

FACULTY OF ELECTRICAL ENGINEERING

From Electrons to Clouds

DEPARTMENT OF

__MATHEMATICS __PHYSICS __LANGUAGES
__ELECTROTECHNOLOGY
__ELECTRIC DRIVES AND TRACTION __POWER ENGINEERING
__ECONOMICS, MANAGEMENT AND HUMANITIES
__ELECTROMAGNETIC FIELD __CIRCUIT THEORY
__TELECOMMUNICATIONS ENGINEERING
__CYBERNETICS __MICROELECTRONICS
__CONTROL ENGINEERING __COMPUTER SCIENCE
__RADIOELECTRONICS __MEASUREMENT
__COMPUTER GRAPHICS AND INTERACTION

2018



CTU

CZECH TECHNICAL
UNIVERSITY
IN PRAGUE

FACULTY OF ELECTRICAL ENGINEERING

DEPARTMENT OF__

__ECONOMICS MANAGEMENT AND HUMANITIES
__ELECTRIC DRIVES AND TRACTION
__ELECTRICAL POWER ENGINEERING.
__ELECTROMAGNETIC FIELD
__ELECTROTECHNOLOGY
__PHYSICS
__LANGUAGES
__CYBERNETICS
__MATHEMATICS
__MEASUREMENT
__MICROELECTRONICS
__COMPUTER SCIENCE
__COMPUTER GRAPHICS AND INTERACTION
__RADIOELECTRONICS
__CONTROL ENGINEERING
__TELECOMMUNICATIONS ENGINEERING
__CIRCUIT THEORY

INSTITUTE OF__

__INTERMEDIA.



CTU

CZECH TECHNICAL
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MESSAGE FROM THE DEAN

Welcome to the Faculty of Electrical Engineering of the Czech Technical University in Prague (FEE CTU). CTU, founded in 1707, is the leading technical university in the Czech Republic. In 1950, the Department of Electrical Engineering became an independent faculty. Our 17 present-day departments are located in two buildings: in Dejvice (on the main CTU campus) and at Charles Square. Both locations are in the central area of Prague.

The Faculty of Electrical Engineering (FEE) offers a first-class education in electrical engineering, telecommunications, automation, informatics, and computer science & engineering. The study programmes, all closely linked to the faculty's research activities, are taught in Czech and English. Even without the other CTU faculties, FEE ranks among the top 5 research institutions in the Czech Republic. FEE generates about 30 % of the whole research output of CTU, collaborating extensively with the top universities and institutions worldwide. We offer innovative solutions to our industrial partners, and to military and security institutions. FEE participates in space research programmes and works with government agencies.

Our graduates find top jobs in the industry, in research institutions and at universities in the Czech Republic and abroad. Since 1950, FEE has awarded more than 30 000 diplomas, which has made us the benchmark.

We are striving to improve our standing as a leading center of research and innovation through our increasingly internationally active academic staff and student body.

prof. Pavel Ripka,
Dean of the Faculty

Students: over 3060 in total		
1657 undergraduate (BSc)	892 master (MSc)	511 PhD
Academic staff:		
57 full professors	75 associate professors	373 assistant professors (180) and researchers (193)
Graduates:		
289 undergraduate (BSc)	323 master (MSc)	54 PhD
International BSc and MSc students:		
560	from more than 44 countries	367 incoming exchange students
97 International PhD students	12 study programmes	17 departments
254 research projects	16 international projects	296 industrial contracts
Attracting a total of CZK 513 million of research funding per year from external sources		281 SCI journal papers
CTU QS University Ranking (Faculty Rankings):		
150–200 Computer Science and Electrical Engineering		
Sources of income:		
60 % Research	15 % Contracts and other income	25 % Education

The faculty offers the following study programmes taught in English:

BACHELOR'S DEGREE PROGRAMME

- + Electrical Engineering and Computer Science

MASTER'S DEGREE PROGRAMMES

- + Electrical Engineering, Power Engineering and Management
- + Electronics and Communications
- + Cybernetics and Robotics
- + Open Informatics
- + Aerospace Engineering

DOCTORAL DEGREE PROGRAMME

The programme is divided into 16 fields of specialization.

More detailed information available at www.fel.cvut.cz

All our study programmes are closely linked to the faculty's research activities.

TUITION FEE

Bachelor's programme: CZK 55 000 per semester (approximately 2240 USD/2030 EUR)

Master's programme: CZK 66 000 per semester (approximately 2690 USD/2435 EUR)

Doctoral programme: CZK 69 000 per semester (approximately 2810 USD/2550 EUR)

The Department of Economics, Management and Humanities links economics with specific technical and technological studies at the Faculty of Electrical Engineering. Its graduates gain a competitive advantage when seeking employment in electrical and power engineering. The department provides courses for all bachelor and master programmes at the Faculty, and also for the master programmes in Economics and Management of Power Engineering and in Economics and Management of Electrical Engineering. The Department also provides courses for students in Electrical Engineering & Management bachelor programmes.

The department has engaged in long-term cooperation with numerous universities abroad, e.g. with TU Vienna in the field of energy economics. It has also been engaging in a long-term cooperation with numerous industrial companies in the energy sector.

DEPARTMENT OF ECONOMICS, MANAGEMENT AND HUMANITIES



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The department deals mainly with:

- + decision-making methods in management of industrial enterprises
- + financial management and financial analyses
- + marketing
- + managerial information systems
- + economic regulation of power transmission and distribution, tariffs and prices
- + economic effectiveness of power generation and heat production
- + system and economic aspects of renewable energy sources
- + history of electrical engineering

Our projects include:

- + development, reliability and security of power systems
- + economic aspects of biomass utilization for energy purposes, economic effectiveness of renewable energy sources, support schemes for renewable energy
- + economic effectiveness of renewable energy sources, financial support schemes for renewable energy
- + economic aspects of smart grid implementation
- + economic models for calculating fees for final disposal of radioactive wastes
- + economic effectiveness of energy saving programs
- + eye tracking system and its utilization in neural science and in managerial applications

The Department of Electric Drives and Traction works on controlled electric drives and their components, including the control systems. The department's staff members are involved in numerous important projects. One of these is the Josef Bozek Competence Centre for Automotive Industry, which carries out research on alternative, hybrid and electric drives for automobiles. Students of the department are frequent victors in the Formula Electric races. The department cooperates with many Czech and foreign industrial companies, where the successful project solution usually culminates in a sample of the given industrial application. Internationally, the department contributes to the development of electric drives for experimental devices, such as equipment for material research in space for the ISS orbital station or components of electric drives used for raw material mining of the sea bottom.

DEPARTMENT OF ELECTRIC DRIVES AND TRACTION



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The department deals mainly with:

- + modern control methods of AC drives
- + power semiconductor converters
- + alternative and hybrid drives for automobiles and electric cars
- + development of low-dissipation electric rotational and non-rotational machines
- + various mechatronic systems
- + control strategy for electric drives of various traction vehicles
- + slow-motion electric drives for vehicles
- + life management of energy industry devices
- + research and design of cogeneration units

Our projects include:

- + control strategies for automobile hybrid drives
- + design and implementation of electric cars including race cars for Formula Electric
- + drives with a high-rpm disc motors and integrated magnetic bearing
- + matrix converters and multilevel inverters
- + methods of automatic measurement of physical quantities and measured data processing
- + non-commutated DC motors
- + non-traditional slow-motion electric generators for air power plants
- + special electric drives for damping the vibration of an experimental crystallizer under conditions of residual gravitation

The Department of Electrical Power Engineering focuses on theoretical and application issues in the production, transmission, distribution and utilization of electric energy. The department cooperates with a number of Czech and foreign universities and research centers. It also maintains a close relationship with the industrial sector.

DEPARTMENT OF ELECTRICAL POWER ENGINEERING



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The department deals mainly with:

- + development, cooperation, control, reliability and optimization in electrical power systems
- + renewable and dispersed generation in distribution systems
- + electrical power systems in industrial plants
- + faulted systems and application of protective systems
- + voltage quality, elimination of power disturbance
- + mathematical and computer modelling of electric power systems and devices
- + selected energy-demanding technologies (induction heating and associated physical processes in solid and liquid metals)
- + high-voltage engineering, including a high-voltage laboratory hall
- + research in the field of modern diagnostic methods in insulation systems for nonrotating and rotating electrical machines
- + research on lighting systems and light fields
- + electro heat devices, processes and technologies

Our projects include:

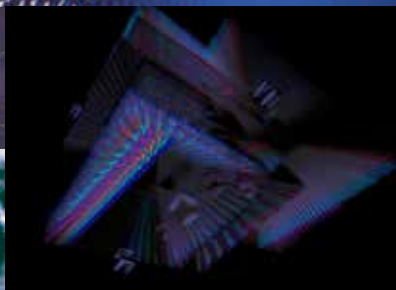
- + stability of transmission and distribution systems; advanced methods for protecting and controlling electrification systems
- + integration of dispersed and large electrical generation to power grids, local automations, smart grids
- + implementation of advanced technologies and approaches to power grids (FACTS, HVDC, WAMS, WAPS, WACS)
- + enhancing the power quality of electrical power supplies
- + advanced mathematical methods for solving coupled problems for electromagnetic, heat and thermo elastic fields
- + thermodynamic phenomena for the thermal comfort of humans, heating systems, energy saving using renewable sources
- + light source photometric assessments and lighting system evaluations
- + precise measurement of high voltage and impulse currents, high voltage diagnostics (FRA)

The Department of Electromagnetic Field prides itself on being a leader in research and education in the area of the theory and technological applications of electromagnetic fields, antennas, propagation of electromagnetic waves, microwave circuits and photonics. The department's research activities span the practical use of microwave technologies in modern communication technologies, in medicine, in industry, and in the applications of sensors to metamaterials and nonlinear optical devices. The department is equipped with highly specialized laboratories for measuring antennas, microwave circuits, interactions between EM fields and the human body, free-space optics and electromagnetic compatibility. It cooperates with leading universities, industrial and medical centers in the Czech Republic and abroad.

DEPARTMENT OF ELECTROMAGNETIC FIELD



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The department deals mainly with:

- + antenna technologies
- + propagation of radiowaves for terrestrial and satellite systems
- + microwave applications for medicine and industry
- + EMC/EMI
- + interaction between EM fields and the human body
- + nonlinear fiber optics and free-space optical systems
- + HF and microwave technologies

Our projects include:

- + new methods for microwave circuit design
- + industrial ecological processing of materials by microwaves
- + microwave systems for measuring shielding performance
- + all-optical packet switching
- + optical wireless communications
- + microwave detection and localization of missiles
- + research in special antennas
- + transdisciplinary research in biomedical engineering, microwave hyperthermia
- + propagation of radiowaves for satellite communications and high altitude platforms
- + signal propagation for advanced communication systems
- + center for quasi-optic systems and terahertz spectroscopy
- + wireless-friendly buildings

The Department of Electrotechnology offers a range of undergraduate, graduate and postgraduate courses. It is responsible for the PhD study program in Electrotechnology and Materials. The department carries out research in materials for electrical engineering, in production technology and comprehensive quality control in power electrical engineering, and in diagnostics of electronics and power electronics components and systems. The department is equipped with a specialized laboratory for measuring solar cells and modules, and with a special laboratory for testing the EMC of power systems. The department engages in long-term cooperation with numerous universities abroad, e.g. with TU Dresden in the field of lead-free soldering and electrically conductive adhesive joining, and with Aalborg University, Denmark in photovoltaics. It also has very good working relationships with some Institutes of the Academy of Sciences of the Czech Republic and with practitioners in the field.

DEPARTMENT OF ELECTROTECHNOLOGY



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The department deals mainly with:

- + the structure, properties, technology and quality analysis of materials
- + optimization and quality control of production processes
- + nanotechnology
- + photovoltaic cells and systems
- + electrochemical sources of electrical energy
- + environmental engineering

Our projects include:

- + design of EMC filters and active power filters and power converters
- + BESTPRODUCT-TENEEST – the trans – European network
- + development, reliability and safety of power engineering systems
- + diagnostics of photovoltaic cells and modules
- + diagnostics of power semiconductor components
- + transdisciplinary research in the area of biomedical engineering
- + development of a bio-inspired artificial muscle in the COST project
- + electrically conductive adhesive joints
- + optimization of soldering processes
- + development of polymer and silicate composite

The Department of Physics provides wide range of general as well as specialized undergraduate, graduate and postgraduate courses related to fundamental and applied physics. The specialized courses and research focus in particular on experimental and theoretical physics of fusion plasma, lasers, electrical discharges, linear and non-linear acoustics, nanomaterials, and their interactions mutually, with biological systems, and environment in general. The department laboratories are equipped with modern diagnostic systems, technologies, and experimental setups including z-pinch fusion plasma source, plasma jets, acoustic anechoic room, and biomedical laboratory. The department of physics thus has solid platform for excellent education, research activities as well as industrial collaborations on national and international level. By various outreach activities the department is equally devoted to promoting technical education, science, and physics to high school students, teachers, and general public.

DEPARTMENT OF PHYSICS



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The department deals mainly with:

- + high-current pulsed discharges for generation of fusion plasma and related phenomena
- + corona, dielectric barrier and gliding discharges at atmospheric pressure, plasma jets
- + plasma treatment and electronic characterization of nanomaterials
- + linear and nonlinear acoustic phenomena
- + technical applications of ultrasonic fields
- + acoustic measurements, noise control, room acoustics, psychoacoustics
- + biomedical applications of plasma, electrical fields, and materials
- + related physical principles, theoretical analyses, and numerical computations

Our R&D projects include:

- + development and application of diagnostic methods for studies of fusion plasma
- + experimental and theoretical study of accelerated deuterons, neutrons, and runaway electrons in fusion reactions
- + electrical discharges combined with catalysts for production of ozone, disposal of NO_x, and inactivation of microorganism growth
- + acoustic streaming, phononic crystals, active methods in acoustics
- + applications of acoustics for stabilization of electrical discharges, noise control in vehicles and airplanes, optimization of sound quality, communications with insects
- + cardiovascular and tissue diagnostics, eye movement analysis, electrotherapy, electronic and pressure sensors
- + miniCube satellites for testing materials, sensors, and detectors in space missions

Our outreach activities include:

- + seminars, hands-on experiments, and popular lectures about exciting physics (e.g. traditional Physical Thursdays)
- + preparatory courses of mathematics and physics for equal opportunity in studies
- + scientific journal and conferences on Plasma Physics & Technology

The Department of Languages has a long tradition in the educational system of the Faculty of Electrical Engineering. Since its establishment, its main task has been to provide language teaching and training for FEE students. English is the only compulsory language in bachelor programmes, because of its importance for technical specialists. Other language courses are available as optional courses.

DEPARTMENT OF LANGUAGES



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The department offers courses in:

- + English (including preparatory courses for FCE, CAE and TOEFL exams)
- + German
- + French
- + Russian
- + Spanish

The courses are provided at various levels (from A1 to C1 CEFR), and the syllabi are amended according to the changing needs of study programs. The aim is to prepare students for their future professional careers in a multilingual environment.

Czech language

Foreign students coming to FEE within the Erasmus programme are offered a course of the Czech language ("Survival Czech"). This is aimed at the needs of students on a short study stay in the Czech Republic. The department also organizes an examination in Czech for foreign applicants wishing to enrol on a study programme delivered in the Czech language.

Chinese and Japanese languages

Since 2009 we are pleased to have been able to offer language courses of Chinese and Japanese.

Professional Career Courses

In response to the increasing importance of communication skills in the career development of students and graduates, the department focuses on:

- + Rhetoric
- + Professional communication skills (presentations and writing skills)

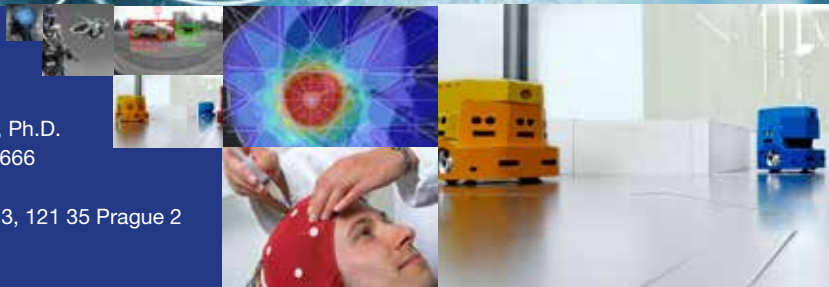
Other activities

The department participates in various scientific projects of the professional departments of FEE.

The Department of Cybernetics is recognized as an outstanding Czech Technical University research center in the area of artificial intelligence, computer vision, robotics, biomedical engineering and applications. The department collaborates with the industrial sector on targeted research and development projects that lead to innovations. We received the EU Center of Excellence award in 2000, and, in 2006, the prestigious European IST Prize from the European Commission. Three Česká hlava (Czech Mind Foundation) national awards were awarded to the department between 2007 and 2010 for excellent scientific and technical solutions. Lukáš Neumann (our PhD student) has received a prestigious Google PhD Fellowship, the only person in Central & Eastern Europe in 2013 to do so. Zuzana Kúkelová received The Cor Baayen Award of ERCIM in 2015 chiefly for her work done at our department under the supervision of Dr. Tomáš Pajdla.



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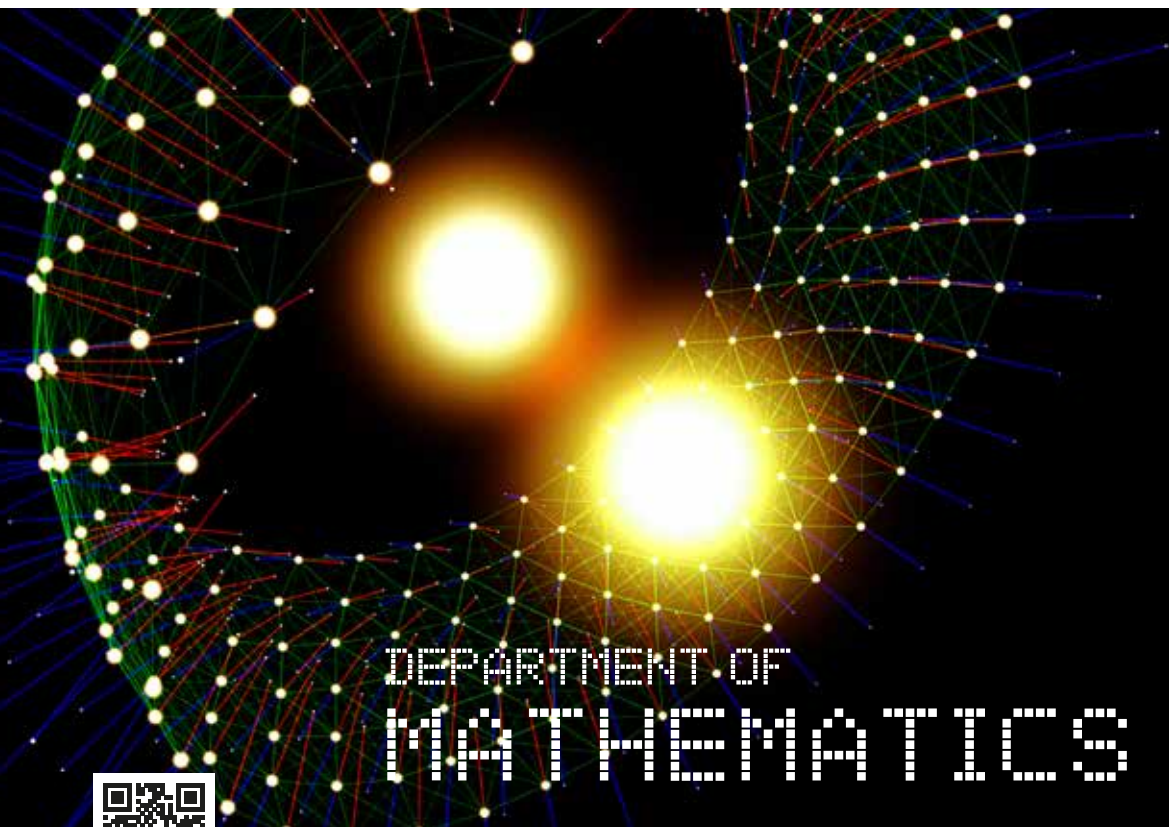
The department deals mainly with:

- + computer vision: 3D reconstruction from photos, geometry and calibration of camera, recognition in images, detection and object tracking in the video, search images in global databases and on the Internet
- + mobile, industrial, humanoid and cognitive robotics: intelligent UGV/UAV control, robot navigation and mapping, sensor fusion, human-robot cooperation
- + machine learning, pattern recognition: intelligent data analysis and scalable optimization
- + biomedical engineering: assistive ICT tools for on-line monitoring/tele-care/e-health, processing and analysis of medical and biological signals and imaging
- + applications of intelligent systems in industry and medicine biomedical image analysis
- + design of ontologies, conceptual models, taxonomies, vocabularies and the design and development of intelligent systems based the above

Our projects include:

- + computer vision-based intelligent driver assistance system for the “smart car”
- + a system for recognizing objects in images and video sequences
- + analyzing data from microscopy, MRI, CT, ultrasound, EEG, ECG
- + automatic control systems for unmanned aircraft (UAVs) and helicopters
- + ontological modeling and applications in the field of aviation safety
- + data quality analysis and intelligent search of urban planning data
- + learning models of virtual sensors from data for automotive
- + detection and classification changes in satellite images

The Department of Mathematics carries out research in various fields of pure and applied mathematics, ranging from mathematical analysis to algebra and probability theory. One of the most successful projects is the seminar on quantum structures, which deals with the mathematical foundations of quantum theory. The department's staff is one of the few teams in the world able to combine methods of functional analysis (operator theory) with discrete mathematics (ordered structures). This approach has resulted in hundreds of papers published in international journals and two research monographs. Excellent results have also been achieved by staff members in measure theory, functional analysis (operator algebras, Banach spaces), category theory, theory of non-associative structures, and probability theory. The department is also working on various projects on mathematical education for technical universities, e-learning of mathematics, and also electronic and computer algebra support for mathematics teaching.



DEPARTMENT OF MATHEMATICS



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The department deals mainly with:

- + discrete mathematics
- + quantum structures
- + category theory
- + mathematical analysis
- + probability and statistics
- + algebra

Our projects include:

- + operator algebras
- + Banach spaces
- + orthomodular structures
- + random sets
- + non-associative algebras

The Department of Measurement carries out research in measurement and instrumentation, including diagnostics and non-destructive testing. World-level and European-level results have been achieved in magnetic fluxgate sensors, resistance standards for low frequency measurement, and tests of high-resolution/medium-speed ADCs. In its field of interest, the department cooperates actively on joint projects with teams from several universities (e.g. Shizuoka University, Hamamatsu, Japan; National University of Ireland, Galway; Instituto Superior Tecnico, Lisboa; PTB Berlin und Braunschweig, to name but a few) On the basis of numerous research achievements, the department also cooperates in R&D with companies in industry, transportation, medicine and telecommunications, in the Czech Republic as well as abroad, and also with governmental institutes in military and space programs.

DEPARTMENT OF MEASUREMENT



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The department deals mainly with:

- + measurement systems, including embedded systems
- + sensors of electric and non-electric quantities
- + magnetic measurements
- + application of microprocessors in measurements
- + videometry
- + diagnostics and non-destructive testing of materials and devices
- + metrology of electric quantities
- + airborne information and control systems
- + intelligent buildings

Our projects include:

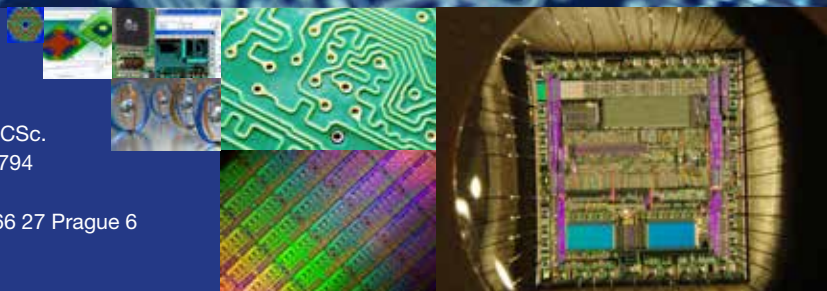
- + AMM system for electric power measurement
- + calibration methods for electrical impedance standards
- + automated testing of CAN vehicle units
- + MAMOK small multipurpose unmanned aerial reconnaissance vehicle for civil and military use
- + thin-film fluxgate sensors
- + microelectronics of vehicle networks for Xby-wire systems
- + interoperability of wireless communication systems between security services (WINTSEC)
- + time synchronisation in distributed DAQ systems and industrial control systems
- + Arrowhead – collaborative automation by networked embedded devices
- + The CzechTechSat – electronic for low Earth orbiting satellite subsystems

The research activities in **the Department of Microelectronics** include electronics, microelectronics, nanoelectronics, nanotechnology, optoelectronics, design and application of integrated circuits, microsystems, sensors, especially electronic elements and so on. We are one of the leading departments of electronics in the country. Our research is oriented towards modern electronics, participation in European projects and cooperation with industry. The department has several top laboratories in support of state-of-the-art research activities: the Center for Design of Integrated Circuits, Sensors and Microsystems; the Microsystems Center (CEMIS); the Nanoelectronics and Semiconductor Electronics Labs, the Center of Security Technologies, etc. The department cooperates actively with a number of renowned institutions, production enterprises and universities on educational, scientific and research activities. Employees of the department have registered many patents and are members of a number of Czech and international professional organizations.

DEPARTMENT OF MICROELECTRONICS



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The department deals mainly with:

- + microsystems, sensors and smart sensor systems – design and applications
- + integrated circuits and electronic elements – design and applications
- + electronic security systems
- + semiconductor structures and components
- + nanoelectronics and spintronics
- + optoelectronics, photonics

Our projects include:

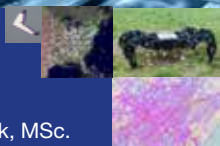
- + microsensor and nanosensor structures and systems with embedded intelligence
- + Consumerizing Solid State Lighting
- + miniature intelligent system for analyzing concentrations of gases and pollutants
- + the interface for wireless powering and communication
- + energy harvesting for power supply o microsystems
- + EMC in integrated circuits, PCB design
- + high temperature diamond sensor
- + lifetime and defect engineering for semiconductor power electronics
- + InAs/GaAs quantum dots based light emitting diodes
- + spintronics based on GaAs:Mn
- + grapheme nanostructures
- + defects in wide-bandgap semiconductors
- + components of integrated optics

We embrace foundational **computer science** topics such as software engineering, networking, and security as well as cross-disciplinary ones such as artificial intelligence, agent-based computing, machine learning, bioinformatics or robotics. We approach the topics through basic research within publicly funded projects (e.g. European Commission or Czech Science Foundation grants) but we are also enthusiasts into applied contractual research projects (e.g. with CISCO). We put no less emphasis on instruction; the department engages in 67 classes in all study programmes, representing 9% of the faculty's education. Besides that, we run popular courses within the University of the 3rd age programme, co-organize the annual ACM programming contest and numerous community building activities mainly for students. We have experience in building complex, large-scale prototypes of software systems in areas ranging from transport system simulation and control, cyber attack detection to genomic data analysis.

DEPARTMENT OF COMPUTER SCIENCE



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The department deals mainly with:

- + software engineering, database systems, XML tools
- + computer networks and security
- + artificial (computational) intelligence
- + multi-agent and autonomous systems, simulation
- + automated planning, distributed scheduling
- + game theory, machine learning, data mining
- + bioinformatics, robotics

Our projects include:

- + game theory, bioinformatics, planning, anomaly detection, robotics (Czech Science Foundation)
- + planning, attack detection, optimization, multi-agent simulation and modelling (US Office of Naval Research)
- + path planning, transport simulation, machine learning, man-machine systems (European Commission)
- + intelligent aviation, simulation (US Federal Aviation Administration)
- + traffic simulation and optimization, autonomous systems in transport, transport infrastructure security (Czech Technology Agency)
- + genomic data analysis (Czech Ministry of Health)
- + steganography, multi-agent planning (European Office of Aerospace Research and Development)

The Department of Computer Graphics and Interaction belongs to top research bodies in the country in the field of Computer Graphics and Human-Computer Interaction. The department takes part in many research projects where the unique equipment of the department is being intensively used: Virtual Reality Laboratory (VRLAB) and Laboratory for Usability Testing (ULAB). An integral part of the department is also Institute of Intermedia (IIM). The main role of this institute is to link-up education and research both in technical and art areas.

DEPARTMENT OF COMPUTER GRAPHICS AND INTERACTION



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The department deals mainly with:

- + computer graphics
- + virtual reality
- + data visualization
- + multimedia
- + rendering and graphics interaction
- + usability of user interfaces
- + accessibility of user interfaces for the disabled
- + design and implementation of special user interfaces (e.g. for mobile applications)

Our projects include:

- + V3C project (Visual Computing Competence Center) that links-up in extraordinary way research at universities and in industry. The project is funded by TACR agency and as such integrates research activities in the field of Computer Graphics and Human-Computer Interaction in six participating institutions and companies.
- + Development of GridCut algorithm that is used for calculation of the flow in grid-like graphs. This algorithm is the fastest one in the world (in the given category) and is subject to recently awarded US patent (US. pat. 8533139).
- + Implementation of advanced features for image processing in Adobe Photoshop
- + Software for visualization of car virtual prototypes (Skoda Auto, Mlada Boleslav)
- + Development of tools for navigation of visually impaired people (Naviterier project)
- + Development of unique mobile device for reflexivity measurement in cooperation with Faculty of Mechanical Engineering at CTU in Prague (funded by GACR agency)

The Department of Radioelectronics works on wireless analog and digital communication and multimedia technology. The department has specialized laboratories for teaching and carrying out research on signal broadcasting, receiving and processing, audiovisual technology, radioelectronic measurements, radar and satellite navigation. It cooperates with universities, scientific institutions and industry, mostly on R&D projects and in teaching support.

DEPARTMENT OF RADIOELECTRONICS



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The department deals mainly with:

- + wireless communication systems; principles and advanced methods of analog and digital transmission, modulation and coding; radiolocation and positioning systems, including satellite systems
- + elements and systems for recording, compressing, processing, and reproducing images and sound
- + Psychoacoustic and psychovisual studies image/video studio multimedia technology, room acoustics, image sensors, electro-acoustic transducers and systems; psychoacoustic and psychovisual studies
- + Space technologies and space projects with focus on X-ray instrumentation for transmitting and receiving radio signals
- + CAD tools for the analysis and design of radio systems

Our projects include:

- + wireless network coding in random connectivity and dense interference networks
- + implementation of the European Galileo satellite positioning system in the Czech Republic
- + modeling and verification of methods for Quality of Experience (QoE) assessment in multimedia systems
- + development of quality evaluation methods for calomel optical elements
- + development of free and open-access network of robotic telescopes
- + an experiment for monitoring the optical counterparts of gamma-ray flashes
- + astronomical glass plates digitization and data mining
- + design, implementation and modelling of imaging systems
- + symbolic and semi-symbolic methods for power RF application
- + multimedia and RF applications in assistive technology
- + Participation in preparation of payloads for space missions of ESA (e.g. LOFT, SMILE, ATHENA, THESEUS)

A system level approach, close links with industry and world-class interdisciplinary research, is the formula for success at the **Department of Control Engineering**. As the leading group in automatic control in the country, we have always oriented our research toward new technologies and ideas that change the world we live in. Interaction with industry through research centers, European projects and research contracts has helped us to anticipate future needs of society in the areas of Cybernetics and Informatics and to shape the future trends. Problem analysis and a model-based approach provide a solid basis for our work. This enables us to react to new challenges and problems and to further improve our understanding of the modern world as well as our know-how in applications at the cutting edge. We work on automating processes in order to achieve optimal solutions. This leads to considerable savings of work, energy and trouble for the users of our research results and advancement of knowledge with an impact on the scientific community.

DEPARTMENT OF CONTROL ENGINEERING



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The department deals mainly with:

- + control theory: polynomial methods, robust and non-linear control and identification - with direct impact on international community
- + predictive control and its applications in power engineering and Diesel engines
- for Honeywell and its projects worldwide
- + control systems for spacecraft and aircraft
- Airbus, EADS, SpaceMaster programme
- + control of physical fields and distributed manipulation – for medicine of the future
- + embedded systems and industrial control networks - for Porsche, Volkswagen
- + optimization and scheduling - for US NAVY, EATON, Prague Airport and various hospitals
- + nanotechnology and thin film layers - for Rolls Royce engines and skyscrapers worldwide

Our projects include:

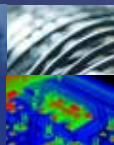
- + power balance control in transmission systems (for ČEPS, used in CZ power grid)
- + control of multivehicle/networked/cooperative systems - for future automated highways
- + advanced bioanalytical methods (with CAS for better detection of cancer)
- + active damping for flexible aircraft (Airbus ACFA)
- + self-lubricating industrial coatings (Volvo engines) and thin films for biological applications (joint replacements, tooth implants)
- + intelligent buildings and energy saving (used in Munich, Lewen and CTU campus)
- + safety and security modeling of time-critical applications in transportation, energy and medicine (Peugeot Citröen, Siemens, GM, Electricité de France)
- + high-performance real-time architectures for low-power embedded systems in automotive (ETH Zurich, Airbus, Magneti Marelli in prestigious EU program Horizon 2020)

The Department of Telecommunications Engineering focuses on optical communications, and carries out high quality research, development and educational activities in the field of wireless networks. The department participates in numerous important European and national projects.

DEPARTMENT OF TELECOMMUNICATIONS ENGINEERING



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The department deals mainly with:

- + mobile and fixed communications
- + telecommunication and computer networks
- + access networks and high-speed data systems
- + transmission media and data transmission technologies
- + wireless and optical networks
- + digital signal processing
- + design of communication equipment
- + quality of service, telecommunications management

Our projects include:

- + flexible wireless networks based on OFDM
- + position localization and its application for directing blind people
- + specification of quality criteria and optimization of modelling tools for high-speed access networks
- + research and development on a multichannel communication system with multi-layer cooperation for industrial applications
- + development of adaptable data processing systems for high-speed, secure and reliable communication in extreme conditions
- + research on the influence of nonlinear phenomena of quantum structures on photonic crystal-based optical components of high-speed transmission systems
- + data communications in intelligent power networks (Smart Grids)
- + effects of additive noise on the subjective and objective evaluation of speech quality in VoIP
- + optimization of algorithms for compressing stereoscopic image signals

The Department of Circuit Theory teaches classes in analog and digital circuit design, basics of medical electronics and digital signal processing. In our modern laboratories, we introduce students to the latest technologies used in circuit design and signal processing, with an emphasis on theory and on practical applications. The department's main research focus lies in the design of analog, digital and mixed electronic circuits, digital signal processing applied to speech and biological signals, measurements of magnetic materials, and measurements of biological signals. Our research results have found practical applications in many fields, including medicine and the military.

DEPARTMENT OF CIRCUIT THEORY



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The department deals mainly with:

- + digital signal processing applied to speech and biological signals including scalp and intracranial EEG; algorithms for speech analysis and recognition, research of speech pathology
- + theory and application of magnetic material measurements
- + design of analog, digital, continuous and discrete-time electronic circuits

Our projects include:

- + spatial filtering techniques for high density electroencephalographic recordings
- + intracranial EEG signal processing; epileptogenic zone identification in non-lesional refractory epilepsy patients
- + acoustic voice and speech analysis in patients with central nervous system disorders
- + research of techniques to distinguish and reliably classify two major temporal lobe epilepsy syndromes
- + computer analysis of speech expression, EEG records and MR tractography in children with developmental dysphasia
- + the design of the telemetrically controlled adaptive model of the cardiovascular system
- + the research of novel selective transforms for non-stationary signal processing, focused specifically on Zolotarev transforms (in cooperation with prof. Vlček from TF CTU)
- + development of novel string sensors for tension measurement
- + speech recognition under real-life conditions; creation of databases for industrial companies
- + the kf8 compensating ferrometer, a prototype for a stationary meter of the magnetic properties of amorphous magnetic materials

The Institute of Intermedia (IIM) is a unique interdisciplinary platform for study and research. Its aim is to bring together students and professionals from a wide range of artistic and technological disciplines, thereby providing the opportunity for a diverse engagement with multiple research and creative projects in the fields of multimedia, performing arts and technologies.

IIM was established in 2007 by the two leading Czech universities: Czech Technical University in Prague and Academy of Performing Art.

Our curriculum consists of a variety of courses that put a strong emphasis on encouraging students to develop their creative and technological abilities. This is often through an engagement in interdisciplinary projects where they can share and refine their skills and interest in meaningful, interactive ways with colleagues from different fields of study. The main course, **Applied Intermedia Technology**, employs this approach.

INSTITUTE OF INTERMEDIA



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Research, Arts and Educational Projects

Since being established, IIM has been engaged in numerous research projects. Our laboratory is placed at the Faculty of Electrical Engineering, at the Czech Technical University in Prague.

IIM encourages academic and professional collaboration across related disciplines such as Industrial Design, Interior Design, IT and Multimedia Technologies, Scenography, Light Design, Choreography, Music Composition or Audiovisual Studies.

Research Highlights

- + Development of tools and methods for virtual reality applications and collaborative environments using high-bandwidth network data transmission protocols. *In collaboration with the CESNET association, the main Czech academic institution network operator.*
- + Development of motion capture techniques that allow simple and fast tracking and recording of human body motion in film making.
- + Development of mocap database and efficient tools enabling automatic analyses, classification and retrieval of recorded motion data. *In collaboration with 5 other prominent Czech research institutions, chiefly Universal Production Partners Inc.*
- + Software development for the installation The Message of the Book - an exhibition on the 50th anniversary of the competition of The Most Beautiful Czech Book of the Year. *In Collaboration with UMPRUM Prague.*
- + Participation on Silent lab – an audiovisual interactive installation for the Czech pavillon at the EXPO 2015 World exhibition in Milan: combination of living biotope, robotic arms and cameras. *In collaboration with Faculty of Architecture and Full Capacity.*

ELEKTRA, the Association of Alumni and Friends of the Faculty of Electrical Engineering at the Czech Technical University in Prague, was founded in 1991. Like other associations of engineers, ELEKTRA brings together alumni and friends of the University, regardless their current location and profession. Private persons and companies can be members of the Association. The main aim of ELEKTRA is to provide support for the development and activities of the Faculty of Electrical Engineering (FEE). ELEKTRA is an informal association for all those who strive to promote the good reputation of the school and its interests – support for scientific and technical research and technical studies for the 3rd millennium. The mission of the association is to facilitate meetings and active participation for all generations of alumni, and to set up a unique platform for exchanging practical experience and keeping abreast of what is new at the faculty.



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ELEKTRA has the following activities:

- ✦ it organizes the meetings of alumni
- ✦ it popularizes the research and scientific findings at the FEE CTU
- ✦ it jointly organizes exhibitions, seminars and conferences
- ✦ it cooperates with a range of expert associations in the Czech Republic and abroad
- ✦ it publishes information materials
- ✦ it organizes cultural and social events
- ✦ it manages assets

WHY STUDY AT FEE?

PRESTIGIOUS UNIVERSITY WITH A RICH TRADITION

Founded in 1707, CTU is the most prestigious technical university in the CR. The Faculty of Electrical Engineering (FEE) was established in 1950 and it currently consists of 17 departments. According to QS we are ranked 150-200 both in Electrical Engineering a Computer Science and Engineering.



TOP-QUALITY EDUCATION

We offer a top-quality education in electrical engineering, telecommunications, automation, cybernetics, informatics and computer science.



SCIENCE AND RESEARCH

Our faculty ranks among the top ten research institutions in the Czech Republic. We are successfully linking the research projects with Masters and Doctoral programmes.

COOPERATION WITH INDUSTRY

Industrial practice is both the source of inspiration and measure of success for our teaching and research. We collaborate with prestigious institutions such as Google, ABB, IBM, Škoda, Samsung and many others.

BEST REPUTATION FOR GRADUATE EMPLOYMENT

Our graduates do not seek jobs. Companies, universities and research institutes around the globe are offering them not only competitive salaries, but also interesting work. Our Alumni form an exclusive network which includes CEOs, ministers and professors at the best universities.



CULTURE

Prague is a true cultural treasure trove bursting with fascinating museums, galleries, theaters and music venues. The city frequently plays host to prestigious exhibitions, events, and more international festivals than you can shake a stick at.



AND PRAGUE IS THE HEART OF EUROPE...

Situated in Central Europe, it is often referred to as the heart of Europe or the City of a Hundred Spires. Since medieval time, this location has made Prague into a great centre of attraction for merchants and cosmopolitan foreigners. Throughout the centuries different architectural styles and their creators have shaped the city's unique atmosphere. The city centre is included in UNESCO'S world cultural heritage list.

SPORTS

Prague has numerous indoors and outdoors sport activities. There is something for everyone! Students can join the university's Institute of Physical Education and Sports which offers a choice in excess of 40 sport activities. Students can sign up for courses in the countryside or in the mountains in summer and winter. In the summer months, the emphasis is on water sports, ball games, mountaineering, windsurfing and cycling. The main winter sports are cross-country skiing, downhill skiing and snowboarding.

TUTORS

We care about students. On average we have only 7 students per teacher, so we can allocate enough time for personal contact between a teacher and a student. Every international student has a tutor. Students work in our laboratories on real research problems.



WHO'S WHO

DEAN

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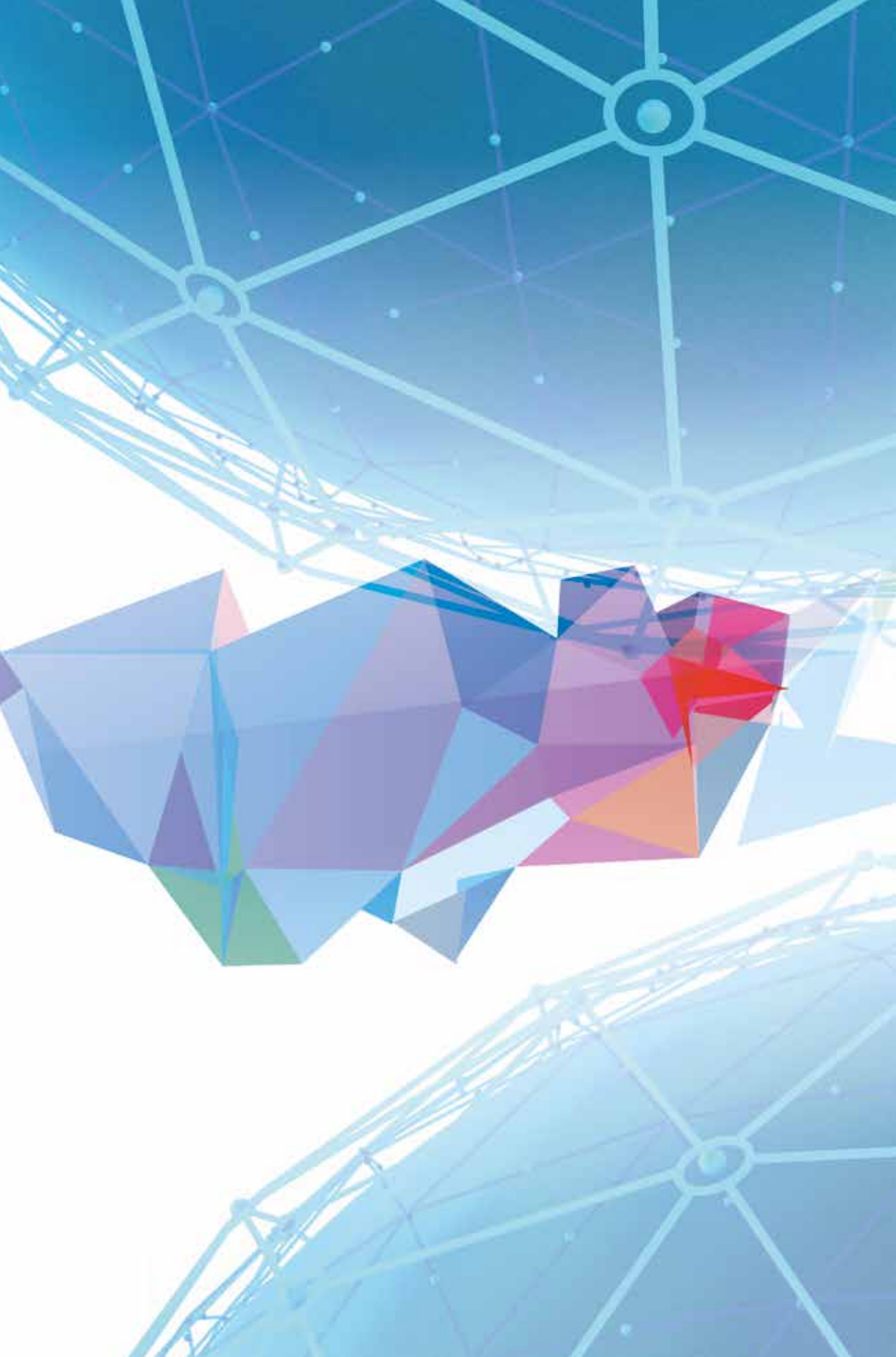
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