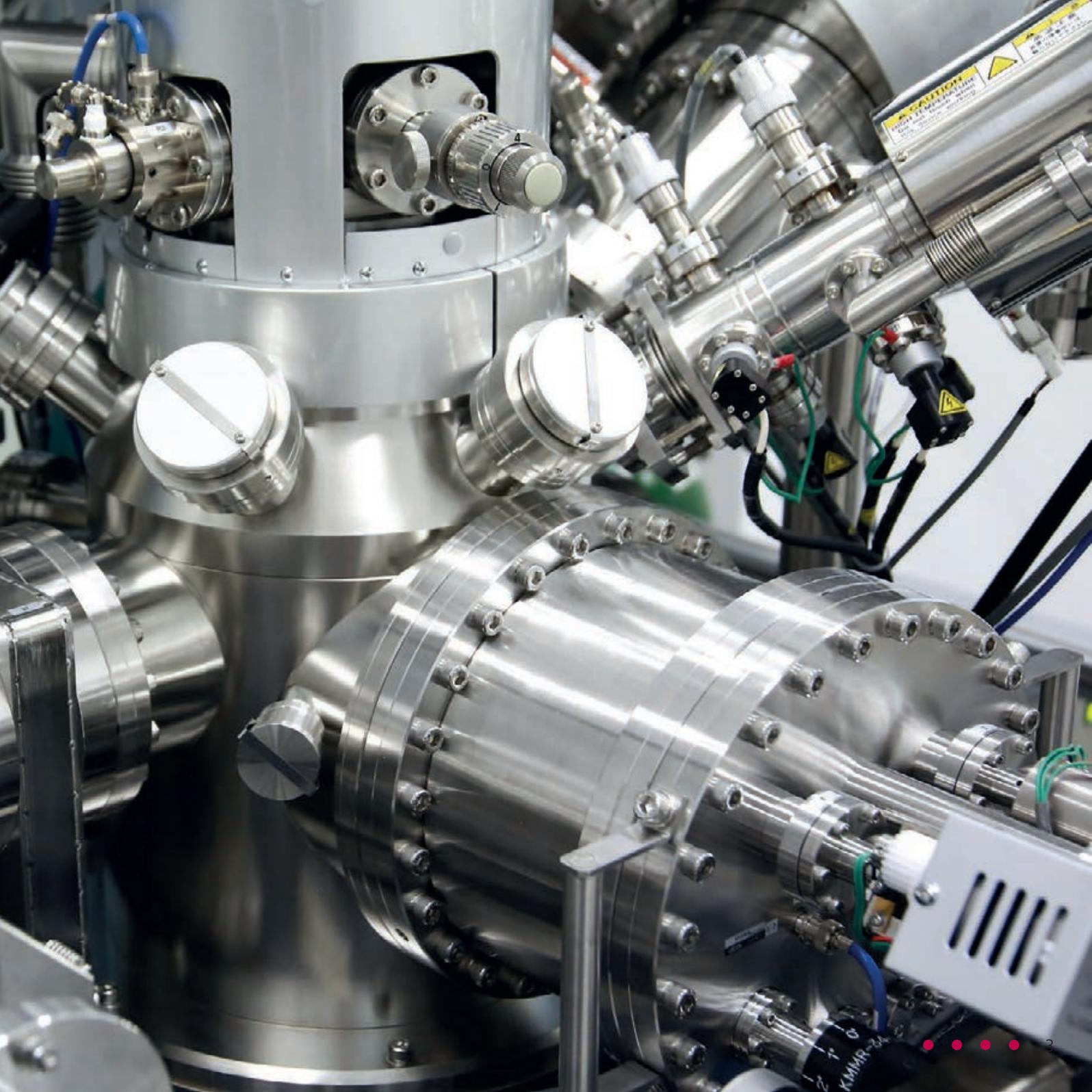




SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA

STU



# Rector's Address

Let me introduce you to the University Science Park (USP) at the Slovak University of Technology (STU), a major research and innovation hub disposing of the most modern infrastructure for scientific research in Slovakia next to the largest Slovak technology university. As an integral part of the University, USP provides a strong foundation for science and research and enables the integration of a large number of the STU labs and partners in the European Research Area (particularly Comenius University and Slovak Academy of Sciences).

Extensive recent investments helped to improve the quality of lab equipment and scientific instruments for various centres and research departments required by the professional research community. New centres include the uniquely equipped Centre for Nanodiagnostics of Materials (high-resolution nanodiagnostics) in Bratislava and SlovakION centre specialising in ion beams and plasma, based in Trnava. We are pleased to have significantly improved the spatial conditions also for international research and reduce greenhouse gas emissions by removing previous faults in our buildings.



The intention to build a science park at STU arose first in 2007. The concept became clearer after 2011 with the preparation and implementation of investment projects co-financed by EU Structural Funds.

One of the most significant milestones was the decision to integrate three separate STU campuses (one in the centre of Bratislava, one in Mlynská Dolina in Bratislava, and one in Bottova Street in Trnava) and create two University Science Parks in Bratislava and Trnava. Implementation of this phase was completed in 2015.

Focusing its research on the needs of the industry, the Slovak University of Technology has taken forward the pioneering concept of the Mining Academy in Banská Štiavnica (Schemnitz, Selmezbánya, established in 1735), which successfully combined theoretical higher education in technical fields with practical teaching methods utilizing well-equipped laboratories.

The STU University Science Park presently provides the latest research infrastructure to fulfil the mission of a modern technology university and is well-positioned to succeed in its integration in the European Research Area and meet the common European objectives.

Robert Redhammer  
Rector

Slovak University of Technology in Bratislava



STU Presentation

# STU facts and figures

- **more than 147,000 students**  
have graduated since its establishment
- **more than 15,000 students**  
currently study at 7 faculties and the University Institute of Management, including 10,000 in bachelor's degree programmes, more than 4,000 in master's degree programmes and over 1,200 in PhD programmes
- **more than 1,400 university teachers and researchers**  
work at STU; many of them are involved in international research teams or lead prestigious professional organizations in Slovakia or abroad
- **7 faculties and 1 institute**  
offer 3 types of degrees (Bachelor's, Master's and Doctoral): Faculty of Civil Engineering, Faculty of Mechanical Engineering, Faculty of Electrical Engineering and Information Technology, Faculty of Chemical and Food Technology, Faculty of Architecture, Faculty of Materials Science and Technology, Faculty of Informatics and Information Technologies and Institute of Management
- **766 research projects**  
including 22 projects within the 7th EU Framework Programme were completed by STU research teams in 2014
- **6 patents and 48 utility models**  
were granted to STU so far 29 patent applications and 18 applications for utility model have been filed with the Slovak Industrial Property Office
- **42 start-up companies and 6 spin-off companies**  
have received technology transfer related help and advice from STU to establish innovative spin-off companies. New start-ups are also supported by the University Technology Incubator InQb
- **Technical University of M. R. Štefánik established in 1937**  
was renamed as the Slovak Technical University in 1939 and in 1997 as the Slovak University of Technology
- **Development of University Science Parks**  
with the aim to provide high-quality conditions for top research, university education and industry collaboration started in 2013



# STU

## University Science Parks

USPs provide high-quality conditions for research by offering both newly-built and renovated research laboratories equipped with the advanced devices, in some cases unique in the European context.

They also support knowledge transfer into practice and provide space for applied research.



### USPs OFFER

- Technology innovations
- Development of new economic sectors based on innovative technologies
- New knowledge transfer into industrial practice
- Increased competitiveness of Slovakia
- Conditions for spin-off and start-up innovative companies
- High-quality research infrastructure
- Intensive collaboration and partnership with the Slovak and international research teams
- Co-operation of the University with academic institutions and enterprises
- Attractive engineering education and university scientific research



University Science Parks



## SCIENCE CITY BRATISLAVA

Mlynská dolina Regional Centre

Centrum Regional Centre

STU Centre for Nanodiagnostics

## CAMBO TRNAVA

Centre of Materials Research – SLOVAKION

Centre of Automation and ICT Implementation  
of Production Processes and Systems

Centre of 5-axis Machining

# SCIENCE CITY BRATISLAVA



## MLYNSKÁ DOLINA REGIONAL CENTRE

- Information and communication technologies, electrotechnics, power industry, robotics, nanoelectronics, photonics and automation of control systems
- Area of 20 thousand m<sup>2</sup>, four strong faculties of two major universities, 800 university teachers, 9 000 students (including about 500 PhD students), 300 research fellows, 12 research institutes of the Slovak Academy of Sciences within the distance of 2 km
- Business incubator that will enhance the services of the current STU Technology Incubator via providing favourable conditions for the start-up and spin-off companies

## CENTRUM REGIONAL CENTRE

- Materials research, chemistry, food, industrial biotechnologies, environment, safety and reliability of buildings
- Area of approximately 10 thousand m<sup>2</sup>, four strong STU faculties, 700 university teachers and researchers, seven thousand students, including about 500 PhD students
- Laboratories equipped with specialized research devices for the analyses of chemicals, materials and structures

## STU CENTRE FOR NANODIAGNOSTICS

- Materials research, research of nanostructures, analysis of samples for physics, chemistry, geology, biology and medicine, using transmission electron microscopy with cold cathode and resolution of 78 pm, and Auger spectrometer with Schottky cathode
- Area of 700 m<sup>2</sup>, seven researchers
- Special laboratories with constant temperature, free from the effect of the external magnetic and electric fields



**UNIVERSITY  
SCIENTIFIC  
PARK | CAMBO**

# CAMBO TRNAVA

ADVANCED TECHNOLOGIES  
RESEARCH INSTITUTE (ATRI)



## CENTRE OF MATERIALS RESEARCH – SLOVAKION

- Ion beam technologies, plasmatic modification and deposition
- Analytical methods, computational modeling, physics, astrophysics and chemistry
- Accurate calculations of molecular NMR properties including relativistic and solvent effects,
- Area of approximately 3 thousand m<sup>2</sup>
- 6 mv Tandetron tandem accelerator, 500 kv Implanter
- Surface/thin layer modification
- Ion beam assisted material synthesis
- Ion beam analysis (RBS/Channeling, PIXE, ERD)
- Radiation damage studies

## CENTRE OF AUTOMATION AND ICT IMPLEMENTATION

- Simulation and optimisation of processes and systems
- Big data and knowledge discovery from production databases in the hierarchical process control
- Implementation of artificial intelligence to the control
- R&D in the field of safety-critical control systems
- R&D in field of mechatronic systems for technological equipment
- Siemens PCS7 control system, factory automation, FESTO

## CENTRE OF 5-AXIS MACHINING

- Research into free-form surfaces by 5-axis technologies (milling, turning, ultrasound machining)



SCIENCE CITY  
MESTO VEDY STU BRATISLAVA

MLYNSKÁ DOLINA  
REGIONAL CENTRE

# INFORMATION AND COMMUNICATION TECHNOLOGIES

Information technologies, Internet, virtual reality etc.

SCIENCE CITY

# VIRTUAL DESKTOP CLOUD CENTRUM

## CONTACT

branislav.steinmuller@stuba.sk (technical issues)  
pavel.cicak@stuba.sk, gabriel.juhás@stuba.sk (research issues)



- Optimization of electronic services, Cloud Computing services, providing Virtual Desktop
- Research into Big Data, Process Mining and Data Mining
- Research in the field of “infrastructure as a service”, representing the services of the hardware or server rent etc.
- Research in the field of “platform as a service”, typically a server rent, including software platform of a database or application server or webhosting
- Research in the field of “software as a service”, from simple web applications up to providing a complete virtual desktop

## TECHNICAL EQUIPMENT

### CLOUD HARDWARE AND SOFTWARE

- 50 computing nodes
- A total of 736 cores
- 11 TB of RWM memory
- 115 TB of disk capacity
- Virtualisation and cloud environment
- IBM SmartCloud Provisioning
- Virtual Bridges VERDE
- 2200 virtual desktops

## SERVICES

- Providing “infrastructure as a service”, hardware and server rent etc.
- Providing “platform as a service”, typically a server rent, including software platform database or application server or webhosting
- Providing “software as a service”, from simple web applications up to a complete virtual desktop
- Providing services in the field of Big Data

## EDUCATION

- Virtualisation
- Cloud computing
- Infrastructure as a service
- Platform as a service
- Software as a service
- Methods of Big Data processing

# RESEARCH CENTRE OF USER EXPERIENCE AND INTERACTION OF UXI@FIIT

CONTACT  
pavol.navrat@stuba.sk



- Research into behaviour of the information system users and their groups based on observing their
- Eye movement, face and emotions on various detail levels
- Selected physiological parameters (conductivity of skin, temperature, pressure, EEG, ECG, respiration)
- Assessment of user behaviour by means of the qualitative and quantitative studies
- Orientation on the desktop, web and mobile applications
- Research into co-operation of users e.g. in programming
- Design of new applications, including the mobile ones, based on the data acquired from the studies of people's behaviour during working with computer

## SIMON LABORATORY OF PERSONALIZATION AND COLLABORATIVE BEHAVIOR RESEARCH IN INFORMATION SPACE

pavol.navrat@stuba.sk, jozef.tvarozek@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- 20× Tobii X2-60 eyetracker, sensing frequency: 60 Hz
- 20× Creative Senz3D depth camera for identification of facial features and basic emotions
- 20× high-performance workstation for a researcher
- Infrastructure for collection and processing of the mass data from 20 workstations, including the context of the data collection (monitored room, annotation of the significant moments of data collection)

### TECHNOLOGY

- Tobii analysis of eyetracking (X2-60 eyetracker)
- Intel Perceptual Computing (Senz3D depth camera) for recognition of facial features and basic emotions
- Software infrastructure for collecting and processing the data from mass experiments

### SERVICES

- Studies for research into user experience and behaviour of people in groups, working with information systems, web or multimedia



- Research with more participants (up to 20) in one experiment
- Design of adaptive software systems, using records of human activities associated with software systems, particularly the data from eyetrackers and in-depth view camera (e.g. eye controlled applications, emotion-based adaptation and perception of website)
- Verification of the customization/personalization methods of web systems and personalized interaction of the people in groups working with software
- Analysis of the data from records of user activity, using context and presented content

### EDUCATION

- Technologies of eyetracking for analysis of user behaviour in information environment
- Research methods in the field of eyetracking
- Research methods in the field of interaction and personalization
- Design and implementation of user studies
- Design of datasets for verification of research results
- Methods of Big Data analysis for the field of implicit user feedback, especially monitoring eye movement and emotions

## ENGELBART USER EXPERIENCE RESEARCH LABORATORY

maria.bielikova@stuba.sk, jakub.simko@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Tobii TX300 eyetracker, sensing frequency of 300 Hz
- Tobii X2-60 eyetracker, sensing frequency of 60 Hz
- Tobii stand for mobile device of X2-60 eyetracker
- Emotiv EEG headset for monitoring synaptic potentials of neural brain cells
- Wireless TEA physiology sensors: ECG, skin conductivity, temperature, pressure, respiration etc.
- Creative Senz3D depth camera for identification of facial features and basic emotions
- Infrastructure and premises designed for implementation of user studies and their observation by third parties for the PC, TV and mobile facilities

### TECHNOLOGY

- Tobii analysis of eyetracking – Tobii Studio, TX300 sensor, X2-60 sensor
- TEA Captiv 7000 analysis of the data from physiology sensors
- Intel Perceptual Computing for analysis of the user's facial features and basic emotions
- EEG Emotiv analysis
- Noldus Observer analysis of basic emotions and the research data processing
- Luxand FaceSDK for identification of application users and their facial features recognition

### SERVICES

- Research studies into user experience and behaviour of people working with information systems, web applications and multimedia in different scenarios (e.g. collecting information, providing services)
- Studies for desktop applications, web applications or for applications on mobile devices
- Research of human behaviour in the information environment, based on detailed eyetracking with the option of using other physiological sensors (e.g. skin conductivity, pressure, temperature, ECG, EEG, respiration) and depth camera
- Design of new applications on the basis of the data regarding behaviour of the people using applications
- Verification of the web systems customization/personalization methods and personalized user/software interaction
- Analysis of data from the user activity records, using physiology sensors, additional context and presented content

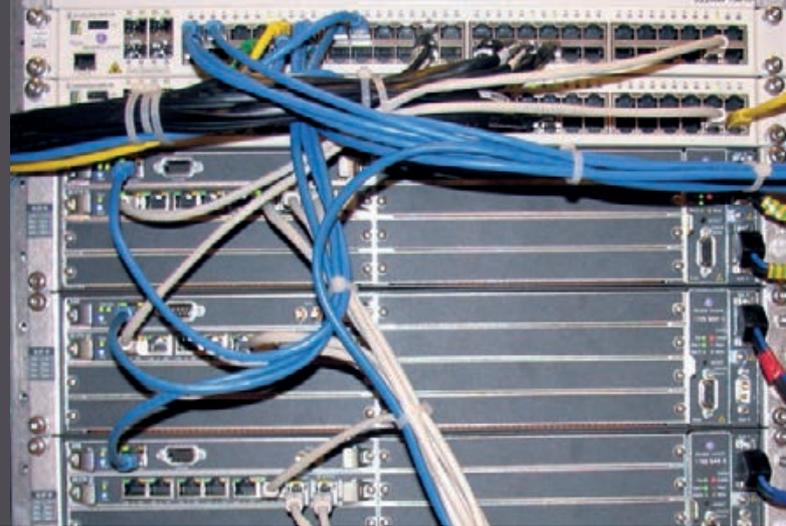
### EDUCATION

- Eyetracking technology for the analysis of user behaviour in the information environment at the level of reading text
- Research methods of eyetracking, interaction and personalization
- Design and implementation of user studies
- Creation of datasets for verification of research results
- Methods of Big Data analysis within an implicit user feedback, particularly eyetracking

# INSTITUTE OF TELECOMMUNICATIONS

## CONTACT

ivan.baronak@stuba.sk



- Mobile and fixed networks based on the IMS, LTE, DVB and IP standards, applications for the mobile and multimedia networks and systems
- Applications for mobile and multimedia networks and systems

## LABORATORY OF MULTIMEDIA TELECOMMUNICATION SYSTEMS AND NETWORKS

ivan.baronak@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Unique, fully functional IP Multimedia Subsystem technology, including LTE (Fix and Mobile telecommunication)
- Optical telecommunication connection, including SDH multiplexer (STM1-155 Mbit/s)
- Hybrid (TDM/IP) multimedia telecommunication system (PBX OXE)
- IP contact centre on GENESYS platform
- Model solution of FWA interface interconnection (26 GHz and FWA WiMAX (3,5 GHz)
- Experimental 10 Gbit/s high-speed network (including total management)

### SERVICES

**Support for scientific experimental activities related to the subject of IP Multimedia Subsystem (IMS) :**

- Modeling, simulations and experimental verification of the IP network parameters
- QoS providing in IP multimedia telecommunication networks
- Optimization of telecommunication operations in the IP multimedia networks



# SCIENCE

- Modeling and experimental verification of activities
  - Proxy, Interrogating and Serving (CSCF) servers
  - IMS Application server for providing VPN, IPTV, VoIP, videoconferences etc.
- Modeling, simulation and experimental verification of
  - New telecommunication services
  - New Admission Control methods
  - IPv6 implementations in new IMS
- Methods of providing multimedia services in IP protocol (voice, video, data)
- Protocols of three layers in IMS and experimental verification of their interface properties in IMS
- Network and communication security in IMS
- Network management in IMS
- Modeling the properties and experimental verification of cross-network collaboration in IMS, signalization and medial levels

## **Support for the scientific experimental activities related to the PBX (Private Branch Exchange) study:**

- Complex network IP communication infrastructure for business sphere (SME)
- Protocols and interfaces used in the IP private telecommunication networks
- Services
- Design optimization of the IP business infrastructure (criteria function)
- Modeling, experimental verification and subsequent implementation of the IP private telecommunication networks based on "open standards"
- Security strategies used in the IP private telecommunication networks
- Modeling of properties and design optimization of VPN networks
- Network management in the IP private telecommunication networks

## **Support for scientific experimental activities related to the activity of Contact Centres:**

- Model solutions for the complex network IP communication infrastructure of a Contact Centre on the platform of various manufacturers
- Modeling the properties and experimental verification of the Contact Centre IP activities
- Optimized design of a Contact Centre for commercial utilisation in terms of operation load

## **EDUCATION**

- Trainings and project co-operation for the companies providing the whole scale of telecommunication services and creation of network solutions
- Trainings oriented on the issues of: IP networks and services, IMS architecture, protocols and interfaces of modern telecommunication networks, telecommunication networks, management of telecommunication networks, open telecommunication platforms, quality of provided services, network parameters, the network and information security, VoIP, IPTV, VPN, videoconferences, Internet, etc.
- Short-time (1-day, 1-week, 2-week) trainings for commercial practice
- Doctoral study (modern telecommunication networks)

# RESEARCH CENTRE OF COMPUTER TECHNOLOGIES

## CONTACT

pavel.cicak@stuba.sk

- Visual detection and discrimination of 2D and 3D objects
- Segmentation of anatomic organs in medical visual 3D data
- Modeling visual attention of a human
- Interactive visualisation of information in augmented reality
- Research methods of computer graphics, using graphic processor units (GPU)
- Research into the human/computer interaction in virtual reality
- Design and testing of embedded systems based on monolithic processors and single-chip microcontrollers
- Design and testing of embedded systems based on programmable hardware
- Real-time monitoring of embedded systems behaviour on the level of logical signals
- Advanced technologies in the field of communication networks, from the fixed networks up to the wireless and mobile networks

## LABORATORY OF COMPUTER VISION AND COMPUTER GRAPHICS

vanda.benesova@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Optical sensor for acquisition of depth map and an RGB Kinect2 signal
- Virtual reality glasses of OculusRift type
- Augmented reality glasses of "Optical See-Through Augmented Reality System" type
- Light field camera
- 2 high-resolution cameras
- Portable spheric photospectrometer
- Eyetracker for both interior and exterior conditions

### TECHNOLOGY

- Virtual reality (VR), augmented reality (AR)
- Creation of space-time model of human visual attention, using precise references of the glasses-type eyetracker

### SERVICES

- Precise colour measurement
- High-resolution data sensing and processing
- Computer vision applications
- VR and AR applications

### EDUCATION

- Modeling and prediction of human visual attention
- Medical data visual processing
- Methods of visual detection and object discrimination







## EMBEDDED SYSTEMS LABORATORY

tibor.krajcovic@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- 10× EEDT 6.0 development kit for processors of AVR, 51, PIC, ARM, Arduino family
- 10× AM3517 development kit based on ARM CORTEX
- 6× MINNOWBOARD development kit based on ATOM
- 3× EJ-SCT JTAG emulator for ARM CORTEX
- 3× EJ-SCT JTAG emulator for ATOM
- 2× AT LA-500 2M logic analyzer with sample generator
- 2× GDS-2204 digital oscilloscope
- 5× Xilinx Virtex-7 FPGA VC707 development FPGA-based system for high-speed network applications
- 1× Xilinx Kintex-7 FPGA KC705 development FPGA-based system for high-level synthesis
- 5× Xilinx Artix-7 FPGA AC701 development FPGA-based system for rapid prototyping
- 10× ABO\_i7-4770 workstations for development kits based on monolithic processors
- 10× ABO\_i7-3930K workstations for FPGA-based development kits
- 6× Lenovo ThinkPad E540 mobile workstations for debugger

### TECHNOLOGY

- Integrated development environment for development kits with graphical user interface
- Debugger for OS-free embedded systems based on x86 in a privileged mode
- Integrated environment for design, synthesis and verification of FPGA-based systems with graphical user interface

### SERVICES

- Development of embedded systems based on monolithic processors and single-chip microcomputers
- Development of FPGA-based embedded systems
- Development of embedded systems without standard OS
- Design of the systems for Internet of Things (IoT)

### EDUCATION

- Technologies in the field of embedded systems and IoT
- Research methods in the field of design of real-time embedded systems
- Research methods in the field of design of systems for IoT

## COMMUNICATION NETWORKS LABORATORY

ivan.kotuliak@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- LTE and GPRS networks (core and access)
- Development and test devices for mobile applications (iOS, Android, Windows Phone)
- WiFi modifiable AP
- SDN and NFV laboratory with functioning prototypes
- IP networks (in compliance with Network Academy)
- VoIP switchboards, including IMS technologies

### TECHNOLOGY

- LTE, GPRS, SDN, NFV, VoIP (SIP-based), IMS

### SERVICES

- Testing and proof of concept for the above-mentioned technologies

### EDUCATION

- NFV, SDN, LTE
- Mobile networks
- Development of applications for mobile devices
- VoIP, IMS, VoLTE

# ELECTRICAL ENGINEERING, AUTOMATION AND CONTROL SYSTEMS

Micro/nano-electronic structures and systems,  
Electrical Power Engineering, electrotechnologies etc.

# INSTITUTE OF ELECTRONICS AND PHOTONICS

## CONTACT

daniel.donoval@stuba.sk

## LABORATORY OF ELECTRICAL, OPTICAL AND ANALYTICAL CHARACTERIZATION OF MICROELECTRONIC, SENSORIC AND PHOTONIC STRUCTURES AND THEIR FABRICATION

jaroslav.kovac@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Parametric analyser with programmable controller (Agilent 4155C) containing four built-in precise sources +/- 100V, 0.1A (resolution 100  $\mu$ V, 100 fA) and with the option of a pulsed mode 500 ms–100 ms; supplemented with a replaceable power unit +/- 200V, 1A and a PGU pulse generator with a range of +/- 40V, 1  $\mu$ s–10s
- Micromanipulation probe station (Süss Microtech) for the measurements on substrate
- Deep Level Transient Spectroscopy (DLTS) BIORAD DL8000, measuring concentration of traps and defining parameters of additions in semi-conductor structures. Temperature range 77 K – 450K and pulse width 1  $\mu$ s–1000 s
- UV-VIS MonoVista 750 CRS micro-Raman spectroscopy using He-Cd excitation lasers with emission wavelength of 325 nm and optical power of 50 mW (325 nm, ~50 mW) and Ar+ (514/488 nm, ~100 mW) with the option of retuning. Cooled EMCCD with eXcelon detector and BX51 Olympus confocal Raman microscope (in the International Laser Centre)

- PhE-102 spectral ellipsometer in the range of 250–1100 nm wavelength and eligible measurement angle in the range of 10–90°
- Quantaaurus Tau automated photoluminescence or fluorescent measurements in the time period of 2.5 ns – 50  $\mu$ s, resolution < 1 ns and in the spectrum band of 380–1030 nm
- Atomic Force Microscope – AFM, Park systems XE-100 with lateral range of 45  $\times$  45  $\mu$ m max. and horizontal range of 12  $\mu$ m max. Option of using special EFM, I AFM, MFM, SCM or STM modes

### TECHNOLOGY

- The cleanest premises in Slovakia; ISO 5 purity class (American class 100) for lithography purposes
- Süss MA6 modular lithographic device, UV lithography with resolution < 1  $\mu$ m, and UV nanoimprint lithography with resolution < 100 nm for research purposes in the field of nanotechnology, photonics, solar cells and SMART sensoric systems
- Growth of oxide layers and reactive ion etching – PlasmalabSystem 100 and Plasma Lab 80.
- Growth of the oxide (SiO<sub>2</sub>, SiO<sub>x</sub>N<sub>y</sub>) and/or nitride (SiN, Si<sub>3</sub>N<sub>4</sub>) layers
- PVD 75 equipment with the option of combining thermal evaporation with electron beam evaporation or magnetron sputtering
- Contact assembly on socket



## SERVICES

- Analysis of surface morphology of nanometric dimensions by means of the atomic strength microscopy with the option of the EFM, I AFM, MFM, SCM or STM modes
- Characterization of optical structures and elements' properties by means of the methods of Raman spectroscopy, photoluminescence, fluorescence and ellipsometry
- Characterization of electric properties of the micro and optoelectronic elements by means of the electronic elements by means of parametric analyser of circuits and Deep Level Transient Spectroscopy (DLTS)
- Technology of manufacturing and assembly of the elements from substrates into sockets in smaller quantities intended primarily for research purposes, including lithography, oxide growth and contact layers, cutting, assembly and contacting on sockets

## EDUCATION

- Comprehensive education process focused on physics, technology and diagnostics of advanced semi-conductor structures and circuits for optimization of technology processes and characterization of the properties of prospective micro/nano-optoelectronic and photonic structures and elements, particularly transistors of HEMT type, solar elements and sensors
- Comprehensive education process focused on the dynamically developing fields of electronics and photonics

## LABORATORY OF ORGANIC ELECTRONICS

[martin.weis@stuba.sk](mailto:martin.weis@stuba.sk)

### TECHNICAL EQUIPMENT/DEVICES:

- Own equipment for passivating organic electronic structures and formation of thin insulating layers allowing to achieve homogeneous insulating layers by order of magnitude thinner than those fabricated by commercially available technologies (complex technology features organic electronics feasible in one laboratory)

### TECHNOLOGY

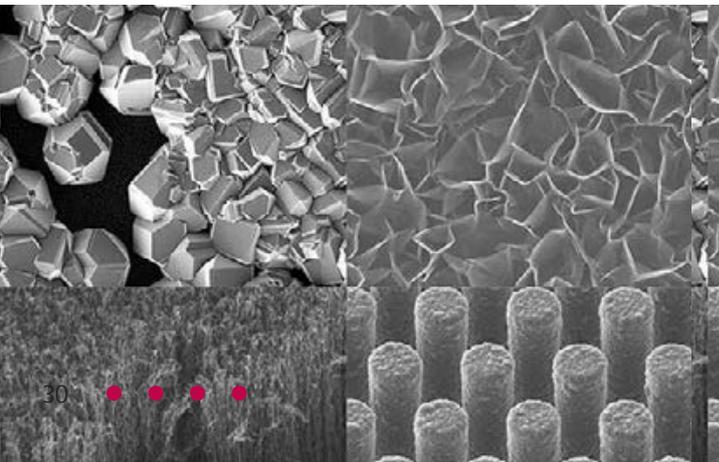
- For preparation and characterization of electronic components such as organic light-emitting diodes (OLEDs) or organic field effect transistors (OFET)

### SERVICES

- Design, preparation, testing and analysis of the organic electronic devices such as organic light-emitting diodes (OLEDs) and organic field effect transistors (OFET)
- Applications of integrated organic electronics, flexible electronics, organic sensors or even organic optoelectronics. Research into organic solar cells

### EDUCATION

- Comprehensive training process focused on the design, construction, testing and analysis of organic electronic devices such as organic light-emitting diodes (OLEDs) and organic field effect transistors (OFET)



Mlynská dolina

## LABORATORY OF CARBON NANOTUBES AND GRAPHEN

marian.vojs@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES:

- SEM Cold Cathode Microscope JEOL JSM 7500
- Raman Spectrometer (ISA-Jobin Yvon-Dilor-Horiba, 633 nm)
- AUTOLAB PGSTAT128N with automatic Dosino system
- RF RIE etching system Plasma PE 200
- Linear antenna microwave CVD reactor, low temp large area (20×30cm) deposition (Scia systems)
- Hot Filament CVD diamond reactor (home-made)
- Microwave/Hot Filament CVD diamond reactor (home-made)
- Arc Discharge Reactor for CNT Growth (home-made)
- CVD Reactor for CNT Growth (home-made)
- RTA – Rapid Thermal Annealing (home-made)
- Evaporation equipment for thin films deposition (home-made)
- Contact Angle Measurement System (home-made)
- Helium leak detector HLT570 (Pfeiffer vacuum)

### TECHNOLOGY

- Deposition of a boron-doped intrinsic micro- and nano-diamond layers, carbon nanotubes, graphene nanowalls and DLC layers
- Waste water treatment, drains and pools by advanced electrochemical oxidation methods
- Production of electrodes and systems for electrochemical analysis and degradation
- Electrochemical analysis of solutions (heavy metals, biomolecules, medications and drugs)
- Vacuum evaporation and sputtering of thin metal films
- Plasma etching in the RF and DC plasma
- Annealing to 800 °C (RTA) in vacuum or gas atmosphere



### SERVICES

- Analysis of materials using SEM and Raman spectroscopy
- Identification and elimination of vacuum leaks
- Professional consultancy and services in the field of vacuum technology and nanotechnology

### EDUCATION

- Comprehensive education process aimed at vacuum physics, vacuum technology and nanotechnology

## LABORATORY OF ELECTROPHYSICAL MODELING AND SIMULATION

ales.chvala@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES:

- PC Intel Core i7 2600 3.4 GHz, 24 GB RAM
- PC Intel Core i7 3770 3.4 GHz, 32 GB RAM
- PC Intel Core i7 930 3.5 GHz, 6 GB RAM

### TECHNOLOGY

- 10x Synopsys TCAD Sentaurus licence
- 20x HSPICE licence

### SERVICES

- Design, analysis and optimization of semi-conductor structures and systems supported by simulation and modelling

### EDUCATION

- Education and participation in international projects of collaboration with the local and foreign partners in the field of design, analysis and optimization of advanced semiconductor structures

## LABORATORY OF DESIGN AND TESTING OF IC

viera.stopjakova@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Design software (compatible with the equipment of commercial companies – CADENCE, MENTOR GRAPHICS, SYNOPSYS, CST Microwave); Measuring Equipment
- Access to the most advanced semiconductor technology with transistor gate dimensions below 100 nm (CMOS, BiCMOS)

### TECHNOLOGY

- Technologies with transistor gate dimensions below 100 nm (CMOS, BiCMOS)

### SERVICES

- Design/integration of circuits and systems for e.g. intelligent microsensors, pre-processing of sensor signals of on-chip, biomedical mobile devices (bionitoring systems, neurochips and neuroprostheses), the monitoring of power consumption on the chip energy collectors etc.
- Development of testing methodology for hybrid integrated circuits and systems on-chip (parametric testing techniques, use of artificial neural networks in diagnosing IC)

### EDUCATION

- Comprehensive education process aimed at design and testing of integrated circuits

## LABORATORY OF MEDICAL AND APPLIED ELECTRONICS

martin.donoval@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Electronic measurement and control systems for design of electronic circuits and biometric equipment
- UIS multipulse tester
- Biometric sensors for wireless ECG sensing
- Stabilometric platform
- CNC milling device
- Semiautomatic assembly system of PCB
- Furnace for PCB baking
- Equipment for implementation and analysis of electronic system

### TECHNOLOGY

- Advanced design and construction methods for production of electronic circuits and biometric devices

### SERVICES

- Development of microprocessor systems and biometric systems for precise measurement of biometric parameters such as ECG, EMG, respiration rate etc.
- Development of precision measuring systems for monitoring electrical parameters
- Development of electronic and sensory systems
- Development of precise PCB and management systems
- Data transmission via wireless networks, fieldbus and Internet
- Implementation of the smart-phones applications controlling wireless units (e.g. sensory systems) and transmitting data to server
- Preparation of a server solution for data receiving and processing

### EDUCATION

- Education in the field of design of electronic circuits and systems, programming microprocessors, utilisation of modern parts, preparation of wireless transmission, utilisation of the analogue and digital parts



## LABORATORY OF THIN SENSORIC FILMS

ivan.hotovy@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES:

- Equipment for measuring and testing smart sensors: PLV 50 (Cascade) with accessories
- Deposition equipment with magnetron sources (Balzers)
- Deposition and etching equipment of PE CVD, CVD/ICP, RIE RIE/ICP. Vakutec 310/320 (FHR)
- Exposure device for optical lithography: KSM MJB 3HP (Karl Suss)

### TECHNOLOGY

- Technology for design, simulation, experimental preparation and development of thin-film sensory structures and microsystems

### SERVICES

- Testing the electrical properties of sensors and microsystems in vacuum and at increased temperatures up to 300°C
- Plasmatic etching and forming of nanostructure motives with powerful ICP source

### EDUCATION

- Education in the field of advanced technologies of preparation and etching the layers, and in the field of design and development of sensors and microsystems

SCIENCE CITY  
MESTO VEDY STU BRATISLAVA



# INSTITUTE OF NUCLEAR AND PHYSICAL ENGINEERING

## CONTACT

julius.cirak@stuba.sk

- Research into construction materials for nuclear devices
- Development of new radiation-resistant materials for the splitting and fusion technologies
- Computer modeling and simulations for nuclear power
- Analysis of microstructure and selected physical parameters of materials

## LABORATORY OF LOW ACTIVITY MEASUREMENT AND GAMMASPECTROSCOPY

robert.hinca@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Alfa, beta and gamma systems for low activity measurement

### TECHNOLOGY

- Low level alpha/beta activity measurement system with POB 302 proportional flow gas detector and TEMA MK310 analyzer
- Scintillation detector of alpha/beta and gamma surface and spatial activity measurement with TEMA DA310 analyzer
- Alpha scintillation Lucas chambers to measure the volumetric activity of radon in air
- Gamma spectrometer with 3 "NaI (Tl) scintillation detector in a low-background lead chamber with Osprey analyzer
- Mobile gamma spectroscopy measuring system with 2 "NaI (Tl) scintillation detector and Unispec analyzer
- High resolution gamma spectroscopy system with HPGe detector placed in a low-background steel chamber with Lynx analyzer

### SERVICES

- Measurement of low activities, gamma spectrometry

### EDUCATION

- University education in the field of environmental science, dosimetry, radiation protection and radiation ecology



## LABORATORY OF AFM/MFM MICROSCOPY

milan.pavuk@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Dimension Edge™ Atomic Force Microscopy by VEECO Co.

### TECHNOLOGY

- AFM – Atomic Force Microscopy enabling investigation of surface properties of samples with high spatial resolution

### SERVICES

- Measurements for determination of local properties of the sample surface, especially the surface morphology, local magnetization, electrical or thermal capacity, conductivity etc.

### EDUCATION

- Diagnostic methods of materials, material structures and technologies

## LABORATORY OF MÖSSBAUER SPECTROSCOPY

marcel.miglierini@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Transmission Mössbauer Spectrometry (TMS) able to record conversion electrons (CEMS, Conversion Electron Mössbauer Spectrometry) or typical conversion radiation (CXMS, Conversion X-ray Mössbauer Spectrometry)

### TECHNOLOGY

- Mössbauer Spectrometry (MS) a non-destructive method of a wide diagnostic potential, applicable to all iron-containing materials; it enables precise phase analysis of materials and identification of iron atoms in various crystallographic positions; it is applicable in the study of the structure of metal materials, alloys, steels and magnetic materials in the studies of magnetic structure

### SERVICES

- Precise identification of iron oxides, MS applications in mineralogy, geology, corrosion products and materials for magnetic recording; it is also suitable for the analysis of amorphous non-crystalline substances

### EDUCATION

- University education: measurement and regulation of nuclear power plants, experimental reactor physics, nuclear physics and technology, nuclear equipment and experimental methods

## LABORATORY OF NUMERICAL SIMULATIONS OF MATERIALS

peter.ballo@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Supercomputer of SimLab laboratory

### TECHNOLOGY

- 120 processors (200, if considering Hyper-threading technology) and 140 GB operation memory

### SERVICES

- ab initio simulations, molecular dynamics and optimisation of structures by simulated annealing or evolution calculations

### EDUCATION

- University education: simulation of material structures, computer physics, modeling and simulations

## LABORATORY OF SEMICONDUCTING DETECTORS

andrea.sagatova@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Automated measurement device to determine electrophysical parameters of detectors by measuring their current-voltage characteristics in a range of voltage from 0.1V to 1000V and current up to 1 fA 20mA
- Spectrometric route for detecting spectroscopic properties of the examined detectors
- Programs for quantitative and qualitative analysis of X-ray fluorescence spectra
- Digitizing microscope image for photo documentation of samples of detectors

### SERVICES

- Research and development of detectors based on perspective semiconductor compounds

### EDUCATION

- University education: nuclear electronics and detectors



## PHYSICAL ENGINEERING

### LABORATORY OF POSITRON ANNIHILATION SPECTROSCOPY

vladimir.slugen@stuba.sk

#### TECHNICAL EQUIPMENT/DEVICES

- Positron Annihilation Lifetime Spectroscopy (PALS)
- Coincident Doppler Broadening Spectroscopy (CDBS)

#### TECHNOLOGY

- PAS, a non-destructive method of testing materials, based on implanting positrons from radioactive source into sample, and measurement of annihilation characteristics

#### SERVICES

- Monitoring the technologies of various materials' preparation, technology impact on materials, and effects such as fatigue, temperature, irradiation load etc.

#### EDUCATION

- University education: experimental methods, material structures and technologies, materials for nuclear power plants, methods of material diagnostics

### LABORATORY OF REACTOR PHYSICS

jan.hascik@stuba.sk

#### TECHNICAL EQUIPMENT/DEVICES

- Hardware of experimental SUR 100 nuclear reactor (Siemens Unterrichtsreaktor, heat output 100 mW)
- graphite column

#### TECHNOLOGY

- Activation of selected materials in radial channel and source of neutrons for experiments in a water tank with a system of fuel rods

#### EDUCATION

- University education – nuclear reactors

## LABORATORY OF ORGANIC MULTILAYERS AND NANOSTRUCTURES

julius.cirak@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Langmuir-Blodgett apparatus for making monolayers at the water surface and subsequent deposition of organic layers on solid substrates

### TECHNOLOGY

- Alteration of deposited monomolecule layers in the desired sequence
- Check and adjustment of process conditions for deposition of water subphase temperature, deposition rate and surface pressure of the formed monolayer on the water surface

### SERVICES

- Diagnostics of organic molecule monolayers and molecule nanostructures enabling contactless measurement of the electrical, optical and thermodynamic properties

### EDUCATION

- Specialised training in the field of biomaterials, bioelectronics and nanotechnologies

## LABORATORY OF OPTICAL METHODS

juraj.chlpik@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Modular spectrofluorimeter for measurement of stationary and time-resolution fluorescence spectra
- Spectroscopic ellipsometer to measure thin films in the range of visible light wavelength of 430 nm – 850 nm, with the possibility of acquiring full 16-element Mueller matrix

### TECHNOLOGY

- Modulation of polarised light using technology of liquid crystals

### SERVICES

- Diagnostics of basic optical parameters of thin layers and nanostructures

### EDUCATION

- Specialised training in the field of applied optics, photonics and nanotechnologies



## P H Y S I C A L   E N G I N E E R I N G

**CENTRE OF SUPERCOMPUTER APPLICATIONS**

[martin.konopka@stuba.sk](mailto:martin.konopka@stuba.sk)

**TECHNICAL EQUIPMENT/DEVICES**

- Calculation server with Intel i7 3930K processor (6 cores), 64 GB DDR3 memory, two disks (1 TB, 4 TB)
- Calculation server with Intel i7 5930K processor (6 cores) 64 GB DDR4 memory and 2 TB disk
- HP Compaq ProLiant ML150 G6 calculation-data server with two Intel Xeon E5504 processors (each with four cores), 48 GB of memory and 8 TB of disk space into four equal disks
- Calculation server purchased in the year 2009. Intel i7 920 processor, 12 GB DDR3 memory, two ASUS GeForce GTX295 dual graphics cards, 500 GB disk. The PC without monitor, suitable for simple calculations on graphics cards
- SUN cluster purchased in the year 2007. Seven out of the total of 10 knots of SUN Fire are fully functional, each with two two-core AMD Opteron 2220 processors and 12 gigabytes of memory.

**TECHNOLOGY**

- Centre of Supercomputing Applications addresses the computationally challenging problems in the field of the electron and lattice structure of materials using ab initio methods

**SERVICES**

- Possibility of supporting the projects relating to the field of molecular interactions in atomic force microscopy, organic monolayers, molecular joints, thin layers of aluminium oxides and quantum electron transport through nanojoints

**EDUCATION**

- Education of undergraduates and doctoral students and specialised courses in the field of advanced methods of computer physics and computer simulations

# LABORATORY OF MICROWAVE AND OPTICAL SYSTEMS

CONTACT  
viktor.smiesko@stuba.sk



- New testing and measurement methods of the microwave, optical sensoric and communication systems

## HIGH-TECH CENTRE OF ELECTROMAGNETIC COMPATIBILITY

mikulas.bittera@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES:

- Shielded cabin with dimensions of 4.5 × 4.5 x 8.5 meters, lined with a ferrite absorbing material and partially pyramidal foam absorbers, so that the test site meets the requirements of STN CISPR 16 for measuring radiated disturbance up to 18 GHz, and EN 61000-4-3 for the verification of immunity against EM field up to 6 GHz, equipped with a turntable antenna masts and 3 × 400V/32A EMC mains filter and 3 × 400V/6A TEMPEST filter
- Rohde & Schwarz measuring receivers for the frequency range of 9 kHz to 7 GHz
- Agilent Technologies EMC analyzer for the frequency range of 100 Hz to 26.5 GHz
- Portable Spectrum Analyzer Rohde & Schwarz for the frequency range of 9 kHz to 8 GHz
- Measurement kit for designing and testing the systems in terms of EMC Hewlett Packard (including spectrum analyzer, preamplifier and near-field probes)
- Agilent Technologies network analyzer (100 kHz – 8 GHz) and Hioki (DC – 100 kHz) impedance meter
- Agilent Technologies signal generators with a frequency range of 250 kHz to 20 GHz (max. Voltage level +14 dBm) and Rohde & Schwarz with a range of 100 kHz to 2 GHz (max. Voltage level +16 dBm)
- Sonoma Instruments measuring amplifiers (+25 dB, 0.009 – 6000 MHz) and (+32 dB, 0.009 – 1000 MHz), Agilent Technologies (+30 dB, 1 – 26.5 GHz), Hewlett Packard (25 dB, 1-1300 MHz) and transient limiters Rohde & Schwarz and Agilent Technologies
- Amplifier Research 150W1000 (150 W, 80 – 1000 MHz) 10W1000 (10 W, 0.25 – 1000 MHz) and 1S4G11 (1 W, 4 – 10.6 GHz), Prana (50 W, 0.01 – 1000 MHz), Milmega (30 W, 0.8 – 4 GHz), Minicircuits (50 W, 26 – 500 MHz, and 35 W, 500 to 1000 MHz), Minicircuits 1 W and 5 W to range from 1 to 500 MHz
- Measuring antennas for the frequency range 9 kHz – 40 GHz (rod, loop, biconic, logperiodic, bilog, horn)
- Single-phase network analyzer and higher harmonic analyser HA1600 and three-phase supply analyzer Kewtech KEW6310
- ETS-Lindgren and HI6105 CA 42 field strength meters for the frequency range DC – 6 GHz
- Emtest and Haefely electrostatic discharge simulator, discharge air into 30 kV, contact discharge up to 30 kV



- Emtest and Haefely simulator of burst pulses to 4.8 kV, 5/50 ns, max. 1 MHz
- EMTEST surge simulator, 4 kV, 2 kA
- Chroma 61503, 1500 VA programmable sources of 1-phase AC voltage, 0-300 V (also with DC output) with the possibility of generating a three-phase network
- Line impedance stabilization networks for measurement of interference in the 1-phase supply system (Rohde & Schwarz) and three-phase (Schwarzbeck) and 50 or 100 A and load impedance of 50 Ohm
- Coils for magnetic field of 300 or 1000 A/m
- Test ferrite clamps for testing resistance to EM field by Lüthi Co. (0.1-1000 MHz) and AHsystem
- FCC CDN-M3-16 (up to 16 A) coupling/decoupling networks and a set of coupling/decoupling networks of Schwarzbeck M1, M2, M5 (Power), AF2, AF4 (I/O unshielded), S1, S2, S9, S25 (I/O shielded) and T2, T4 (telecommunication lines), Schwarzbeck impedance stabilization networks
- Digital storage oscilloscope by Tektronix Co. up to 1 GHz – 5 GSa/s with the possibility to store the waveform to a USB memory drive
- Closed circuit camera monitoring immunity tests
- GSM and UMTS repeater to support the test of communication devices via mobile networks
- Modern measuring Hewlett Packard and Agilent Technologies equipment: multimeters, function generators, counters and programmable power supplies (60V / 3A)
- Powerful computers to control measurements and simulation of EMC problems

## TECHNOLOGY:

- Automated measurement of interference emissions from electric devices
- Automated tests of the electrical equipment immunity to undesired effects

## SERVICES

- Consultancy in the field of EMC
- Accredited EMC tests
- Special high-frequency measurements

## EDUCATION

- Teaching measurement technology, diagnostic systems, electromagnetic compatibility on all degrees of university study
- Regular EMC courses for designers of electrical appliances

## LABORATORY OF MICROWAVE SYSTEMS

rene.hartansky@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Waveguides with accessories (resources, circulators, splitters, attenuators, directional couplers etc.) in X band
- High-frequency power meter
- Voltage-controlled oscillator (VCO) in the band 150–300MHz with a broadband directional coupler
- Emitters based on microstrip lines

### TECHNOLOGY

- Determination of the static and dynamic mechanical power phenomena using conversion to HF signal
- Measurement of material parameters of the dielectric and magnetic materials in X band

### SERVICES

- Measurement of input impedance sources, directional characteristics, microwave power, the linear and non-linear material constants in X band
- Design and matching of microwave chain

### EDUCATION

- Fundamentals of microwave technology, analysis and synthesis of emitters, microwave measurements

## LABORATORY OF OPTICAL FIBRE SYSTEMS

jozef.jasenek@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Optical Spectrum Analyser
- Optical Time-Domain Reflectometry (OTDR)
- Optical polarimeter to measure parameters of optical radiation polarization
- Prototype of optical fibre reflectometer based on combination of PC-OTDR and PO-OTDR

### TECHNOLOGY

- Optical Time-Domain Reflectometry (OTDR) and a number of its variations such as Coherent OTDR, correlation OTDR, polarization OTDR, OTDR based on photon counting and also Optical Frequency-Domain Reflectometry (OFDR) as well as various their combinations, in particular the combination of Polarization OTDR and Photon-Counting OTDR. These methods or technologies are based on the detection of back-scattered optical radiation in the optical fiber core by the mechanism of Rayleigh scattering, while the scattered radiation is potentially affected by sensed external physical quantities
- Technologies based on Bragg gratings inscribed in the optical fibre and structural optical fibres (photonic crystals) that allow multiple sensory applications of optical fibres for sensing of external physical quantity changes (temperature, pressure, tension, torsion etc.)

### SERVICES

- Measurement of parameters of optical systems, fibres, components of measurement assemblies, sources and detectors
- Development and implementation of optical fibre sensors



## MAGNETIC MATERIALS TESTING LABORATORY

rastislav.dosoudil@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES:

- Vector Network Analyzer, vibration magnetometer
- Measurement station for measuring the magnetization characteristics and Barkhausen noise
- Semi-automatic auto balance inductivity bridge for magnetic susceptibility measurement

### TECHNOLOGY:

- Sample preparation by ceramic technology and self-propagated combustion method

### SERVICES:

- Characterization of materials by measuring the temperature dependence of magnetic susceptibility, magnetization characteristics, frequency dependence of complex permeability and Barkhausen noise

### EDUCATION:

- Progressive materials for electrotechnics, applied magnetism, electromagnetic elements and systems



FACULTY OF CIVIL ENGINEERING / FACULTY OF MECHANICAL ENGINEERING / FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY / FACULTY OF CHEMICAL AND FOOD TECHNOLOGY / FACULTY OF ARCHITECTURE / FACULTY OF INFORMATICS AND INFORMATION TECHNOLOGIES

# SCIENCE CITY

MESTO VEDY STU BRATISLAVA

CENTRUM  
REGIONAL CENTRE

# INFORMATION AND COMMUNICATION TECHNOLOGIES

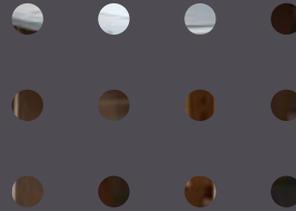
Information Technologies, Internet, virtual reality etc.

SCIENCE CITY

# PRODUCT DEVELOPEMENT RESEARCH CENTER

CONTACT  
peter.paliatka@stuba.sk

- Consultancy in the field of product development, industrial design and multimedia presentation
- Fabrication of design models and prototyping of mass-produced products



## MODELMAKING STUDIO

peter.paliatka@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES:

- KUKA KR 15/2 KR C1 robotic arm, rev.1.3.3 (interchangeable tools)
- Sets of tables for creating clay models of cars in scale 1: 4
- Carpentry workshop (a table circular saw, combined woodworking machine, table drill, straight grinder and lathe for wood)
- SPA-700 P centre lathe

### TECHNOLOGY:

- Experimental robotic fabrication (interchangeable tools, including 3D printing)
- Carpentry work
- Rotation turning

### SERVICES:

- Production of prototypes of industrially manufactured products
- Design and production of models of industrially manufactured products
- Design and production of furniture prototypes

### EDUCATION:

- Teaching the model design of industrially manufactured products
- Teaching the clay model design for automotive industry

## DIGITAL FABRICATION AND VISUALIZATION LABORATORY

meciar@fa.stuba.sk, marian\_kralik@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES:

- 3D printer Objet – PolyJet technology (working area 260 × 260 × 200 mm)
- 3D ZPrinter, powder-based composite, multi-colour print (working area 236 × 185 × 127 mm)
- 3-axis CNC centre (working area 900 × 600 × 80 mm)
- 5-axis CNC centre (working area 300 × 400 mm)
- Laser plastics, wood, organic glass, textile, paper, leather, rubber, anodized aluminium, ceramics (working area 1400 × 900 mm)
- Portable laser 3D scanner
- Programmable 3D cutter for polystyrene
- Vacuum moulding
- Computer Laboratory

### TECHNOLOGY:

- 3-axis and 5-axis machining
- 3D printing and 3D scan
- Laser cutting
- Vacuum pressing
- Programmable spacial cutting of polystyrene

### SERVICES:

- Prototyping of industrially manufactured products
- Digital processing of the static and moving 3D visualisations
- Development of technical documentation for 3D models

### EDUCATION:

- Teaching control of the 3D modeling and visualization software
- Teaching control of the 2D graphic programs, fundamentals of graphic design and the editing of graphic materials for printing
- Teaching industrial prototyping and data preparation of 3D object for production technologies





## PRODUCT PHOTOGRAPHY STUDIO

michala.lipkova@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES::

- Nikon D800 camera
- Objectives: Nikon 28–300 mm f/3.5-5.6G ED VR AF-S NIKKOR, Nikon 24–120 mm f/4G ED VR AF-S NIKKOR, Nikon 50 mm F1.4 G AF-S Nikkor
- RODE VideoMic Pro microphone
- Manfrotto 055XPROB + 498RC2 SET stand
- BOWENS GEMINI flashes 3 × 500R with Pulsarom Tx (a set including three lights, stands, softboxed, umbrella, transmitter and a case)
- Walimex phototable (120 × 100 × 80 cm)

### SERVICES:

- Professional photodocumentation of smaller products
- Preparation of multimedial presentation (video recording, video editing, 2D and 3D animations)

# INDUSTRIAL BIOTECHNOLOGY

Progressive biomaterials, biocatalysis and product  
biotransformation etc.

SCIENCE CITY



# LABORATORY OF BIOCATALYSIS

## CONTACT

milan.polakovič@stuba.sk



- Biocatalysis and biotransformation products (chemical specialties, flavourings and food additives)
- Preparation of biocatalysts, optimization of their activity and stability, design of biotransformation reactors and bioseparation processes

## TECHNICAL EQUIPMENT/DEVICES:

- Chromatographic equipment with simulated moving layer
- Spray drying
- Flow crystallizer
- Ultrafiltration and microfiltration equipment
- Low pressure chromatography equipment for characterization of adsorbents and separation of proteins

## SERVICES

- Biochemical research in the field of biocatalytic production of oligosaccharides and natural flavours, chromatographic separation of oligosaccharides, enzymes, therapeutic proteins and aromatic alcohols
- Education
- Chemical engineering, biotechnology

# LABORATORY OF COMPOSITE BIOMATERIALS

## CONTACT

Prof. Ing. Ján Híveš, PhD.; Prof. Ing. Marian Koman, DrSc.;  
Doc. Ing. Marian Janek, PhD.



- Development of new biomaterials and their structural analysis

## LABORATORY OF SINGLE CRYSTAL X-RAY DIFFRACTION

jan.moncol@stuba.sk

## LABORATORY OF SPECTROSCOPY

anton.gatial@stuba.sk

## LABORATORY OF ANALYTICAL METHODS

ivan.spanik@stuba.sk

## TECHNICAL EQUIPMENT/DEVICES

- Monocrystal diffractometer with Cu micro-focused source of X-ray radiation by optical focusing on the output and Mo micro-focused source of X-ray radiation
- Microwave vacuum furnace 1800 °C
- FT Raman spectrometer with microscope

## SERVICES

- Chemical crystallography, photocystallography
- Study of phase transformations on monocrystals
- Biology crystallography
- Chemical analyses by means of ICP-OES, AAS, XRF, SEM-EDS/WDS

## EDUCATION

- PhD – Inorganic Chemistry, Inorganic Technology and Materials, Physical Chemistry

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MESTO VEDY STU BRATISLAVA



# LABORATORY OF NEW MATERIALS

## CONTACT

jan.hives@stuba.sk



- Research and development of new materials with specific properties for extreme conditions
- Multifunctional inorganic materials and systems with spin crossover, magnets based on molecules, single-molecule magnets, magnetoactive conductive polymers, new classes of photomagnetic materials
- Refractory materials and layers for applications in nuclear power industry
- Corrosion resistance of materials in aggressive media
- Development of new types of aluminum-based metal materials
- Preparation of strong environment-friendly oxidants

## LABORATORY OF ELECTROCHEMICAL PROCESSES AT HIGH TEMPERATURES

vladimir.danielik@stuba.sk

## LABORATORY OF COMPOSITE COATINGS

matilda.zemanova@stuba.sk

## LABORATORY OF THERMAL ANALYSIS

peter.simon@stuba.sk

## LABORATORY OF MAGNETOCHEMISTRY

roman.boca@stuba.sk

## TECHNICAL EQUIPMENT/DEVICES:

- SQUID magnetometer
- LABIMEX corrosion chambre
- X-ray powder diffractometer
- DTA/TG high-temperature analyser
- AFM microscope
- Potenciostat/galvanostat, 20 A booster

## SERVICES

- Electrochemical impedance measurements in a wide range of temperatures and electrolytes
- Corrosion tests and corrosion chambre (neutral salt fog)
- Preparation and crystallization of compounds defined by dimensions and shapes
- Testing the properties and fabrication of stained surfaces on aluminium
- Corrosion tests of materials in melts
- Chemical analysis of materials using ion chromatography
- Thermal analysis of materials (DTA / TG, DSC, TMA)

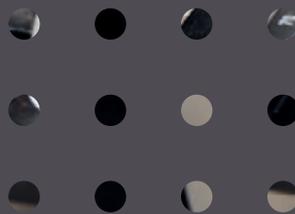
## EDUCATION

- PhD – Inorganic Chemistry, Inorganic Technology and Materials, Physical Chemistry
- Galvanotechnology – course

# RESEARCH CENTRE OF MATERIAL UTILISATION OF BIOMASS

## CONTACT

ludovit.jelemensky@stuba.sk



- Technological and material utilisation of biomass
- Physico-chemical characterization of biomass
- Energetic analysis of technologies of biomass utilisation

## LABORATORY OF PHYSICO-CHEMICAL DECOMPOSITION OF BIOMASS

jozef.markos@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Gasification reactor with a moving countercurrent bed with the capacity of 7 kg/h. The reactor is equipped with a combustion chamber for produced gas
- Gasification reactor for very wet biomass in supercritical water
- Supercritical CO<sub>2</sub> extractor
- UV-VIS spectrophotometer with a flow cuvette
- UV-VIS-NIR spectrophotometer
- HPLC with UV-VIS detector and accessories
- TGA-DSC with FTIR online

### TECHNOLOGY

- Biomass pyrolysis technology
- Biomass gasification technology
- Technology for the removal of tars from the pyrolysis gases
- Wet biomass gasification in supercritical water

### SERVICES

- Recovery of renewable materials and energy
- Measurements of porosity and surfaces of the solid materials
- Thermogravimetric analysis of the solid materials degradation
- Qualitative analysis of the composition of gas from thermogravimetric analysis
- Process analysis, integration and rationalization of material and energy flows in the processes of biomass utilisation
- Risk assessment of the biomass utilisation technology

### EDUCATION

- Training in possibilities of material utilisation of biomass
- Training in energetic analysis of technological utilisation of biomass



## LABORATORY OF COMPLEX UTILISATION OF BIOMASS

igor.surina@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES

- Thermoanalytical methods (simultaneous TG-DTA, DSC) for the characterization of the input materials (determination of suitable degradation technology), and for the evaluation of the prepared products
- Calorimetric bomb (Determination of gross calorific value) according to the requirements of standard methods (ISO, EN, ASTM, DIN)
- Elemental analyser (special apparatus for determining the elemental composition of inhomogeneous materials such as lignocellulosic materials – wood)
- Device for the evaluation of oxidation stability
- Analytical determination of qualitative and quantitative composition of biofuel prepared by combined techniques such as GC/MS and HPLC/MS
- Accelerated Solvent Extraction (ASE) 350 DIONEX – Thermoscientific
- MicroSYNTH microwave reactor
- DCSBD plasma apparatus
- ADRE plasma apparatus – Electron T600 camera

### TECHNOLOGY

- Technology of pulps production and characterization
- Technology of paper production and characterization
- Technology of plasma-chemical surface treatment of materials, technology of comprehensive evaluation and analysis of biomass products (thermo-chemical conversion, isolation of individual components)

### SERVICES

- Determination of alpha-cellulose and holo-cellulose according to Wise, the content of  $\alpha$ ,  $\beta$  and  $\gamma$  cellulose
- Acetone extract from chemical pulp
- Evaluation of fibre (grinding, SR number, formation, weight, thickness and two optional strength properties)
- Oxygen delignification
- Bleached pulp ( $\text{ClO}_2$ ,  $\text{Cl}_2$ ,  $\text{O}_3$ ,  $\text{H}_2\text{O}_2$  etc.)
- Determination of lignin in pulps and semi-pulps
- IR spectrum obtained by the Fourier transform, Infrared Spectrometer (FT-IR), and other special-purpose IR methods (micro-samples, ATR, IR microscope)
- Determination of gross calorific value
- Determination of elemental CHNS composition
- Determination of chlorine by elemental analysis
- Determination of thermal parameters of materials – thermal analysis (TG/DSC)
- GC/MS determination of composition
- Py-GC-MS determination, identification and quantification

### EDUCATION

- Basic course for paper producers and manufacturers
- Training course “From wood to paper”
- Course of the paper production technology
- Course of the pulp production technology

# BUILDING AND CIVIL ENGINEERING

Low-energy civil engineering, environmental quality of buildings, progressive building and construction materials, safety and reliability of structures and buildings, interaction of the engineering and water works with the environment, monitoring and mitigation of natural hazards, geoinformatics

# LABORATORY OF PHYSICAL PROPERTIES OF BUILDING CONSTRUCTIONS

CONTACT  
anton.puskar@stuba.sk



- Systems for improving the structure and environmental quality of buildings
- Intelligent/smart buildings as a product of the organic, low-energy and cyber architecture and innovative engineering design
- Mathematical modeling of the indoor environment processes and their power requirements

## TECHNICAL EQUIPMENT/DEVICES

- Climate chamber for modeling the synergy heat transfer phenomena, diffusion of water vapour and air filtration under both stationary and non-stationary boundary conditions
- Acoustic chamber for testing the acoustic properties of padding frames of windows and doors as well as separating and ceiling structures
- Small pressure chamber for the research of air filtration by sealing profiles depending on the conditions of their compression and boundary conditions of the total pressure, air and temperature difference, and also the wind effect
- High pressure chamber for research of air infiltration via the details such as contact between parts of exterior walls or elements such as windows and glass walls of the building envelope
- Large rain chamber for research of the phenomenon of water penetration via the details, parts and systems of the building envelope
- Research laboratory for experimental determination of lifetime of roofs and functional layers under the conditions of accelerated ageing

### TECHNOLOGY

- Complex laboratory and in-situ investigation of physical properties of details, elements and systems of engineering structures
- Mathematical modeling and simulation supporting integrated design, evaluation and optimization of energy and indoor environment

### SERVICES

- Experimental testing of details, elements and structures with multidimensional heat flux (thermal bridges)
- Experimental testing of joints between panels of exterior walls and transparent structures in terms of air infiltration and penetration of rain water
- Laboratory measurements of lifetime of roofs and their functional layers under the conditions of accelerated ageing
- Experimental determination of:
  - Heat transfer coefficient  $U$  ( $W/(m^2.K)$ ) of external walls of buildings, pitched and flat roofs, glass systems and transparent structures
  - Coefficient of thermal conductivity  $\lambda$  ( $W/(mK)$ ) of new construction materials

- Index of the airborne sound insulation  $R_w$  (dB) of transparent and opaque parts of the packaging and the separating structures of buildings; step and airborne sound insulation of the horizontal separating structures of ceilings and floors
- Absorption of the materials designed to reduce noise in interior and in road transport
- Physical and technical characteristics of sealing materials in terms of air permeability of sealing profiles under the conditions of varying compression
- Air permeability coefficient of new construction materials  $il_v$  ( $m^3/(m.s.Pan)$ )

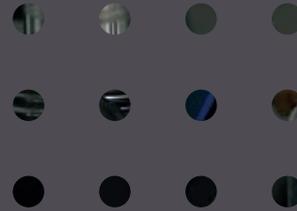
### EDUCATION

- University education: building thermal technology, aerodynamics and hydrodynamics of buildings, building acoustics and lighting, and waterproofing technology
- Postgraduate education: experimental and simulation methods for intelligent buildings
- Improvement of the environmental and construction quality of buildings and indoor environment



# LABORATORY OF STATICS AND DYNAMICS OF LOAD-BEARING STRUCTURES

CONTACT  
juraj.kralik@stuba.sk



- Supporting civil engineering structures and buildings under extreme environmental conditions
- Progressive methods of designing the bearing civil engineering structures and buildings, and their interaction with the environment and subsoil in terms of safety, reliability and sustainability
- Seismic safety and reliability of supporting civil engineering structures and buildings

## TECHNICAL EQUIPMENT/DEVICES

- Portable dynamic measuring apparatus, including software and hardware for the measurement of dynamic characteristics of structures
- Portable device for measuring the static and dynamic deviations of structures
- Thermographic camera
- Optical laboratory with helium-neon laser
- Loading press with capacity to 5 kN

## TECHNOLOGY

- Complex laboratory and in-situ research of supporting structures of civil engineering buildings and their interaction with the environment and subsoil in terms of safety, reliability and sustainability

- Numerical simulation of seismic safety and reliability of supporting structures of civil engineering buildings and bridges, and their experimental verification

## SERVICES

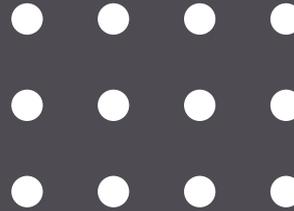
- Optimal design and assessment of structures and technological units
- Numerical analyses of materials and structures in the fields of statics, dynamics, fluid mechanics and thermodynamics
- Risk analyses, evaluation of safety and reliability of structures under extreme conditions (extreme climatic effects, seismicity, explosion, fire, etc.)
- Experimental measurement of dynamic characteristics of structures and bridges
- Investigation of the stress and deformation state of models by optical methods (holography, interferometry, photoelasticity and a method of caustics)
- Thermovision evaluation of structures and their contact details

## EDUCATION

- University education: statics and dynamics of building structures, nonlinear mechanics, aero-elasticity and seismicity, modeling of materials, structures and environment by the Finite Element Method
- Doctoral study of Applied Mechanics
- Study of progressive methods of designing and modeling the materials and structures, and their interaction with environment and subsoil in terms of safety and reliability, aero-elasticity and seismicity

# LABORATORY OF BUILDING MATERIALS

CONTACT  
mikulas.sveda@stuba.sk



- Progressive materials for building constructions and low-energy constructions in terms of sustainable development

## TECHNICAL EQUIPMENT/DEVICES

- Automatic high pressure mercury porosimeter with accessories (measurement range 0.01 kPa–400 MPa, measurement range of pore size 0.0036  $\mu\text{m}$  to 900  $\mu\text{m}$ , particle size measurement range 0.01  $\mu\text{m}$  to 3000  $\mu\text{m}$ )
- Equipment for simultaneous thermal analysis – measurement of mass changes and thermal effects TGA, TGA / DTA, TGA / DSC (temperature range 20°C to 1550°C)
- Laser analyzer of particle size – determination of particle size of fine-grain materials and their percentage in the range of 0.08 microns to 2000 microns
- Climate chamber (volume 350 L, temperature range -40 °C to +180 °C, humidity range of 10 % to 98 %)
- Automatic system for the freeze-thaw test (temperature range -25 °C to + 30 °C)

## TECHNOLOGY

- Complex laboratory for research into the composition and properties of materials for progressive building structures and low-energy construction industry
- Optimization of the composition of raw material mixture for the production of brick products

- Design of the fresh concrete mix, tests of selected properties of the fresh and hardened concrete
- Use of secondary raw materials, including waste-based plastics in lightweight concrete and other construction materials

## SERVICES

- Determination of pore structure of building materials
- Determination of particle size of fine-grain materials
- Thermogravimetric and DSC/DTA analysis of materials
- Determination of cyclic simulation of temperature and humidity on building materials
- Determination of frost resistance of building materials

## EDUCATION

- University education: building materials, structure of building materials, concrete technology
- Postgraduate education: laboratory study of the properties and production of materials for the progressive building structures and low-energy constructions



# LABORATORY FOR MODELING GEOSPATIAL OBJECTS AND PHENOMENA

CONTACT  
jan.hefty@stuba.sk



- Methods of the geodetic monitoring and modeling of objects and phenomena on the Earth's surface
- Monitoring the global and regional environmental changes by the geodetic satellite and terrestrial observational methods
- Progressive surveying technology for increasing the safety and reliability of building structures
- Design and implementation of geographic information systems in terms of their quality, reliability and timeliness in building the information society

## TECHNICAL EQUIPMENT/DEVICES

- Relative Monitoring Gravimeter
- Geodetic receiver of signals from the Global Navigation Satellite Systems
- Frequency and timing gauge
- Unmanned aerial measuring system

## TECHNOLOGY

- High-frequency relative gravimetry with resolution of  $1 \text{ nm} \cdot \text{s}^{-2}$
- Precise positioning based on the measurement and processing of the signals transmitted by global navigation satellite systems with the NAVSTAR-GPS, GLONASS, GALILEO, BEIDOU/COMPASS, IRNSS, QZSS, EGNOS, and OmniSTAR support
- Satellite radar interferometry, using natural or artificial permanent reflectors

## SERVICES

- Monitoring the changes in the spatial position of buildings and large structures (dams, power plants, bridges, tall buildings)
- Tracking the vertical changes of buildings, structures and stable points on the Earth's surface via the continuous monitoring of the changes in the Earth's gravity field and microseismic shakes

## EDUCATION

- University education for the study programme of Geodesy and Cartography, and for PHD. Students engaged in Geodynamics, Photogrammetry and Remote Sensing of Earth
- Postgraduate education: methods of geodetic monitoring and modeling the objects and phenomena on the Earth surface, and progressive geodetic technologies to increase the safety and reliability of building structures

# NATURAL HAZARDS MODELING AND MITIGATION LABORATORY

CONTACT  
andrej.soltesz@stuba.sk



- Integrated water resources management under the conditions of global and climate change
- Optimization of design, utilisation and interaction of hydraulic structures with the environment for integrated water resources management
- Methods of integrated protection against atmospheric and hydrologic extremes for sustainable land use

## TECHNICAL EQUIPMENT/DEVICES:

- Hydraulic engineering laboratory: a magnetic-induction flowmeters and ultrasonic
- Flow velocity sensors, laser flow velocity sensors by 2D traverse mechanism, 2D acoustic Doppler anemometer
- Terrestrial 3D laser scanner
- Laboratory and field equipment for the determination of hydraulic and environmental parameters of watercourses
- Laboratory and field equipment for the determination of hydrophysical properties of soils
- Laboratory and field equipment for monitoring water quality

## TECHNOLOGY:

- Complex laboratory and field research of hydrological and hydraulic processes in the country and hydraulic structures
- Hydrological research and multidimensional mathematical modeling of water flow in open channels, pipelines and underground waters
- Optimization of flood protection of residential areas based on the latest methods of theoretical and applied research
- Optimization of water treatment and wastewater treatment design

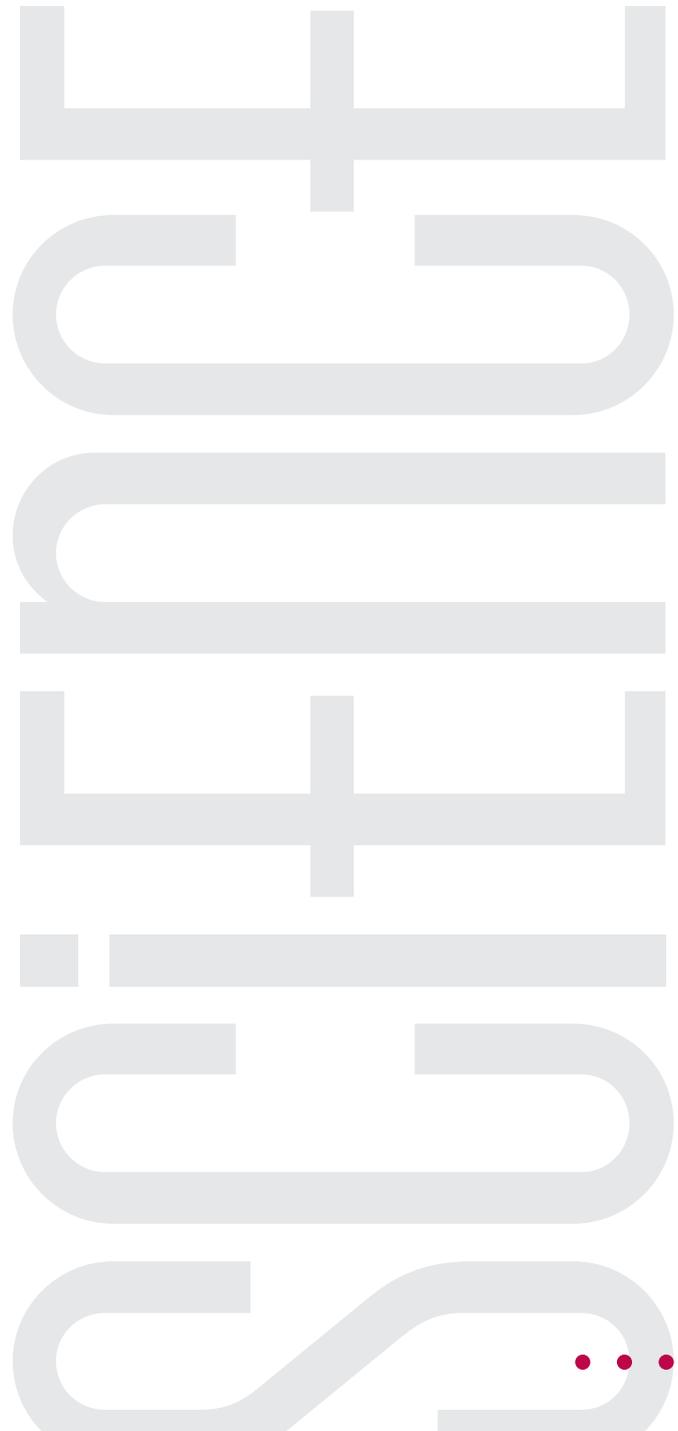


## SERVICES:

- Theoretical and applied research (hydrology, hydraulics and water management)
- Comprehensive design of flood protection measures of residential areas
- Design and hydraulic optimization of the irrigation, drainage and water distribution systems
- Design of revitalization and renaturation of watercourses
- Integrated water resources management of river basins

## EDUCATION:

- University education: hydraulic engineering and water management, structures for the protection of the environment, flood protection structures for, landscaping and landscape planning, water resources engineering
- Postgraduate education: Integrated water resources management in the conditions of global change and optimization of design, use and interaction of hydraulic structures with the environment, and methods of integrated protection against extreme atmospheric and hydrologic events
- Postgraduate courses: progressive methods in hydrology, hydraulics and water management



# MATERIALS ENGINEERING, ION AND PLASMA TECHNOLOGIES

Materials, nanostructures and modified surfaces

SCIENCE CITY



# STU CENTRE FOR NANODIAGNOSTICS

## CONTACT

maria.caplovicova@stuba.sk

- Characterization of a wide range of micro and nano-structures, systems for micro/nanoelectronics applications and their use in sensorics, photonics, electronics, medicine, environment, geology and Materials Engineering

**LABORATORY OF ATOMIC RESOLUTION  
TRANSMISSION ELECTRON MICROSCOPY**

**LABORATORY OF AUGER SPECTROMETRY**

**LABORATORY OF VACUUM EVAPORATION  
AND SPUTTERING FOR TEM AND AES SAMPLE  
PREPARATION**

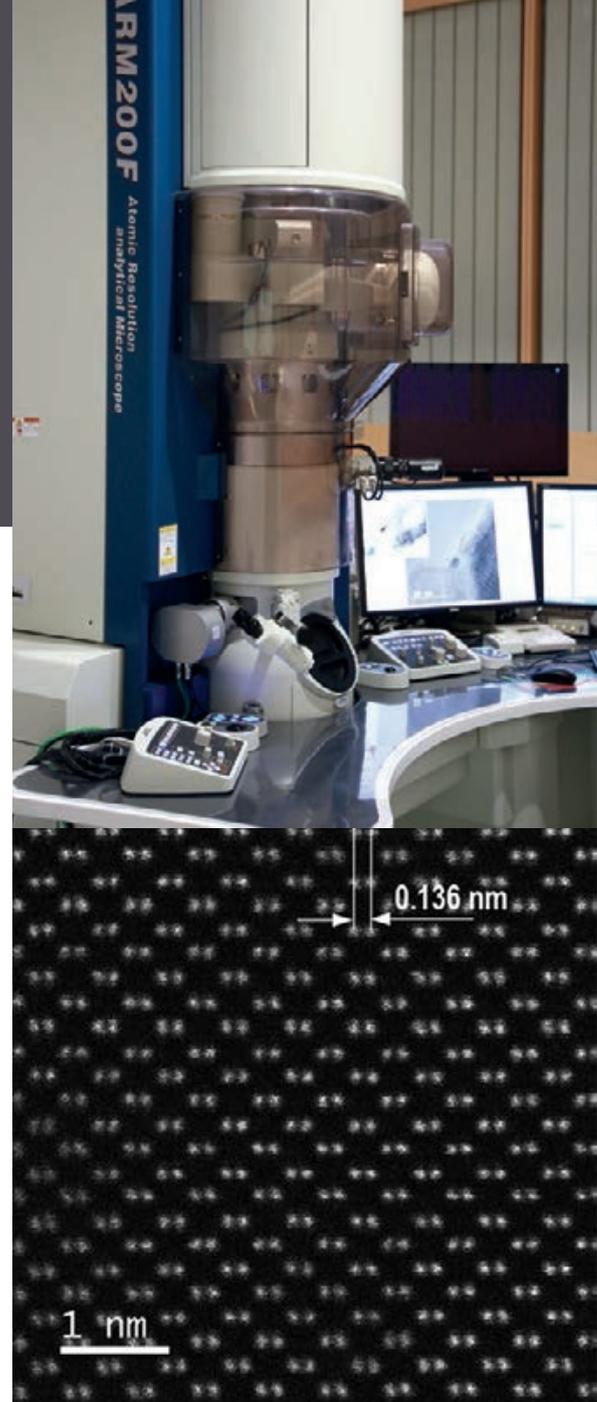
**LABORATORY OF ION AND PLASMA METHODS  
FOR SAMPLE PREPARATION**

**CHEMICAL LABORATORY**

**COOLING, VACUUM AND UPS SYSTEMS FOR TEM**

**POWER AND CONTROL SYSTEMS FOR ARM**

**CENTRAL AIRCONDITIONING UNIT**



HAADF STEM image of the [110] Si dumbbell structure with an atomic spacing of 0.136 nm recorded on JEM ARM 200F at 200kV. Bright dots correspond to the positions of Si atoms.



#### TECHNICAL EQUIPMENT

- Transmission Electron Microscope ARM 200F
- Auger Electron Spectrometer JAMP 9510 F
- Universal Vacuum Evaporation System Quorum 150T
- High Resolution Fine Sputter Coater JEOL JFC-2300HR
- Ion Mill Fishione 1050 TEM Mill
- Fischione Plasma Cleaner Model 1020
- Metallographic Grinder and Polisher Agar Scientific AGB9003
- Fishione Ultrasonic Disk Cutter Model 170
- Precision Saw Agar Scientific AGB9002
- Fishione Automatic Twin-Jet Electropolisher Model 110

#### TECHNOLOGY

- Chemical Vapour Deposition (CVD) for preparation of diamond layers by means of plasma

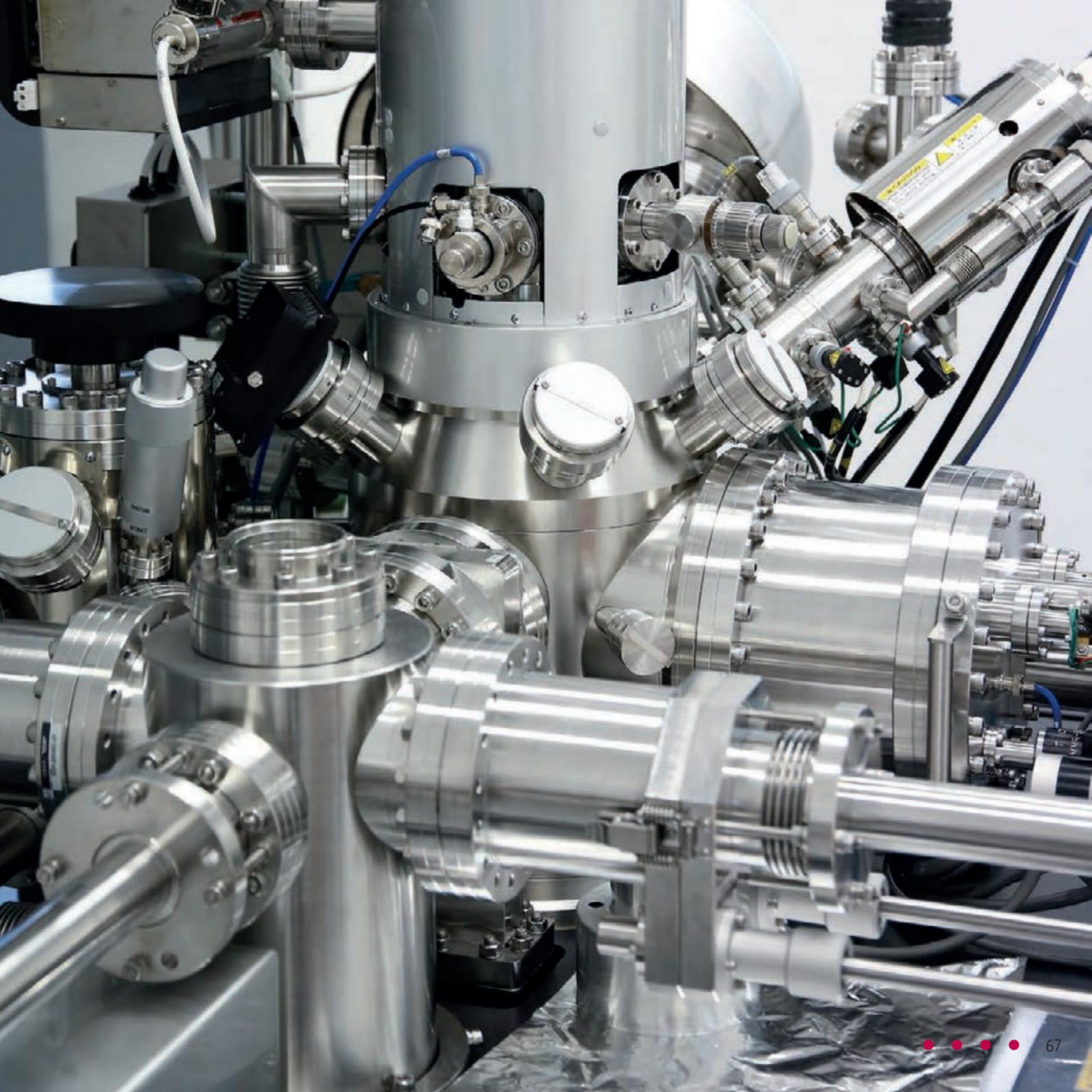
#### SERVICES

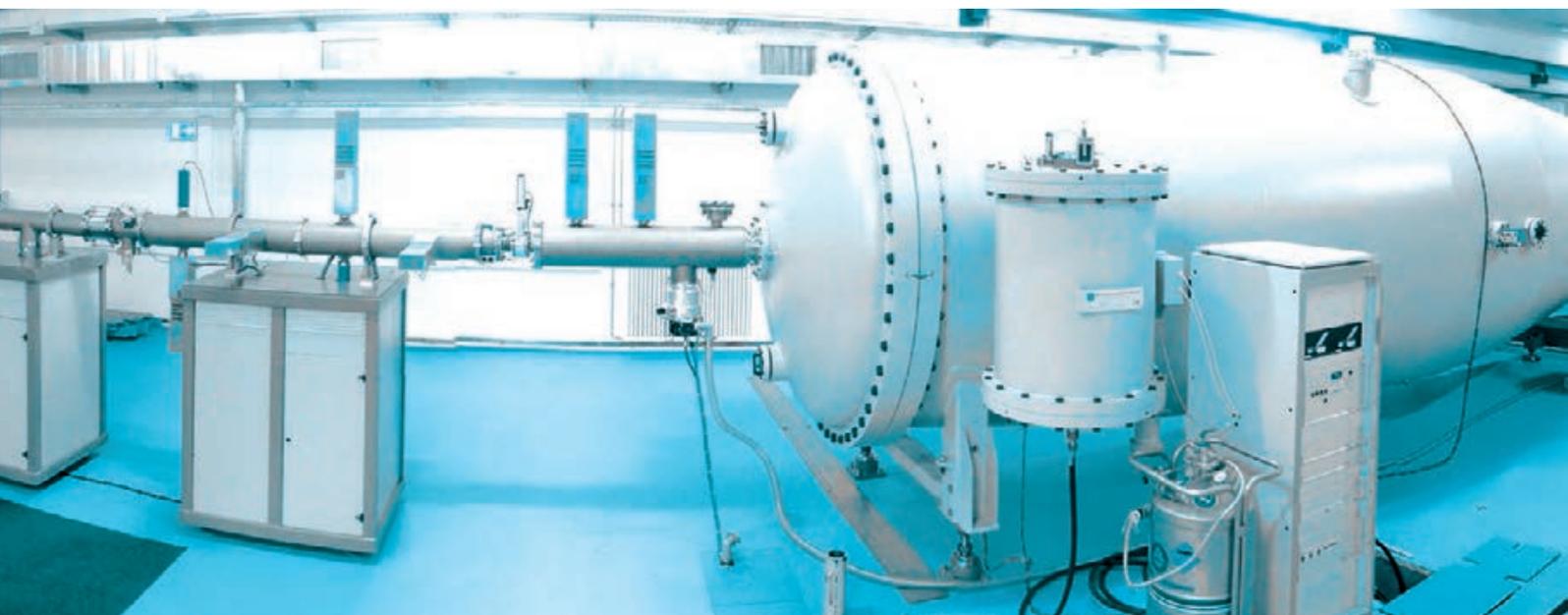
- Complex analysis of samples by Transmission Electron Microscopy with atomic resolution (JEOL JEM ARM 200F) and Auger Spectrometry (JEOL JAMP 9510F)

#### EDUCATION

- Doctoral study oriented on application of the top analytical devices for the complex structural analysis of nanomaterials







# CAMBO TRNAVA

Advanced Technologies  
Research Institute (ATRI)

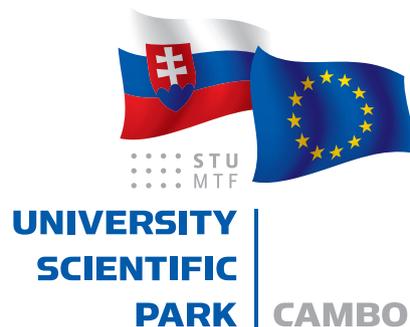
ATRI is the first and main institute at the University Science Park (Faculty of Materials Science and Technology in Trnava, Slovak University of Technology in Bratislava), having a team of excellent researchers, engineers, PhD candidates and junior researchers. ATRI is focused on materials engineering in the field of ion and plasma technologies, physics, astrophysics, chemistry, automation and ICT implementation in industrial processes or research fields such as nanotechnology and nanostructures, sensorics, specific hardware & software development, bioengineering and health, big data, software engineering, calculations, simulation and modeling. The area of materials research will include theoretical modeling using ab-initio methods, either at very accurate level treating small systems at the molecular scale, or DFT methods concerning bulk materials and surfaces. The area of Automation and ICT implementation will also provide space for research and development in a wide range of hardware, communication and management of automated software tools, knowledge-based systems, as well as archiving and distribution of knowledge to higher-level systems.

ATRI comprises two new buildings for the purposes of research, located on the campus.

ATRI research centres:

- **Centre of Materials Research**  
with the laboratories focused on: ion beam technologies, plasmatic modification and deposition, analytical methods, computational modeling, physics, astrophysics and chemistry.
- **Centre of Automation and ICT Implementation of Production Processes**  
and related laboratories comprise: control systems, ICIM, information integration and control systems, artificial intelligence, bioengineering, medicine/healthcare etc.

The ATRI laboratories in the above-mentioned scientific centres are listed below.



# MATERIALS ENGINEERING, ION AND PLASMA TECHNOLOGIES

Materials, nanostructures and modified surfaces



# CENTRE OF MATERIALS RESEARCH

## CONTACT

maximilian.stremy@stuba.sk, robert.riedlmajer@stuba.sk



- Ion beam technologies, plasmatic modification and deposition
- Analytical methods, computational modeling, physics, astrophysics and chemistry

## LABORATORY OF ION BEAM TECHNOLOGIES

pavoL.noga@stuba.sk

Range of applicable ion energies and species ranging from 40keV up to 50MeV for heavy ions and currents up to 2 mA for low energy beams and 50  $\mu$ A for high energy beams. Ion sources enable working with virtually all elements of the Periodic Table

### TECHNICAL EQUIPMENT

- 6MV Tandatron Tandem Accelerator
  - Experimental end-station for ion implantation (wafer size up to  $\varnothing$ 100 mm) with substrate temperature control (-195 °C to 800 °C)
  - End-station for Ion Beam Analysis covering RBS, PIXE and ERD (hydrogen depth profiling)
- 500kv Implanter
  - Experimental end-station for ion implantation (up to  $\varnothing$ 100mm) with substrate temperature control
  - Semi-automatic single wafer (up to  $\varnothing$ 200 mm) processing end-station

### TECHNOLOGY

- Surface/thin layer modification
- Ion beam assisted material synthesis
- Ion beam analysis (RBS/Channeling, PIXE, ERD)
- Radiation damage studies

### SERVICES

- Ion implantation of substrates up to  $\varnothing$ 200mm
- High energy ion implantation of substrates up to  $\varnothing$ 100mm
- Analysis of thin layers and surfaces
- Radiation hardness testing
- Consulting services in the field of ion beam applications



## LABORATORY OF PLASMA TECHNOLOGIES AND PLASMA SURFACE INTERACTION

marcel.mesko@stuba.sk

Understanding the complex plasma-surface processes involved in sputtering, etching, ion implantation and deposition at nanoscale level. Activities dedicated to investigation of plasma/surface interaction in technological plasmas

### FIELDS OF INTEREST

- Automotive industry (low friction coatings for car engines with higher efficiency)
- Electronics (transparent conductive layers with improved optical and electrical properties)
- Machinery and Aerospace (coatings with higher wear resistance and thermal stability)
- Biomedicine (implants with improved biocompatibility)

### TECHNICAL EQUIPMENT

- Magnetron sputtering /dc, rf (ZnO, TiO<sub>2</sub>, TiC, DLC coatings)
- Plasma Immersion Ion Implantation (surface protection of Ti and TiAl alloys, Biomedical – tribological protective coatings, antibacterial surfaces)

## LABORATORY OF NUMERICAL MODELING

andrej.antusek@stuba.sk, andrej.dobrotka@stuba.sk

### THE CURRENT RESEARCH OF COVERS

#### THE FOLLOWING TOPICS:

- Development and applications of coupled cluster methods
- Ab initio calculations of metallic clusters properties
- Accurate calculations of molecular nmr properties including relativistic and solvent effects
- Potential energy surfaces for theoretical infrared spectroscopy, computational atmospheric chemistry
- Ab initio modeling of materials interface structure and its impact on the thermodynamic properties of nano-layers
- Fast stochastic variability (red noise) of accretion processes in the binary stars and active galactic nuclei
- Monte Carlo simulations of red noise and satellite observation data analysis from Kepler and xmm-Newton missions

The problems solved by the researchers in the frame of applied research for industry are e. g. development of computer application for numerical modeling of magnetic fields in the high reliability relays (Hengstler/Danaher) and design and optimization of high performance ultra-sound transducers (Kraintek).

The Laboratory uses computational resources of HPC cluster of the Slovak University of Technology and Slovak Infrastructure for High Performance Computing.

### PARTNERS

Institute of Astrophysics, Kyoto University, Japan; Institute of Organic Chemistry, Polish Academy of Sciences; EMPA, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland; ESAC, European Space Agency, Madrid, Spain; Cadarache, Saint-Paul-lez-Durance, France; GSMA, Reims University Champagne-Ardenne, Reims, France

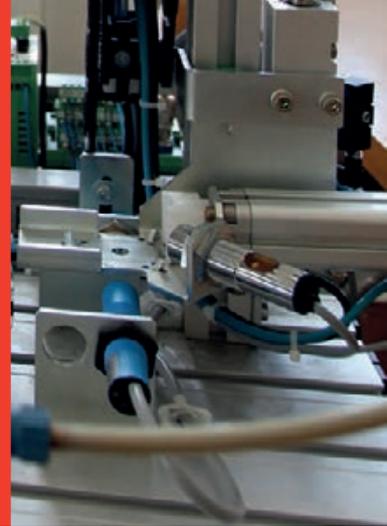
# AUTOMATION AND ICT IMPLEMENTATION OF INDUSTRIAL PROCESSES

Control systems of the technology and production systems

# CENTRE OF AUTOMATION AND ICT IMPLEMENTATION OF PRODUCTION

## CONTACT

maximilian.stremy@stuba.sk, oliver.moravcik@stuba.sk



- Simulation and optimisation of processes and systems
- Big Data and knowledge discovery from production databases in the hierarchical process control
- Implementation of artificial intelligence to the control
- Horizontal and vertical integration of information and control systems
- R&D in the field of safety-critical control systems
- Dynamical systems with high-speed feedback control
- R&D in field of mechatronic systems for technological equipment
- Utilising the graph theory in the complex network structures

## LABORATORY OF CONTROL SYSTEMS

maximilian.stremy@stuba.sk, pavol.tanuska@stuba.sk

Lower management level of production and technological processes including collection and processing of technological process information, as well as the control of algorithms through programmable logic controllers or industrial controllers.

- Research Workplace of Complex Processes
  - Hybrid production systems
  - Model of communication vessels
- Research Workplace of Development and Design of Control Systems
- Research Workplace of Simulation of Technology Processes

## LABORATORY OF ICIM

pavol.vazan@stuba.sk, pavol.tanuska@stuba.sk

Technology and visualisation level of corporate governance providing space and development in a wide range of hardware, communication and management of automated software tools, knowledge-based systems, archiving and distribution of knowledge to higher-level systems.

- Research Workplace of Distributed Control Systems of Production and Technology processes:
  - Modular production systems
  - CNC production system
- Research Workplace of Logic and Sequence Control
  - System for logic and sequence control
  - System of frequency converters and induction motors
  - Optical system for optical detection and control of dimensional and shape accuracy
  - System for autonomous carriage movement in space
  - System of robot control

## LABORATORY OF INTEGRATED INFORMATION AND CONTROL SYSTEMS

pavol.tanuska@stuba.sk, pavol.vazan@stuba.sk

Integrated information system at the enterprise management level.

### CORE SYSTEMS:

- System for production and planning (Enterprise Resource Planning, ERP)
- System documents administration (Enterprise Content Management, ECM)
- Tool for Business Intelligence (BI)
- Tool for knowledge discovery (Knowledge Discovery in Databases, KDD)
- Tool for Process Mining (PM)
- Simulator of production processes and logistic systems with the optimisation option
- System of database management





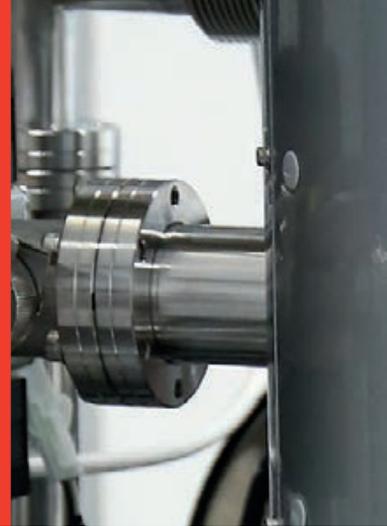
# RESEARCH OF SHAPE SURFACES BY 5-AXIS TECHNOLOGIES

Technologies of 5-axis Machining

# CENTRE OF EXCELENCE OF 5-AXIS MACHINING

## CONTACT

peter.pokorny@stuba.sk, peter.sugar@stuba.sk,  
ivan.buransky@stuba.sk



- Methods and strategies of 5-axis machining
- HSC CNC milling, CNC ultrasound and laser machining, CA technologies

## WORKPLACE OF CNC HSC HIGH-TECHNOLOGIES FOR 5-AXIS MACHINING

### MACHINES

- DMG HSC 105 Linear
- DMG Ultrasonic20
- DMG CTX ALPHA 500
- DMU 85 mono BLOCK
- LASERTEC 80 SHAPE
- REINECKER WZS 60
- CNC multi-axis robot for laser machining with accessories

### EQUIPMENT AND DEVICES:

- ZOLLER GÉNIUS 3 measuring instrument
- ATOS SO 4M3D scanner
- HAIMER Tool Dynamic balancing instrument
- KISTLER rotational dynamometer
- KISTLER stationary dynamometer
- TOC Analyser
- Ozoniser

## CAD/CAM HIGH-TECHNOLOGY WORKPLACE FOR 5-AXIS MACHINING

peter.pokorny@stuba.sk, peter.sugar@stuba.sk, ivan.buransky@stuba.sk

### TECHNICAL EQUIPMENT/DEVICES:

- PowerSHAPE CAD software
- PowerMILL CAM software
- ArtCAM CAD/CAM software
- CopyCAD CAD/CAQ software

### TECHNOLOGY

Research into all strategies of 5-axis machining by setting up discontinuous and continuous

- CNC milling of shape surfaces
- Research into HSC CNC milling and turning
- Research into CNC ultrasonic and 5-axis machining
- Research into machining of hard-to-machine materials
- Research into CNC laser machining
- Research into utilisation of CA technologies in CAD/CAM/CNC/CAQ
- Research into tool wear in machining
- Research into parameters of cutting process
- Research into parameters and properties of cutting fluids
- Research in the field of cutting fluids, so called MQL, DRY machining

### SERVICES

- Consultancy in the field of CAD/CAM systems
- Consultancy in the field of developing an environmental-friendly approach to machining
- Consultancy in the field of process media
- Consultancy in the field of the production process optimisation
- Production of zero series
- Production of prototypes, forms, artistic objects
- Measuring and evaluation
- Inspection of parameters and shape by using optical methods
- Generating, testing and adjusting the NC trajectories
- Reverse engineering – 3D scanning
- Design, manufacturing and optimisation of 3D models.

### EDUCATION

- Education in the field of NC programming
- Education in the field of CAD/CAM systems
- Education in the field of reverse engineering
- Organising workshops, conferences and seminars





STU