mladen Tkalić

Author: MARIO KUŠEK
Title: Coordination of Mobile Agents for Remote Software System Operations
Date: 14 January 2005
Mentor: Ignac Lovrek

Author: MARKO FERIŠAK
Title: Intelligent automata models in data mining processes for telecommunication services forecasting
Date: 25 February 2005
Mentor: Mladen Tkalić

Author: MARKO TOPOLNIK
Title: XML-based Framework for Telecommunications Software Development
Date: 3 June 2005
Mentor: Marijan Kunštić

Author: MARKO LACKOVIĆ
Title: Modelling and performance analysis of multi-service photonic network
Date: 7 November 2005
Mentor: Branko Mikac

Author: KRUNOSLAV TRŽEC
Title: Multi-agent system for service level agreement management in the electronic market for telecommunications services
Date: 7 November 2005
Mentor: Branko Mikac

Author: NINA SKORIN-KAPOV
Title: Heuristic algorithms for virtual topology design and routing and wavelength assignment in WDM networks
Date: 4 May 2006
Mentor: Mladen Kos

Author: VIKTOR MATIĆ
Title: Parallel Signaling Servers in Networks for Multimedia Sessions
Date: 20 December 2006
Mentor: Mladen Kos

Author: SUAD KASAPOVIĆ
Title: Performance of Mobile Network with Dynamic Resource Allocation in Access Network
Date: 28 September 2007
Mentor: Ignac Lovrek

Master of science degree

Author: DINKO DELIĆ
Title: Analyses of Quality of Service Mechanisms for Real-Time Applications in Information Networks
Date: 8 July 2005
Mentor: Mladen Tkalić

Author: MATIJA ŠERMAN
Title: Security Problems in Wireless Local Area Networks
Date: 30 September 2005
Mentor: Miljenko Mikuc

Author: ROBERT HORVAT
Title: Analyses of Intelligent Network Implementations for Mobile Number Portability
Date: 14 October 2005
Mentor: Mladen Kos

Author: Goranka Zorić
Title: Automatic lip synchronization by speech signal analysis
Date: 21 October 2005
Mentor: Igor S. Pandžić

Author: GORAN KOŠARIĆ
Title: Public transport network for broadband access
Date: 6 December 2005
Mentor: Mladen Tkalić

Author: HRVOJE KOMERIČKI
Title: Control of multimedia session parameters in UMTS network
Date: 20 December 2005
Mentor: Maja Matijašević

Author: ALISA DEVLIĆ
Title: Semantic agents for location-aware service provisioning in mobile network
Date: 20 December 2005
Mentor: Gordan Ježić

Author: DANKO VILENDEČIĆ
Title: Session management emulator for networked virtual reality services in UMTS
Date: 16 January 2006
Mentor: Maja Matijašević

Author: JASNA MULABEGOVIĆ
Title: Function Testing of Software Modules in Telecommunications Systems
Date: 7 February 2006
Mentor: Marijan Kunštić

Author: DAVOR GALIĆ
Title: Protocol Support to the VPN services
Date: 19 May 2006
Mentor: Marijan Kunštić

Author: ANTO IVIĆ
Title: Customer care and billing system in function of telecommunication services quality management
Date: 19 May 2006
Mentor: Mladen Kos

Author: DRAŽEN MOKROVIĆ
Title: Distribution of broadband services in public access network
Date: 30 May 2006
Mentor: Mladen Tkalić

Author: TONĆI IVANKOVIĆ
Title: Multimedia Multicast Communication in UMTS
Date: 2 June 2006
Mentor: Ignac Lovrek

Author: ALEN BULIĆ
Title: International Preference Call in Multiservice Network Implemented by BICC Protocol
Date: 10 July 2006
Mentor: Ignac Lovrek

Author: MIHAELA SMADILO
Title: Effectiveness assessment of using project management software in ICT projects
Date: 17 October 2006
Mentor: Željka Car

Author: NENAD DRAGUN
Title: Derivation of knowledge base from databases in telecommunication network management system
Date: 17 October 2006
Mentor: Marijan Kunštić

Author: TIHOMIR ALADROVIĆ
Title: Hierarhical Coding of Video Stream for Transmission in Lossy Channels
Date: 8 December 2006
Mentor: Mladen Kos

Author: DUŠAN BOGDANOVIĆ
Title: WCDMA Network Tuning Based on Drop Call Analysis
Date: 21 December 2006
Mentor: Miljenko Mikuc

Author: NIKOLA RENDULIĆ
Title: Modelling and analysis of software testing process compatible with quality assurance standard
Date: 26 January 2007
Mentor: Željka Car

Author: GORAN ĐAMBIĆ
Title: Analysis of protocols for wavelength-based multiple access in optical networks
Date: 16 Februrary 2007
Mentor: Alen Bažant

Author: IRENA JURDANA
Title: Modelling and availability analysis of optical fibre transmission network
Date: 6 March 2007
Mentor: Branko Mikac

Author: NIKOLA MUSA
Title: Analyses and Application of Distributed IP Traffic Forwarding Models in Broadband Local Area Networks
Date: 11 June 2007
Mentor: Mladen Kos

Author: PETRA SVOBODA
Title: Tailoring Software Development Methodology to Collaborative Database Design Model
Date: 9 July 2007
Mentor: Željka Car

Author: JURE NIŽIĆ
Title: Software Agent for enabling Interoperability in School Software Systems
Date: 5 October 2007
Mentor: Željka Car

Author: MATIJA MIĆIN
Title: Interoperability of Distributed Systems based on Publish-Subscribe Scheme
Date: 5 October 2007
Mentor: Ignac Lovrek

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

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

Founded in 1943

Head of the department:
Prof. **Neven Mijat**, PhD

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Neven Mijat - electrical network, system theory and signal processing

Vladimir Naglić – distinguished professor

Stanko Tonković - electronic instrumentation and measurements, biomedical engineering

Ante Šantić - professor emeritus

ZESOI zajednička fotografija za Progress Report 2007

1 Ratko Magjarević, 2 Branko Jeren, 3 Zoran Stare, 4 Vladimir Naglić, 5 Neven Mijat, 6 Hrvoje Babić, 7 Stanko Tonković, 8 Mario Cifrek, 9 Nevenka Šukurma, 10 Jasmina Zorko, 11 Igor Lacković, 12 Davor Petrinović, 13 Dražen Jurišić, 14 Sven Lončarić, 15 Damir Seršić, 16 Mladen Vučić, 17 Vedran Bilas, 18 Darko Vasić, 19 Aleksandra Cesarik, 20 Nikolina Volf, 21 Ana Sović, 22 Željka Lučev, 23 Josip Mihel, 24 Ognjen Krkač, 25 Tomislav Pribanić, 26 Mile Šikić, 27 Krešimir Šikić, 28 Hrvoje Kalinić, 29 Silvio Svečnjak, 30 Goran Molnar, 31 Marijan Kuri, 32 Ivo Majić, 33 Hrvoje Džapo, 34 Boris Šnajder, 35 Zvonko Kostanjčar, 36 Tihomir Marjanović, 37 Goran Horak, 38 Andro Bačan, 39 Marko Subašić, 40 Ivan Dokmanić
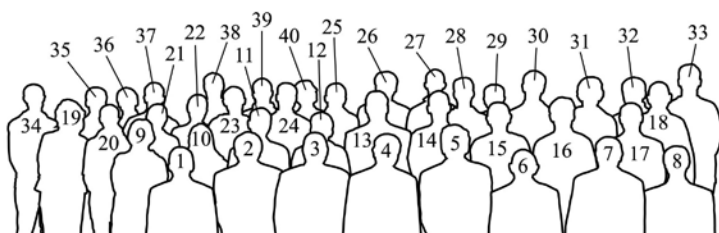
▼ Associate professors

Vedran Bilas - electronic instrumentation and measurements, biomedical engineering

Mario Cifrek - electronic instrumentation and measurements, biomedical engineering

Davor Petrinović - digital signal and speech analysis and processing

Damir Seršić – digital signal and image processing

Zoran Stare - electronic instrumentation and measurements, biomedical engineering

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

▼ Assistant professors

Dražen Jurišić – analog signal processing and filtering

Igor Lacković - electronic instrumentation and measurements, biomedical engineering

▼ Assistans

Hrvoje Džapo
Tomislav Pribanić
Mile Šikić

▼ Junior Researchers

Hrvoje Bogunović
Goran Horak
Hrvoje Kalinić
Zvonko Kostanjčar
Vjekoslav Levačić
Tihomir Marjanović
Goran Molnar
Tomislav Petković
Ana Sović
Siniša Sovilj
Marko Subašić
Krešimir Šikić
Darko Vasić

▼ Researchers

Andro Bačan
Ivan Dokmanić
Tihomir Katić
Ognjen Krkač
Željka Lučev
Ivo Majić
Ivica Medved
Josip Mihel
Saša Mrvoš
Predrag Pale
Silvio Svečnjak
Boris Šnajder
Ivica Vukoja

▼ Administrative staff

Jasmina Zorko
Aleksandra Cesarik
Nikolina Volf

▼ Lab support

Marijan Kuri

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. 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.

▼ Core undergraduate courses:

- Electrical circuits
- Embedded Systems
- Signals and systems
- Biomedical electronics
- Design and manufacturing of electronic equipment
- Digital signal processing
- Electronic instrumentation
- Electronic measurement and components
- Electronic measurements and instrumentation
- Embedded system design
- Filters and filter amplifiers
- Network and transmission line theory
- Random processes in systems
- Systems for process control
- Stochastic Processes in Systems
- Transmission and telemetry systems

▼ Elective courses

- Advanced methods of digital signal processing
- Advanced tools for digital system design
- Automated instrumentation
- Biomedical informatics
- Design of intelligent measurement systems
- Digital image processing
- Digital speech processing
- Industrial measurement systems
- Integration of computer and telephone services
- Introduction to high-technology entrepreneurship
- Multimedia data transfer and computer networks
- Multisensor systems and locomotion
- Neural networks
- Selected topics of biomedical engineering
- Software design for measurement and control systems
- Switched capacitor circuits
- Transducers in measurement systems

▼ Postgraduate courses

- Biomechanical and neurophysiological mechanisms
- Digital image analysis
- Digital signal processing and applications
- Digital signal processor architectures
- Digital simulation in real time
- Digital speech processing
- Electrical filters - selected topics

- Graphs and networks
- Instrumentation in environmental control
- Measurement and analysis of stochastic processes
- Measuring amplifiers
- Medical instrumentation for 2-D imaging
- Multisensor biomonitoring systems
- Multimedia data transfer and computer networks
- Multisensor systems and locomotion
- Neural networks
- Nonlinear systems
- Selected topics on digital image processing
- Signal theory
- Switched capacitor circuits
- 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. 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. Biomedical instrumentation design. Bioelectric signal analysis. Bioelectrical impedance measurement and modeling. Bioelectromagnetics. Biomonitoring. 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

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

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)

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

Intelligent methods for image processing and analysis (Project 036-0362979-1989, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Sven Lončarić)

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

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)

Distributed System for Analog and Mixed Signal Processing (Project 0036003, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Neven Mijat)

Noninvasive Measurements and Technologies in Biomedicine (Project 0036007, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Stanko Tonković)

Systems and Algorithms for Signal and Image Processing (Project 0036028, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Branko Jeren

Analog and Digital System Design Based on Optimization Procedures (Project 0036029, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Mladen Vučić)

Digital Speech Processing in Contemporary Information Technologies (Project 0036054, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Davor Petrinović)

Intelligent Multidimensional Image Processing and Analysis (Project 0036058, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Sven Lončarić)

Electronic Instrumentation for Harsh Environment (Project 0036061, Ministry of Science and Technology, Republic of Croatia, Principal investigator:Vedran Bilas)

Minimally Invasive Measurements and Technologies in Biomedicine – Program 0362979 Ministry of Science and Technology, Republic of Croatia, Principal investigator: Stanko Tonković)

Crypto Phone for Fixed Telephony (Technological Project E51/2005, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Stanko Tonković)

Numerical modeling of electric and termal behaviour of tissue during electrochemotherapy and electrogene therapy (Bilateral Croatian-Slovenian research project, Principal investigator: prof.dr.sc. Ratko Magjarević, 2005-2006)

Electrophysiology of anticipation and learning process: Processing of cognitive EXG potentials (Bilateral Croatian-Macedonian research project, Principal investigator: prof.dr.sc. Ratko Magjarević, 2005-2006)

Numerical modeling of electric field distribution in electrochemotherapy and electro gene therapy of deep tissue (Bilateral Croatian-Slovenian research project, Principal investigator: prof.dr.sc. Ratko Magjarević, 2007-2008).

Intelligent Instrumentation for Home Health Monitoring, (Bilateral Croatian-Hungarian research project, Principal investigator: prof.dr.sc. Ratko Magjarević, 2007-2008)

Wireless Sensor Network of an Intelligent Building, (Siemens, Project leader: Vedran Bilas)

General Purpose Telemetry Platform (Siemens, Project leader: Vedran Bilas)

Multiphase Flow Sensors (Hotwell Austria, Project leader: Vedran Bilas)

Through-Casing Formation Conductivity Measurement (Hotwell Austria, Project leader: Vedran Bilas)

Production Logging Instrumentation (Hotwell Austria, Project leader: Vedran Bilas)

An integrated, model based, approach for the quantification of cardiac function based on cardiac imaging. (The National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia, FER project coordinator: prof. dr.sc. Sven Loncaric)

Functional X-ray Neuro Imaging (Philips Medical Systems, Netherlands, Project leader: Sven Lončarić)

Face Image Validation System (Siemens dd, Project leader: Sven Lončarić)

Physiological Modelling of MR Image Formation (COST Action B21, Croatian Coordinator:)

Medical Imaging & Medical Information Processing (CEEPUS project CII-AT-0042-02-0607 Croatian coordinator: prof. dr.sc. Sven Loncaric)

Medical Imaging & Medical Information Processing (CEEPUS project CII-AT-0042-03-0708 Croatian coordinator: prof. dr.sc. Sven Loncaric)

Access Control System Technical Analysis (Ministry of Defence, Project Leader: Krešimir Šikić)

CARNet Centre for Computer Security (CARNet – Croatian Academic and Research Network, Project Leader: Tihomir Katić)

Hoax recognizer (CARNet, Project Leader: Mile Šikić)

Electrical power infrastructure design of the Ministry of Justice (Ministry of Justice, Project Leader: Ivica Medved)

Electrical power infrastructure design of Faculty of Kinesiology (CARNet, Project Leader: Ivica Medved)

Linux e-learnig course for the Information Systems and Information technologies support Agency – APIS IT (APIS, Leader: Srđan Pajić)

Local Area Network of the Faculty of Graphic Arts (CARNet, Project Leader: Ivica Medved)

Local Area Network of Centar Banka (Centar Banka, Project Leader: Ivica Medved)

Local Area Network of Croatian Motorways (Croatian Motorways, Project Leader: Ivica Medved)

Local Area Network of the Ministry of Justice (Ministry of Justice, Project Leader: Ivica Medved)

Local Area Network of the Privredna banka Zagreb (Privredna banka Zagreb member of Intesa SanPaolo group, Project Leader: Ivica Medved)

Local Area Network of the Rectorate of the University of Zagreb (University of Zagreb, Project Leader: Ivica Medved)

Local Area Network of the Rectorate of Student Centre (CARNet, Project Leader: Ivica Medved)

Local Area Network of Škola narodnog zdravlja "Andrija Štampar" (CARNet, Project Leader: Ivica Medved)

Network traffic monitoring and forensic analysis (Croatian National Bank, Project Leader: Tihomir Katić)

Software development consulting for Croatian National Institute of Public Health (Croatian National Institute of Public Health, Project Leader: Krešimir Šikić)

System room for FINA - Financial Agency (FINA, Project Leader: Ivica Medved)

Teleconferencing system for communication with schools on islands (CARNet, Project Leader: Ivica Medved)

Teleconferencing Room of the Faculty of Mechanical Engineering and Naval Architecture (CARNet, Project Leader: Damir Seršić)

Teleconferencing Room of Polytechnic Lavoslav Ružička in Vukovar (CARNet, Project Leader: Damir Seršić)

Vulnerability Scanning for the CARNet (CARNet, Project Leader: Tihomir Katić)

Wide Area Network of Hrvatska elektroprivreda – HEP (HEP, Project Leader: Krešimir Šikić)

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▼ Journal papers

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Kopriva, Ivica; Seršić, Damir. **Wavelet packets approach to blind separation of statistically dependent sources**. Neurocomputing (0925-2312) (2007)

Mihel, Josip; Magjarević, Ratko. **Personalised Healthcare Meets Users' Needs**. *IFMBE News, International Federation for Medical and Biological Engineering*. June 2007. 84 (2007); pp. 15-18.

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Subašić, Marko; Lončarić, Sven; Sorantin, Erich. **Model-based quantitative AAA image analysis using a priori knowledge**. *Computer Methods and Programs in Biomedicine*. 80 (2005), 2; pp. 103-114

Vasić, Darko; Bilas, Vedran; Šnajder, Boris. **Analytical modelling in low-frequency electromagnetic measurements of steel casing properties**. *NDT & E International*. **40** (2007) , 2; pp. 103-111

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▼ Educational materials

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Petrinović, Davor; Vučić, Mladen. **Osnove projektiranja računalnih sustava** Faculty of Electrical Engineering and Computing, Dept. of Electronic Systems and Information Processing, 2007. (in Croatian)

Stojković, Nino; Mijat, Neven. **Analogna obrada signala**. Rijeka.Fintrade & Tours i Tehnički fakultet Sveučilišta u Rijeci, 2005.

Stojković, Nino; Naglić, Vladimir; Mijat, Neven. **Teorija mreža i linija**. Rijeka. Fintrade & Tours : Tehnički fakultet Sveučilišta u Rijeci, 2005.

Tonković, Stanko. **Biomedicinska elektronika - ispitni materijali**. Zagreb: Faculty of Electrical Engineering and Computing, Dept. of Electronic Systems and Information Processing, 2006. 4th edition, (in Croatian)

Vučić, Mladen. **Upotreba mikrokontrolera u ugrađenim računalnim sustavima**. Faculty of Electrical Engineering and Computing, Dept. of Electronic Systems and Information Processing, 2007. (in Croatian)

Vučić, Mladen; Petrinović, Davorka. **Projektiranje ugrađenih računalnih sustava - laboratorijske vježbe** Faculty of Electrical Engineering and Computing, Dept. of Electronic Systems and Information Processing, 2007. (in Croatian)

▼ Invited lectures

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Magjarević, Ratko. **Impact of the IFMBE on Patient Safety**. Conference on Health Tecnology Assessment: evolution and diffusion in Italy, October 2006, Pavia, Italy.

Magjarević, Ratko. **International Federation for Medical and Biological Engineering; - Past, Present & Future.** Portuguese Biomedical

Engineering conference, June 2006., Lisabon, Portugal.

Pale, Predrag. **E-teaching: Drivers and Likely Results**. *EQIBELT 2006 Proceedings*. 1st Policy workshop on creating university e-learning vision and strategy, Dubrovnik, Croatia, 2006. pp. 35-42

▼ Conference papers

Alajbeg, Ivan; Tonković, Stanko; Alajbeg, Iva; Cekić-Arambašin, Ana; Kuri, Marijan. **Oral Stimulation of Patients with Burning Mouth Syndrome Using Sinusoidal Constant Current.** *IFMBE Proceedings, vol. 11*. 3rd European Medical & Biological Engineering Conference; IFMBE European Conference on Biomedical Engineering EMBEC'05, Prague, 2005.

Alajbeg-Žilić Iva; Valentić-Peruzović, Melita; Alajbeg, Ivan; Cifrek, Mario. **The Influence of Age and Dental Status on the Duration of Chewing Cycles during Mastication.** *IFMBE Proceedings, vol. 11.* 3rd European Medical & Biological Engineering Conference; IFMBE European Conference on Biomedical Engineering EMBEC'05. Prague, 2005. pp. 841-844

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Bijnens, Bart; Claus, P; Parsai, C; Čikeš, Maja; Lončarić, Sven; Anderson, L.; Sutherland, G. R. **An integrated framework for the assessment of cardiac function - Description and illustrated applications**. *Proceedings of the Fifth Int'l Symposium on Image and Signal Processing and Analysis* Istanbul, Turska, 2007. pp. 332-337

Bogunović Nikola, Grudenić Igor, Pek Edgar: **A Synthesized Framework for Formal Verification of Computing Systems**, *Proc of the 9th. International Conference on Information Systems Analysis and Synthesis: ISAS '07*, July 31 - August 2, 2007, Orlando, FL, USA, pp. 379-384.

Bogunović, Hrvoje; Lončarić, Sven. **Blood Flow and Velocity Estimation Based on Vessel Transit Time by Combining 2D and 3D X-ray Angiography** . *Medical Image Computing and Computer-Assisted Intervention - MICCAI 2006, 9th International Conference, Proceedings, Part II, Series: Lecture Notes in Computer Science, Vol. 419,* Medical Image Computing and Computer-Assisted Intervention - MICCAI 2006, 9th International Conference, Copenhagen, Danska, 2006. pp. 117-124

Bogunović, Nikola: **Exploring the Constraints in Formal Verification of Communication and Computing Systems**, *Proc. of IEEE MELECON 2007 Conference*, May 7-9, 2007, Cairo, Egypt, pp.173-177.

Božinovski, Adrijan; Božinovska, Ljiljana; Tonković, Stanko. **A Brain-Computer Interface: Expectancy Potentials.** *Proceedings of the 2nd Balkan Conference in Informatics.* Skopje, 2005. pp. 283-289

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Dokmanić, Ivan; Šikić, Mile; Tomić, Sanja. **Koreliranje oblika površine i hidrofobnosti proteina korištenjem razvoja u kugline funkcije** // *Book of abstracts, The 2nd Opatija Meeting on Computational Solutions in the Life Sciences.* The 2nd Opatija Meeting on Computational Solutions in the Life Sciences, Opatija, Croatia, 2007. pp. 69-69

Dumitrescu, Bogdan; Bregović, Robert; Saramäki, Tapio; Niemistö, Riitta. **Low-delay nonuniform oversampled filterbanks for acoustic echo control** . *Proceedings of the European Signal Processing Conference EUSIPCO-2006*. Firenca, Italija, 2006.

Džapo, Hrvoje; Giannini, Roberto; Tonković, Stanko. **Reconstruction of the Earth Surface Potential Distribution using Radial Basis Functions**. *Proceedings of the 15th IMEKO TC4 International Symposium on Novelties in Electrical Measurements and Instrumentations*. Iasi, Rumunjska. 2007. pp. 11-16

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Ergović, Vladimir; Tonković, Stanko. **SIP-HL7 integration evaluation.** *Proceedings ELMAR-2006* , 2006. pp. 315-318

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Josipović, Petar; Babić, Hrvoje. **Simple Method for FIR Filter Design Based on Frequency Sampling Approach** // *Proceedings of the IASTED International Conference on Circuits, Signals and Systems* Marina del Rey, California, SAD, 2005.

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Kasović, Mario; Medved, Vladimir; Cifrek, Mario; Mejovšek, Mladen: **Dynamic stability in landing with ACL deficient knee joint**. *Abstracts book of 5th World Congress of Biomechanics*, July 29th – August 4th, Munich, Germany. Journal of Biomechanics, 2006, vol. 39, Supplement 1, pp. S501.s

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Krkač, Ognjen; Bilas, Vedran; Knapp, Krešimir; Novak, Mijo. **Electronic Design Challenges for Next-Generation Nuclear Formation Evaluation Tool** . *PNN Annual Conference 2007* Klingenbach, Austria, 2007.

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International links

Case Western Reserve University, Cleveland, Ohio, USA

College of Medicine, University of Wales, Cardif, UK

Computer Vision Laboratory, Faculty of Computer Science and Informatics, University of Ljubljana, Ljubljana, Slovenija

Dipartimento di Elettrotecnica, Elettronica ed Informatica, Universita` degli Studi di Trieste, Trieste, Italy

Department of Applied Informatics, University of Szeged, Szeged, Hungary

Department of Bioengineering, College of Engineering, University of Toledo, USA

Department of Electrical and Computer Engineering, New Jersey Institute of Technology, USA

Department of Information Science, Loughborough University, Loughborough, UK

Department of Radiology, University Hospital Graz, Karl-Franzens Universität Graz, Austria

Duke University, Durham, North Carolina, USA

Faculteit Geneeskunde en Farmacie Vrije Universiteit Brussel, Belgium

Image Processing and Analysis Group, School of Medicine,Yale University, USA

Institut für Signal- und Informationsverarbeitung, Eidgenössische Technische Hochschule (ETH) Zürich, Switzerland

Institute of Biomedical Engineering, University of Stuttgart, Germany

Laboratory for Biocybernetics, Faculty of Electrical Engineering, University of Ljubljana, Slovenia

Ludwig Boltzmann – Institut f. Experimentelle Anaesthesiologie u. Intensivmedizinische Forschung, Wien, Austria

ORKI – National Institute for Hospital and Medical Engineering, Budapest, Hungary

Royal Institute of Technology, Stockholm, Sweden

Scuola di Specializzazione in Ingegneria Clinica, Universita` degli Studi di Trieste, Trieste, Italy

Universita di Firenze, Dipartimento di Sistemi e Informatica, Firenza, Italy

University of California, Berkeley, USA

University of California, Los Angeles, USA

University of California, Santa Barbara, USA

University of Cincinnati, Cincinnati, USA

University of Texas at Arlington, Arlington, USA

University of Memphis, Memphis, Tennessee, USA

Doctor of science degree

Author: BOŽIDAR FEREK-PETRIĆ
Title: Cardiac Pacing Based on Intracardiac Flow Measurement
Date: 2 November 2005
Mentor: Stanko Tonković

Author: TOMISLAV PRIBANIĆ
Title: A Method for Modelling and Analysis of Human Movement Using Optoelectronic System
Date: 28 November 2005
Mentor: Mario Cifrek

Author: MIROSLAV VRANKIĆ
Title: Adaptive Lifting Scheme for Nonseparable Two-Dimensional Wavelet Transforms
Date: 6 July 2006
Mentor: Damir Seršić

Author: HRVOJE DŽAPO
Title: Model-Based Measureent with Application to Grounding System Testing
Date: 30 May 2007
Mentor: Stanko Tonković

Author: MIROSLAV KONČAR
Title: Localization Methods and Verification of Communication Protocols for Healthcare Systems
Date: 5 October 2007
Mentor: Stanko Tonković

Master of science degree

Author: HRVOJE BOGUNOVIĆ
Title: Blood Flow Analysis from Angiogram Image Sequence
Date: 4 November 2005
Mentor: Sven Lončarić

Author: DARKO VASIĆ
Title: Single Coil Method for Simultaneous Measurement of Multiple Parameters of a Metal Tube
Date: 30 November 2005
Mentor: Vedran Bilas

Author: SAŠA OSTOJIĆ
Title: Comparison Of Methods For Surface Myoelectric Signal Analysis During Dynamic Fatigue
Date: 05 December 2005
Mentor: Mario Cifrek

Author: ŽELJKO HEIMER
Title: Automated Clinical Measurement Of Biomechanics And Kinesiology of Gait
Date: 12 December 2005
Mentor: Vladimir Medved

Author: DAVORIN AMBRUŠ
Title: Pulsed Eddy Current Based Electronic Tool for Nondestructive Inspection of Oil-Well Casing
Date: 22 December 2005
Mentor: Vedran Bilas

Author: SINIŠA SOVILJ
Title: Application of Wavelet Detector in ECG P-Wave Analysis After Coronary Artery Bypass Grafting
Date: 7 July 2006
Mentor: Ratko Magjarević

Author: TOMISLAV PETKOVIĆ
Title: Catheter Motion Tracking from Fluoroscopy Image Sequence
Date: 29 December 2006
Mentor: Sven Lončarić

Author: VLADIMIR ERGOVIĆ
Title: Multichannel Disributed Medical Systems based on Hybrid Models and Protocols
Date: 1 March 2007
Mentor: Stanko Tonković

Author: ADRIJAN BOŽINOVSKI
Title: Anticipatory Brain Potentials and their Application in Medical Investigations and Brain-Computer Communication
Date: 3 April 2007
Mentor: Stanko Tonković

Author: MARTINA MELINŠČAK
Title: Analysis Of Voltage Pulse Plethysmography Characteristics
Date: 8 May 2007
Mentor: Vedran Bilas

5.9. Department of Control and Computer Engineering

Faculty and staff

▼ Professors

Vladimir Muljević – *professor emeritus (2007†)*

Gabro Smiljanić – retired, professor emeritus

Ljubomir Kuljača – linear continuous and digital control systems, non-linear and stochastic control, guidance and control of marine vehicles

Nedjeljko Perić – estimation and system identification, plant and process automation, servo drives and servo systems, digital control systems, predictive and intelligent control

Founded in 1954

Head of the department:
Prof. **Zdenko Kovačić,** PhD

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E-mail:	zari@fer.hr
URL:	http://www.fer.hr/zari

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

1 Snježana Poljak, 2 Blanka Gott, 3 Nedjeljko Perić, 4 Zdenko Kovačić, 5 Željkica Šikuten, 6 Ljubomir Kuljača, 7 Vukić Zoran, 8 Željko Ban, 9 Ivana Bosnić, 10 Danko Basch, 11 Stjepan Bogdan, 12 Ivan Petrović, 13 Alan Mutka, 14 Marija Seder, 15 Matko Barišić, 16 Damir Josić, 17 Andreja Kitanov, 18 Mato Baotić, 19 Branko Mihaljević, 20 Hrvoje Mlinarić, 21 Ivica Draganjac, 22 Martin Žagar, 23 Toni Bjažić, 24 Nikola Mišković, 25 Mate Jelavić, 26 Jadranko Matuško, 27 Edouard Ivanjko, 28 Krešimir Vrdoljak, 29 Mario Vašak, 30 Tomislav Sečen, 31 Josip Knezović, 32 Marin Orlić, 33 Mišel Brezak

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

Mario Kovač – multimedia algorithms and architectures, data compression, medical information systems, telemedicine, large business systems, computer architectures, VLSI design

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

▼ Associate professors

Željko Ban – modelling and simulation, intelligent and model reference adaptive control, optimisation of control algorithm parameters, robotics

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

Ivan Petrović – mobile robotics, optimal estimation, intelligent control, predictive control, distributed control systems

▼ Assistant professors

Stjepan Bogdan – discrete event systems, flexible manufacturing automation, intelligent control, supervisory control

▼ Assistants

Igor Čavrak
Hrvoje Mlinarić

▼ Junior researchers

Mato Baotić
Miroslav Barić
Matko Barišić
Bruno Birgmajer
Toni Bjažić
Mišel Brezak
Alan Goluban
Edouard Ivanjko
Andreja Kitanov
Josip Knezović
Kristijan Maček
Jadranko Matuško
Branko Mihaljević
Damjan Miklić
Nikola Mišković
Marin Orlić
Krešimir Petrinec

Tomislav Reichenbach
Tomislav Sečen
Marija Seder
Nenad Smolić-Ročak
Mario Vašak
Martin Žagar

▼ Researchers

Marko Bago
Ivana Bosnić
Ivica Draganjac
Darko Fudurić
Mate Jelavić
Alan Mutka
Krešimir Vrdoljak

▼ Administrative staff

Blanka Gott
Snježana Poljak

▼ Lab support

Damir Josić

Educational activities

▼ Core undergraduate courses

- Automatic control
- Automation of plants and processes
- Computers and processes
- Digital and nonlinear control systems
- Digital computers I
- Digital computers II
- Digital control systems
- Elements of process automation
- Fundamentals of robotics
- Introduction to digital computers
- Modelling and simulation
- Nonlinear and optimal control systems
- Process modelling and simulation
- Remote and distributed control systems
- Servo systems

▼ Elective courses

- Adaptive and optimal control of the systems
- Adaptive and robust control
- Automation of biotechnological processes
- Automation of ship processes
- Flexible manufacturing systems

- Intelligent control systems
- Mobile robotics
- Open computing
- Optimisation of system parameters
- Process identification
- Process measurements
- Project management
- Software engineering - selected topics

▼ Postgraduate courses

- Adaptive and optimal control of the systems
- Adaptive and robust control - selected topics
- Applied Estimation Techniques
- Control of autonomous systems
- Control of discrete event systems
- Control of robotised plants
- Design of multivariable control systems
- Digital servo systems
- Flight objects guidance and control
- History of electrical engineering
- Intelligent control systems
- Intelligent measuring systems in process automation
- Intelligent manufacturing systems
- Mathematical modelling of electric power systems
- Microcomputers
- Model reference adaptive control
- Modelling and simulation using computers
- Multimedia computer systems
- Nonlinear control systems
- Process automation - selected topics
- Project management
- Software engineering - selected topics
- Synthesis and optimisation of the servo system parameters

Research and development

Control algorithms for various plants and processes, e.g. servo drives, robots, ships, floating and underwater vessels, pH process, heat exchangers, water supply systems, etc. Vibration control. Estimation. Process identification, adaptive and robust control in industrial environment. Application of fuzzy logic, neural networks and genetic algorithms in the control systems. Predictive control and its applications. Automation of systems with discrete events and flexible manufacturing systems. Modelling and control of hybrid systems. Supervisory control (e.g. multi-AGV systems. wireless sensor networks). Virtual reality and Internet-based remote motion control. Internet-based telemetry and expert control of aquaculture plants. Development and implementation of model reference adaptive control algorithms.

Optimisation methods and criteria for optimal system and controller parameter determination. Failure detection, isolation and accommodation in marine vehicles and power plant systems. Integration of communication and control systems in plant automation. Intelligent measurement systems, multi-sensor fusion. Vision based control. Navigation and control of mobile autonomous sensory-based systems. Distributed control systems for rail vehicles. Public lighting systems. Wind turbine control and monitoring systems. Secondary regulation of frequency and power exchange in power systems. Development of embedded systems, application-specific computer architectures, and microprocessor architecture design. Research in pervasive, ubiquitous computing, Immune systems in wireless sensor networks. Research of multimedia system architectures. Data compression. 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. Object-oriented distributed systems. Remote data acquisition and measurement systems. Electronic commerce – electronic payment systems. Fast volume rendering and compression. Medical information systems. Telemedicine. Development and integration of complete multiapplication smart card solutions - introduction of a novel System architecture of a new national student smart card in Croatia. Cooperation with banking sector and introduction of EMV compatible payment system based on a smart card. Cooperation with EU partners in setting up EU standards for European Education Connectivity Solution. SearchMe, interactive database of products and services of ICT industry- easy search of business partners in in Croatian region – prerequisite for clustering of industry SME's.

▼ Projects

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))

Advanced Control Strategy of Complex Systems (project 0036017, Ministry of Science Education and Sports, Republic of Croatia, Principal investigator: Nedjeljko Perić)

Computers and Processes (project 0036006, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Mario Žagar)

Control of Mobile Robots And Vehicles in Unknown and Dynamic Environments (project project 036-0363078-3018 , Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Ivan Petrović))

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)

Intelligent Control of Mobile Robots (project 0036018, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Ivan Petrović)

Intelligent and Adaptive Control of the Systems (project 0036022, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Željko Ban)

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)

Integrated Control of Robotised Plants, (project 0036044, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Zdenko Kovačić)

Virtual and Remote Motion Control Laboratory (Sitek s.p.a., Italy, Project leader: Zdenko Kovačić)

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)

Multi-AGV Control System (Sitek s.p.a., Italy, Project leaders: Zdenko Kovačić, Stjepan Bogdan)

Intelligent Estimators of Hard to Measure Process Variables (project TP-01/0036-14, Ministry of Science, Education and Sports, Republic of Croatia, Project leaders: Nedjeljko Perić)

Distributed Software engineering (project 2004-125, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Mario Žagar)

Computationally Efficient Robust Model Predictive Control (Swiss National Science Foundation, Joint Research Project, Project leaders: Manfred Morari, Nedjeljko Perić)

Distributed Measurements and Control Software Development, (Societe Europeenne des Satellites Luxembourg, Amphinicy, Faculty of Electrical Engineering and Computing, Project leader: Mario Žagar)

Integrated Process and Robot Control (Sitek s.p.a., Italy, Project leaders: Zdenko Kovačić; Stjepan Bogdan)

Advanced Control Techniques in Electromechanical Systems (Croatian-Hungarian ntergovernmental S&T Cooperation Programme, Project leaders: Nedjeljko Perić, Istvan Nagy)

Internet Based Control of Electromechanical Systems (Croatian-Hungarian Intergovernmental S&T Cooperation Programme, Project leaders: Nedjeljko Perić, Istvan Nagy)

Modelling, Estimation and Control of Automotive Systems with Friction (Ford Motor Company, Project leader: Nedjeljko Perić)

Research on the full digital control system of the novel Switched Reluctance servo motor drive (Chinese-Croatian Scientific and Technological Cooperation, Project leaders: Nedjeljko Perić, Chen Hao)

New Generation of the Broadband Satellite Communications (Societe Europeenne des Satellites Luxembourg, Amphinicy, Faculty of Electrical Engineering and Computing, Project leader: Mario Žagar)

Multimedia and Internet Technologies, (Societe Europeenne des Satellites Luxembourg, Amphinicy, Faculty of Electrical Engineering and Computing, Project leader: Mario Žagar)

Autonomous Mobile Sensor Platform for Closed Space Surveillance and Cleaning (project TP-E 44/2005, Ministry of Science, Education and Sports, Republic of Croatia, and Sitek s.p.a., Italy, Project leader: Stjepan Bogdan)

Navigation of Autonomous Mobile Robots (Austrian-Croatian bilateral project, Institute for Handling Devices and Robotics, University of Technology Vienna and Faculty of Electrical Engineering and Computing, University of Zagreb, Project leaders: Peter Kopacek, Ivan Petrović)

Multi-Agent Systems of Mobile Robots (Slovenian-Croatian bilateral project, Faculty of Electrical Engineering, University of Ljubljana and Faculty of Electrical Engineering and Computing, University of Zagreb, Project leaders: Drago Matko, Ivan Petrović)

Public Lighting Control System Concept for the City of Zagreb (Municipal Authorities of City of Zagreb, Project leader: Nedjeljko Perić)

RoboLab – Guidance and Control System for the Automated Marine Laboratory (project 0036010, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Zoran Vukić)

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)

Distributed Control System for Rail Vehicles (Končar Electrical Industries d.d, Zagreb, Project leaders: Nedjeljko Perić, Ivan Petrović)

Secondary Regulation of Frequency and Power Exchange in Power System of the Republic of Croatia (Končar Electrical Industries d.d, Zagreb, Project leaders: Nedjeljko Perić, Ivan Petrović)

Wind Turbine Control and Monitoring System (Končar Electrical Industries d.d, Zagreb, Project leaders: Nedjeljko Perić, Ivan Petrović)

Advanced Control of Industrial Plants – Road Tunnel Učka Ventilation Control System (Exor Informatički inženjering d.o.o., Zagreb, Project leaders: Stjepan Bogdan, Zdenko Kovačić)

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

Educational Centre for Programmable Logic Controllers and Distributed Control Systems (Siemens d.d. Zagreb, Project leader: Ivan Petrović)

Multimedia Compression Algorithms for Telemedicine (Ministry of Science education and sports, Republic of Croatia, Project leader: Mario Kovač)

Program: Ubiquitous Computing (Program: 0361959, Ministry of Science Education and Sports, Republic of Croatia, Principal investigator: Mario Žagar) with the following projects:

Software Engineering in Ubiquitous Computing (Project: 0361965, Ministry of Science Education and Sports, Republic of Croatia, Principal investigator: Mario Žagar)

Architectures of Integrated Computer and Communication Systems and Services (Project: 0361971, Ministry of Science Education and Sports, Republic of Croatia, Principal investigator: Mario Kovač)

Design and Implementation of Special Purpose Computer Languages (Project: 0361979, Ministry of Science Education and Sports, Republic of Croatia, Principal investigator: Danko Basch)

Technology and business aspects for introduction of telemetry services in mobile networks (Ericsson Nikola Tesla d.d., Project leader: Mario Kovač)

FER Technology, Innovation and Consulting (CARDS Intellectual Property Rights Infrastructure Project Pilot Institution, Project leader: Mario Kovač)

SearchMe, interactive database of products and services of ICT industry in Croatia (Technology project, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Mario Kovač)

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)

Publications

Books

Kovačić, Zdenko; Bogdan, Stjepan. *Fuzzy Controller Design: Theory and Applications*, CRC Press, Taylor & Francis Books LLC, 2005.

Bogdan, Stjepan; Lewis, Frank L.; Kovacic, Zdenko; Mireles, Jose Jr. *Manufacturing Systems Control Design: A Matrix-based Approach*, London, Springer-Verlag, 2006.

Žagar, Mario. *UNIX how to use it* http://www.fer.hr/rasip/knjiznica/unix1 (1st Internet edition) Zagreb, FER, 2007. (In Croatian)

Žagar, Mario. *UNIX how to utilise it* http://www.fer.hr/rasip/knjiznica/unix2 (1st Internet edition) Zagreb, FER, 2007. (In Croatian)

Edited proceedings

Vukić, Zoran; Mandžuka, Sadko. *Intelligent underwater systems and technologies, Vision of R&D in Republic of Croatia, IPSIT05*, Vukić, Zoran; Mandžuka, Sadko, editor(s) skup - radionica / Zagreb, Brodarski institut, 2006

Vukić, Zoran; Longhi, Sauro. *Proceedings of the IFAC Conference on Control Applications in Marine Systems* / Vukić, Zoran; Longhi, Sauro, editor(s). Zagreb, CEPOST, 2007

Kovačić, Zdenko. *Proceedings of the 15th Mediterranean Conference on Control and Automation MED07* / Kovačić, Zdenko, editor. Athens, Greece, MCA, 2007.

Chapter in book

V. Kordić, A. Lazinica, M. Munir (editors): *Cutting Edge Robotics, Advanced Robotic Systems (ARS)*, T. Reichenbach, Z. Kovačić, "**Collision-free path planning in robot cells using virtual 3D collision sensors**", pp. 683-704, 2005.

Journal papers

Baotić, Mato; Christophersen, Frank J.; Morari, Manfred. **Constrained Optimal Control of Hybrid Systems with a Linear Performance Index.** IEEE Transactions on Automatic Control. 51 (2006), 12; 1903-1919

Barić, Miroslav; Petrović, Ivan; Perić, Nedjeljko. **Neural Network Based Sliding Mode Control of Electronic Throttle. Engineering applications of artificial intelligence. 18 (2005.); 951-961**

Bogdan Stjepan.; Birgmajer Bruno. **Model Predictive Fuzzy Control of Longitudinal Ventilation System in a Road Tunnel**, Automatika, Vol. 47, No. 1-2, 2006. pp. 39- 48.

Borrelli, Francesco; Baotić, Mato; Bemporad, Alberto; Morari, Manfred. **Dynamic programming for constrained optimal control of discrete-time linear hybrid systems.** Automatica. 41 (2005), 10; 1709-1721

Christophersen, Frank J.; Baotić, Mato; Morari,. Manfred. **Optimal control of piecewise affine systems: A dynamic programming approach.** Lecture notes in control and information sciences. 322 (2005); 183-198

Experiment with mobile robot

Grieder, Pascal; Kvasnica, Mihal; Baotić, Mato; Morari, Manfred. **Stabilizing low complexity feedback control of constrained piecewise affine systems.** Automatica. 41 (2005), 10; 1683-1694

Jones, Colin; Barić, Miroslav; Morari, Manfred. **Multiparametric Linear Programming with Applications to Control.** European Journal of Control. 13 (2007), 2-3; 152-170

Kezić, Danko; Perić, Nedjeljko; Petrović, Ivan. **An Iterative Siphon Control Algorithm for Deadlock Prevention Based on Petri net.** AUTOMATIKA - casopis za automatiku, mjerenje, elektroniku, racunarstvo i komunikacije. 47 (2006), 1-2; 19-30.

Kulić, Ranka; Vukić, Zoran. **Methodology of concept control synthesis to avoid unmoving and moving obstacles (II).** Journal of Intelligent and Robotic Systems. 45 (2006), 3; 267-294

Maček, Kristijan; Matuško, Jadranko; Martinelli, Agostino; Siegwart, Roland. **Discussion on: "Adaptive and Predictive Path Tracking Control for Off-road Mobile Robots".** European Journal of Control. 13 (2007), 4; 440-444

Mikac, Stjepan; Banović, Zrinko; Crnošija, Tihan; Perić, Nedjeljko; Petrović, Ivan; Kuzle, Igor. **Street Lighting Control in the City of Zagreb.** Elektroenergetika - casopis za proizvodnju, prijenos, distribuciju i koristenje electricne energije. 2 (2005), 1; 28-32

Mireles J; Lewis F.L.; Gurel A.; Bogdan Stjepan.; **Deadlock Avoidance Algorithms and Implementation**, **a Matrix Based Approach**, Deadlock Resolution in Computer Integrated Systems, Editor: Mengchu Zhou, Marcel Dekker Inc., 2005, pp. 183-241.

Morari, Manfred; Barić, Miroslav. **Recent developments in the control of constrained hybrid systems.** Computers and Chemical Engineering. 30 (2006); 1619-1631

Slišković, Dražen; Perić, Nedjeljko; Petrović, Ivan. **Continuum regression in process modeling based on plant data.** AUTOMATIKA - casopis za automatiku, mjerenje, elektroniku, računarstvo i komunikacije. 46 (2005), 3-4; 173-184.

Strah, Bruno; Kuljača, Ognjen; Vukić, Zoran. **Speed and Active Power Control of Hydro Turbine Unit.** IEEE Transactions on Energy Conversion. 20 (2005), 2; 424-434

Pavković, Danijel; Deur, Josko; Jansz, Martin; Perić, Nedjeljko. **Adaptive Control of Automotive Electronic Throttle.** Control engineering practice. 14 (2006), 2; 121- 136.

Vašak, Mario; Baotić, Mato; Morari, Manfred; Petrović, Ivan; Perić, Nedjeljko. **Constrained Optimal Control of an Electronic Throttle.** International Journal of Control. 79 (2006), 5; 465-478

Vašak, Mario; Baotic, Mato; Petrović, Ivan; Perić, Nedjeljko.**Hybrid Theory Based Time-Optimal Control of an Electronic Throttle**. IEEE Transactions on Industrial Electronics. 54 (2007), 3; 1483-1494

▼ Invited lectures

Zdenko Kovačić. Review of LARICS research in the period 2002-2006, The Oklahoma State University (OSU), Stillwater, USA, 03.12.2006.

Zdenko Kovačić. String Algebra-based Approach to Dynamic Routing in Multi-LGV Automated Warehouse Systems, Systems Workshop on Adaptive & Networks SWAN 06, The Automation and Robotics Research Institute (ARRI), Arlington, Texas, USA, 08.12.2006.

Stjepan Bogdan. Fuzzy Controller Design Based on Fuzzy Lyapunov Stability, Systems Workshop on Adaptive & Networks SWAN 06, The Automation and Robotics Research Institute (ARRI), Arlington, Texas, USA, 08.12.2006.

Zoran Vukić. Overview of Control Systems Research in WB. Invited lecture for the EU FP7 IST Info Days, May 23rd, 2007, Brussels. http://cordis.europa.eu/fp7/ict/programme/events3-20070522_en.html

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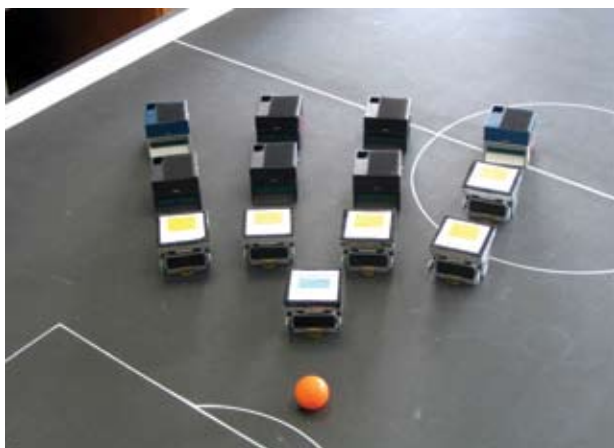
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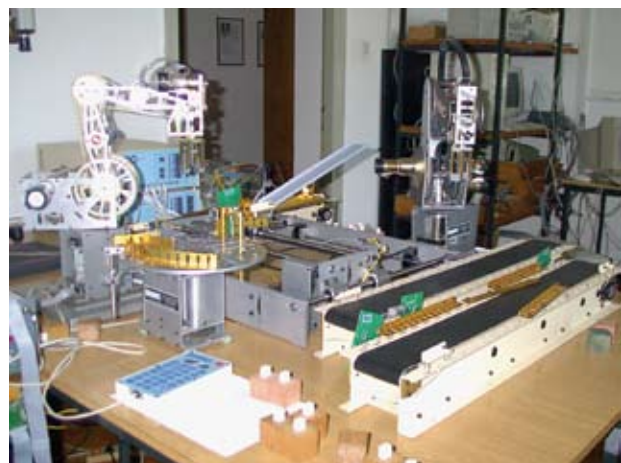
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Vrdoljak, Krešimir; Petrović, Ivan; Perić, Nedjeljko. **Discrete-Time Sliding Mode Control of Load Frequency in Power Systems with Input Delay** *Proceedings of the 12th International Power Electronics and Motion Control Conference.Portoroz, Slovenija, 2006. 567-572*

Vrdoljak, Krešimir; Horvat, Branko; Petrović, Ivan; Perić, Nedjeljko. **Sliding mode load frequency control** *Zbornik sedmog simpozija o sustavu vodjenja elektroenergetskog sustava hrvatskog ogranka CIGRE, Tomisa, Irena, editor(s). Zagreb, Hrvatski ogranak CIGRE, 2006. 146-152.*

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Žagar, Mario; Bosnić, Ivana; Žagar, Martin. **Distributed Digital Book, Interactive Mobile & Computer Aided Learning** *(IMCL) 2006*, Auer, Michael E. ; Al-Zoubi, Abdullah, editor(s). Wien, Austria, International Association of Online Engineering, 2006. 1-15.

Žagar, Martin; Kovač, Mario; Bosnić, Ivana. **Lossless and Lossy Compression in 4d Bio-modeling**, *New Trends in ICT & Accessibility Proceeding of the First International Conference in Information and Communication Technology & Accessibility April 12- 14, 2007*, Hammamet, Tunisia, Mohamed Jemni, editor(s). Hammamet, The Research Unit of Technologies of Information and Communication, Higher School of Sciences and Techniques of the University of Tunis, 2007. 271-277.

International links

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

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

Eidgenössische Techniche Hochschule Zürich (ETH), Institut für Automatik, Switzerland

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

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

Technische Universität Wien, Institut für Handhabungsgeräte und Robotertechnik, Vienna, Austria

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

Anglia Polytechnic University, Department of Design and Technology, Cambridge, UK

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

Budapest University of Technology and Economics, Budapest, Hungary

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

University of Paderborn, Paderborn, Germany

L'Ecole Polytechnique Fédérale de Lausanne, Systèmes autonomes, Lousanne, Switzerland

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

Doctor of science degree

Author: MATO BAOTIĆ
Title: Optimal Control of Fiecewise Affine Systems- a Multi-parametric Approach
Date: 07 March 2005
Mentor: Manfred Morari (ETH Zürich)

Author: KRUNOSLAV HORVAT
Title: Fault Tolerant Turbine Governing System For Hydroelectric Power Unit
Date: 14 November 2006
Mentor: Zoran Vukić

Author: DRAŽEN SLIŠKOVIĆ
Title: Estimation Of Difficult-To-Measure Process Variables Based On Plant Operational Data
Date: 28 November 2005
Mentor: Nedjeljko Perić

Author: LEJLA BANJANOVIĆ-MEHMEDOVIĆ
Title: Autonomous Mobile Robots Localization in Large Indoor Environmets by Using Ultrasound Range Sensors″
Date: 27 January 2006
Mentor: Ivan Petrović

Author: MARIO VAŠAK
Title: Time Optimal Control of Piecewise Affine systems
Date: 13 July 2007
Mentor: Nedjeljko Perić

Author: IGOR ČAVRAK
Title: Wireless Sensor Network Adaptability Based On Artificial Immune System
Date: 07 April 2006
Mentor: Mario Žagar

Master of science degree

Author: MARAS MLADEN
Title: Distribution Power Network Reconfiguration Using Genetic Algorithm
Date: 06 July 2007
Mentor: Nedjeljko Perić

Author: SMOLIĆ-ROČAK NENAD
Title: Flexible Manufacturing Systems Control By Using Matrix Algebra
Date: 25 November 2005
Mentor: Zdenko Kovačić

Author: BIRGMAJER BRUNO
Title: Integrated Vision System For Supervision And Guidance Of A Steam Generator Tube Inspection Manipulator
Date: 28 September 2006
Mentor: Zdenko Kovačić

Author: ORLIĆ MARIN
Title: Interaction Modelling in Multi-agent Systems
Date: 06 July 2006
Mentor: Mario Žagar

Author: ĆURIN TOMISLAV
Title: Multitier Application Model In Interactive Television System
Date: 21 December 2005
Mentor: Mario Žagar

Author: MIHALJEVIĆ BRANKO
Title: Recommender System Model Based On Artificial Immune System
Date: 21 December 2005
Mentor: Mario Žagar

Author: IVANČIĆ DORIJAN
Title: Modeling Of Adaptive Methods For Memory Allocation And Garbage Collection
Date: 31 May 2006
Mentor: Danko Basch

5.10. Department of Electroacoustics

Faculty and staff

▼ Professors

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

Ivan Jelenčić - retired, distinguished professor

Branko Somek - retired, distinguished professor

▼ Associate professors

Hrvoje Domitrović - audio technique, sound reinforcement, loudspeakers, acoustical designing,

Founded in 1954

Head of the department:
Bojan Ivančević, Ph.D.

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Fax: +385 1 612 96 80
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URL: http://www.zea.fer.hr

sound recording and editing, broadcasting systems, audio in multimedia

Mladen Maletić - audiotechnique, room acoustics, electroacoustic transducers, noise and vibration, audio signal processing

1 Kristian Jambrošić, 2 Ljubica Konjević, 3 Mia Suhanek, 4 Sanja Grubeša, 5 Antonio Petošić, 6 Vjekoslav Futivić, 7 Marko Horvat, 8 Bojan Ivančević, 9 Hrvoje Domitrović, 10 Ivan Đurek, 11 Siniša Fajt, 12 Mladen Maletić, 13 Darko Gašparović

▼ Assistant professors

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

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

▼ Junior researchers

Ivan Đurek
Sanja Grubeša
Mia Suhanek
Marko Horvat
Antonio Petošić

▼ Administrative staff

Ljubica Konjević

▼ Lab support

Vjekoslav Futivić
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.

▼ Core undergraduate courses

- Acoustic signals and systems
- Audio electronics
- Digital audiotechnique
- Electroacoustics
- Receivers

▼ Elective courses

- Acoustics of speech and music
- Architectural acoustics
- Digital processing of music and speech
- Noise and vibration
- Professional audio equipment
- Psychoacoustics
- Sound systems and loudspeakers
- Ultrasound and hydroacoustics

▼ Postgraduate courses

- Audio Forensics
- Audiocommunications
- Acoustical Design
- Electroacoustical measurements
- Electroacoustical transducers and systems
- Hearing Acoustics
- Noise and vibration
- Receiver techniques in digital transmission
- Sound in architecture
- Sound in Multimedia Systems
- The technology of acoustic space
- 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

Processing and Evaluation of Acoustical Signals in Communications (Project 0036011, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Branko Somek, 2002-2006)

Influence of high energy ultrasound on tissue (Project 0036023, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Bojan Ivančević, 2002-2006)

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, 2007-2012)

Estimation, monitoring and noise control (Project 036-0361630-1633, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Hrvoje Domitrović, 2007-2012)

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, 2007-2012)

Acoustic design and sound reinforcement project of two halls (Hotel Mogorjelo, Project leader: Bojan Ivančević)

Improvement of acoustic characteristics of the Histrion theatre (Town of Zagreb, Project leader: Bojan Ivančević)

Acoustical design for two control rooms and a studio (Radio Rovinj, Project leader: Hrvoje Domitrović)

Acoustical design and noise control of three multimedia auditoriums (Ministry of Foreign Affairs and European Integration, Project leader: Hrvoje Domitrović)

Noise control (Data centre Republic of Croatia State Geodetic Administration, Project leader: Hrvoje Domitrović)

Acoustical design of school's Concert hall (Josip Hatze Music school Split, Project leader: Hrvoje Domitrović)

Acoustical design and noise control for main studio and 3 control rooms (AVA Television Production, Zagreb, Project leader: Hrvoje Domitrović)

Acoustical design for Studio Bajsić (Croatian Radiotelevision, Zagreb, Project leader: Hrvoje Domitrović)

Acoustical design for rehersal spaces (Academy of Musics, Zagreb, Project leader: Hrvoje Domitrović)

Noise control of air-conditioning station (Clinical hospital centre Rebro, Zagreb, Project leader: Hrvoje Domitrović)

Sound system design (Corpus Christi church, Zagreb, Project leader: Hrvoje Domitrović)

Publications

▼ Educational materials

Ivančević, Bojan. **Elektroakustika**. Zagreb: Faculty of Electrical Engineering and Computing, Dept. of Electroacoustics, 2007., ISBN 978-953-184-118-4, (in Croatian)

▼ Journal papers

Maletić, Mladen, Rogina, M, Hanžek, B.: **Dvorak sliding tones: Do they exist,** *International review of the aestethics and sociology of music. ISSN: 0351-5796, Vol. 37/2,* December 2006., pp 225-230

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Maletić, Mladen, Krajačić, Neven, Matica, H.**: Frequency Response Measurements of Hearing Aids Based On Composed Audio Test Signal,** *Automatika,* Vol. 47, 2006, 3-4, str. 256-258

Čuković-Bagić, Ivana; Domitrović, Hrvoje; Verzak, Željko**: Razina buke u pedodontskoj stomatološkoj ordinaciji.** *Acta Stomatologica Croatica.* 40 (2006) , 3; 278-86

Đurek, Ivan; Žnidaršić, Andrej; Košak, Aljoša; Đurek, Danijel: **Thermal Conductivity Measurements of the CoFe$_2$O$_4$ and γ-Fe$_2$O$_3$ based Nanoparticle Ferrofluids.** *Croatica Chemica Acta.* 80 (3-4) (2007), 4 str.

▼ Conference papers

Krstić, E.; Večerina-Volić, S.; Srzentić, M.; Fajt, S: **Utjecaj tonzilektomije na akustički sastav glasa,** *Zbornik radova IV. kongresa hrvatskog društva za otorinolarigologiju i kirurgiju glave i vrata.* Poreč, 2005.

Šalovarda, Marija; Bolkovac, Ivan; Domitrović, Hrvoje: **Estimating Perceptual Audio System Quality Using PEAQ Algorithm,** *Conference Proceedings of 18th ICECom.,* Dubrovnik, 2005.

Grubeša, Tomislav; Grubeša, Sanja; Domitrović, Hrvoje:**Architecture of exciter for digital radio and video transmitters,** *Conference Proceedings of 18th ICECom.,* Dubrovnik, 2005.

Grubeša, Sanja; Grubeša, Tomislav; Domitrović, Hrvoje: **Speaker Recognition Method Combining FFT, Wavelet Functions And Neural Networks,** *The Proceedings of the AES 26th International Conference.* Denver, Colorado, 2005. 47-50

Jambrošić, Kristian; Ivančević, Bojan; Petošić, Antonio: **Effects of Similar Multiple Signals on Intelligibility and Localization of a Referent Signal,** *Proceedings Euronoise 2006.* Tampere : Acoustical Society of Finland, 2006. 4-65

Radić, Ana; Šimunić, Vjeran; Ivančević, Bojan: **Noise Influence on Quality of Communication in a Tram,** *Proceedings of the 48th International Symposium ELMAR-2006.* Zadar : Croatian Society Electronics in Marine, 2006. 139-142

Žonja, Sanja; Livun, Nina; Jambrošić, Kristian: **Audio - Visual Interaction: Multimedia Applications,** *Proceedings of the 48th International Symposium ELMAR-2006.* Zadar : Croatian Society Electronics in Marine, 2006. 143-146

Dadić, Martin; Somek, Branko; Tonković-Klobučar Andrea: **Dynamic Range Compressor/ Expander for Digital Audio Based on LMS Algorithm,** *Proceedings MIPRO 2006 - MEET/ HGS.* Opatija : MIPRO, 2006. 153-156.

Dadić, Martin; Sruk, Vlado; Somek, Branko: **Adaptive Design of Linear-Phase Maximally Flat Filters for Digital Audio,** *CD-ROM Proceedings of the Thirtheenth International Congress on Sound and Vibration (ICSV13).* Vienna, 2006. 7p

Đurek, Ivan; Đurek, Danijel; Petošić, Antonio; Demoli, Nazif: **Non linear stiffness of the loudspeaker measured in an evacuated space,** *AES Papers, 121st Convention.* San Francisco, 2006. p. 6940

Horvat, Marko; Domitrović, Hrvoje; Kurjak, Maja: **Source audio coding in digital radio mondiale,** *Procedings of The 13th International Congress on Sound and Vibration.* Vienna, 2006.

Grubeša, Sanja; Domitrović, Hrvoje; Horvat, Marko: **Noise level control on a busy intersection,** *Proceedings of 13th International Congress on Sound and Vibration.* Vienna, 2006.

Grubeša, Sanja; Grubeša, Tomislav; Domitrović, Hrvoje: **Applied virtual sources method,** *Proceedings of 13th International Congress on Sound and Vibration (ICSV13).* Vienna, 2006.

Kurjak, Maja; Grubeša, Sanja; Domitrović, Hrvoje: **Acoustical solutions in**
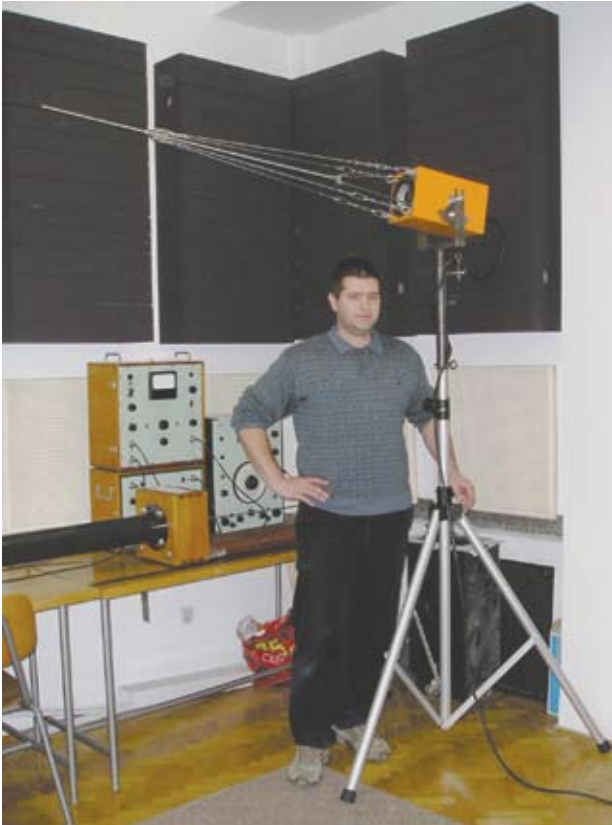
modern architecture, *Proceedings of 13th International Congress on Sound and Vibration.* Vienna, 2006.

Bucak, Tino; Horvat, Marko; Novak, Doris: **Subjective Speech Intelligibility Measurements in a Light Aircraft Cabin Under Laboratory Conditions,** *Proceedings of the 13th International Congress on Sound and Vibration (ICSV13)*, Austria, Vienna, 2006. SS24-935

Maletić, Mladen; Fajt, Siniša; Srbiš, M.: **The Rate of Change Distorsion Measurement with Composed Audio Test Signal in Loudspeaker System,** *AES* Convention, *Paris*. 2006.

Grubeša, S., Grubeša, T., Domitrović, H.: **Increasing average transmitted power in DRM broadcasting systems using the multiband audio compressor-limiter algorithms in baseband signal,** *Proceedings of 13th International Congress on Sound and Vibration (ICSV13).* Vienna, 2006.

Djurek, Ivan; Petosic, Antonio; Djurek, Danijel.**: Mass nonlinearity and intrinsic friction of the loudspeaker membrane,** *AES Papers. 122nd Convention.* Vienna, 2007. p. 7075.

Petosic, Antonio; Djurek, Ivan; Djurek, Danijel: **Modeling of an electrodynamic loudspeaker using runge-kutta ode solver,** *AES Papers. 122nd Convention.* Vienna, 2007. p. 7076.

Djurek, Danijel; Djurek, Ivan; Petosic, Antonio: **Chaotic state in an electrodynamic loudspeaker,** *Proceedings of 122nd AES Convention.* Vienna, 2007. p. 7077.

Horvat, Marko; Domitrovic, Hrvoje; Grubesa, Sanja: **Acoustic treatment of the regional flight cintrol center hall in Zagreb, Croatia,** *Proceedings of 122nd AES Convention,* Vienna, 2007. p. 7086.

Tomas G., Fajt S., Olujic V., **Dynamics processing and coding for digital broadcasting and web streaming**, *Proceedings of 122nd AES Convention,* Vienna, 2007.

Petošić, Antonio; Ivančević, Bojan; Jambrošić, Kristian: **Measuring Output Acoustic Power of an Ultrasonic Surgical System Using the Calorimetric Method,** *19th International congress on acoustics Official Publication,* Madrid, 2007. ULT-09-012

Ivančević, Bojan; Jambrošić, Kristian; Petošić, Antonio: **Acoustic Characteristics of the New "Histrion" Drama Theatre in Zagreb**, *Proceedings 3rd Congress of the Alps Adria Acoustics Association,* Graz, 2007. 1-5

Petošić, Antonio; Ivančević, Bojan; Jambrošić, Kristian: **Experimental and Theoretical Considerations of Ultrasound Transducers Working in Nonlinear Regime**, *Proceedings 3rd Congress of the Alps Adria Acoustics Association*, Graz, 2007. 1-10

Đurek, Ivan; Petošić, Antonio; Đurek, Danijel: **Chaos in an Electrodynamic Loudspekaer**, *Proc. of 3rd Congress of the Alps Adria Acoustics Association*, Graz, 2007.

Horvat, Marko; Domitrović, Hrvoje; Grubeša, Sanja: **Design Of A New Omni-Directional Sound Source**, *Proceedings 3rd Congress of the Alps Adria Acoustics Association*, Graz, Austrija, 2007.

Jambrošić, Kristian; Horvat, Marko; Domitrović, Hrvoje: **The Influence of Excitation Type on Reverberation Time Measurements**, *Proceedings 3rd Congress of the Alps Adria Acoustics Association*, Graz, 2007. 1-6

Jambrošić, Kristian; Horvat, Marko; Domitrović, Hrvoje: **Methods of Measuring the Reverberation Time**, *Proceedings 3rd Congress of the Alps Adria Acoustics Association*, Graz, 2007. 1-9

Furdek M., Tomaš G., Fajt S., Olujić V., **Harmonic distortion perception threshold**, *Proceedings 3rd Congress of the Alps Adria Acoustics Association*, Graz, 2007.

Furdek M., Tomaš G., Fajt S., Olujić V. Brući K., **Perceptibility of aggressive dynamics processing in digital audio broadcasting**, *Proceedings 3rd Congress of the Alps Adria Acoustics Association*, Graz, 2007.

Đurek, Danijel; Đurek, Ivan; Petošić, Antonio: **Intrinsic Membrane Friction and Onset of Chaos in an Electrodynamic Loudspeaker,** *AES paper, 123rd AES Convention*, New York, 2007. p. 7255

Đurek, Ivan; Petošić, Antonio; Đurek, Danijel: **Damping of an Electrodynamic Loudspeaker by**

Air Viscosity and Turbulence, *AES papers, 123rd AES Convention*, New York, 2007. p. 7256

Ivković M., Fajt S., **Vrijednost time step stimulus testa u sveobuhvatnom probiru na oštećenje sluha u novorođenčadi**, *5. kongres hrvatskog društva za otorinolaringologiju i kirurgiju glave i vrata s međunarodnim sudjelovanjem,* Osijek 2.-5. svibnja 2007.

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

Doctor of science degree

Author: DUBRAVKO MILJKOVIĆ
Title: Active Noise Control in Light Aircraft Cabin Using Multichannel Coherent Method
Date: 21 December 2006
Mentor: Mladen Maletić

Master of science degree

Author: JOSIP HERCEG
Title: Perceptual evaluation and measurement of speech and music quality
Date: 19 June 2006
Mentor: Mladen Maletić

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

Faculty and staff

▼ Professors

**Petar Biljanović** – electronic devices, solid state circuits, microelectronics

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

Leo Budin – operating systems, real-time systems, CAD, computational intelligence

Founded in 1943

Head of the department:
Prof. **Nikola Bogunović,** PhD

Tel:	+385 1 612 99 35
Fax:	+385 1 612 96 53
E-mail:	zemris@fer.hr
URL:	http://www.zemris.fer.hr/
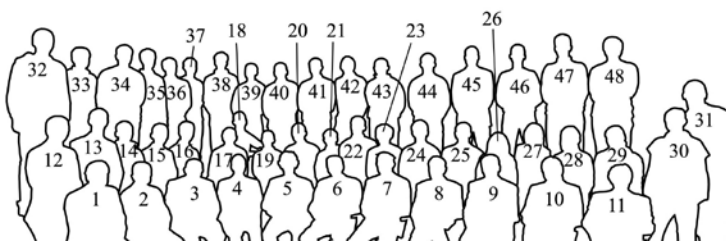
1 Aleksandar Szabo, 2 Željko Butković, 3 Leo Budin, 4 Vlado Glavinić, 5 Adrijan Barić, 6 Uroš Peruško, 7 Nikola Bogunović, 8 Petar Biljanović, 9 Siniša Srbljić, 10 Bojana Dalbelo-Bašić, 11 Slobodan Ribarić, 12 Vlado Sruk, 13 Domagoj Jakobović, 14 Ivan Žužak, 15 Dejan Škvorc, 16 Tomislav Suligoj, 17 Marin Golub, 18 Miroslav Popović, 19 Željka Mihajlović, 20 Zoran Kalafatić, 21 Marijo Maračić, 22 Darijan Marčetić, 23 Branko Samardižija, 24 Vladimir Jovanović, 25 Marko Koričić, 26 Đurđica Dandić, 27 Julijana Divković-Pukšec, 28 Zdenka Dandić, 29 Dubravka Bernat, 30 Biljana Geratović, 31 Daniel Srkobo, 32 Jakov Krolo, 33 Marin Šilić, 34 Igor Krois, 35 Alan Jović, 36 Leonardo Jelenković, 37 Mario Križan, 38 Tvtko Mandić, 39 Vladimir Čeperić, 40 Mirko Poljak, 41 Tomislav Hrkać, 42 Ivan Fratrić, 43 Stjepan Groš, 44 Danko Ivošević, 45 Jan Šnajder, 46 Jure Mijić, 47 Artur Šlić, 48 Igor Grudenić

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

Vlado Glavinić – digital systems, computer networks, Semantic Web, user interfaces, e-learning systems

Uroš Peruško – retired, distinguished professor

Slobodan Ribarić – artificial intelligence, intelligent systems, robot vision, pattern recognition, biometrics, computer architectures, multiprocessor and parallel computer systems, digital system design

Siniša Srbljić – Web computing; widget programming and composition; end-user programming; service-oriented computing; programming language translation; programming language and compiler design; theory of computing.

▼ Associate professors

Adrijan Barić - electronic devices and circuits, high speed integrated circuits, chip interconnect, modelling of passive and active devices

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

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

Zoran Kalafatić – computer vision, pattern recognition

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

Joško Radej – computer control, machine automation, real-time computing

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

▼ Assistant professors

Marin Golub – operating systems, computer security, evolutionary computation

Domagoj Jakobović – evolutionary computation, parallel and distributed computation

Leonardo Jelenković – operating systems, embedded operating systems

Igor Krois – analog design

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

Siniša Šegvić – computer vision, autonomous navigation, software architecture

▼ Lecturers

Aleksandar Szabo

▼ Assistants

Hrvoje Bunjevac
Vladimir Čeperić
Vladimir Jovanović
Alan Jović
Boris Kette
Marko Koričić
Tvrtko Mandić
Branko Samaržija
Daniel Skrobo

▼ Junior researchers

Marko Čupić
Ivan Fratrić
Stjepan Groš
Igor Grudenić
Tomislav Hrkač
Danko Ivošević
Josip Krapac
Mario Križan
Marijo Maračić
Darijan Marčetić
Edgar Pek
Mario Perić
Mirko Poljak
Miroslav Popović
Dejan Škvorc
Jan Šnajder
Ivan Žužak
Sanja Žonja

▼ Researchers

Ivan Gavran
Vladinir Klemo
Jakov Krolo
Hrvoje Marković
Andro Milanović
Matija Podravec
Marin Šilić
Marko Šinkić

▼ Administrative staff

Dubravka Bernat
Biljana Geratović

▼ Lab 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 electronics. Digital logic design. Digital systems design. Data store design. Arithmetic circuit design. Computer architecture and organisation. Multiprocessor and parallel systems. Distributed systems. Digital control. Operating systems. Software architectures. Real-time systems. Computer and communication networks. Internet technologies. Programming language translation. Programming language and compiler design. Computer system evaluation. Computer graphics. Computer animation. Office automation. Object oriented system design. Automata theory. Pattern recognition. Biometrics. Computer vision. Expert systems. Intelligent systems. Data mining. User interfaces. Formal methods in system design. Fuzzy logic. Neural networks. Genetic algorithms. Parallel programming in distributed systems. Evolutionary algorithms. Information system security. Software engineering and design. Web computing. Theory of computing.

▼ Core undergraduate courses

- Automata, formal languages, and compiler design I
- Automata, formal languages, and compiler design II
- Communication networks (FER-2)
- Computer aided analysis and design
- Computer architecture and organisation
- Computer networks
- Digital electronics
- Digital logic
- Digital system design
- Electronics I
- Electronics II
- Electronics 1 (FER2)
- Electronics 2 (FER2)
- Formal methods in the design of computing systems
- Fundamentals of microelectronics
- Intelligent systems
- Introduction to theory of computation
- Microelectronic circuits
- Operating systems
- Programming language translation.

▼ Elective courses

- Analog integrated circuits
- Advanced microelectronic structures
- Chips of ultra high complexity

- Compiler technology for parallel computer systems
- Computer animation.
- Computer architecture CISC and RISC
- Computer graphics
- Design of CMOS microprocessor circuits
- Expert systems techniques
- Fuzzy, evolutionary and neuro-computing
- GaAs and heterostructure semiconductor devices
- Machine learning
- Memory systems
- Open office systems
- Operating systems II
- Optimising compilers
- Parallel programming
- Pattern recognition
- Physical design of integrated circuits
- Real-time systems
- Reliable and fault-tolerant digital systems
- User interfaces and interactive systems design

▼ Postgraduate courses

- Advanced and intelligent networking technologies
- Algorithms in control systems
- Biometric-based Security Systems
- Compiler technology for distributed computer systems
- Computer and robot vision
- Computer architecture CISC and RISC
- Computer graphics
- Computer systems evaluation
- Computer system security
- Custom design of VLSI/ULSI circuits
- Distributed computing systems
- Dynamic Scene Analysis
- GaAs and heterostructure semiconductor devices
- High speed integrated circuits
- Human computer interaction
- Knowledge discovery in data sets
- Knowledge representation in information systems
- Memory circuits and systems
- Methods for object-oriented system design
- Microelectronic circuits design
- Microelectronics of computing and communicating systems
- Multiprocessors and parallel systems
- Network computer systems
- Processes in distributed computing systems
- Programming language translation in distributed computing systems
- Programmable logic circuits
- Reliability and fault-tolerance of computer systems
- Robot and Computer Vision.
- Statistical models for data mining

- Storage systems
- System-on-Chip (SoC)
- Visualization methods.

Research and development

▼ Electronics & 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. Investigation and application of formal methods in the design of computing systems. Software and hardware reliability. Embedded systems. Distributed real-time systems. Large-scale systems. Dependable systems design and development. Network security. Computer system security. Computer graphics, animation, visualization and human-computer interaction. Adaptive scheduling systems in single computers, clusters and grids. Internet computing. Semantic Web and ontologies. Widget programming and composition. End-user programming. Service-oriented computing. Intelligent information systems. Mapping data to ontologies. Multi-agent systems. Computer vision. Pattern recognition. Biometrics. Expert and other

On chip transistor characterization

knowledge based systems. Machine learning. Data, text and signal mining. E-learning. Office automation.

▼ Projects

ROBUst mixed signal design methodologies for Smart Power ICs (ROBUSPIC, FP6 project, European Commission, National coordinator: Adrijan Barić, 2003-2007)

FP6 Marie Curie International Incoming Fellowship **Advanced Vision-based Concurrent Mapping and Navigation (AviCMaL),** project number 21532, jointly proposed by Axel Pinz and Siniša Šegvić, coordinated by Axel Pinz (TU Graz), 2006-2007.

COST Action 2101 Biometrics for Identity Documents and Smart cards (**BIDS,** coordinator: Prof. dr. sc. Slobodan Ribarić; start: 1. Dec. 2006. end: 30. Nov. 2009.)

European project **BioSecure Network of Excellence (NoE)** is defined as project **"Biometrics for Secure Authentication"** (**BioSec,** coordinator: Prof. dr. sc. Slobodan Ribarić; start: 1. June 2005. end: 30. Sept. 2007.)

AMI Semiconductor Researh and Development Agreement (AMI Semiconductor Belgium BVBA, Principal investigator: Adrijan Barić, 2007-2008)

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

Knowledge discovery and visualization of textual data (Croatian-French research project, program COGITO, coordinators: Bojana Dalbelo Bašić and Annie Morin, 2007-2008)

Computer-aided document indexing for accessing legislation (KRO/009/006, Croatian-Flemish project,coordinators: Bojana Dalbelo Bašić and Marie-Francine Moens, 2007-2009)

Croatian – Chinese Scientific and Technological Project **Fuzzy Knowledge Representation and Reasoning for Multi-agent Systems** (project leader: Prof. dr. sc. Slobodan Ribarić; start: 1. January 2006. end: 30. December 2007.).

Bilateral Croatian-Slovenian **Multimodal Biometric Verification System** (**VMS**, project leader: Prof. dr. sc. Slobodan Ribarić; start: 1. January 2006. end: 30. December 2007.).

Measurements and Modeling of Signal Integrity in Mixed-Signal Integrated Circuits (National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia, Principal investigators: Branimir Pejčinović and Adrijan Barić, 2006-2007)

Semiconductor Device Modeling and High-Speed Ciruit Design (Project 0036027, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Adrijan Barić, 2002-2006)

Signal Integrity of Mixed-Signal Integrated Circuits (Project 036-0361621-1622, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Adrijan Barić, 2007- 2009)

Sophisticated Semiconductor Structures for Communication Technology (Project 036-1642, Ministry of Science, Education Sports of the Republic of Croatia, Principal Investigator: Petar Biljanović, 2007.-2009.)

Nanometric electron devices and circuit applications (Project 036 – 0361566 – 1567 Ministry of Science and Technology, Republic of Croatia, Principal investigator: Tomislav Suligoj, 2007-2009)

Knowledge discovery in textual data (036-1300646-1986, Croatian Ministry of Science, Education and Sports, principal investigator: Bojana Dalbelo Bašić, 2007-20009)

Automatic document indexing with descriptors from Eurovoc (Croatian Information, Documentation and Referral Agency (HIDRA) and Institute of Linguistics, Faculty of Philosophy, University of Zagreb, Principal investigator: Bojana Dalbelo Bašić, 2005-2007)

Semantic Web as Information Infrastructure Enabler (Project 0036033, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Vlado Glavinić, 2002-2006)

Universal Middleware Platform for e-Learning Systems (Project 036-0361994-1995, Ministry of Science, Education and Sport, Republic of Croatia, Principal investigator: Vlado Glavinić, 2007-2009)

Intelligent Support to Omnipresence of e-Learning (Program 0361994, Ministry of Science, Education and Sport, Republic of Croatia, Program coordinator: Vlado Glavinić, 2007-2009)

Multi-Agent Systems for Dynamic Scene Interpretation (**0036025 - MAS for Dynamic Scene Interpretation,** project leader Prof. dr. sc. Slobodan Ribarić; start: 1. Dec. 2002. end: 30. Nov. 2006.):

Autonomy-Oriented Computing Structures (**AOC –** 036 –0361935-1954, project leader Prof. dr. sc. Slobodan Ribarić; start: 1. Dec. 2006. end: 30. Nov. 2009.)

System for Object State Diagnostic Based on Multispectral Image Analysis (TP-036 principal investigator Prof. dr. sc. S. Ribarić, start: June 2004. end June 2006.)

Design Environments for Embedded Systems (Project 036-0362980-1929 , Ministry of Science and Technology, Republic of Croatia, Principal investigator: Daniel Gajski, 2007-2009)

Distributed Embedded Computer Systems (Scientific project 0036051, Ministry of Science and Technology, Republic of Croatia, Principal investigator: Leo Budin, 2002-2006)

Distributed Systems, Methods, and Applications (Scientific program 036-0362980, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Siniša Srbljić, 2007-2009)

Computing Environments for Ubiquitous Distributed Systems (Scientific project 036-0362980-1921, Ministry of Science, Education and Sports, Republic of Croatia, Principal investigator: Siniša Srbljić, 2007-2009)

Wrapper of Public Information System Mediator (Project TP-01/036-29, Ministry of Science, Education and Sports, Republic of Croatia, Part of national CroGrid technological multi-project, Project leader: Siniša Srbljić, 2003-2007)

Middleware Architecture in New Generation Networks (ERICSSON Nikola Tesla dd. Zagreb, Project leader: Siniša Srbljić, 2000-present)

Internet Key Exchange ver. 2 (Siemens d.d., Project Leader: Vlado Glavinić)

Publications

Books

Srbljić, Siniša. **Introduction to theory of computing** (Uvod u teoriju računarstva) / Elezović, Neven (ed.). Zagreb : Element, 1st ed., 2007., (in Croatian)

Srbljić, Siniša. **Programming language translation** (Prevođenje programskih jezika) / Elezović, Neven (ed.). Zagreb : Element, 1st ed., 2007., (in Croatian)

Chapter in book

Marasović, Kristina; Dalbelo-Bašić, Bojana; Brigljević, Vuko. **Process Control of an Event Filter Farm for a Particle Physics Experiment Based on Expert System Technology**. Knowledge-Based Intelligent Information and Engineering Systems : 11th International Conference KES 2007, XVII Italian Workshop on Neural Networks ; Proceedings ; Part 1 / Apolloni, Bruno ; Howlett, Robert J. ; Jain, Lakhmi (ur.). Berlin, Heidelberg : Springer, 2007. Str. 319-326.

Pavešić, Nikola; Savič, Tadej; Ribarić, Slobodan. **Multimodal Biometric Authentication System Based on Hand Features**; From data and Information Analysis to Knowledge Engineering / Spiloupoulou, M. ; Kruse, C. ; Nurnberger, A. ; Gaul, W. (ed.).Heidelberg : Springer, 2006. Str. 630-637.

Van der Mast, Charles; Popović, Siniša; Lam, Dave; Castelnuovo, Gianluca; Kral, Pavel; Mihajlović, Željka. **Technological Challenges in the Use of Virtual Reality Exposure Therapy** . Novel Approaches to the Diagnosis and Treatment of Posttraumatic Stress Disorder / Roy, Michael J. (ur.). Amsterdam : IOS Press, 2006.

▼ Patents

Suligoj, Tomislav; Biljanović, Petar; Wang, Kang L. **Horizontal Current Bipolar Transistor and Fabrication Method**, *United States Patent,* No.7,038,249, May 2, 2006.

▼ Journal papers

Dobša, Jasminka; Dalbelo-Bašić, Bojana. **Approximate Representation of Textual Documents in the Concept Space**. *Informatica*. **31** (2007) , 1; 21-27.

Glavinić, Vlado; Rosić, Marko; Zelić, Marija. **Agents in m-Learning Systems Based on Intelligent Tutoring**. ; *Lecture Notes in Computer Science*. 4556 (2007) ; 578-587.

Grudenić, Igor; Bogunović, Nikola. **Modeling and Verification of MPI Based Distributed Software**. // *Lecture Notes in Computer Science*. **4192** (2006) , 1; 123-132

Hrkać, Tomislav; Kalafatić, Zoran; Krapac, Josip. **Infrared-Visual Image Registration Based on Corners and Hausdorff Distance**. *Lecture notes in Computer Science: Image Analysis*. 4522 (2007) ; 383-392.

Jakobović, Domagoj; Budin, Leo. **Dynamic Scheduling with Genetic Programming.** *Lecture Notes in Computer Science*. **3905** (2006) ; 73-84

Jakobović, Domagoj; Jelenković, Leonardo; Budin, Leo. **Genetic Programming Heuristics for Multiple Machine Scheduling.** *Lecture Notes in Computer Science*. **4445** (2007) ; 321-330

Jozić, Krešimir; Mihajlović, Željka. **Programmable graphic hardware**. *Automatika - Journal for Control, Measurement, Electronics, Computing and Communications.* **47** (2006), 3-4; 177-181.

Kolar, Mladen; Vukmirović, Igor; Dalbelo Bašić, Bojana; Šnajder, Jan. **Computer-Aided document Indexing Systems**. *Journal of Computing and Information Technology - CIT*. **13** (2005) , 4; 299-305.

Pavešić, Nikola; Savič, Tadej; Ribarić, Slobodan; Fratric, Ivan. **A Multimodal Hand-based Verification System with an Aliveness-detection Module**; *Annals of Telecommunications.* **62** (2007), 1-2; 1655-1680.

Petrović, Saša; Šnajder, Jan; Dalbelo Bašić, Bojana; Kolar, Mladen. **Comparison of Collocation Extraction Measures for Document Indexing**. *Journal of Computing and Information Technology - CIT*. **14** (2006) , 4; 321-327.

Ribarić, Slobodan. **Temporal Knowledge Representation and Reasoning Model for Temporally Rich Domains**. // *Lecture Notes in Computer Science*. **3682** (2005), 430-436.

Ribarić, Slobodan; Fratrić, Ivan. **A Biometric Identification System Based on Eigenpalm and Eigenfinger Features**; *IEEE Transactions on Pattern Analysis and Machine Intelligence*. **27** (2005), 11; 1698-1709 (paper in CC journal).

Ribarić, Slobodan; Pavešić, Nikola. **A Recognition-Inference Procedure for a Knowledge Representation Scheme Based on Fuzzy Petri Nets**; *MICAI 2006: Advances in Artificial Intelligence: 5th Mexican International Conference on Artificial Intelligence,* Lecture Notes in Computer Science 4293 /2006/ Carbonell, J. G.Siekmann,J.(ur .).Heidelberg : Springer Berlin, (2006), 38-48.

Rosić, Marko; Glavinić, Vlado; Stankov, Slavomir. **Intelligent Tutoring Interoperability for the New Web**. ; *Telecommunication Systems*. 32 (2006) , 2-3; 193-207.

Sertić, Hrvoje; Kalafatić, Zoran. **Generic Software Component as a Foundation for Computer Vision Systems**. *WSEAS Transactions on Computers*. 5 (2006) , 11; 2615-2762.

Srbljic, Sinisa; Milanovic, Andro; Skvorc, Dejan; Skrobo, Daniel; Popovic, Miroslav; Gavran, Ivan; Podravec, Miroslav; Zuzak, Ivan; Benc, Ivan; Skuliber, Ivan. **Programmable Internet Environment**. // Revija Ericsson Nikola Tesla, Zagreb, Vol. 20, No. 1, 2007, pp. 5-21.
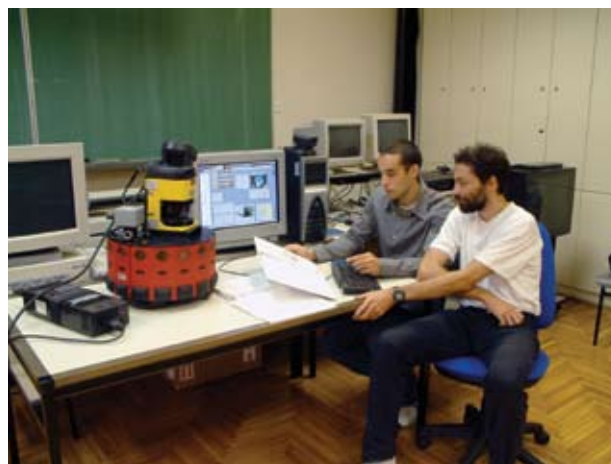
Laboratory for inteligent systems

▼ Educational materials

Suligoj, Tomislav. **Fundamentals of Microelectronics**, Lecture Slides, Faculty of Electrical Engineering and Computing, Dept. of Electronics, Microelectronics, Computer and Intelligent Systems, 2006. (in Croatian)

Suligoj, Tomislav. **Advanced Microelectronic Structures**, Lecture Slides, Faculty of Electrical Engineering and Computing, Dept. of Electronics, Microelectronics, Computer and Intelligent Systems, 2007. (in Croatian)

▼ Invited lectures

Dalbelo Bašić, Bojana; Tadić, Marko. **Computer Aided Document Indexing System (CADIS) with Eurovoc**. EUROVOC Conference 2006, European Parliament, Bruxelles, Belgium, 10.3.2006.

Srbljić, Siniša; Skrobo, Daniel; Popović, Miroslav. **From Service to Gadget Composition: Enabling Process-oriented Web** // *Google Inc.*, Mountain View, California, USA, 17.01.2007., http://video.google.com/videoplay?docid=8996631603649405286&q=srbljic&total=1&start=0&num=10&so=0&type=search&plindex=0

Srbljić, Siniša; Skrobo, Daniel; Škvorc, Dejan. **PIE: End-User Programmable Internet Environment** // *Google Inc.*, Mountain View, California, USA, 06.01.2006., *UC Berkeley Chess Seminar*, Berkeley, California, USA, 08.11.2005., *Intel Corporation*, Santa Clara, California, USA, 11.11.2005., *CECS Colloquium - Information & Computer Science, UC Irvine*, Irvine, California, USA, 15.11.2005., *Graduate Engineering Seminar, Santa Clara University*, Santa Clara, California, USA, 17.11.2005.

Suligoj, Tomislav. **Horizontal Current Bipolar Transistor (HCBT) 3rd Lot Process Issues**, Asahi Kasei EMD Co. Tokyo, Japan, September 2007.

Suligoj, Tomislav. **Horizontal Current Bipolar Transistor (HCBT) in AKM's 0.18 μm BiCMOS Process, Device Concepts and Integration Schemes**, Asahi Kasei Microsystems Co. Nobeoka, Japan, January 2007.

▼ Conference papers

Bako, Niko; Čeperić, Vladimir; Barić, Adrijan: **Design and Optimisation of Local Interconnected Network Interface**, *Proc. Of MEET and HGS, vol. I, 29th Int. Convention MIPRO 2006*, May 2006, Rijeka, pp. 120-124.

Blažona, Bojan; Mihajlović, Željka. **Introduction to the Visualization Service Based on Web Services**. *Proceedings of the Work in Progress Session of the Software Engineering and Advanced Applications* / Erwin Grosspietsch, Konrad Klockner (ur.). SEA - J. Kepler Universitat, Linz : Acccademic Press, 2006. 29-30.

Blažona, Bojan; Mihajlović, Željka. **Visualization Service Based on Web Services**. *Proceedings of the ITI 2007 29th International Conference on Information Technology Interfaces* / Luzar - Stiffler, V ; Hljuz Dobric, V. (ur.). Zagreb : SRCE University Computing Centre, 2007. 673 – 678.

Blečić, Raul; Ivanković, Andrej; Petrović, Sebastian; Crnković, Boris; Barić, Adrijan: **Modelling of On-Chip Spiral Inductors,** *Proceedings of MEET and HGS, vol. I*, 30th International Convention MIPRO 2007, Rijeka, 103-108

Bogunović, Nikola. **Programsko inženjerstvo - prioritetna istraživačka, razvojna i proizvodna djelatnost u Hrvatskoj** // *Prvi kongres hrvatskih znanstvenika iz domovine i inozemstva - Zbornik* / Barišić, Pavo (ur.). Zagreb : Ministarstvo znanosti, obrazovanja i športa RH, 2006. 162-174

Bogunović, Nikola; Pek, Edgar. **Model Checking Procedures for Infinite State Systems** // *Proceedings of the 13th IEEE International Symposium and Workshop on Engineering of Computer-Based Systems: Mastering the Complexity of Computer-Based Systems* / Riebisch, Matthias ; Tabeling, Peter ; Zorn, Werner (ur.). Los Alamitos, California : IEEE Computer Society Conference Publishing Service, 2006. 419-425

Budiselic, Ivan; Srbljic, Sinisa; Popovic, Miroslav. **RegExpert: A tool for Visulation of Regular Expressioins**, EUROCON 2007, Proceedings of the International Conference on "Computer as a Tool, Warsaw, Poland, September 9-12, 2007, pp. 2387-2389

Cafuta, D., Dodig, I., Sruk, V.: **An Approach to Embedded Internet System Development**, MIPRO 2006, 29th International Convention: Computers in Technical Systems, May 22-26, 2006, Opatija, Croatia, pp. 68-73.

Čeperić Vladimir; Butković, Željko; Barić, Adrijan: **Design and Optimisation of Self-Biased Complementary Folded Casode**, *Proc. IEEE MELECON 2006*, May 2006, Malaga, pp. 145-148.

Čeperić, Vladimir; Dalbelo-Bašić, Bojana; Barić, Adrijan. **EMC Aware Circuit Design and Optimizations**. *Proc. 18th International Wroclaw Symposium on Electromagnetic Compatibility 2006* / Lewandowski, G ; Janiszewski, J. M. (ur.). Wroclaw : Oficyna Wydawnicza Politechniki Wroclawskiej, 2006. 182-186.

Čeperić, Vladimir; Mandić Tvrtko; Barić, Adrijan: **Simulations of Symmetrical Transverse Electromagnetic Cell,** *Proceedings of MEET and HGS, vol. I,* 30th Intl. Convention MIPRO 2007, Rijeka, 126-132
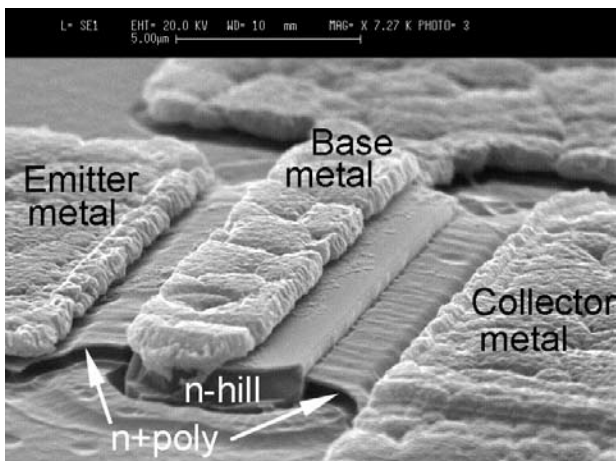
Dadic, M., Sruk, V., Somek, B.: **Adaptive Design of Linear-Phase Maximally Flat Filters for Digital Audio**, 13th International Congress on Sound and Vibration, July 2-6, 2006, Vienna, Austria, pp. 1-6.

Dalbelo Bašić, Bojana; Dovedan, Zdravko; Raffaelli, Ida; Seljan, Sanja; Tadić, Marko. **Computational Linguistic Models and Language Technologies for Croatian**. *ITI 2007 Proceedings of the 29th International Conference on INFORMATION TECHNOLOGY INTERFACES* / Lužar - Stiffler, Vesna ; Hljuz Dobrić, Vesna (ur.). Zagreb : SRCE, 2007. 521-528.

Diosi, Albert; Remazeilles, Anthony; Šegvić, Siniša, Chaumette, Francois. **Experimental evaluation of an urban visual path following framework;** *Proceedings of 6th IFAC Symposium on Intelligent Autonomous Vehicles*, IAV'07. / Michel Devy, Miguel Salichs, H.Asama (ur.). Toulouse, France : IFAC, 2007

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Dodig, I., Cafuta, D., Sruk, V.: **Information System for Attendance Records Evidence in Diverse Locations**, Information and Intelligent Systems, 17th International Conference, September 20-22, 2006, Varaždin, Croatia, pp. 93-98.

Dodig, I., Cafuta, D., Sruk, V.: **Personal Identification Number Complexity Evaluation**, MIPRO 2006, 29th International Convention: Computers in Technical Systems, May 22-26, 2006, Opatija, Croatia, pp. 63-67.

Duplančić, Jerko; Golub, Marin; **Implementing Automated Vulnerability Assessment in Large Network Environments**, *Proceedings of the Information Systems Security, MIPRO 2006*, May 22 - 26, 2006, Opatija, Croatia, pp. 205-210.

Fuštin, Jakov; Mihajlović, Željka. **Fluid Flow Animation**. *Proceedings of MIPRO 2006, Computers in Technical Systems, Intelligent Systems, CTS&CIS,* / Budin, Leo; Ribarić, Slobodan (ur.). Rijeka : Studio Hofbauer, 2006. 94-99.

Gavran, Ivan; Milanovic, Andro; Srbljic, Sinisa. **End-User Programming Language for Service-Oriented Integration**, Proceedings of the 7th Workshop on Distributed Data and Structures, Santa Clara, California, USA, January 4-5, 2006, pp. 1-8.

Glavinić, Vlado; Kukec, Mihael; Ljubić, Sandi. **Mobile Virtual Laboratory: Learning Digital Design** ; *Proc. of the ITI 2007. 29th Int'l Conf. on Information Technology Interfaces – ITI 2007* ; Luzar-Stiffler, Vesna ; Hljuz Dobric, Vesna (Eds.). Zagreb : SRCE University Computing Center, University of Zagreb, 2007. 325-332.

Golub, Marin; Jakobović, Domagoj; Janeš, Ivan. **An overview of distributed programming techniques** *Proceedings of the Hypermedia and Grid Systems, MIPRO 2005* / Biljanović, Petar ; Karolj, Skala (ur.). Rijeka : MIPRO, 2005. 215-220

Granić, Andrina; Glavinić, Vlado. **Evaluation of Interaction Design in Web-Based Intelligent Tutoring Systems** ; *Proc. 28th International Conference on Information Technology Interfaces – ITI 2006* ; Luzar-Stiffler, Vesna ; Hljuz Dobric, Vesna (Eds.). Zagreb : University Computing Centre SRCE, University of Zagreb, 2006. 265-270.

Groš, Stjepan; Glavinić, Vlado. **Architecture of an IKEv2 Protocol Implementation** ; *Proceedings of the Fourth IASTED International Conference on Communication, Network, and Information Security* ; Dasgupta, Partha (Eds.). Berkeley, CA, USA : Acta Press, 2007. 1-6.

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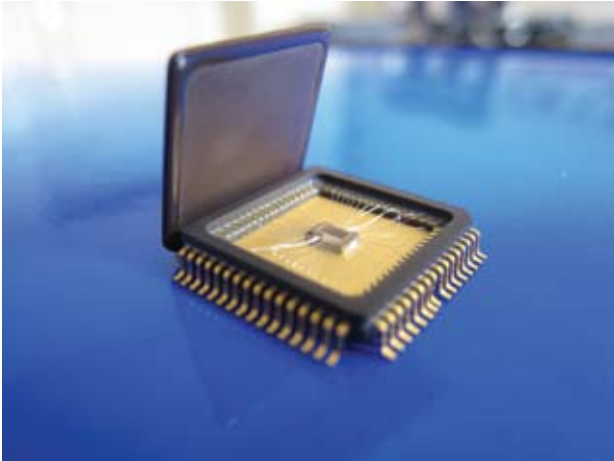
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Jelenković, Leonardo; Jakobović, Domagoj; Golub, Marin. **Sinkronizacijski problemi**. *Proc. 30th Jubilee Int'l Convention MIPRO 2007, Vol. IV - Computers in Education* / Čičin-Šain, Marina ; Turčić Prstačić, Ivana ; Sluganović, Ivanka (ur.). Rijeka : Croatian Society for Information and Communication Technology, Electronics and Microelectronics - MIPRO, 2007. 119-125

Jovanovic, Vladimir; S. Milosavljević, Silvana; Nanver, Lis K.; Suligoj, Tomislav; and Biljanović, Petar. **Sub-200 nm Silicon Nitride Hard-Mask for High Aspect Ratio Silicon Fins**, *Proceedings of MIPRO 2007*. pp. 62-66

Jovanović, Vladimir; Milosavljević, Silvana; Nanver, Lis K.; Suligoj, Tomislav. **Application of spacer hard-masks for sub-100 nm wide silicon fin-etching**, *Proceedings of 9th Annual Workshop on Semiconductor Advances for Future Electronics and Sensors, SAFE 2006*. pp. 519-522

Jović, Alan; Bogunović, Nikola. **Feature Extraction for ECG Time-Series Mining Based on Chaos Theory** // *Proceedings of the ITI 2007 29th International Conference on Information Technology Interfaces* / Luzar - Stiffler, Vesna ; Hljuz Dobric, Vesna (ur.). Zagreb, 2007. 63-68

Jović, Ognjen; Čeperić, Vladimir; Barić, Adrijan: **Influence of Packing on the Oscillation Frequency of a High Voltage CMOS Quadrature LC Oscillator**, *Proceedings of MET and HGS, vol. 1, 29th Int. Convenction MIPRO 2006*, May 2006, Rijeka, pp. 106-109.

Koričić, Marko; Biljanović, Petar; Suligoj, Tomislav. **Properties of Lateral Bipolar Transistors in SiGe Technology**, *Proceedings of MIPRO 2006*. pp. 68-71

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International links

Agilent, Santa Rosa, California, USA

AMI Semiconductor, Oudenaarde, Belgium

Cadence Design Systems GmbH, Feldkirchen, Germany

Cadence Design Systems, Velizy, France

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

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

Faculty of Electrical Engineering, University of Ljubljana, Slovenia

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

Fakulteta za računalništvo in informatiko, Univerza v Ljubljani, Slovenia

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

Institut "Jožef Stefan", Knowledge technologies department, Slovenia

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

Inter-university MicroElectronics Center, Belgium

IRISA, Universite de Rennes 1, Rennes, France

Katholieke Universiteit Leuven, Computer science department, Leuven, Belgium

Katholieke Universiteit Leuven, ESAT-TELEMIC, Belgium

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

Doctor of science degree

Author: JASMINKA DOBŠA
Title: Text mining using concept indexing
Date: 8 December 2006
Mentor: Bojana Dalbelo-Bašić

Author*:* DOMAGOJ JAKOBOVIĆ
Title*:* "Raspoređivanje zasnovano na prilagodljivim pravilima"
Date*:* December 7, 2005
Mentor*:* Leo Budin

Author*:* LEONARDO JELENKOVIĆ
Title*:* "Monitor-based multithreaded embedded systems"
Date*:* November 30, 2005
Mentor*:* Leo Budin

Author*:* ANDRO MILANOVIĆ
Title*:* "Service-oriented programming model"
Date*:* December 21, 2005
Mentor*:* Siniša Srbljić

Master of science degree

Author*:* MARKO ČUPIĆ
Title*:* *"*Moidel of e-Examination System with Support for Intelligent Assessment Management"
Date*:* July 5, 2006
Advisor*:* Vlado Glavinić

Author: IVAN GAVRAN
Title: "End-user language for service-oriented programming model"
Date: March 22, 2006
Mentor: Siniša Srbljić

Author: IGOR GRUDENIĆ
Title: "Parallel algorithms for construction and manipulation of binary decision diagrams"
Date: January 26, 2006
Mentor: Nikola Bogunović

Author*: IVAN JANEŠ
Title*: *"*Distributed programming techniques in a firewalled system"
Date*: November 15, 2005
Mentor*: Marin Golub

Author*: JOSIP KRAPAC
Title*: *"*Segmentation Based on Background Subtraction Methods"
Date*: October 30, 2006
Mentor*: Prof. dr. sc. Slobodan Ribarić

Author*: IVAN KREVATIN
Title*: *"*User Identification Based on Fisherpalms and Eigenpalms"
Date*: December 12, 2006
Mentor*: Prof. dr. sc. Slobodan Ribarić

Author: HRVOJE MARKOVIĆ
Title: „Mining spatial-temporal data for travel time estimation in urban traffic networks"
Date: 27 March 2007
Mentor: Bojana Dalbelo-Bašić

Author: EDGAR PEK
Title: "Formal verification of communication protocols in distributed systems"
Date: November 3, 2005
Mentor: Nikola Bogunović

Author: MATIJA PODRAVEC
Title: "Service discovery and deployment in service-oriented computing systems"
Date: January 26, 2006
Mentor: Siniša Srbljić

Author: MIROSLAV POPOVIĆ
Title: "Access Control in Service-Oriented Information Systems"
Date: May 26, 2006
Mentor: Siniša Srbljić

Author*: HRVOJE REGELJA
Title*: *"*Dynamic Terrain Modeling and Visualization"
Date*: 10 May 2007
Mentor*: Željka Mihajlović

Author: DANIEL SKROBO
Title: "Distributed Parallel Program Interpretation in Service-Oriented Architectures"
Date: January 25, 2006
Mentor: Siniša Srbljić

Author: DEJAN ŠKVORC
Title: "Virtual network of service-oriented computing systems"
Date: January 25, 2006
Mentor: Siniša Srbljić

Author*: JAN ŠNAJDER
Title*: *"*Multi-agent System Architecture Based on Coloured Petri Nets"
Date*: October 30, 2006
Mentor*: Prof. dr. sc. Slobodan Ribarić

5.11.

5.12. Department of Wireless Communications

Faculty and staff

▼ Professors

Juraj Bartolić - electromagnetic wave theory, microwave engineering, antennas and propagation, smart antennas, remote sensing, EMC

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

Boris Kviz, retired, distinguished professor - optical communication systems, radiotelemetry, radiolocation and navigation

Borivoj Modlic - broadcasting, wireless access networks, EMC

Founded in 1954

Head of the department:
Prof. **Borivoj Modlic,** Ph.D.

Tel: + 385 1 6129 857
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Robert Nađ - mobile communications, electromagnetic compatibility, RF amplifier design

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

1 Zvonimir Šipuš, 2 Boris Kviz, 3 Dina Šimunić, 4 Borivoj Modlic, 5 Branka Zovko-Cihlar, 6 Juraj Bartolić, 7 Sonja Grgić, 8 Ervin Zentner, 9 Antonio Šarolić, 10 Gordan Šišul, 11 Tomislav Kos, 12 Josipa Baček, 13 Mislav Grgić, 14 Davor Bonefačić, 15 Silvio Hrabar, 16 Damir Zrno, 17 Krešimir Malarić, 18 Damir Petričević, 19 Robert Nađ, 20 Tomislav Debogović, 21 Siniša Škokić

BrankaZovko-Cihlar, retired, distinguished professor - television, video signal generation, processing and transmission, multimedia communications, noise in radio communications

▼ Associate professors

Davor Bonefačić - microwave engineering, active antennas, radar systems

Mislav Grgić - digital video communications, Internet communications, face recognition

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

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

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

Dina Šimunić - biomedical effects of electromagnetic fields, microwave communications

Zvonimir Šipuš - optical communication systems, computational electromagnetics, antennas

▼ Assistants

Ninoslav Majurec, left on September 2005

Antonio Šarolić, left on December 2005

Gordan Šišul

Radovan Zentner, temporarily left on 31 December 2004

Mario Cvitković, started on 16 September 2006

▼ Junior researchers

Marko Bosiljevac
Tomislav Debogović
Emil Dumić
Branimir Ivšić
Tin Komljenović
Mario Muštra
Siniša Škokić
Damir Zrno

▼ Administrative staff

Ljerka Nuić
Josipa Tanja Baček

▼ Lab 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 Communications, 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, Packet Radiocommunications, Picture Quality in Digital Video Communications, Protection of Radiocommunication Systems, Radar Systems, Radio Positioning and Navigation, Radio Communication System Fundamentals, Radio Communication Systems, Radio-Frequency Amplifier Design, Radio Frequency Electronics, Satellite Communications, Spread Spectrum Systems, Television, Theory of Communication Systems, Theory of Electromagnetic Waves, Wireless Circuits Design.

▼ Core undergraduate courses

- Antennas
- Digital video communications
- Microwave communications
- Microwave engineering
- Modulations and modulators
- Optical communication systems
- Optoelectronic circuits
- Radiocommunication system fundamentals
- Radiofrequency electronics
- Television
- Theory of electromagnetic waves

▼ Elective courses

- Application of microwaves in industry and science
- Digital television
- Electronic surveillance, electronic countermeasures and counter-countermeasures
- Frequency and signal synthesis
- Microwave receivers
- Mobile communication
- Mobile systems planning
- Noise analysis in communication system
- Numerical analysis of antennas and guiding structures

- Optical communication networks
- Packet radiocommunications
- Protection of radiocommunication systems
- Radar systems
- Radio positioning and navigation
- Radiocommunication multimedia services
- Remote sensing

▼ Postgraduate courses

- Active antennas
- Advanced electromagnetic engineering
- Biomedical effects of electromagnetic fields
- Broadband networks for television signal distribution
- Communications for multimedia services
- Digital television
- Electronic tracking systems
- Frequency and signal synthesis
- Microwave instrumentation and measuring methods
- Microwave semiconductor electronics
- Modulation methods
- Multimedia content retrieval
- Navigation systems
- Noise in radiocommunications
- Optical communications
- Optical sensors and components
- Picture quality in digital video communications
- Radiocommunication systems
- Satellite communications
- Spread spectrum systems
- Technology of radiofrequency components
- Theory of communication systems
- Wireless circuits design

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 planar, cylindrical and spherical 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.

Electric field distribution of a typical GSM base station

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. Soliton propagation in fibers. Numerical modelling of multilayer fibers. Meta-materials. Multi-frequency radar systems. Ionospheric and tropospheric propagation impact on satellite positioning performance.

▼ Projects

ACE2 - Antenna Centre of Excellence (FP6 - NoE, National coordinator: Juraj Bartolić)

ESoA - The European School of Antennas (Marie Curie Actions, National coordinator: Juraj Bartolić)

ASSIST - Antenna Systems & Sensors for Information Society Technology (COST Action IC 0603, Co-operation in Science and Technology, European Commission, National coordinator: Juraj Bartolić)

Innovative Antennas for Emerging Terrestrial and Space-based Applications (Project COST 284, Co-operation in Science and Technology, European Commission, National coordinator: Juraj Bartolić)

Mitigation of Ionospheric Effects on Radio Systems (COST Action 296, Co-operation in Science and Technology, European Commission, National coordinator: Tomislav Kos)

Optical Fibres for New Challenges Facing the Information Society (COST Action 299, Cooperation in Science and Technology, European Commission, National coordinator: Zvonimir Šipuš)

CEEPUS network CII-HU-0008-01-0607 - Telecommunication (Institutional Coordinator Tomislav Kos)

Electric field meassurement of high power transmiters

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

Analysis of Curved Frequency Selective Surfaces (Project FA8655-07-1-3018 – European Office of Aerospace Research and Development (EOARD), Principal investigator: Zvonimir Šipuš, 2007-2008)

Luneberg Antenna for Multimedia on Train (EUREKA Cluster project: PIDEA + EURIPIDES EUR-06-109 LAFMOT - European Commission, Ministry of Science and Technology, Republic of Croatia, Project coordinator: Zvonimir Šipuš, 2007-2010)

Adaptive Antennas in Communication and Radar Systems (Ministry of Science and Technology, Principal investigator: Juraj Bartolić, 2002-2006)

Applied Electromagnetics in Communication Technologies (Ministry of Science and Technology, Principal investigator: Zvonimir Šipuš, 2002-2006)

Electromagnetic Compatibility - Environmental Impacts (Ministry of Science and Technology, Principal investigator: Borivoj Modlic, 2002-2006)

GTEM-Cell Prototype Development (Ministry of Science and Technology, Principal investigator: Krešimir Malarić, 2002-2006)

Independent Laboratory for Research and Students (Ministry of Science and Technology, Principal investigator: Dina Šimunić, 2002-2006)

Multimedia Communication Systems (Ministry of Science and Technology, Principal investigator: Branka Zovko-Cihlar, 2002-2006)

Research and Development Laboratory for Wireless Data Communications and Dosimetry (Ministry of Science and Technology, Principal investigator: Dina Šimunić, 2002-2006)

Efficiency increase of wireless communications systems (Ministry of Science, Education and Sport, Principal investigator: Dina Šimunić, 2007-2009)

Electromagnetic Compatibility - Environmental Protection, (Ministry of Science, Education and Sport, Principal investigator: Borivoj Modlic, 2007-2009)

Electromagnetic effects and structures in communication systems, (Ministry of Science, Education and Sport, Principal investigator: Zvonimir Šipuš, 2007-2009)

Electromagnetic Metamaterials and Nanoelectromagnetics, (Ministry of Science, Education and Sport, Principal investigator: Silvio Hrabar, 2007-2009)

Environment for satellite positioning, (Ministry of Science, Education and Sport, Principal investigator: Tomislav Kos, 2007-2009)

Intelligent Image Features Extraction in Knowledge Discovery Systems, (Ministry of Science, Education and Sport, Principal investigator: Mislav Grgić, 2007-2009)

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Multifunctional Antennas in Communication and Radar Systems, (Ministry of Science, Education and Sport, Principal investigator: Juraj Bartolić, 2007-2009)

Picture Quality Management in Digital Video Broadcasting, (Ministry of Science, Education and Sport, Principal investigator: Sonja Grgić, 2007-2009)

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International links

Air Force Research Laboratories, Hanscom AFB, Massachusetts, USA

Battelle Pacific Northwest National Laboratory (PNNL), USA

Brunel University, Department for Manufacturing and Engineering Systems, West London, United Kingdom

Chalmers Tekniska Hogskola, Institutionen för Elektromagnetik, Gothenburg, Sweden

City University, School of Engineering, Division of Electrical, Electronic and Information Engineering, London, United Kingdom

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Food and Drugs Administration, USA

Motorola, Florida Corporate Electromagnetics Research Laboratory, Ft. Lauderdale, Florida, USA

Queen Mary University of London, Department of Electronic Engineering, Multimedia and Vision Lab, London, United Kingdom

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Date: 2 March 2007
Mentor: Tomislav Kos

Author: LIDIJA MANDIĆ
Title: Method for Visual Color Matching in Image Reproduction Systems
Date: 06 March 2007
Mentor: Sonja Grgić

Author: KREŠIMIR DELAČ
Title: Face Recognition in Compressed Domain
Date: 05 March 2007
Mentor: Mislav Grgić

Master of science degree

Author: MARIO RAVNJAK
Title: Technologies for Video Signal Transmission over Packet Networks
Date: 21 May 2007
Mentor: Sonja Grgić

Author: MATKO DODIG
Title: Compression Parameters of Digital Lung and Sinus Radiographs in Children
Date: 09 November 2006
Mentor: Sonja Grgić

Author: MIRAN GOSTA
Title: Optimization of Terrestrial Broadcast Digital Television Network Planning
Date: 27 October 2006
Mentor: Branka Zovko-Cihlar

Author: NIKICA BELANČIĆ
Title: Adaptive antenna systems in mobile radiocommunications
Date: 27 October 2006
Mentor: Ervin Zentner

Author: MLADEN GOLUBIĆ
Title: Filtering Circuit Impact on Class D Medium Frequency RF Power Amplifier Operation
Date: 26 May 2006
Mentor: Borivoj Modlic

Author: SANJA JURIĆ
Title: Digital Video Signal Processing in Television Cameras
Date: 21 December 2005
Mentor: Sonja Grgić

Author: SINIŠA ŠKOKIĆ
Title: Moment method analysis of spherical structures
Date: 28 November 2005
Mentor: Zvonimir Šipuš

Author: TOMISLAV LUKIČIĆ
Title: Quality Evaluation of Film Image Using Telecine
Date: 30 September 2005
Mentor: Sonja Grgić

Author: ŽELJKO TABAKOVIĆ
Title: "Analysis of coexistence possibilites for broadband wireless access systems"
Date: 4 May 2007
Mentor: Dina Šimunić

6.

Management and Administration

6.1. Dean and Vice Deans

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Mario Cifrek – Vice Dean

Sead Berberović – Vice Dean

Adrijan Barić – Vice Dean

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Dean and vice deans (from left to right): Sead Berberović, Mario Cifrek, Vedran Mornar (dean), Adrijan Barić.

6.2. Secretary's Office

Vladimir Malarić - Head of Office

Marija Rumac – Head of Dean's Office

Nikolina Miljan

Carmen Gršić

Marija Kovačević – Head of Office for General Affairs

Jožica Poslon

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Jadranka Matleković – Head of Human Resources Office

Renata Peček

Đurđica Jelić – Head of Registry Department

Petar Janković
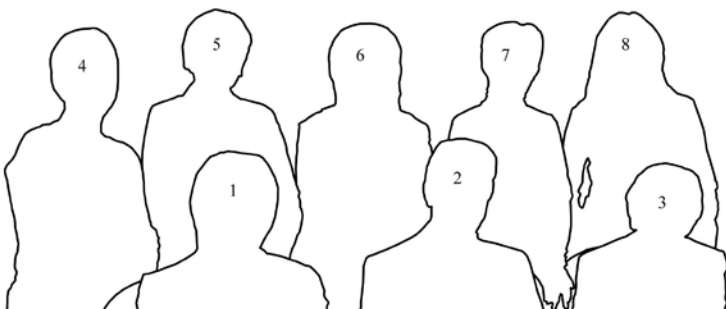
1 Marija Kovačević, 2 Vladimir Malarić, 3 Jadranka Matleković, 4 Nikolina Miljan, 5 Božica Horvat, 6 Marija Rumac, 7 Renata Peček, 8 Davorka Puljić

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- Procurement

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Ivana Hebel

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Mira Silov

Gordana Šincek

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Vasilije Vladisavljević

Dijana Bontempo

Gordana Gluščević

1 Anka Jurić, 2 Olga Županić, 3 Mira Silov,
4 Željka Veljković, 5 Gordana Šincek,
6 Vasilije Vladisavljević,
7 Martina Petrović, 8 Ivana Hebel,
9 Dijana Bontempo,
10 Gordana Gluščević

6.4. 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 accomodation in student dorms, student meal discount, public transportation, and organization of promotions of graduate engineers.

Petra Žitnik - Head of Student Administration Office

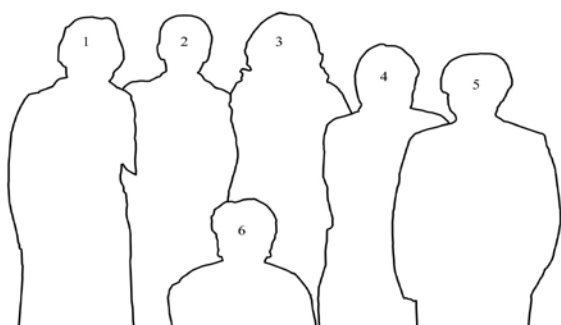**Željka Bratić Odobašić** - undergraduate and graduate study

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Smiljanka Turkalj - postgraduate specialist research study

Mirjana Grubiša - postgraduate specialist study

1 Mirjana Grubiša, 2 Petra Žitnik, 3 Željka Bratić Odobašić, 4 Vasilija Tovarloža, 5 Smiljanka Turkalj, 6 Danijela Ležaić

6.5. FER Library

The collections of FER library include 30,000 volumes of technical literature, including a very valuable collection of reference books, dictionaries, encyclopedias, and technical journals (around 700 titles), which cover the area of the Faculty curriculum. Library users (aproximately 4,200 students, 800 postgraduate students and students of Diploma study in management, high school graduates and employees) can search the library's digital and on-line catalogues, they can borrow books and journals, or use the reading room in the library.

FER library, working as an independent unit within the Faculty, provides a high-quality information service to its users, by combining subject expertise with direct access to online databases. The library also provides the service of interlibrary loan, by lending books and photocopies of articles from its collection to other libraries, as well as by borrowing books and photocopies of articles from other libraries in the country and abroad. Library management is computerised, and most of the library's activities are performed in programmes created by the Faculty's team of IT experts.

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Since the library operates in an environment where continuous development is of high importance, it has to be capable to perceive those developments, appropriately react to them, as well as to participate in the educational process of the Faculty.

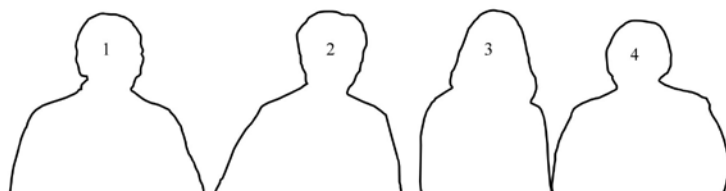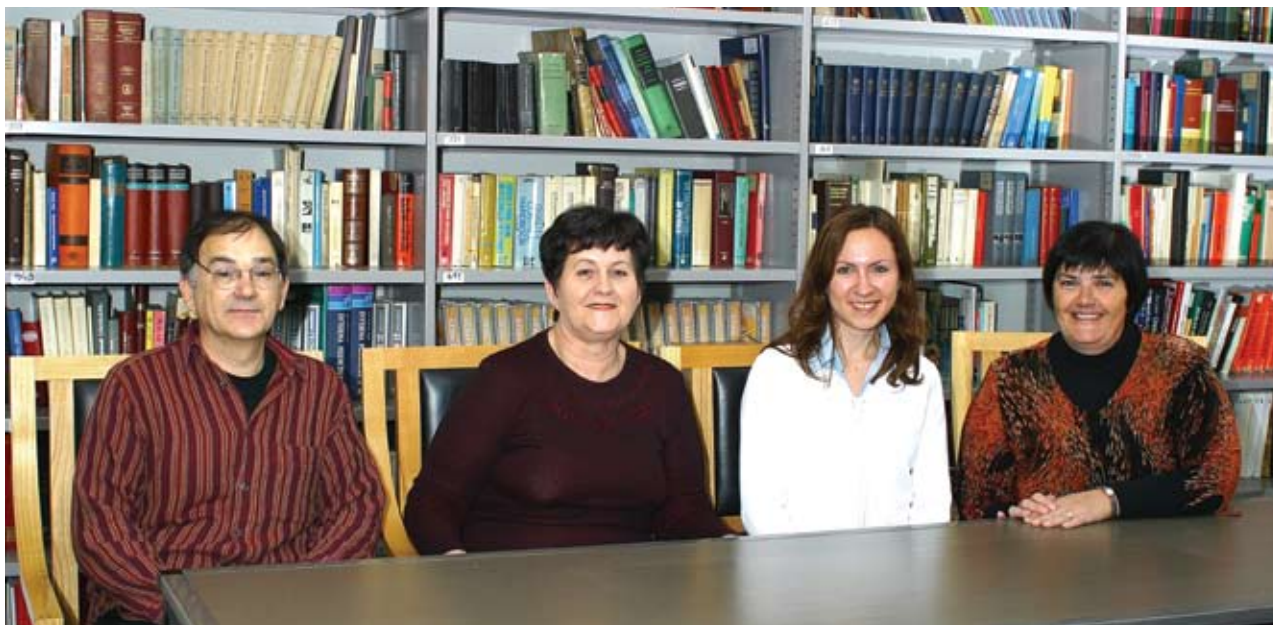**Jadranka Lisek** – Chief Librarian

Zora Žitnik – Assistant Librarian

Stjepan Šimara - Librarian

Branka Lovreček - Librarian

Đurđica Ban, retired on 31 December 2006

Vlasta Maljković, retired on 30 September 2006

1 Stjepan Šimara, 2 Jadranka Lisek,
3 Branka Lovreček, 4 Zora Žitnik

6.6. Information Support Centre

The main purpose of the Information Support Centre 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 Centre is constantly expanding and upgrading: the networking infrastructure including numerous switches and wireless access points, various UNIX/Linux/Windows servers, more then 250 PC workstations in various laboratories, various operating systems and application software and IT services. In the last 2-year period the Centre has developed the new Faculty web / intranet portal based on the advanced Faculty's Content Management System and the E-Campus e-learning infrastructure. In that period, the Centre has also adopted virtual server technology based on the IBM Blade system which will provide more flexible application infrastructure in the future.

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Prof. Mario Žagar, PhD – Head of Information Support Centre

Šadi El Assadi

Josip Herceg

Damir Kirasić

Vedran Klasić

Damir Pehar

Siniša Tomić

Ivan Voras

Kristijan Zimmer

Tomislav Žganec

1 Ivan Voras, 2 Mario Žagar, 3 Damir Pehar,
4 Josip Herceg, 5 Damir Kirasić, 6 Vedran Klasić,
7 Tomislav Žganec, 8 Šadi El Assadi, 9 Siniša Tomić

6.7. Technical Support and Maintenance

Lovorko Erceg – Head of Technical Support and Maintenance

Dubravko Dajević – Techical Support Department

Ivan Čajsa

Marijan Kundih

Željko Stojin

Dušan Bušljeta

Boris Grgiln

Miljenko Vukmanić

Josip Leskovec

Božo Armelin

Željko Bosilj

Miroslav Iličić

Josip Kalaj

Robert Veljković

Josipa Baček

Đurđica Blaga

Vesna Borošak

Mirjana Brozović

Ika Budanko

Marija Čukelj

Vera Čukelj

Đurđica Dandić

Zdenka Dandić

Mira Đurašin

Ružica Gavranović

Barica Kenig-Sovina

Marija Kočiš

Branka Marjanović

Manda Marković

Mara Mihaljević

Marija Mikić

Ljiljana Mišerić

Gordana Ožvalt

Zrinka Plodinec

Vesna Popović

Nada Rabik

Ankica Radaš

Marija Raljević

Ana Relotić

Anastazija Rendulić

Branka Rihtarić

Đurđica Šešerinac

Željkica Šikuten

Nevenka Šukurma

Ivanka Šokota

Mirica Špiljar

Marijana Trputec

Ankica Turkalj

Ruža Vukelić

Zoran Babok

1 Dušan Bušljeta, 2 Marijan Kundih, 3 Ankica Radaš, 4 Zoran Babok, 5 Đurđica Šešerinac, 6 Ivan Čajsa, 7 Miljenko Vukmanić, 8 Miroslav Iličić, 9 Lovorko Erceg, 10 Dubravko Dajević, 11 Nenad Fejzagić, 12 Boris Grgin, 13 Božo Armelin