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**Department of Microelectronics
Faculty of Electrical Engineering
Czech Technical University in Prague
Czech Republic**

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Edited by Pavel Kulha (February 2010)

FOREWORD

The Department of Microelectronics belongs to The Faculty of Electrical Engineering (FEE) that is one of the six faculties forming the Czech Technical University in Prague (CTU in Prague). The roots of CTU in Prague can be followed as far back as the year 1705, when Christian Josef Willenberg (1655 - 1731) wrote a letter to Emperor Leopold I. in Vienna seeking permission to begin public teaching of engineering sciences. This was granted by a decree of Emperor Josef I (successor to Leopold I.) on 18 January 1707. For these reasons, the priority of CTU to be the first technical school at university level in the world is usually claimed for.

The Department of Microelectronics has been established in January 1977. During the past 28 years more than 1000 students graduated in the branch of Microelectronics and nearly 50 Ph.D and 5 DrSc. degrees have been awarded. Five persons from the Department staff became professors and 14 Associate Professors. The Department offers the B.Sc., M.Sc. and Ph.D. degrees in Electronics.

The Department maintains international co-operation with many universities, research laboratories, and institutes in the Europe. This is in connection with the LEONARDO and SOCRATES Programmes, EUROPRACTICE projects, the NATO Science for Peace programme, and the Framework Programmes of the European Community.

The Department gives a high priority to collaborative research with industry. The donation from Cadence is being used to continue the education of IC design at industrial level. Several domestic electronic factories were supported by R&D works from the Department this year.

This brochure is the 17th annual review of our Department. The content of this report emphasises our effort for continuing the close association of teaching, research and co-operation with external subjects at both national and international levels.

Prague
February 2010

Pavel Kulha
Editor

STAFF OF THE DEPARTMENT

Head of the Department:

M. Husák, M.Sc., Ph.D.

Deputy:

J. Foit, M.Sc., Ph.D.

Professors:

M. Husák, M.Sc., Ph.D.

J. Kodeš, M.Sc., Ph.D., DrSc.

(Emeritus Professor)

J. Vobecký, M.Sc., Ph.D., DrSc.

Associate Professors:

Z. Burian, M.Sc., Ph.D.

J. Foit, M.Sc., Ph.D.

P. Hazdra, MSc., Ph.D.

J. Vaníček, M.Sc., Ph.D.

J. Voves, M.Sc., Ph.D.

Assistant Professors:

A. Bouřa, M.Sc.

J. Jakovenko, M.Sc., Ph.D.

V. Janíček, M.Sc.

V. Jeřábek, M.Sc., Ph.D.

L. Jirásek, M.Sc., Ph.D.

P. Kulha, M.Sc. PhD.

V. Komarnickij, M.Sc., Ph.D.

A. Krejčířík, M.Sc., Ph.D.

A. Laposa, M.Sc.

J. Novák, M.Sc. Ph.D.

V. Prajzler, M.Sc., Ph.D.

T. Teplý, M.Sc.

T. Vítek, M.Sc.

V. Záhlava, M.Sc., Ph.D.

Ph.D. students:

J. Baloun, M.Sc.

M. Janoušek, M.Sc.

J. Kroutil, M.Sc.

M. Kubař, M.Sc.

R. Taragel, M.Sc.

J. Scheirich, M.Sc.

Z. Šobáň, M.Sc.

SUPPORT STAFF

Department Secretary

H. Kubátová

Administration

R. Burianová

Teaching Laboratories:

L. Kafka

Technical Service:

M. Horník

ABOUT THE STAFF



Miroslav Husák was born in Kladno in 1953. He graduated in Radioengineering from FEE-CTU in Prague in 1978. Ph.D. in 1985, Assoc. Professor in 1997, Full Professor in 2000. Manager of Microsystems Group. Author or co-author 6 lecture notes and more than 200 scientific and technical papers. Research in the field of microsystems and integrated sensor systems. Teaching the courses Sensor systems, Power Suppliers in Electronics, Electronic Security Systems and Microsystems. Supervisor of Electronics branch (Master and Ph.D. study).



Jiří Kodeš was born in 1932. He received MSc., Ph.D., and D.Sc. degrees in electronics, semiconductor physics and microelectronics from the CTU in Prague in 1956, 1963 and 1990, resp. At present, he is Full Professor at the Department. His area of research includes electronic transport in semiconductors and quantum electronics devices. He is the author or co-author of numerous technical papers in journals and conference proceedings. He has written several textbooks for students.



Jan Vobecký was born 1957, Prague. MSc. 1981 and Ph.D. 1988 from FEE-CTU, Assoc. Professor 1992, DrSc. 1999, Full Professor 2000. Visiting fellow: University of Uppsala (1988-90), MOTOROLA Toulouse (1993). Research: High-power devices - design & technology. Author and reviewer of numerous scientific papers, H-index = 8, 36 SCI papers, 149 SCI citations, 2 patents granted, 7 patent applications, 1 textbook, 9 printed lectures. Member of Scientific Board FEE-CTU in Prague and Academy of Sciences. Senior Member IEEE. 2007-now with ABB Switzerland Ltd. Semiconductors, Lenzburg, Product Management & Technology Group.



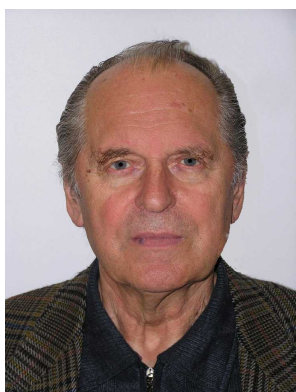
Zdeněk Burian was born in 1944. He graduated from the FEE-CTU in 1966. In 1975 he received Ph.D. degree. He is the author of 35 technical papers, 10 printed lectures and he owns 7 technical inventions. He is Assoc. Professor and gives lectures on optoelectronics. He is working in the field of integrated optics and planar optical waveguides. He researched the optical waveguides in silica in University of York, U.K.. Member of EOS and Czech Society of Photonics.



Julius Foit was born in 1932. He received MSc., PhD. and Ass. Prof. degrees in Radar Engineering, Colour TV Eng. and Multiphase Signal Processing from the CTU in Prague in 1954, 1961 and 1978, resp.. Dean of the Faculty in the University of Maiduguri, Nigeria in 1987-1989 and B. Tech. Programme Coordinator in the University of Zimbabwe, Harare, in 1990-1993. Currently, he is Associate Professor in the Dept. He is the author of many papers, several monographs and textbooks for students. He is a Fellow of ZIE and Past-President of Rotary Int.



Pavel Hazdra was born in 1960. M.Sc. and Ph.D. in Microelectronics from FEE-CTU. In 1987 and 1996 he became Assistant and Assoc. Professor, resp. In 1988, 1992, and 1993 visiting fellow at the University of Surrey, Hull, and Lund, resp. Research on defects in semiconductors, quantum structures and their characterization. Manager of the Electron Device Group, since 2006 vice-dean of the FEE. More than 160 scientific and technical papers, 2 patents and printed lectures. SM IEEE and chairman of the IEEE MTT/AP/ED Chapter in the Czech Republic.



František Vaníček was born in 1936. He graduated in Radioelectronics from the FEE-CTU in Prague, in 1960. PhD. in 1972 and Assoc. Professorship in 1978. From 1972 to 1975 he gave lectures in MTC Kahira, Egypt, and from 1981 to 1983 in HIE Beni Walid, Lybia. He is the author of 15 techn. papers and 10 printed lectures. He is teaching in the area of semiconductor structures and their models. The winter term of 1992 and 1993 he spent in KIHVV Ostende in the frame of TEMPUS programme.



Jan Voves was born in Prague in 1960. MSc. and RNDr. degree in Physical Electronics and Optics from the Charles' University in Prague in 1984. Since 1984, Research Assistant in the Department (characterisation of ion implanted doping profiles in semiconductors). From 1987 and 1996, Assistant and Assoc. Professor, resp. Ph.D in 1993. Research in the device physical modelling (Monte Carlo Method). Author of about 30 technical papers and 3 printed lectures. Member of the IEEE.



Jiří Jakovenko born 1972, Prague. He graduated in Microelectronics from FEE-CTU, Ph.D. from FEE-CTU in 2004. Member of Microsystems group. Research: MEMS design and modeling. In 1998 he spent 4 months in Hogeschool Gent in the frame of TEMPUS programme. Author of many scientific and technical papers. Since 1999 Assistant Professor at the Dept. Education: Microelectronics, IC Design, Design of VLSI, Practice of IC design, Electronics.



Vladimír Janíček was born in 1974 in Most. He graduated in Microelectronics from the FEE-CTU in Prague and he belongs to the Microsystems group. His Ph.D. research is in the field of polymer electronics power supply. At present, he is IT manager of the Department



Vítězslav Jeřábek born 1951. 1975: MSc. from FEE-CTU in Prague. 1987: PhD. in Optoelectronics. 1976–91: TESLA Research Institute, Prague. 1981: Optoelectronics Division, dynamics and modelling of optoelectronics devices & broad band optoelectronic modules. 1991–98: Head R&D lab. Dattel Ltd. - integr. optoelectronics modules and systems. Since 1999: teaching technology of optics and optoelectronics components and systems for transmission and processing of information. Author of 35 technical papers, 2 printed lectures and 3 patents, Member IEEE, Committee member of IEE in the Czech Republic.



Lubor Jirásek was born in Prague in 1953. He graduated from the FEE CTU in Prague, in 1978. He received PhD. degree in Electronics in 1983. From 1978 to 1983 he was working as a Research Fellow in the area of high-power devices. He is author of 7 technical papers and 3 printed lectures. He is teaching in the area of semiconductor devices and solid-state physics. Presently, he is responsible for the curriculum of the Department.



Vladimir Komarnitskij was born in 1980 in Ukraine. In 2002, he graduated Chernivtsy National University, Ukraine, from the specialization physics electronics. He received Ph.D. degree in Electronics from FEE-CTU in 2006. He is currently working as a postdoc in the Electron Device Group. His research is in the field of radiation defects in semiconductors and characterization of quantum structures.



Alexandr Krejčířik was born in 1947. He graduated in Electrotechnology from the Faculty of Electrical Engineering, CTU in Prague, in 1971. He received Ph.D. degree in Mathematics and Physics – branch Semiconductors. He is the author of 10 technical papers, 21 printed lectures and 12 textbooks. He is teaching courses on Electronics, Power supplies in Electronics and Design of Power Supplies.



Pavel Kulha was born in Písek in 1978. He graduated in Microelectronic from the FEE-CTU in 2002. He is working towards his PhD in the Microsystem group. He is working as assistant professor since September 2004. His work is concentrated on microsensors and microsystems for high temperature applications.



Jan Novák was born in Prague in 1973. He graduated in Microelectronics from FEE-CTU, Ph.D. from FEE-CTU in 2006. Member of Microsystems group. Research: Electromagnetic compatibility of integrated circuits and microsystems. Since 2001 he is an Assistant Professor at the Department. He is teaching Electronics, PCB Design and IC Design. He is finance manager of the Department.



Václav Prajzler Václav Prajzler was born in Prague, the Czech Republic in April 10th 1976. In 2001 he graduated from the Faculty of Electrical Engineering at the Czech Technical University in Prague at Department of Microelectronics. Since 2005 he has been working at the Czech Technical University in Prague, Faculty of Electrical Engineering, Department of Microelectronics as a research fellow. His current research is focused on the fabrication and the investigation of the properties of optical materials doped with rare earth ions with special focus on GaN and polymeric materials.



Vít Záhlava was born in Prague in 1965. He graduated in Microelectronics from the FEE-CTU in 1988. Ph.D. degree in 1994. He is teaching Electronics and PCB design. Active in EMC on PCB, design, application and testing. He is a member of the Academic Senate of the Faculty. He is the author of 4 textbooks, several printed lectures for students, and technical papers on power devices.



Adam Bouřa Adam Bouřa was born in Ostrava in 1980. He graduated in Microelectronics from the FEE-CTU in Prague in 2004. Since 2004 he is a PhD student at the Department of Microelectronic and member of the Microsystems group. His work is concentrated on wireless sensor systems. Since January 2005 to February 2006 he was part-time research fellow and since February 2006 he is an assistant professor at the Department. He is teaching Electronics, Electronic Devices and Structures, Sensors for Electronic and Sensors for Medicine.



Jiří Baloun was born in Humpolec in 1982. He graduated in Microelectronics from the CTU-FEE in Prague in 2007. Since 2007 he is a PhD student at the Department of Microelectronic. He is a member of the Microsystems group.



Jiří Kroutil was born in Tábor in 1980. He graduated in Microelectronics from the CTU-FEE in Prague in 2005. Since 2005 he is a PhD student at the Department of Microelectronic. He is a member of the Microsystems group. His work is focused on intelligent microsystem structures.



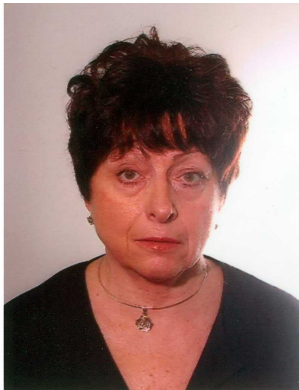
Alexandr Laposa was born in Pardubice in 1978. He graduated in Automation and Computer Science from Faculty of Mechanical Engineering from Brno University of Technology. He is working towards his Ph.D. in Microsystems Group. His work is concentrated on intelligent microsystem structures.



Tomáš Teplý was born in Chrudim in 1979. He graduated in Microelectronics from the FEE-CTU in Prague in 2005. He is working towards his PhD in the Microsystems group. His work is concentrated on simulation and optimization of microsystems. Since October 2005 he is part-time research fellow at the Department.



Tomáš Vítek was born in Opava in 1980. He graduated in Microelectronics from the FEE-CTU in Prague in 2005. Since March 2005 he is a PhD student at the Department of Microelectronic. He is a member of the Microsystems group. His work is focused on microsystems and security systems. Since October 2005 he is part-time research fellow in the Department.



Hana Kubátová was born in Český Brod in 1941. She graduated from Secondary Business School in 1958. She joined the Department of Microelectronics in 1977. Since that she has been in charge of organisational and administrative work of the Department, mainly as the Departments secretary. At present, she is the Secretary of the Head of the Department.



Renáta Burianová was born in Prague in 1960. She graduated from grammar school in 1979 and Secondary school for librarians in 1981. She joined the Department of Microelectronics in September, 1981. From that time she has been in charge of administrative work of the Department.



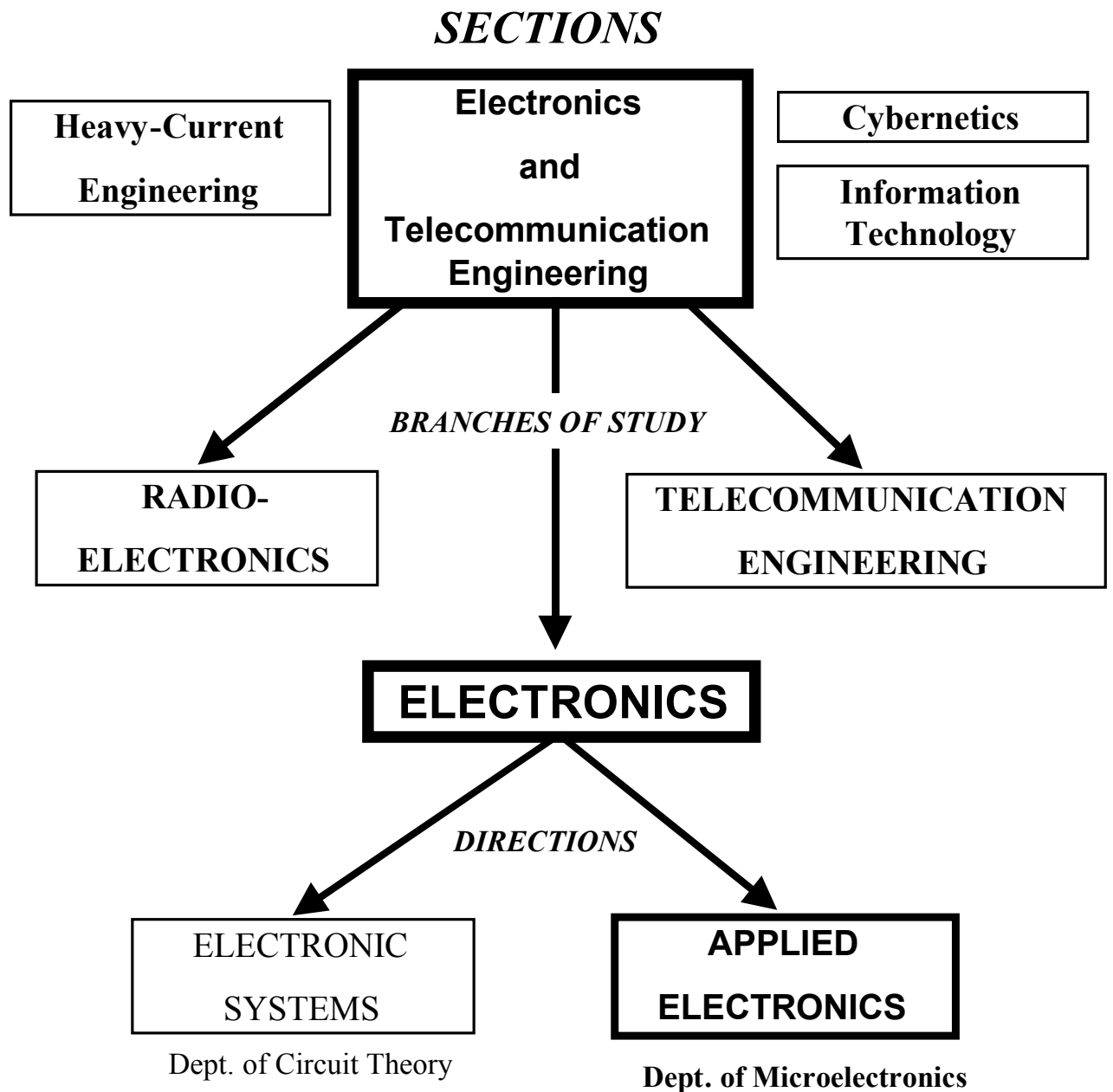
Lubomír Kafka was born in 1943. He attended the grammar school from 1958 to 1961. From 1961 to 1963 he studied the secondary school on "Mechanic of electronic equipments". In 1965 he joined the CTU in Prague as a technician. At present, he is working as a technician in the Department. He is responsible for teaching laboratories. He is engaged in mechanical and electronic service.



Miroslav Horník was born in Prague in 1946. He graduated in 1966 at a Secondary school specialized in Machinery engineering in Prague. He joined CTU Prague, then the Institute of Physics, Czechoslovak Academy of Science and, nowadays, he is working in the Department as a technician. He provides repair and service of miscellaneous tools and equipments.

UNDERGRADUATE TEACHING

Organization of study at the Faculty of Electrical Engineering



BRANCH OF STUDY ELECTRONICS

The objective of the electronic branch of study is to educate electrical engineers competent to solve problems concerning the wide spectrum of the structure of electrical industry and also extending to the field of information and computing technology, ecology, health care, mechanical engineering, robotics, etc.

The study involves the necessary theoretical introduction into subjects that provide general education for an electrical engineer which is followed by specialized courses. As to specialized orientation, the stress is laid on electronic components, semiconductor structures, digital and analog electronic circuits, microelectronics, application specific integrated circuit design, microcomputers, signals and electronic systems, sensors, sensor systems, design of electronic equipment, integrated and coherent optics, radiation sources and detectors, applications of optoelectronics and telecommunication systems. The study of the applied electronics and electronic systems aims to prepare engineers who are able to solve problems of the applications of integrated circuits and of the special electronic structures and systems, as well as the electronic instrumentation design. The students master the digital signal processing methods and the implementation of algorithms in the special processor systems.

The optional subjects in the higher terms provide the students an opportunity of individual choice of their further specialization emphasizing the applications of electronics and optoelectronics.

The topics of lectures, laboratory and seminar exercises have been selected so that a student can master the reported stuff perfectly also in practice. The Department of Microelectronics endeavors to give the students, especially those with excellent results, the possibility of satisfying their professional ambition home, as well as abroad. The graduates are also offered a possibility of further postgraduate (Ph.D) studies. We believe that the graduates of our specialization will find good jobs in the industry of developed countries.

COURSES DELIVERED BY THE DEPARTMENT

In summer semester 2008/2009

Courses in Czech – Bachelor Study Program

Course Code	Course Name	Lectures and exercises in hours per week
X34BAP	Bachelor Project	0+5
X34BPJ	Semestral Project	2+2
X34ELE	Electronics	2+2
X34ESS	Electronic Devices and Structures	2+2
X34FOT	Photonics	2+2
X34NZE	Design of Power Supplies for Electronics	2+2
X34SEE	Sensors in Electronics	2+2

Course in Czech – Master Study Program

Course Code	Course Name	Lectures and exercises in hours per week
X34APS	Advanced Electronic Devices	2+2
X34DIP	Diploma Project	0+14
X34MSY	Microsystems	2+2
X34EVS	Electronic Security Systems	2+2
X34FPV	Photonic receivers and transmitters	2+2
X34MIT	Microcontroller Systems	2+2
X34NFS	Design of Photonic Devices	2+2
X34SOS	Devices for Optoelectronic Systems	2+2
X34TCA	TCAD	2+2
X34PMI	Individual Project	2+2
X34PMT	Team Project	2+2
X348MS	Microsensors and Microsystems	2+2
X34NSE	New Trends in Electronics	2+2
X34PPN	Principles and Rules of Electronic Design	2+2

Courses in English

Course Code	Course Name	Lectures and exercises in hours per week
XE34APS	Applications of Modern Devices	2+2
XE34ESS	Electronic Devices and Structures	2+2
XE34NZE	Design of Power Supplies	2+2
XE34TCA	TCAD	2+2
XE34SIE	Synthesis of Integrated El. Systems	2+2

Courses for Ph.D. students

Course Code	Course Name	Lectures and exercises in hours per week
XP34APD	Modern Power Semiconductor Devices	3+0
XP34AT	Application of TCAD tools	2+1
XP34MSY	Microsystems	3+0
XP34ORD	Radiation Sources and Detectors	3+0
XP34PED	Advanced Electronic Devices	3+0
XP34SRS	Semiconductor Radiation Sources	3+0
XP34TOS	Technology of Optoelectronic Structures	3+0

Courses for vocational students

Course Code	Course Name	Lectures and exercises in hours per week
XD34BAP	Bachelor Project	0+15
XD34ELE	Electronics	14+6
XD34ESS	Electronic Devices and Structures	14+6
XD34FOT	Photonics	14+6

COURSES GIVEN BY THE DEPARTMENT

In winter semester 2009/2010

Courses in Czech – Bachelor Study Program

Course Code	Course Name	Lectures and exercises in hours per week
New curriculum		
A0B34PPN	Principles and Rules of Electronic Design	2+2
Old curriculum		
X34BPJ	Semester Project	2+2
X34MPC	Microcontrollers	1+2
X34NZE	Design of Power Supplies for Electronics	2+2

Courses in Czech – Master Study Program

Course Code	Course Name	Lectures and exercises in hours per week
New curriculum		
A2M34SIS	Integrated System Structures	2+2
A0M34EVS	Electronic Security Systems	2+2
A0M34NFO	Design of Photonic Circuits	2+2
A0M34NNZ	Design of Power Supplies for Electronics	2+2
Old curriculum		
X34SIO	Structures of Integrated Circuits	2+2
X34EPO	Physics of Semiconductor Devices	2+2
X34NII	Design of Integrated Circuits for Informatics	2+2
X34NIO	Design of Integrated Circuits	2+2
X34SES	Sensor Systems	2+2
X34AVS	Application of Semiconductor Power Devices	2+2
X34NFS	Design of Photonic Devices and Circuits	2+2
X34NNZ	Design of Power Supplies for Electronics	2+2
X34NOS	Design of Optoelectronic Devices	2+2
X34POP	Practice of Optoelectronics	2+2
X34PFO	Practice of Photonics	2+2
X34SIF	Devices for Integrated and Fibre Optics	2+2
X34BMS	Biomedical Sensors	2+2
X34PMI	Individual Project	2+2
X34PMT	Team Project	2+2
X34DIP	Diploma Project	0+4
X34PPN	Principles and Rules of Electronic Design	2+2

Courses in English

Course Code	Course Name	Lectures and exercises in hours per week
New curriculum		
AE2M34SIS	Integrated System Structures	2+2
Old curriculum		
XE34ELE	Electronics	2+2
XE34ESS	Electronic Devices and Structures	2+2
XE34NZE	Design of Power Supplies	2+2
XE34SIO	Structures of Integrated Circuits	2+2
XE34TCA	TCAD	2+2
XE34EPO	Physics of Semiconductor Devices	2+2

Courses for Ph.D. students

Course Code	Course Name	Lectures and exercises in hours per week
XP34APD	Modern Power Semiconductor Devices	3+0
XP34CNO	Crystal optics and Non-linear Optics	3+0
XP34ETS	Electrical Transport in Semiconductors	2+2
XP34IO	Integrated Optics	3+0
XP34MSY	Microsystems	3+0
XP34PED	Advanced Electronic Devices	3+0
XP34PIC	Design of Programmable Integrated Circuits	4+0
XP34STV	Structures and Technology of VLSI	4+0
XP34TOS	Technology for Optoelectronics	3+0

Courses for vocational students

Course Code	Course Name	Lectures and exercises in hours per week
New curriculum		
AD2M34SIS	Structures of Integrated Systems	14+6

A BRIEF DESCRIPTION OF COURSES DELIVERED BY THE DEPARTMENT

Electronics, BSc

Lectures given by J. Foit and V. Záhlava

Semiconductors. PN junction, diodes, Schottky diode. Rectifiers. Bipolar transistors, biasing circuits. JFET and MOSFET, biasing circuits. Small signal amplifier, power amplifier. Switching circuits. Power amplifier classes. Thyristor, latch-up. Operational Amplifiers – negative and positive feedback, basic circuits. Optoelectronics – LED, laser, photodiode, phototransistor, photoresistor. Introduction to digital technique – CMOS, LSTTL.

Electron Devices, BSc

Lectures given by L. Jirásek

Diodes, unipolar and bipolar transistors, switching, optoelectronic and passive components, vacuum tubes. Physical mechanisms, principles of device operation, properties, characteristics, parameters and models of devices. Basic circuits, recommended applications, switching operation. Noise parameters. Basic structures of integrated circuits. Computer modeling and experimental verification.

Photonics, BSc

Lectures given by Z. Burian

The major aim of these lectures is to explain the principles and using of the main parts of modern optical systems, both from the theoretical and application point of view. Measurement methods for optoelectronics are presented. The part of lectures is devoted to optical display structures, optical processors and to the image processing.

Power Supplies in Electronics, BSc

Lectures given by M. Husák, F. Vaníček

Rectifiers. Stabilisers - parametric, with continuous control. IC voltage regulators. Fly-back converter. Forward converter. Push-pull converter, double forward converter. Monolithic regulators. EMC. Over current protection. Over voltage, under voltage, output reverse voltage protection. Overload and thermal protection. Batteries, solar battery, accumulator, chargers. References.

Microcontrollers, BSc

Lectures given by T. Teplý

Microchip PIC18F252 family. I/O tasks, programmable peripheral ICs. Development and debugging tools. Design and programming of instruments and systems based on single-chip computers. Individual students' projects.

Design of Integrated Circuits, BSc

Lectures given by J. Jakovenko

Basic functional structures of ICs. Passive and active elements. Technological process. Bipolar and unipolar structures. Logic integrated circuits, VLSI circuit systems. Analogue integrated circuits. Design of vertical structure, layout, design rules. System of IC process quality control. IC functional and parametric testing, test structures, yield and reliability.

Optoelectronics I, BSc

Lectures given by V. Jeřábek

Basic principles of optoelectronics. Planar and fiber optical waveguides. Semiconductor lasers and LEDs. Semiconductor light detectors. Structures for distribution and harnessing of optical radiation. Optoelectronic processors. Optical communication systems. Optical amplifiers. Display devices. Optical memories. Optical fiber sensors. Integrated optical and photonic structures.

Sensor Systems, BSc

Lectures given by M. Husák

Sensor - classification, materials, production. General characteristics - static and dynamic parameters, errors, noise, linearisation, calibration. Microelectronic sensors materials, physical principles, design, integration. Temperature sensors, pressure sensors, SAW sensors, optoelectronic sensors, fibre optic sensors. Radiation sensors. Magnetosensors. Chemical sensors, biosensors. Humidity sensors. Flow meters. Level sensors. Sensor signals processing. Smart sensors. Application of sensors.

Physics of Semiconductor Devices, MSc

Lectures given by J. Voves

Semiconductor crystal lattices, band structure of semiconductors, statistical distributions, charge transport, scattering mechanisms, non-equilibrium carrier densities, non-homogeneous semiconductor systems, heterostructures, physics of bipolar and unipolar devices, semiconductor sources and detectors of radiation, laser physics, low dimensional structures.

Integrated System Structures, MSc

Lectures given by J. Jakovenko

Importance of ICs. Economic aspects of IC. Design methodologies: gate arrays, standard cells and functional blocks, full custom design. Design hierarchy: behavioural description, logic and electric design, simulation, layout capture and verification. CAD tools for IC design: HDL, front end tools, simulators, layout editors, structural synthesis, silicon compilers. IC testing.

Sensors in Security Systems, MSc

Lectures given by M. Husák

Security, safety and multi-channel systems. Dynamic analysis and optimisation. Signal interference and system internal noise. Input quantities. Analog and digital signal processing, conversions. Signal representation and sensor signal code. System calibration. Communication in system, interface. Output unit - communication, indication, registration, protection, switch, local and remote control, actuators.

Optoelectronics II, MSc

Lectures given by Z. Burian

Optocouplers. Sensors (spectral, amplitude, interferometric, polarimetric). Distributed fiber-optics sensors. Fiber-optics communications, components of the optical fiber link, modulation. Modulation, multiplexing and coupling. System performance. Receiver sensitivity. Coherent optical communications. Optical memories. Optical processors. Laser measuring system. Laser Doppler velocimetry. Spectral analyzers.

Application of Power Devices, MSc

Lectures given by L. Jirásek

Static and dynamic processes of power structures in forward, blocking and reverse mode of operation. Power diodes, BJTs, thyristors and special thyristor structures, field controlled power devices, HF and HV devices, power ICs, characteristics and features. Packaging and cooling, transient thermal impedance. Principles of application in power circuits, basic trigger and application circuits.

Radiation Sources and Detectors, MSc

Lectures given by Z. Burian

Optical radiation Thermal sources, electroluminescent diode. Lasers active medium, optical resonators, gas, liquid, dye, solid-state and injection lasers, laser modes: mode controlled, frequency agility, spectral width, frequency stability, amplifiers, mode locked. Photomultipliers, photoresistors, photodiodes, nonselective detectors. Optical receivers, PIN and APD coupling, optical preamplifiers.

Practice of IC Design I, MSc

Lectures given by J. Jakovenko

Main purpose of this course is to enable students to design their own integrated circuit. Students will work in groups (of 5 to 10 students) on the design project using industrial standard CAD tools (CADENCE, SYNOPSYS). Successful circuits could be fabricated via EUROPRACTICE project. The lectures will be concentrated in the first three weeks of the term and will be devoted to IC design methodologies, CAD tools, description of available libraries and design rules.

Applications of Modern Devices, MSc

Lectures given by J. Foit

Analog devices, optimisation. Interference of different types of signal transmission, optimisation. Rules for optimisation of large arrays, power distribution, interfacing. Mixed-mode devices. Diagnostics in ADC's and DAC's, minimising residual errors. Standards for interface buses, sensors, actuators, ergonomics. Processing of small and large signals, noise, insulation.

Design of Power Supplies, MSc.

Lectures given by A. Krejčířik

This represents extension of the subject “Power Supplies in Electronics”. The main field comprises Integrated circuits for SMPS (principles, design, verification.) Coils, transformers, regulators, synchronous rectifiers, resonance power supplies. Switcher CAD. Magnetic design Tool. Filter CAD. MicroPower Switcher CAD.

TCAD for Electronics

Lectures given by J. Voves

Principles of Technology CAD – Silvaco tools. Introduction to the ATLAS device simulator. Drift-diffusion approximation. Poisson and continuity equations. SRH model. Models of Auger, optical generation-recombination and surface recombination, impact ionization and mobility. Heat flow equation. Boundary conditions. Boltzmann transport equation. Mathematical background of simulation techniques. The practice of device simulation: diode, BJT, MOSFET. Individual projects. Hands-on principle of seminars.

Principles and Rules of Electronic Design

Lectures given by V. Záhlava

Computer design of printed circuit boards (PCB). System OrCAD. Design rules for PCB according to EMC in analog, digital and power applications. Supply and grounding techniques. Technological processes and fabrication of PCB, classes of accuracy. Surface mount technology and devices, circuit layout process and soldering. Technological and design trends. Design of student PCB by use of PC in departments computer room.

Programmable Logic Devices

Lectures given by P. Hazdra

Programmable logic devices (PLD): types, principles, internal architecture, and production technologies. SPLDs (PAL, GAL, PLA), CPLD devices and field programmable gate arrays (FPGA): architecture of internal elements, interconnections, development systems, configuration and reconfiguration. Configurable Systems on Chip. PLD design using VHSIC HDL (VHDL): synthesis, mapping and testing. Practical design of CPLD and FPGA using Xilinx ISE.

COURSES FOR PhD. STUDENTS (IN CZECH)

Applications of TCAD Tools

Lectures given by J. Voves

Fundamentals of TCAD. Device and mixed device-circuit simulators, principles and application. ATLAS, principles and application. Semiconductor equations. Boundary conditions. Numerical methods. Models of recombination, impact ionization, mobility. Practical exercises according to individual projects on SUN workstations.

Crystaloptics and Non-linear Optics

Lectures given by J. Čtyroký

Optical medium type classification. Single- and double-axis optical anisotropy. Chiral media. Propagation of planar waves, polarisation, phase and group velocity vectors. Energy balance and reciprocity. Reflection and refraction. Electro-optical and piezoelectric tensors. Theory and design of beam handling devices.

Programmable IC Design

Lectures given by P. Hazdra

IC's, reasons for integration, processes and methods of IC design. Custom IC's, programmable IC's. PICs with AND-OR matrices (PLD). Higher grade PLD-CPLD structures; architecture, logical blocks, interconnections. Programmable gate arrays (PGA) - principles, internal architecture. LCA-type PGA, "fine grain" structures. Tools for automated PIC design. Description of the PIC by a schematic diagram. The VHDL language for CPLD and PGA. Design of basic logic blocks in CPLD and PGA structures. Methods of PIC design, distribution to blocks. Data paths analysis, timing, testability. Advanced PICs: re-configurable and mixed-mode structures. PIC choice strategy and economics of PIC-based design.

Integrated Optics

Lectures given by V. Jeřábek

Theoretical and technological principles of IO. Light propagation in dielectric waveguide structures. Methods of waveguide structures solution. Basic physical effects and interactions used for IO structures. Fabrication of dielectric waveguides and IO structures. Passive and dynamic waveguide devices. Non-linear devices. Semiconductor integrated optoelectronics.

Optical Radiation Detection and Detectors

Lectures given by Z. Burian

Electromagnetic radiation spectrum. Radiometric and photometric units. Detection of optical radiation. Ideal detector, internal and external photo-effect. Optical receivers, design principles, properties. Noise. Detectors based on external or internal photo-effect, on thermal phenomena and others. Solar cells, properties.

Advanced Electron Devices

Lectures given by J. Voves

Energy band engineering, quantum well, wire, point. 2-D electron gas devices (HEMT, MOD FET) and double-barrier resonance tunneling (RDTB, RHET) as memories, generators, multipliers etc. Heterostructures, microwave and cryotronic devices. Recording media.

Advanced Power Semiconductor Devices and ICs

Lectures given by J. Vobecký

Physical and technological principles of advanced power devices. Trends of evolution. Parameters and applications of advanced devices. Bipolar structures. MOS structures. BiMOS structures. PN diodes. Schottky diodes. BJT transistors. DMOS and IGBT transistors. Thyristors, including GTO and MCT. Secondary breakdown theory and design rules. Smart-power devices. High voltage devices, applications.

Semiconductor Radiation Sources

Lectures given by Z. Burian

Stimulated emission in semiconductors, Homogeneous junction and heterojunction. Double heterostructure lasers. Waveguide resonators, DFB structures. Types and properties of lasers. Bistable and memory devices, switches. Non-coherent LEDs. Super-LEDs. Laser injection amplifiers. Applications and measurement of various types.

Technology of Optoelectronic Structures

Lectures given by V. Jeřábek

Preparation of optoelectronic materials and structures, diagnostic and testing methods. Fabrication of semiconductor waveguides, LEDs, lasers, photodetectors and QW structures. Design and fabrication of planar dielectric waveguide structures for distribution and harnessing of optical radiation. Measuring and testing methods. Properties of various structures, practical examples.

VLSI Structures and Technologies

Lectures given by J. Jakovenko

Functional structures of integrated circuits, unipolar and BiMOS structures. 3D structures, submicron technologies. Problems associated with dimensional reduction. Memory cells. Test structures. VLSI processes. New technologies. IC design, layout, design rules. Reliability and yield. Limitations in ICs.

Electrical Transport in Semiconductors

Lectures given by J. Voves

Electrons and holes in semiconductor crystals. Boltzmann transport equation, scattering. High field transport. Quantum transport, resonant tunneling. Single electron transport, Coulomb blockade. Ballistic transport. Transport in magnetic field, quantum Hall effect.

RESEARCH ACTIVITIES

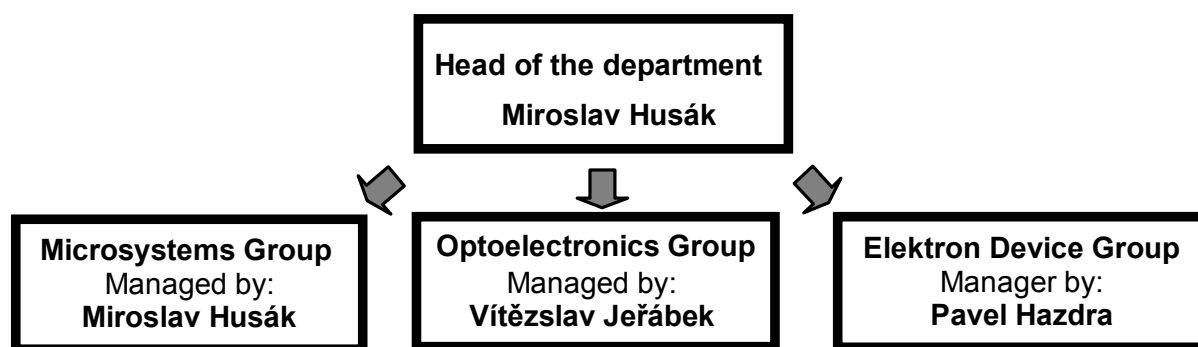
The Department has continued in research activities through grants and contracts from the Ministry of Education of the Czech Republic, Grant Agency of the Czech Republic, and CTU in Prague. A significant part of research activities was supported by the Programmes of the Ministry of Education in the following fields in alphabetical order:

- Development, Reliability and Safety of Electro-Energetic Systems,
- Information and Communication Technology,
- Methods and Systems for Measurement of Physical Quantities and Data Processing,
- Trans-Disciplinary Biomedical Engineering Research.

The international projects were those of the Framework Programmes of the European Community.

In the field of research contracts the co-operation with Robert Bosch and Magnetron took place.

The research activities of the Department are focused on Electron Devices, Optoelectronics and Microsystems as listed below in the order of their date of origin. These three directions constitute the organization scheme of research in our Department and are schematically shown below. This scheme is supplemented by a brief summary of activities of individual research groups and list of their members. This is followed by the description of relevant research projects of individual research groups. The list of contracts is given as well.



MICROSYSTEMS GROUP

Head of the Research Group: M. Husák

Members: J. Foit, J. Jakovenko, V. Janíček, L. Jirásek, P. Kulha, J. Novák, A. Bouřa, T. Vítek, T. Teplý, A. Laposa, J. Kroutil, M. Kubař, J. Scheirich

Research Activities:

- Modeling of Temperature and Mechan. Behaviour of Microsystem Structures
- Design of Strain Gauge Sensors for High-Temperature
- Semiconductor Microsystem Structures
- Sensor Signals Processing and Wireless Transmission
- Sensor Control Systems
- Integrated Circuit Design

ELECTRON DEVICE GROUP

Head of the Research Group: P. Hazdra

Members: J. Vobecký, J. Voves, V. Záhlava, J. Kodeš, , V. Komarnickij, J. Janoušek, Z. Šobán

Research Activities:

- Quantum Devices and Nanostructures
- Device and Process Simulation
- Lifetime and Defect Engineering
- Ion Irradiation
- Power Devices and Integrated Circuits
- Current Injection Capability of Microcontroller Units
- Programmable Logic Devices
- PCB Design and EMC

OPTOELECTRONICS GROUP

Head of the Research Group: V. Jeřábek

Members: Z. Burian, V. Prajzler, K. Bušek, J. A. Arciniega

Research Activities:

- Preparation and Testing of Planar Waveguides
- Analysis, Preparation and Testing of Novel Planar Electro-Optic Structures for Distribution and Harnessing of Optical Radiation
- Analysis, Preparation and Testing of Novel Devices and Integrated Planar Electro-Optic Structures for Transmitting and Receiving of Opt. Radiation
- Modeling of Electro-Optic Structures
- Research toward the Integrated Optic Circuits for Measurement and Sensor Applications

RESEARCH PROJECTS

MICROSYSTEMS GROUP

THE APPLICATION OF POLYMER ELECTRONICS TOWARDS AMBIENT INTELLIGENCE

M. Husák, V. Janíček, J. Jakovenko, P. Kulha, J. Novák

Project support: under European Commission's 6th Framework Program Nr. 507143 POLYAPPLY

PolyApply aims to lay the foundations of a scalable and ubiquitously applicable communication technology. The boundary condition is the cost of the micro system, combining basic RF communication with sensor functions. The key to achieving a fundamentally different cost structure than what the evolution of existing technologies (e.g. CMOS) can achieve is to resolutely move to a disruptive new manufacturing technology: going from batch processing to in-line manufacturing technology. The semiconductor system envisaged for this end is based on polymers. Scalability refers to PolyApply's plan to develop generic technologies with a meaningful impact in the mid- to long term, rather than propose a solution for a certain generation of RF communication devices useful at one point in time. In other words, the developed technologies will lead to an extendable family of products, ranging from "simple" RF tags at ultra-low cost to RF communication devices with complex capability, such as integrated re-writable memory, sensory inputs, display, etc...

MORGAN

Project leader: M. Husák

MICRO AND NANO SENSOR STRUCTURES AND SYSTEMS WITH EMBEDDED INTELLIGENCE (MINASES)

Project leader: M. Husák

Grant No. GA102/06/1624.

The goal of the proposed project is research and development of new types of intelligent integrated micro and nano sensors structures and actuators incl.

electronic circuits for data signal processing and transfer. For the sensor realization will be used micro technology resources together with nano-technologies namely in the area of materials and chemical sensors and biosensors structures. Project includes modelling, properties simulation of RF MEMS switch and MEMS structure for absorptive sensor of HF emission realization, development of active integrated strain gauges and wireless, Bluetooth and ZigBee data signal transfer, development of sensors using polymeric electronic, research of new opto-chemical sensors for pollutant concentration measurement of living environment, development of micro and nano sensors for chemical and biochemical applications, build-in intelligence of integrated sensors systems, electro-magnetic compatibility in integrated circuits structures and bio-systems.

ELECTRON DEVICE GROUP

P-I-N DIODE WITH BURIED LOW DOPED P-LAYER PROCESSED USING RADIATION ENHANCED DIFFUSION OF SPUTTERED PALLADIUM

J. Vobecký, V. Záhlava, V. Komarnitsky

Project Support: Research Centre LC06041, Research Program MSM

6840770017, Ministry of Education, Youth and Sports of the Czech Republic

Radiation enhanced diffusion of palladium by the radiation defects from He irradiation has provided the new concept of fast recovery diode with a buried p-layer called RED diode. In 2009, this concept was proved to work at 4 inch wafer [1]. The RED performed under the optimal temperature has been shown to compensate N-base doping uniformly at 100 mm wafer so that a resulting low doped P-layer is tightly fitted to anode doping profile previously processed by a conventional diffusion. As a result a standard high-power diode can be changed into RED diode, in which a sufficiently low doping concentration of the additional P⁻ layer increases breakdown voltage and at the same time decreases dynamic avalanche during fast recovery. The presence of Pd-related defects decreases carrier lifetime and provides soft recovery. The analogous technology using the RED of platinum was studied in more details [2]. It has been shown that contrary to palladium, the platinum does not compensate the doping profile and the RED concept does not work.

[1] Vobecký J., Záhlava V., Hemman K., Arnold M., Rahimo M.: The Radiation Enhanced Diffusion (RED) Diode Realization of a Large Area p⁺p-n-n⁺ Structure with High SOA. Proceedings of 21st International Symposium on Power Semiconductor Devices and ICs. Piscataway: IEEE, 2009, p. 144-147.

[2] Vobecký J., Záhlava V., Komarnitsky V.: Fast recovery Radiation Enhanced Diffusion (RED) Diode: Palladium versus Platinum. Proceedings of EPE 2009, Barcelona, 2009, p. P.1-P.8.

NEON IMPLANTATION AND THE RADIATION ENHANCED DIFFUSION OF PLATINUM IN SILICON

J. Vobecký, V. Záhlava, V. Komarnitskyy

Project Support: Research Centre LC06041, Research Program MSM

6840770017, Ministry of Education, Youth and Sports of the Czech Republic

10 MeV helium and 120 MeV neon implantations were used for the local lifetime control of silicon power diodes with subsequent annealing at 200 °C [1]. DLTS measurements show that the concentration ratio between $\text{VO}^{(-/0)}$ pairs and divacancies $\text{V}_2^{(-/0)}$ after the implantation of neon is close to one in agreement with the data published for other heavy ions. The implantation dose to achieve the same point at the technology curve of the diodes under test was found about ten times lower for the neon compared to helium. The Radiation Enhanced Diffusion (RED) of platinum at 725 °C was evaluated both for the enhancement by implantation of helium and neon. The electrical parameters of silicon diodes (carrier lifetime, voltage drop, leakage current, reverse recovery) were compared. One order lower implantation dose of the neon compared to that of the helium was found necessary to obtain the same improvement of electrical parameters. The RED of Pt using the neon implantation was found functional in a similar way to that of the helium. The reduction of carrier lifetime, which would be normally sufficient for robust diodes, was found for the doses of neon at about $1 \cdot 10^{13} \text{ cm}^{-2}$. The simultaneous increase of background doping concentration at the end of range of neon was found responsible for the decreased static breakdown voltage, decreased turn-off ruggedness and increased leakage current.

[1] J. Vobecký, V. Záhlava, A. Denker, V. Komarnitskyy: Neon implantation and the radiation enhanced diffusion of platinum for the local lifetime control in high-power silicon diodes. Nuclear Instruments and Methods in Physics Research, Section B, Beam Interactions with Materials and Atoms. 2009, vol. B267, no. 17, p. 2832-2838.

NEXT GENERATION IGBT TECHNOLOGY

M. Rahimo¹, A. Kopta¹, U. Schlapbach¹, J. Vobecký,

Project Support: ABB Switzerland Ltd. Semiconductors

¹ABB Switzerland Ltd. Semiconductors

New technologies for advanced Reverse Conducting (RC) IGBT concept has been studied. The new technology was developed which is referred to as the Bi-mode Insulated Gate Transistor (BIGT) implying that the device can operate at the same current densities in transistor (IGBT) mode and freewheeling diode mode by utilizing the same available silicon volume in both operational modes. The BIGT design concept differs from that of the standard RC-IGBT while

targeting to fully replace the state-of-the-art two-chip IGBT/Diode approach with a single chip. The BIGT is also capable of improving the over-all performance especially under hard switching conditions.

[1] M. Rahimo, A. Kopta, U. Schlapbach, J. Vobecký, R. Schnell, - et al.: The Bi-mode Insulated Gate Transistor (BIGT) A Potential Technology for Higher Power Applications. Proceedings of 21st International Symposium on Power Semiconductor Devices and ICs. Piscataway: IEEE, 2009, p. 283-286..

[2] M. Rahimo, U. Schlapbach, R. Schnell, A. Kopta, J. Vobecký - et al.: Realization of Higher Output Power Capability with the Bi-Mode Insulated Gate Transistor (BIGT). Proceedings of EPE 2009, Barcelona, 2009, p. P.1-P.10.

SYNTHESIS OF NOVEL DEFECTS IN SILICON BY ION IRRADIATION FOR FUTURE APPLICATION IN SEMICONDUCTOR TECHNOLOGY

Project Manager: V. Komarnickij

Postdoctoral project of Czech Science Foundation (2008-10),

Project No. GP102/08/P488

Project will bring detailed information about influence of intrinsic defects (atoms of O, C, N) on generation and thermal stability of defects resulting from irradiation of silicon by protons and alphas. The project extends the topic studied within the framework of The Center of basic research LC 06041 and it will use its background and infrastructure. The atoms of O, C, N will be introduced in FZ silicon by ion irradiation. Their subsequent interaction with radiation defects will be studied by electrical methods (DLTS, HVCTS, C-V, I-V) in wide temperature range (100-700 C). Simultaneously, the effect of hydrogen (introduced either by proton irradiation or hydrogenation) on defect stability and electrical activity will be studied. The emphasis will be put on identification of new defects and mechanism of their generation. Their influence on silicon parameters (generation/recombination, doping) will be established to enable their use in development of radiation-hard and fast power devices.

IMPACT OF CAPPING LAYERS ON ELECTRONIC STATES IN QUANTUM DOTS

Project Manager: P. Hazdra

Project No. GA202/09/0676

The aim of the grant proposal is to determine the impact of the QD overgrowth process on the structure and electronic properties of buried InAs/GaAs QD systems prepared by MOVPE and emitting around 1.55 μm . $\text{In}_x\text{Ga}_{1-x}\text{As}$ and $\text{GaAs}_{1-y}\text{Sb}_y$ capping layers will be used to keep the emission wavelength around 1.55 μm by protecting the QDs from drastic size changes during their overgrowth. The relations between the In content of the $\text{In}_x\text{Ga}_{1-x}\text{As}$ capping layer, the surface reconstruction and the photoluminescence (PL) will be analyzed and the growth parameters optimized to achieve the desired wavelength and a high PL intensity.

OPTOELECTRONICS GROUP

NEW POLYMER OPTICAL COMPONENTS FOR PHOTONICS APPLICATIONS

Project Manager: V.Prajzler

Grant no. GACR 102/09/P104, Grant Agency of the Czech Republic

Goal of this project is to fabricate photonics structures as optical Y-branches and microresonators using easy fabrication process and low cost materials. Photonics structures will be designed by using RSoft software. I chose new type polymer Su-8 for my research due to its unique optical and mechanical properties (Low optical losses 0.08 - 1.5 dB/cm at wavelength 632.8 do 1550 nm, suitable refractive indices).

RESEARCH GRANTS AND CONTRACTS

Structures for spintronics and quantum phenomena created by electron beam lithography

Project leader: **J. Voves**

Grant No. KAN400100652

EDUCATIONAL GRANTS AND CONTRACTS

PUBLICATIONS

JOURNALS (SCI & SCI EXPANDED)

Hazdra, P. - Komarnitskyy, V. - Buršíková, V.: Hydrogenation of Platinum Introduced in Silicon by Radiation Enhanced Diffusion. *Materials Science and Engineering: B*. 2009, vol. 159, no. 160, p. 342-345. ISSN 0921-5107.

Hazdra, P. - Komarnitskyy, V.: Influence of Radiation Defects on Formation of Thermal Donors in Silicon Irradiated with High Energy Helium Ions. *Materials Science and Engineering: B*. 2009, vol. 159, no. 160, p. 346-349. ISSN 0921-5107.

Hazdra, P. - Oswald, J. - Komarnitskyy, V. - Kuldová, K. - Hospodková, A. - et al.: Influence of capping layer thickness on electronic states in self assembled MOVPE grown InAs quantum dots in GaAs. *Superlattices and Microstructures*. 2009, vol. 46, no. 1, p. 324-327. ISSN 0749-6036.

Kulha, P. - Kromka, A. - Babchenko, O. - Vaněček, M. - Husák, M. - et al.: Nanocrystalline Diamond Piezoresistive Sensor. *Vacuum*. 2009, vol. 84, no. 1, p. 53-56. ISSN 0042-207X.

Lyutakov, O. - Hüttel, I. - Prajzler, V. - Jeřábek, V. - Jančárek, A. - et al.: Pattern formation in PMMA film induced by electric field. *Journal of Polymer Science Part B: Polymer Physics*. 2009, vol. 47, no. 12, p. 1131-1135. ISSN 0887-6266.

Prajzler, V. - Hüttel, I. - Lyutakov, O. - Oswald, J. - Machovič, V. - et al.: Optical properties of PMMA doped with erbium(III) and ytterbium(III) complexes. *POLYMER ENGINEERING AND SCIENCE*. 2009, vol. 49, no. 9, p. 1814-1817. ISSN 0032-3888.

Vobecký, J. - Záhlava, V. - Denker, A. - Komarnitskyy, V.: Neon implantation and the radiation enhanced diffusion of platinum for the local lifetime control in high-power silicon diodes. *Nuclear Instruments and Methods in Physics Research, Section B, Beam Interactions with Materials and Atoms*. 2009, vol. B267, no. 17, p. 2832-2838. ISSN 0168-583X.

Voves, J. - Cukr, M. - Novák, V.: The AFM LAO lithography on GaMnAs layers. *Microelectronic Engineering*. 2009, vol. 86, no. 4-6, p. 561-564. ISSN 0167-9317.

Voves, J. - Šobáň, Z. - Janoušek, M. - Komarnitskyy, V. - Cukr, M. - et al.: Nanostructures defined by the local oxidation of the ferromagnetic GaMnAs layer. *Microelectronics Journal*. 2009, vol. 40, no. 4-5, p. 697-705. ISSN 0026-2692.

JOURNALS (IN ENGLISH)

Hazdra, P. - Oswald, J. - Komarnitskyy, V. - Kuldová, K. - Hospodková, A. - et al.: InAs/GaAs quantum dot structures emitting in the 1.55 μm band. IOP Conference Series: Materials Science and Engineering. 2009, vol. 6, no. 6, p. 012007. ISSN 1757-8981.

Janiček, V. - Husák, M.: Resonant Structures For Energy Microgenerator. ElectroScope [online]. 2009, vol. 2009, no. 11, Internet: http://147.228.94.30/index.php?option=com_content&task=view&id=178&Itemid=1. ISSN 1802-4564.

Jeřábek, V. - Armas Arciniega, J.: Hybridní optoelektronický přijímač s gigahertzovou šířkou pásma. Slaboproudý obzor. 2009, roč. 65, č. 3, s. 22-25. ISSN 0037-668X.

Jirásek, L. - Jirásková, M.: Perspektiva, výhody a rizika zimního opalování. Světlo. 2009, roč. 2009, č. 6, s. 62-64. ISSN 1212-0812.

Komarnitskyy, V. - Hazdra, P.: Electrical Characterization of Deep-Lying Donor Layers Created by Proton Implantation and Subsequent Annealing in N-Type Float Zone and Czochralski Silicon. ECS Transactions: Analytical Techniques for Semiconductor Materials and Process Characterization 6 (ALTECH 2009). 2009, vol. 23, no. 3, p. 55-65. ISSN 1938-5862.

Prajzler, V. - Hüttel, I. - Lyutakov, O. - Špírková, J. - Machovič, V. - et al.: Spectroscopy Properties of Epoxy Novolak Resin Doped with Rare Earth Ions. International Journal of Microwave and Optical Technology [online]. 2009, vol. 4, no. 5, p. 318-323. Internet: <http://www.ijmot.com/index.asp>. ISSN 1553-0396.

Prajzler, V. - Jeřábek, V. - Lyutakov, O. - Hüttel, I. - Špírková, J. - et al.: Optical properties of erbium and erbium/ytterbium doped polymethylmethacrylate. Acta Polytechnica. 2009, vol. 48, no. 5, p. 14-21. ISSN 1210-2709.

Prajzler, V. - Lyutakov, O. - Hüttel, I. - Veselý, T. - Machač, P. - et al.: Designed and Fabrication of ENR Polymer Rib Optical Waveguides. ElectroScope [online]. 2009, vol. 2009, no. 2009, p. 67-71. Internet: http://147.228.94.30/index.php?option=com_frontpage&Itemid=1. ISSN 1802-4564.

Šobán, Z. - Voves, J. - Kalna, K.: The characterization of the hole transport in Sb based strained quantum wells. Journal of Physics: Conference Series [online]. 2009, vol. 193, no. 1, p. 012128-012131. Internet: <http://www.iop.org/EJ/toc/1742-6596/193/1>. ISSN 1742-6596.

Yatskiv, R. - Voves, J.: Analysis of the resonant tunneling diode with the stepped prebarrier. Journal of Physics: Conference Series [online]. 2009, vol. 193, no. 1, p. 012007-012010. Internet: <http://www.iop.org/EJ/toc/1742-6596/193/1>. ISSN 1742-6588.

JOURNALS (IN CZECH)

Bouřa, A. - Husák, M. - Kulha, P.: BEZDRÁTOVÉ NAPÁJENÍ INDUKČNÍ VAZBOU. Slaboproudý obzor. 2009, roč. 65, č. 2, s. 16-22. ISSN 0037-668X.

Kulha, P. - Bouřa, A. - Husák, M. - Mikulík, P. - Kučera, M. - et al.: Výroba SOI tenzometrů pro vysokoteplotní aplikace. Slaboproudý obzor. 2009, roč. 65, č. 3, s. 26-28. ISSN 0037-668X.

SCIENTIFIC CONFERENCES WITH PUBLISHED PROCEEDINGS (INTERNATIONAL)

Bouřa, A. - Kulha, P. - Husák, M.: Applicability of the Inductive Powering for Enclosed Systems and Data Transfer. In 45th International Conference on Microelectronics, Devices and Materials, MIDEM 2009. Ribno at Bled: MIDEM, 2009, vol. 1, p. 141-146. ISBN 978-961-91023-9-8.

Bouřa, A. - Kulha, P. - Husák, M.: Simple Wireless A/D Converter for Isolated Systems. In IEEE ISIE 2009, 2009 IEEE International Symposium on Industrial Electronics [CD-ROM]. Wonmi-gu, Gyeonggi-do: Institute of Control, Robotics and Systems (ICROS), 2009, p. 323-328. ISBN 978-1-4244-4349-9.

Foít, J.: Electronic Thermometer. In MEASUREMENT 2009 - Proceedings of the 7th International Conference on Measurement. Bratislava: Institute of Measurement Science, 2009, vol. 1, p. 389-392. ISBN 978-80-969672-1-6.

Hazdra, P. - Komarnitskyy, V.: Radiation Defects in Silicon: Effect of Contamination by Platinum Atoms. In Gettering and Defect Engineering in Semiconductor Technology XIII. Zürich: Transtech Publications, 2009, p. 167-172. ISBN 3-908451-74-4.

Husák, M. - Jakovenko, J.: Microsystems, Microsensors and Microactuators: Research and Education. In 2009 International Conference on Microelectronic Systems Education [CD-ROM]. New York: IEEE Computer Society Press, 2009, vol. ANO, ISBN 978-1-4244-4406-9.

Jakovenko, J. - Lalinský, L.T. - Držík, M.D. - Ivanova, M.I. - Vanko, G.V. - et al.: GaN, GaAs and Silicon based Micromechanical Free Standing Hot Plates for Gas Sensors. In Eurosensors XXIII: Sensors, Actuators and Micro/Nanosystems [CD-ROM]. Lausanne: Elsevier Science, 2009, ISSN 1876-6196.

Janiček, V. - Husák, M.: Resonant Energy Generator for Self-Powered Microsystem. In New Energy Solutions In Tours 2009 - Talks [CD-ROM]. Tours: ST Microelectronics Tours, 2009, vol. 1, p. 1.

Komarnitskyy, V. - Hazdra, P.: Electrical Characterization of Deep-Lying Donor Layers Created by Proton Implantation and Subsequent Annealing in N-Type Float Zone and Czochralski Silicon. In ECS Transactions: Analytical Techniques for Semiconductor Materials and Process Characterization 6 (ALTECH 2009). New Jersey: The Electrochemical Society, 2009, vol. 3, p. 55-65. ISBN 978-1-56677-740-7.

Kubař, M. - Šubrt, O. - Martinek, P. - Jakovenko, J.: Experience in Virtual Testing of RSD Cyclic A/D converters. In Proc. of 12th IEEE Design and Diagnostics of Electronic Circuits and Systems Workshop 2009 (DDECS'09). Los Alamitos: IEEE Computer Society Press, 2009, p. 178-181. ISBN 978-1-4244-3339-1.

Kučera, O. - Cifra, M. - Vaniš, J. - Pokorný, J. - Hašek, J. - et al.: Nanoelectromechanics of Yeast Cells. In 8th International Symposium on SPM in Life Sciences. Berlin: JPK Instruments AG, 2009, p. P8.

Kulha, P. - Bouřa, A. - Husák, M. - Kromka, A. - Babchenko, O.: Design and Characterization of NCD Piezoresistive Strain Sensor. In IEEE ISIE 2009, 2009 IEEE International Symposium on Industrial Electronics [CD-ROM]. Wonmi-gu, Gyeonggi-do: Institute of Control, Robotics and Systems (ICROS), 2009, p. 121-126. ISBN 978-1-4244-4349-9.

Kulha, P. - Bouřa, A. - Husák, M. - Kromka, A. - Babchenko, O.: Modeling and Fabrication of Piezoresistive Strain Sensor Based on Diamond Layers. In 45th International Conference on Microelectronics, Devices and Materials, MIDEM 2009. Ribno at Bled: MIDEM, 2009, vol. 1, p. 367-370. ISBN 978-961-91023-9-8.

Lalinsky, T. - Vanko, G. - Jakovenko, J. - Kutis, V. - Ivanova, M. - et al.: AlGaIn/GaN HEMT based micro-hotplate for high temperature gas sensors. In The 35th International Conference on Micro & Nano Engineering. Leuven: IMEC, 2009, vol. 1, p. 103.

Lalinsky, T.L. - Kutis, V.K. - Jakovenko, J. - Ivanova, M.I. - Vanko, G.V. - et al.: GaN MICRO-HOTPLATES FOR HIGH TEMPERATURE MEMS GAS SENSOR APPLICATIONS. In MME 2009 Micromechanics Europe Workshop. Toulouse: The Laboratory of Analysis and Architecture of Systems (LAAS), 2009, vol. 1, p. 206-209.

Prajzler, V. - Hüttel, I. - Lyutakov, O. - Veselý, T. - Špírková, J. - et al.: POLYMER OPTICAL WAVEGUIDES FOR HYBRID PHOTONICS APPLICATIONS. In The Fifteenth Microoptics Conference. Seoul: IEEE CLEO/Pacific Rim, 2009, p. 184-185. ISBN 978-4-86348-037-7.

Prajzler, V. - Lyutakov, O. - Hüttel, I. - Oswald, J. - Machovič, V. - et al.: Bismuth(III) Doped Polymer Layers for Telecommunication Applications. In The 8th Pacific Rim Conference on Lasers and Electro-Optics [CD-ROM]. Washington: CLEO, 2009, vol. 1, p. 301-302. ISBN 978-1-4244-3830-3.

Prajzler, V. - Oleksiy, L. - Tůma, J. - Hüttel, I. - Jeřábek, V.: New Technique for Preparation of Epoxy Novolak Resin Polymer Waveguides. In The Fifteenth Microoptics Conference. Seoul: IEEE CLEO/Pacific Rim, 2009, p. 182-183. ISBN 978-4-86348-037-7.

Rahimo, M. R. - Schlapbach, U. S. - Schnell, R. S. - Kopta, A. K. - Vobecký, J. - et al.: Realization of Higher Output Power Capability with the Bi-Mode Insulated Gate Transistor (BIGT). In EPE 2009 [CD-ROM]. Brussels: EPE Association, 2009, vol. 1, p. P.1-P.10.

Rahimo, R. M. - Kopta, K. A. - Schlapbach, S. U. - Vobecký, J. - Schnell, S. R. - et al.: The Bi-mode Insulated Gate Transistor (BIGT) A Potential Technology for Higher Power Applications. In Proceedings of 21st International Symposium on Power Semiconductor Devices and ICs. Piscataway: IEEE, 2009, p. 283-286. ISSN 1943-653X.

Šubrt, O. - Kubař, M. - Martinek, P. - Jakovenko, J.: VIRTUAL TESTING METHOD FOR STATIC ADC NON-LINEARITY – RSD CYCLIC A/D CONVERTER CASE. In XIX IMEKO World Congress 2009 – Fundamental and Applied Metrology [CD-ROM]. Lisbon: Instituto Superior Técnico/Instituto de Telecomunicações Portugal, 2009, ISBN 978-963-88410-0-1.

Urbář, J. - Scheirich, J. - Jakůbek, J.: MEDIPIX Cosmic Ray Tracking Device on BEXUS-7 Stratospheric Balloon Flight. In Proceeding of the 19th ESA Symposium on European Rocket and Ballon Programmes and Related Research. Noordwijk: European Space Agency, 2009, p. 483-488. ISBN 978-92-9221-235-3.

Vobecký, J. - Záhlava, V. - Hemman, H. K. - Arnold, A. M. - Rahimo, R. M.: The Radiation Enhanced Diffusion (RED) Diode Realization of a Large Area p+p-n-n+ Structure with High SOA. In Proceedings of 21st International Symposium on Power Semiconductor Devices and ICs. Piscataway: IEEE, 2009, p. 144-147. ISSN 1943-653X.

Vobecký, J. - Záhlava, V. - Komarnitsky, V.: Fast recovery Radiation Enhanced Diffusion (RED) Diode: Palladium versus Platinum. In EPE 2009 [CD-ROM]. Brussels: EPE Association, 2009, vol. 1, p. P.1-P.8.

CONFERENCES WITH PUBLISHED PROCEEDINGS (NATIONAL - IN ENGLISH)

Armas Arciniega, J. - Jeřábek, V. - Prajzler, V. - Bušek, K. - Hüttel, I.: Performance of the Planar Hybride Optoelectronic Receiver. In Workshop 09 [CD-ROM]. Prague: CTU, 2009, p. 154-155. ISBN 978-80-01-04286-1.

Bouřa, A. - Kulha, P. - Husák, M.: IMPROVED METHOD FOR TID ESTIMATION. In Electronic Devices and Systems, IMAPS CS International Conference 2009 Proceedings. Brno: VUT v Brně, FEI, 2009, vol. 1, p. 10-15. ISBN 978-80-214-3933-7.

Bušek, K. - Jeřábek, V. - Hüttel, I. - Prajzler, V.: The VHGT Triplex Filter for the Hybrid Photonic Integrated Circuits with the Polymer Optical Waveguides. In Workshop 09 [CD-ROM]. Prague: CTU, 2009, p. 153-154. ISBN 978-80-01-04286-1.

Hazdra, P. - Oswald, J. - Komarnitsky, V. - Kuldová, K. - Hospodková, A. - et al.: Engineering of MOVPE grown InAs/GaAs Quantum Dot Structures. In Workshop 09 [CD-ROM]. Prague: CTU, 2009, p. 156-157. ISBN 978-80-01-04286-1.

Jakovenko, J. - Lalinský, L.T. - Husák, M.: New Micromechanical Free Standing Hot Plates with HEMT Heater. In Electronic Devices and Systems, IMAPS CS International Conference 2009 Proceedings. Brno: VUT v Brně, FEI, 2009, vol. 1, p. 188-191. ISBN 978-80-214-3933-7.

Janiček, V. - Husák, M.: Resonant Structures for Energy Microgenerator. In Electronic Devices and Systems, IMAPS CS International Conference 2009 Proceedings. Brno: VUT v Brně, FEI, 2009, vol. 1, p. 192-196. ISBN 978-80-214-3933-7.

Jeřábek, V. - Hüttel, I. - Prajzler, V. - Bušek, K.: DESIGN AND CONSTRUCTION WDM TYPE TRIPLEX OPTICAL RECEIVER MODULE

USING SYSTEM MULTIMODE POLYMERIC PLC HYBRID INTEGRATION TECHNOLOGY. In Electronic Devices and Systems, IMAPS CS International Conference 2009 Proceedings. Brno: VUT v Brně, FEI, 2009, vol. 1, p. 437-442. ISBN 978-80-214-3933-7.

Jeřábek, V. - Hüttel, I. - Prajzler, V. - Bušek, K.: Design and construction WDM type triplex optical receiver module using system multimode polymeric PLC hybrid integration technology. In Proceeding of the the 9th WSEAS International Conference on Applied Informatics and Communications. Athens: WSEAS Press, 2009, p. 178-181. ISBN 978-960-474-107-6.

Komarnitskyy, V. - Hazdra, P.: Synthesis of novel defects in silicon by ion irradiation for future application in semiconductor technology: low-temperature formation of deep donor layers. In Workshop 09 [CD-ROM]. Prague: CTU, 2009, p. 150-151. ISBN 978-80-01-04286-1.

Kubař, M. - Jakovenko, J.: Design and Measurement of the 8-bit dual-slope A/D Converter. In Electronic Devices and Systems, IMAPS CS International Conference 2009 Proceedings. Brno: VUT v Brně, FEI, 2009, vol. 1, p. 325-330. ISBN 978-80-214-3933-7.

Kulha, P. - Bouřa, A. - Husák, M.: High-Temperature Strain-Gauges Based on Nanocrystalline Diamond Layers. In Electronic Devices and Systems, IMAPS CS International Conference 2009 Proceedings. Brno: VUT v Brně, FEI, 2009, vol. 1, p. 197-200. ISBN 978-80-214-3933-7.

Novák, J. - Foit, J. - Janíček, V.: Inductive Coupling in Integrated Circuits. In Electronic Devices and Systems, IMAPS CS International Conference 2009 Proceedings. Brno: VUT v Brně, FEI, 2009, vol. 1, p. 34-37. ISBN 978-80-214-3933-7.

Prajzler, V. - Lyutakov, O. - Hüttel, I. - Veselý, T. - Jeřábek, V.: Designed and Fabrication of ENR Polymer Rib Optical Waveguides. In Electronic Devices and Systems, IMAPS CS International Conference 2009 Proceedings. Brno: VUT v Brně, FEI, 2009, vol. 1, p. 455-460. ISBN 978-80-214-3933-7.

Prajzler, V. - Hüttel, I. - Špírková, J. - Oswald, J. - Zavadil, J. - et al.: Optical Properties of Gallium Nitride Layers Doped with Erbium and Erbium + Ytterbium Ions. In Workshop 09 [CD-ROM]. Prague: CTU, 2009, p. 172-173. ISBN 978-80-01-04286-1.

Prajzler, V. - Lyutakov, O. - Hüttel, I. - Špírková, J. - Oswald, J. - et al.: Polymer Layers Doped with Rare Earth Ions for Photonics Applications. In Workshop 09 [CD-ROM]. Prague: CTU, 2009, p. 170-171. ISBN 978-80-01-04286-1.

CONFERENCES WITH PUBLISHED PROCEEDINGS (NATIONAL - IN CZECH)

Bušek, K. - Jeřábek, V. - Prajzler, V. - Hüttel, I.: VLNOVĚ SELEKTIVNÍ OPTICKÁ ROZBOČNICE SE SOUSTAVOU PLANÁRNÍCH OPTICKÝCH POLYMERNÍCH VLNOVODŮ. In Optické komunikace [CD-ROM]. Praha: Agentura Action M, 2009, s. 1-5. ISBN 978-80-86742-28-1.

Husák, M.: Elektronické součástky a systémy pro radioelektroniku. In Radiokomunikace 2009. Pardubice: UNIT, 2009, s. 139-153.

Husák, M.: Mikrosystémové součástky a obvody pro mezioborové aplikace. In Moderní elektronické součástky – od fotonu k elektronu 2009 [CD-ROM]. Praha: Sdělovací technika, 2009, díl 1,

Jeřábek, V. - Hüttel, I. - Prajzler, V. - Bušek, K. - Seliger, P.: WDM PLANÁRNÍ OPTOELEKTRONICKÝ POLYMEROVÝ PŘIJÍMAČ. In Optické komunikace [CD-ROM]. Praha: Agentura Action M, 2009, s. 55-61. ISBN 978-80-86742-28-1.

INVITED LECTURES (in English)

Voves, J.: Nanoelectronics and nanolithography. In Nanocon 2009 Conference Proceedings. Ostrava: TANGER, spol.s r.o, 2009, . ISBN 978-80-87294-12-3.

PhD. THESIS

Kulha, P.: Microsystems for Deformation Measurement and High-Temperature Application, 2009

Ondráček, F.: Charakterizace fotonických vlnovodných struktur (in Czech), 2009

Vaniš, J.: Characterization of Semiconductor Nanostructures by BEEM/BEES, 2009

DIPLOMA WORKS (In Czech)

Defended Diploma Works

[illegible]