

**CZECH  
TECHNICAL  
UNIVERSITY**  
IN PRAGUE



**This is CTU!**

Flexible Research University in Europe





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**Editors:** PhDr. Vladimíra Kučerová, Mgr. Andrea Vondráková

**Translation and language editor:** Robin Healey

**Graphic design:** Lenka Klimtová

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## EXCELLENT TEACHERS, OUTSTANDING RESEARCHERS...

### **In your opinion, what is it that makes CTU a leading university fit to be compared with famous European universities?**

CTU is a leading university specializing in technical education. This comes from the university's history, and specially from the fact that many exceptional personalities from a whole number of fields of study are concentrated here. They are not just excellent lecturers and teachers, but also outstanding researchers. CTU is at the same time an outstanding institution for science and research. The results of our scientific work, research and innovation place us in long-term third position in the Czech Republic, behind the Academy of Sciences and Charles University. The Academy has three times as many researchers as we do, and Charles University has twice as many.

### **A university is not only for studying, but also for scientific work and research work. There are many teams and many personalities at CTU that are recognized for the results they have achieved. Which recent results and achievements have pleased you most?**

I was particularly pleased by the announcement of the winners of the Werner von Siemens 2016 prize, where awards were made to the best teachers. Prof. Šebek, from the Faculty of Electrical Engineering at the Czech Technical University in Prague, was inducted into the Siemens Prize Hall of Fame. The prize for the best results in science and innovation was awarded to Prof. Filip Železný, also from the same faculty.

These have not been the only successes. I'm very pleased with the results of the team headed by Prof. Michal Pěchouček, also from the Faculty of Electrical Engineering, in the field of agent systems; and by the results of the team of Assoc. Prof. Karel Kolář, from the Faculty of Civil Engineering, which works on high-strength rapid-hardening concrete. The team of Prof. Michael Valášek, from the Faculty of Mechanical Engineering, works on robotic processing of materials. CTU student Jakub Hoffmann won first place in the INSPIRELI AWARDS, an international architectural competition. Prof. Igor Jex's team, from the Faculty of Nuclear Science and Physical Engineering, had a paper published in the prestigious Science Magazine. The team of Prof. Svátek, from the Faculty of Transportation Science, is working on the Smart City Písek project. The team of Prof. Rosina and Prof. Kneppo, from the Faculty of Biomedical Engineering, is developing medical technology in the field of display methods. The groups of Assoc. Prof. Janoušek and Dr. Kordík, from the Faculty of Information Technologies, are collaborating with industry on IT. The team of Prof. Hlaváč, from the Czech Institute of Informatics, Robotics and Cybernetics, is carrying out research on robotics, mainly for the requirements of the army and security. The team of Dr. Kolísko, at the Klokner Institute, collaborates with the construction industry, and the team of Assoc. Prof. Švecová, from the Masaryk Institute of Advanced Studies, collaborates with the state administration.



**Prof. Ing. Petr Konvalinka, CSc.**  
Rector  
Chairman of Scientific Council of CTU

This is CTU!

About CTU



>>> **Has the leadership of the university been succeeding in improving the environment for students and for researchers?**

I'm convinced that we're succeeding. However, this is mainly a matter for the deans of the faculties and for the directors of the institutes, who bear the main responsibility for implementing the study programmes and the scientific, research and innovation projects. The university leadership attempts to create conditions for these two areas of university activities to function ever better, specially by providing help with administrative matters.

**As a specialist in building construction and materials, which are rapidly-developing, constantly changing fields, you must be pleased with the opportunities offered to students and scientists by the Experimental Centre, which you lead at the Civil Engineering Faculty, and also by other scientific and research workplaces at CTU. There are big challenges ahead at the Czech Institute of Informatics, Robotics and Cybernetics and in the other new centres. In which direction do you want to develop our university?**

Further developments should be particularly in the direction of issues concerning the fourth industrial revolution, which is presented in the document INDUSTRY 4.0. This is not just a matter for mechanical engineers, electrical engineers, programmers and specialists in IT/ISC. It's a complex area, in which civil engineers, architects, transport engineers, power supply engineers and biomedical engineers need to integrate their efforts. ■









## MORE THAN 20 000 STUDENTS

The Czech Technical University in Prague (CTU) is one of the biggest and oldest technical universities in Europe. It was founded on the initiative of Josef Christian Willenberg on the basis of a decree issued on January 18<sup>th</sup>, 1707 by Emperor Josef I.

**CTU educates modern specialists**, scientists and managers with knowledge of foreign languages, who are dynamic, flexible and able to adapt rapidly to the requirements of the market. CTU offers a very broad and attractive range of study programmes. For the 2015/2016 academic year, students can choose from 123 study programmes,

within the framework of which 482 study specializations are offered.

In the 2015/2016 academic year, more than 20 000 students were registered in bachelor, master and doctoral programmes at CTU, and about 1 500 academic workers taught and carried out research at the university. The European dimension is gradually becoming part of the ordinary everyday work of the faculties, departments and research teams, and the difference between national and international is becoming less visible and less significant. International activities are coordinated by the International Office, in close collaboration with the university's outstanding International Student Club (ISC).



CTU students and staff receive growing numbers of visitors from abroad, and also travel more intensively outside the country, not only within the framework of centrally organized activities. More and more of the international links are on a faculty, department or individual basis. Internationalization of education, science and research is already a normal part of the academic life of university workplaces. This has been raising the popularity of CTU, especially with incoming exchange students. CTU has been awarded the prestigious Diploma Supplement Label.

### CTU in University Rankings

In 2013, CTU was placed between 451<sup>st</sup> and 460<sup>th</sup> place out of 17 000 world universities in the QS World University Rankings (published in September 2013), and in 207<sup>th</sup> place in the ranking of technical universities. In Civil and Structural Engineering, CTU was ranked in 51<sup>st</sup> – 100<sup>th</sup> place in the QS World University Rankings in 2013 (in 2011, it was ranked in 151<sup>st</sup> – 200<sup>th</sup> place, and in 2012 it was in 101<sup>st</sup> – 150<sup>th</sup> place). In Mechanical Engineering, CTU was ranked in 151<sup>st</sup> – 200<sup>th</sup> place in 2013 (in 2012, it was in 101<sup>st</sup> – 150<sup>th</sup> place). In Computer Science & Information Systems, CTU was ranked for the first time in 2013, and appeared in the group of universities ranked between 151<sup>st</sup> – 200<sup>th</sup> place.

Research, development, artistic and creative work form an integral part of the activities of CTU as a university. CTU is one of the largest research institutions in the Czech Republic, and ranks as a major research institution in world terms. It carries out research in a wide range of fields of engineering. Basic and applied research have been and

will continue to be major activities in the long term. More than 700 scientific and research projects are being worked on at CTU. Research is carried out not only at all eight faculties of the university, but also at university institutes: the Klokner Institute, the Masaryk Institute of Advanced Studies, and the Institute of Technical and Experimental Physics. CTU has many centres for basic and applied research, where research is carried out on an excellent international level.

An outstanding Information and Communication Technology infrastructure is a basic part of the university's strategy. High-quality ICT forms the basis for collecting, analyzing and processing valid information. In 2012, the CTU Computing and Information Centre was awarded the following quality certificates: ISO 9001:2009 Quality Management System, ISO 20 000 Information Technology – Service Management System, and ISO 27 000 Information Security Management System.

### Lifelong learning

CTU is also very active in the field of lifelong learning. For its future students, it organizes preparatory courses for the entrance examinations. For the university's graduates, it offers courses aimed at extending their knowledge and skills in a specific field. For working engineers, it offers professionally-oriented courses in technical fields.

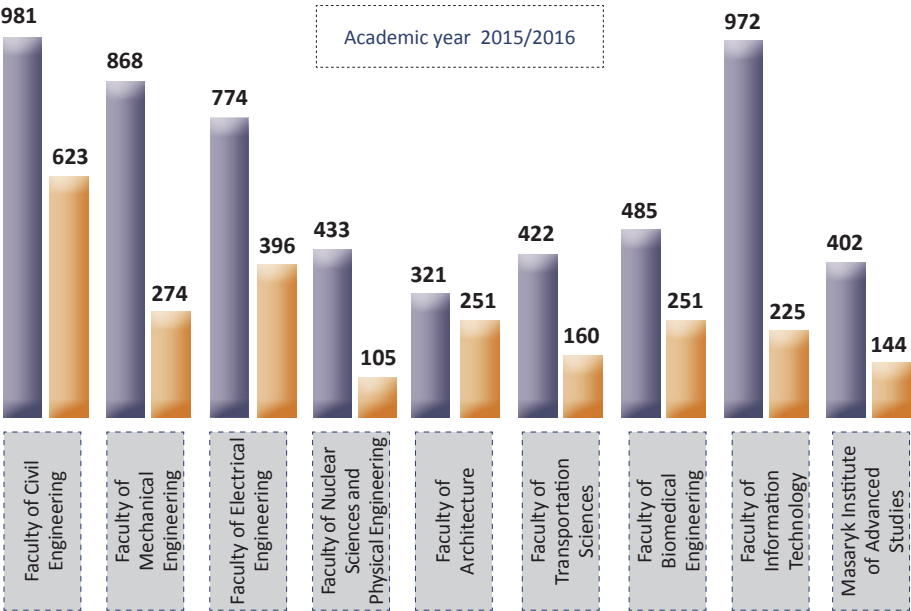
CTU participates in the so-called University of the Third Age, offering study courses for seniors who consider that further education is essential for a full life. The students work on extending their specialist knowledge and professional skills. ■

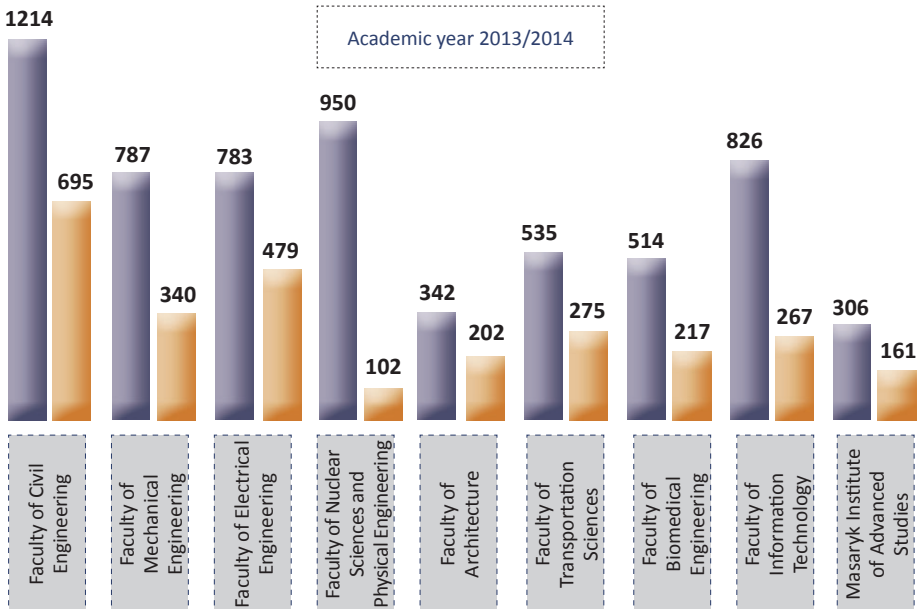
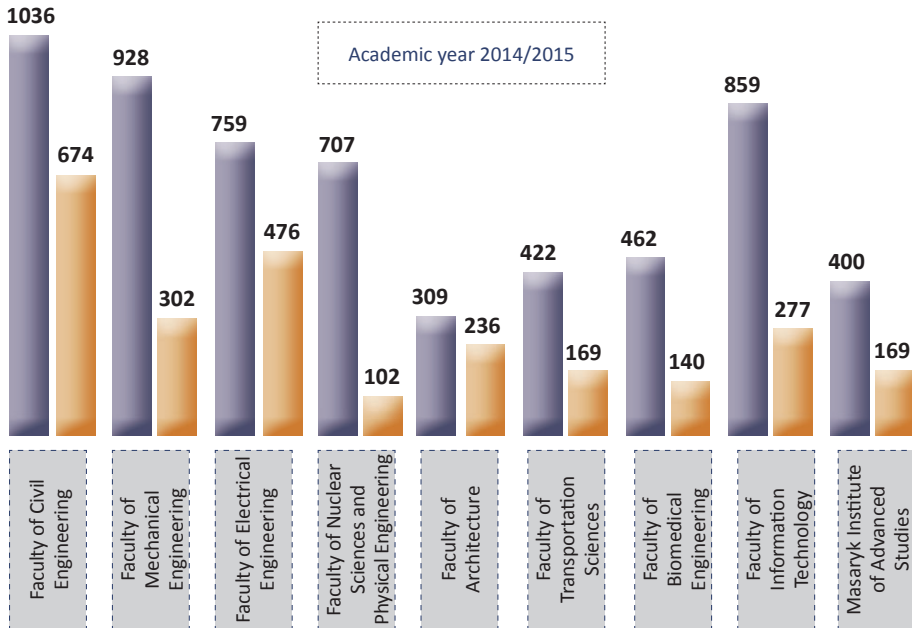
CONSIDERABLE INTEREST IN STUDYING AT CTU

**A**t CTU in Prague, you can study at bachelor, master or doctoral level. We offer three-year and four-year bachelor programmes, leading to a Bc. degree, followed by one-and-a-half or two-year programmes leading to an Ing. or Ing. arch. degree, equivalent to a master's degree, and a three- or four-year programme leading to a PhD degree. Candidates interested in studying in a foreign language can choose from the study programmes offered in English. Within the framework of their study programme, all students have the opportunity to study abroad in Europe or elsewhere in the world, without needing to extend their study period. There continues to be considerable interest

in studying at CTU. The numbers of new students have generally held steady, in spite of the dip in the numbers of secondary school leavers in the Czech Republic in recent years. In the 2012/2013 academic year, 8 412 new students registered for bachelor and master's study programmes at CTU. In 2013/2014, there were 8 995 new students. A year later there were 8 427 new students, and 8 087 new students registered in 2015/2016. An overview of the numbers of new students in bachelor and master's programmes, on a faculty-by-faculty basis (plus the Masaryk Institute of Advanced Studies), is shown here in graphical form. ■

Numbers of new students in ■ bachelor and ■ master's programmes







CTU CarTech/Formula Student – a very successful activity of CTU students (21<sup>st</sup> position in the world rankings out of more than 500 teams)  
Photo from Hockenheimring, Germany:  
© FSG, Grams





## WE REACT TO THE REQUIREMENTS OF INDUSTRY

**The Faculty of Civil Engineering is the biggest faculty at CTU. How are you able to handle this colossus? It cannot be easy, when you are outnumbered by men...**

Yes, we are a large faculty, but I don't manage it single-handedly. All positive things at the faculty result from teamwork. I can rely on hardworking, communicative and stimulating colleagues. That is why the faculty has good results, and I can take pleasure in my work. I don't have any worries about working among men. I believe in the success of mixed work teams, which have great flexibility and potential, because the good attributes of the different approaches of men and women have a synergetic effect.

### **What are the key plans and aims?**

The key plans and aims are for the long term. I'm troubled by the perception of the attractiveness of engineering, including civil engineering, as projected in the media and in society. Throughout history, construction and architecture have been milestones of development and civilization for mankind. Nowadays, however, works that have turned out successfully attract little attention. Our aim is for enthusiastic students to come to us, and for them to have respect for technical education and for their field of specialization. Studying requires great efforts, and students need to enjoy learning to think like an engineer, and to have a creative approach to the solution of complex issues.

### **Is the faculty able to compete with universities abroad?**

I'm sure it is, although construction is always a local undertaking. We've been adjusting

our study programmes and study profiles taking into account what has been happening abroad, making use of the experience of our students and our teaching staff. Our competitiveness is reflected in our long-term high position in the QS World University Rankings. Alongside the overall rankings of the universities, rankings are also published according to specializations. For example, in the field of Civil and Structural Engineering we were ranked in 51<sup>st</sup> – 100<sup>th</sup> position in 2015. We are making efforts to further extend the amount of teaching in English. Lectures by specialists from abroad are commonplace.

### **How has the offer of what is studied been changing with the requirements of the construction industry?**

One example is the study programme in Intelligent Buildings, which came about in response to the need for energy savings when buildings come into operation. The programme is taught jointly by three CTU faculties. The newly-accredited master's programme in Structures for Power Engineering is also a response to the requirements of industry. This study profile has been accredited in the framework of the master's programme in Nuclear Power Equipment, through the Faculty of Mechanical Engineering. We are offering a new, professionally-oriented bachelor programme in Structural Engineering, focusing on the preparation, erection and operation of structures. Our flagship programme is in Architecture and Construction, and the graduates from this programme are in demand on the employment market. We are now preparing an English-language version of this programme. ■





## FACULTY OF CIVIL ENGINEERING

**The basic mission of the faculty** is to teach future specialists in the area of projecting, preparing, constructing and maintaining structures in accordance with the latest trends in the field. An integral part of this mission involves creative work – science, research, development and innovation, at the highest level. The faculty also provides expert opinions and services, and supports standardization processes and the establishment of technical norms. It collaborates closely with professional chambers and associations.

The Faculty of Civil Engineering is the oldest of part of CTU, on the basis of which the present-day university was founded. It is the university's biggest faculty. The large number of students is mainly a matter of tradition, the flexibility of the fields that are studied, and the good conditions for studying, rather than a reflection of the current needs of construction companies or a condition for finding a good job.

The outputs of the faculty total about one fifth of the overall outputs of the university, in teaching and in other activities. It is an advantage for the faculty that construction companies and project companies show long-term interest in our high-quality

graduates. The faculty maintains a tradition of university-educated specialists in civil engineering, architecture and geotechnical fields, but the most important task of all is to keep looking forward to the future. That is the reason for the flexibility in the offer of study programmes and study profiles, which can be adapted to present-day needs of industry and to the interests of students. We have long-term good results in teaching surface structures, transport and engineering structures, architecture with a strong technical basis, and water engineering closely linked with environmental considerations. Students have an opportunity to do a part of their studies at one of the universities abroad with which the faculty has an agreement. Doctoral study programmes bring together basic and applied science, with emphasis on collaboration with industry on innovations. Civil engineering is an interdisciplinary field, so active collaboration is essential. Since 2012, the faculty has been coordinating a unique international master's study programme under the title Sustainable Constructions under Natural Hazards and Catastrophic Events – SUSCOS\_M. This is one of a small number of highly prestigious Erasmus Mundus study programmes offered



in the Czech Republic, with the aim of attracting the highest quality students from abroad.

Flexibility and cooperation are essential, especially in the area of science, research, development and innovation. Our scientific research teams work on unique projects. They investigate ways of storing nuclear wastes, ways to develop and apply new materials in construction engineering, and ways to use fibre-cement composites to provide improved protection against terrorist attacks for the technical infrastructure.

They introduce progressive technologies into construction, and also create new instruments for processing measurements of global navigation systems and stations for making microclimate measurements. One of the faculty's workplaces has been selected to work on a very attractive and prestigious problem – the design of the water park for the Olympic Games in Rio de Janeiro.

Various awards for projects have made a good name for the faculty, for example the Innovation Prize and the Technology Agency of the Czech Republic Award. The Architects' Grand Prix in 2009 awarded a National Prize for Architecture in the Interiors category for the new large-scale teaching space for the Architecture and Civil Engineering study programme at the Faculty of Civil Engineering. This studio space emerged as a reconstruction project, and also won first place in the Contractworld Award 2011 international architecture review in Hannover. Awards stimulate interest among prestigious companies in working with the faculty. This, in turn, extends the opportunities to take part in more grant-funded competitions, and this gives students ever better chances to prepare

themselves for their professional careers.

The faculty is the home of the prestigious Grant Agency of the Czech Republic Centre of Excellence in basic research, dealing with cumulative time-dependent processes in construction materials and structures. The faculty is the coordinator of the CESTI Centre of Competence (the Centre for Efficient and Sustainable Transport Infrastructure). Twenty-one partners are participating in this technical innovation project aimed at developing technical solutions for cost-effective construction of the transport infrastructure with a long lifetime, based on predictions and models of usability and functional characteristics, including in-situ diagnostics, aimed at removing the deficiencies in the present-day transport infrastructure.

The Faculty's experimental workshops provide a long-term basis for the faculty's science and research. One of these workshops is the Experimental Centre, which works on investigations of construction materials and structures, and provides support for basic and applied research and for students' projects on construction materials and structures.

The first Centre for Nanotechnology in Civil Engineering in the Czech Republic is based in the Experimental Centre. This Centre provides access to a range of mature research technologies for nanoscale and microscale research on silicate materials, and for producing nanomaterials. The Water Management Experimental Centre carries out research on hydraulic phenomena in the field of water structures (weirs, watercourses, dams, water power plants), water streams, water pipelines, wastewater treatment plants, etc. ■

## MECHANICAL ENGINEERING WITH GREATER CREATIVITY

### **What aims have you set yourself for developing the faculty?**

Students of the Faculty of Mechanical Engineering don't have the slightest problem with finding a job and making progress as an engineer. The faculty also has no difficulty getting offers to collaborate with industry. Nevertheless, the main aim that I've set for developing the faculty is to improve the courses for students and our collaboration with industry. It's a matter of graduates having better soft skills, targeted programs for collaborating with industry, improved project management, and producing proposals for innovations, etc.

### **In your view, what is the main difference between a graduate of the Faculty of Mechanical Engineering at the beginning of the third millennium and a mechanical engineer who graduated fifty or a hundred years ago?**

The basic difference no doubt lies in their level of specialization. In the past, mechanical engineers went to lectures on the construction of all types of machines and devices. For example, turbines, boilers, combustion engines, cranes, production machinery, etc. Then they would specialize in one area of mechanical engineering. Present-day graduates learn about the construction of just one type of engine, and in their work they often go on to design various types and versions of it. The versatility of present-day mechanical engineers is based on the theory of the creative basis of versatile computer approaches. For example, the finite elements method for deformations and

oscillations, multi-body systems for moving mechanisms, the finite capacity method for fluid flow, etc. In the past, studies at the faculty were more wide-ranging, followed by greater specialization at work. Nowadays, despite the more specialized studies, the applications are more versatile.

### **You are a specialist from the Department of Mechanics, Biomechanics and Mechatronics. This is a field that documents the change from traditional mechanical engineering to the most modern trends, pushing the limits of high tech production. What do you like most about this change in mechanical engineering?**

The change from traditional mechanical engineering to modern advanced production has emerged from the development of creativity. It's been caused by the transition from passive systems to active systems. In the past, products and product design were restricted by passive systems based on natural systems and materials. Nowadays, products are designed as active systems with interacting components and materials. Activity is represented by controlled properties. This trend is represented in its fullest form in mechatronics. Product design is carried out with components with ten times better properties than their traditional passive counterparts had. This trend enables the application of products to be extended, and greater creativity can be employed than was imaginable in the past. What I like most about this trend is that it extends the space for the very essence of engineering, with the creation of new artistic artefacts to satisfy people's demands. ■





## FACULTY OF MECHANICAL ENGINEERING

**The Faculty of Mechanical Engineering** of the Czech Technical University in Prague is one of the original faculties of the oldest Czech civilian technical university, which was founded in 1707. In 2014, the faculty celebrated the 150<sup>th</sup> anniversary of its establishment. Mechanical engineering began to be taught as a separate field of study in the Czech lands in 1864.

As its name suggests, mechanical engineering deals with machines. Machinery is a concept that has been with us since the beginning of the so-called industrial revolution. This is

often linked with the development of steam-powered machinery. However, the range of mechanical engineering is much broader. To give an idea of the range, we point out that a mechanical engineering approach is used whenever something is to be produced on an industrial scale. Industrial production involves either serial production, without human intervention and at minimal expense, i.e. using machinery, or producing a single item with various outstanding properties that cannot be produced in an ordinary production workshop.



Mechanical engineering thus provides methods and knowledge for producing ordinary products, e.g. cars, domestic appliances and production machinery, “high tech” products, e.g. mobile phones, tablets, chips, CDs and MP3 players, chemical materials and pharmaceuticals, on massive production lines. It also provides methods and knowledge for producing, e.g. unique physical and medical instruments, such as astronomical telescopes, particle accelerators and knee replacements. Mechanical engineering forms the basis for almost all kinds of industry. The physical principle for functional products can be proposed by physicists, chemists, electrical engineers or civil engineers, but the products finally have to be designed and above all manufactured by mechanical engineers.

Mechanical engineering forms the basis of all modern industry. If a country is industrialized, like the Czech Republic, mechanical engineering is the decisive factor in the sustainability of the economy and the standard of living in the country. For this reason, the number of students accepted for studies has been rising by 10% per year, although the demographic curve in the Czech Republic has fallen by 15%.

Mechanical engineering is a traditional field of study, but it has been undergoing long-term tumultuous development, in which certain basic developmental trends can be identified. One basic trend has been in general toward designing artefacts (products) in the virtual world, with the use of modeling and simulation. We carry a proposed product in our heads, and then we transfer it in a computer program into the virtual world, like in *The Matrix*, where we propose it and prepare it for production, and then we

materialize it using a suitable production technology, almost without it being touched by a human hand.

Another trend that has been noted is the integration of the physical domains in which mechanical engineering operates. With its design procedures, on the one hand, and the functionality that is used in material products, on the other, mechanical engineering brings together more and more physical phenomena and areas. In the course of the last 150 years, the interconnection of physical phenomena has taken place gradually, and today in mechatronics we are making these interconnections deliberately.

The third trend is the continuous growth in work efficiency and work productivity. Mechanical engineering may not achieve the speed of Moore’s Law for growth in the performance of processors, but the features and the performance of machines and processes have been doubled and even improved tenfold.

The Faculty of Mechanical Engineering at CTU in Prague has been participating in all these trends, and has played an active role in many of them. The faculty’s 17 institutes cover the whole range of mechanical engineering, from mathematics and physics, through the materials and the technologies used in each type of machinery and process, to business economics. This may explain why the faculty is participating in the work of seven Centers of Competence covering most of the industry in the Czech Republic.

150 years is a long history, a great undertaking, and also a promising pledge for the future development of industry in the Czech lands, based on Czech mechanical engineers. ■

## WE LINK ELECTRICAL ENGINEERING WITH INFORMATICS

**Your faculty covers a broad area, from traditional electrical engineering to cybernetics... Is there also a changing emphasis inside the fields of specialization?**

This broad range of studies is an advantage for us. Smart phones provide a classic example of what I mean: they contain high-frequency electronics, an antenna, batteries, a processor, and a range of sensors. In addition, they are full of sophisticated software. All of the disciplines needed for designing a smart phone are taught in our faculty. And they are taught by people who are doing world-class research and collaborating with international companies. Electric drives are nowadays surrounded by electronics controlled by sophisticated algorithms, containing nanostructured materials, and designed using computers. The accent nowadays is therefore on being interconnected, and on interdisciplinarity. We try to give our students a solid background in the theoretical disciplines and deep knowledge in their field of specialization. But above all, we want them to have an overview, and the ability to work effectively with new ideas and to recognise connections. This is the third year that we have been working under the catchphrase “We link electrical engineering with informatics”.

**Your teaching staff includes internationally known scientific personalities. How do you manage to retain the services of people like this at the faculty?**

I think we are now able to pay our top people quite well, and provide good equipment and instrumentation for them. However, we don't try to keep hold of our best graduates at all costs – we send them out into the world. People with international experience have

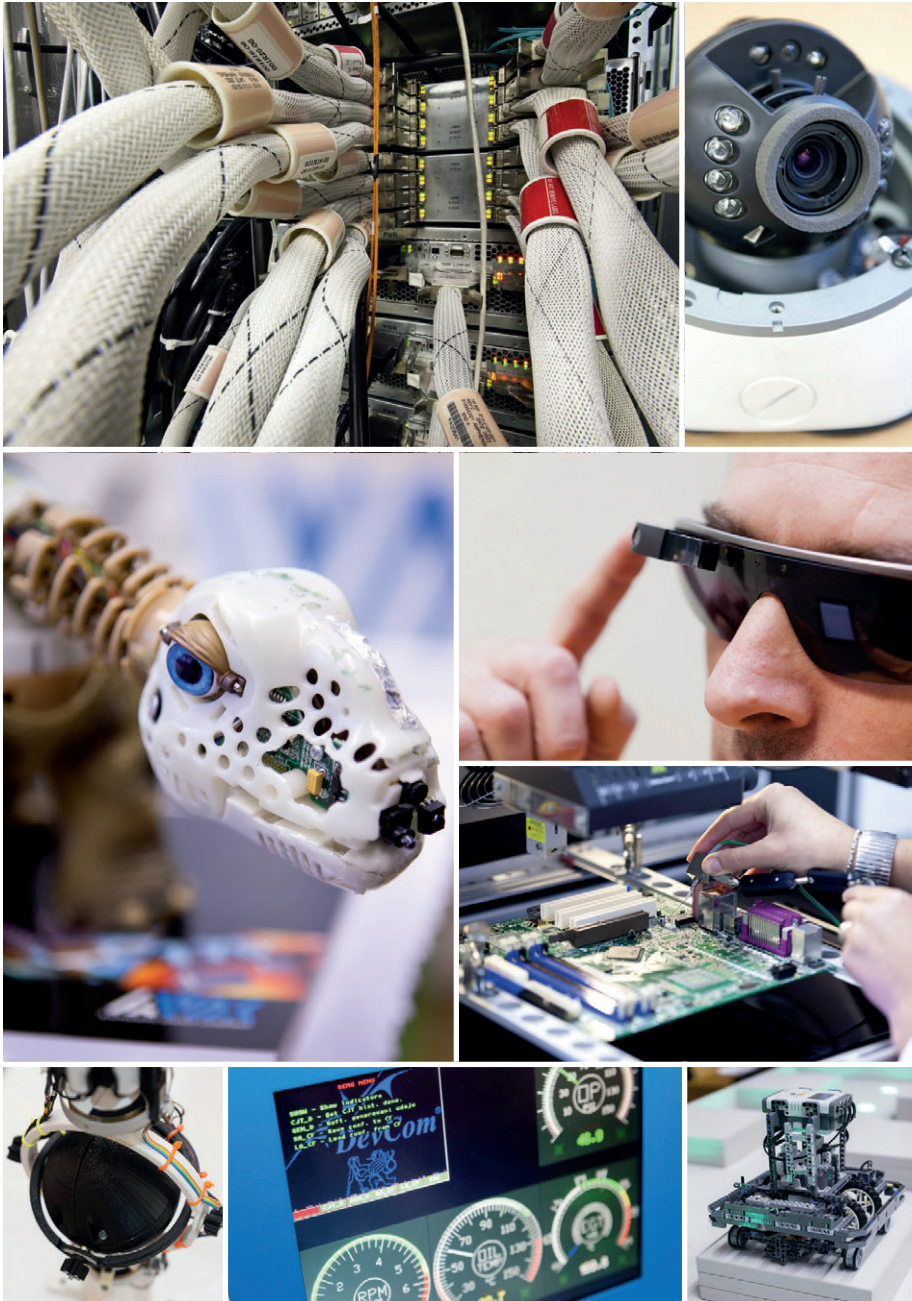
a broader perspective. And they often come back to us. Since last year we have been working with new career regulations, and a year of experience abroad is now a requirement for a staff position at the faculty. Our students, too, have opportunities to study abroad at top universities and in top workplaces, and I wish more of them would take advantage of these opportunities. We have brought in some travel scholarships for this purpose. Currently, more foreign students and researchers come to us than go abroad from us – but that is just the way it is for a top institution.

**Which direction should the faculty take in the next few years?**

We are gradually upgrading our study programmes: We concentrate all degree-seeking foreign students in our new integrated study programme in Electrical Engineering and Computer Science. We also set up an applications-oriented bachelor study programme in Software and Information Technology. The idea is to concentrate degree-seeking foreign students into this programme. We are also setting up an applications-oriented bachelor study programme in Software and Information Technology. In the research area, we are trying to coordinate the efforts of separate departments, for example in the area of micro- and nanotechnology, EMC and space technologies. We make systematic efforts to extend the our smaller and larger areas of excellence, so that they will cover the whole faculty. It is a slow job, but the results are emerging. In science and research, we are the best engineering faculty in the country. However, that is not enough for us, and we know how we can keep on improving. ■









## FACULTY OF ELECTRICAL ENGINEERING

**The Faculty of Electrical Engineering (FEE)** offers first-class education in electrical engineering, telecommunications, automation, space and aviation engineering, informatics science and engineering, and computer science and engineering. The FEE Informatics and Computer Science programme ranked first in the latest survey conducted by *Hospodářské noviny*, a leading Czech newspaper. FEE graduates have among the highest starting salaries in the country, and often progress to leading positions in industry, government institutions, research establishments and universities.

The faculty offers the following study programmes taught in English:

- Electrical Engineering and Computer Science (BSc)
- Electrical Engineering, Power Engineering and Management (MSc)
- Electronics and Communication (MSc)
- Cybernetics and Robotics (MSc)
- Open Informatics (MSc)
- Biomedical Engineering and Informatics (MSc)
- PhD programmes, covering a broad range of fields of Electrical Engineering and Computer Science

All study programmes are closely linked with research work. FEE is among the top five research institutions in the Czech Republic, and generates about 30% of the research output of CTU. We collaborate extensively in research with other universities and with research institutions worldwide. FEE offers innovative solutions to industrial partners,

participates in space research programs and works for government agencies, including military and security institutions. FEE has been successfully supporting the creation of spin-off companies.

### FEE CTU 2014 in numbers

- 17 departments located on the Dejvice campus (the main CTU campus) and on the Karlovo namesti campus.

Academic staff:

- 55 full professors
- 79 associate professors
- 359 assistant professors and researchers

Students: over 3 500 in total

- 1823 undergraduate students (BSc)
- 1 040 master students (MSc)
- 569 PhD students

International BSc and MSc students: 512  
(from more than 45 countries)

incoming exchange students: 307

International PhD students: 86

FEE receives a total of CZK 513 million of research funding per year from external sources.

- 247 Science Citation Index journal papers
- 234 industrial contracts
- 230 research projects  
(including 46 international projects)

Sources of income:

- Research: 64%
- Contracts and other income: 12%
- Education: 24%

## ENGINEERS WITH THE BIGGEST INPUT OF NATURAL SCIENCES, AND NATURAL SCIENTISTS WITH THE BIGGEST INPUT OF ENGINEERING

**N**uclear physics is one of the most difficult fields of university study. How would you summarize the characteristic features of students at your faculty?

Our faculty is far from being only nuclear physics. The education that we offer is based on mathematics, physics and informatics, and of course studies of relevant foreign languages. This is the foundation for preparing our students to work on modern applications of natural sciences in engineering and in science. In brief, our students are engineers with the biggest input of natural sciences, and natural scientists with the biggest input of engineering.

**The faculty has its own nuclear reactor for training purposes and its tokamak fusion reactor. The laboratories are equipped with modern lasers and other high tech instrumentation. In terms of equipment, how can you compare your faculty with other European universities in your field of specialization?**

The greatest resource of any faculty, including ours, is its people – their knowledge, their skills and their abilities. In this respect, we have a long list of internationally recognized scholars. The reactors that you have mentioned really do make our university and our faculty a unique workplace. We also have other top-level laboratories, which attract high-quality foreign students to our faculty. At the same time, we are based in Prague, a region that has been significantly underfunded over a long period of time. In other words, we have good foundations, but there are some

selected types of experimental facilities that need to receive further support.

**The students of your faculty are very active in terms of studying abroad as exchange students and in scientific and research institutions. Is this linked with the broad scientific and research collaboration between your faculty and institutions abroad? What are your priorities in this?**

Our priority is quality, as concerns both students and collaborating institutions. The emphasis is on mutual benefit and synergetic effects. We are not, and we do not want to be, a supplier of talents for someone else. We keep looking for opportunities for our people to go abroad, and we create good conditions for them, but the successful return of students and young researchers from foreign institutions is proof for us of our good work and of the attractiveness of our faculty.

**How does it come about that graduates of your faculty get good positions not only in the fields that they have studied – nuclear energy, physical engineering and mathematics, IT, etc. – but also in management and non-technical fields?**

I have to go back to the rigorousness of their preparation in their first semesters at the faculty, which provides the students not only with factual knowledge but also with a culture and style in their thinking. With this preparation, graduates can quickly and effectively master other activities and tasks, including of course management skills at various levels. Our graduates are top graduates, in the broadest sense of the word. ■



## FACULTY OF NUCLEAR SCIENCES AND PHYSICAL ENGINEERING

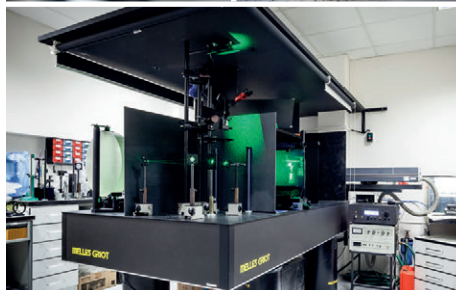
**The Faculty of Nuclear Sciences and Physical Engineering (FNSPE)** of the Czech Technical University in Prague is a relatively young and dynamic teaching and research institution operating at the interface between modern science and its applications in technology. The academic staff consists of 42 professors, 40 associate professors, 60 assistant professors and 65 researchers.

The faculty offers 16 bachelor and 16 master study programmes, and a doctoral study programme. There are 889 students at bachelor level, 294 at master level, and 308 at PhD level. Students elect their self-governing bodies and organise a wide variety of social, cultural and sporting activities. Their representatives on the Faculty Senate and on other boards make a significant contribution

to the decision-making process and thus participate in all aspects of faculty life.

The study programmes are based on a thorough knowledge of mathematical methods as well as experimental and theoretical physics, chemistry and information technologies. Progressively, the studies are directed towards engineering applications of these sciences. The main educational principle of the faculty is that each student should participate in various research projects. This system prepares graduates who can adapt easily to broadly oriented research teamwork, who can fit into scientific and industrial R&D projects as required, and who are prepared for future developments in technology.

Science and research work performed at the faculty covers a range of applications in the natural sciences, from fundamental





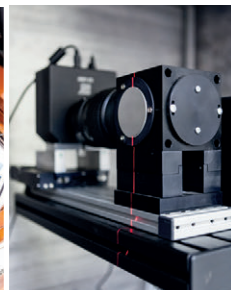
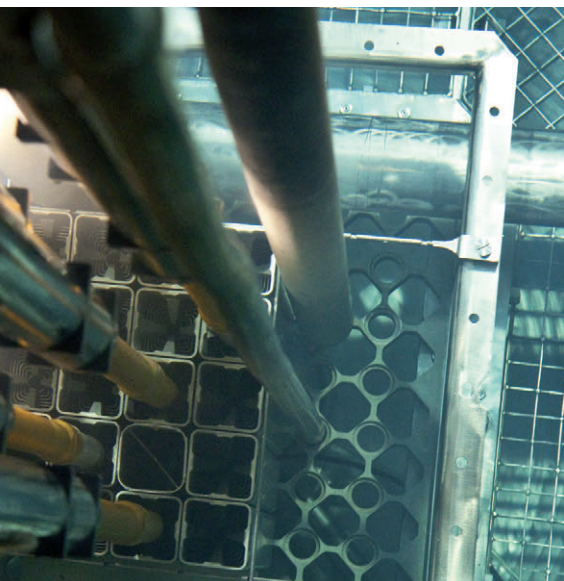
research to close cooperation with industry: applied nuclear sciences (reactor physics and technology; particle physics; dosimetry; applications of ionizing radiation, radiation protection and safety; nuclear chemistry); physics in advanced technology (quantum electronics and laser technologies, plasma and solid state physics, material engineering, nanotechnology, cosmic research); many fields of mathematics, informatics and software engineering. Interdisciplinary projects for application in ecology, medicine, biology, economics, archeology and many other areas are often undertaken at the faculty.

For teaching and research purposes, the faculty offers several large research facilities, e.g. the VR-1 training nuclear reactor, the GOLEM tokamak, the Satellite Laser Ranging Station in Egypt, scanning electron microscopes and AFM microscopes, high-performance and medical laser systems and

computing clusters. There are specialized laboratories for optics and holography, ion beams, advanced detection technologies, mechanical testing, spectroscopy (optical, gamma, laser, etc.), photonics, advanced radiochemistry, etc.

More than 70 universities and scientific institutions from more than 45 countries cooperate with or support research at the faculty, including leading international scientific institutions such as CERN, BNL, GSI, FERMILAB, JINR Dubna, etc. The faculty is also involved in many large-scale projects, such as ITER, JET, ELI, PALS and COMPASS. It is unique in providing education in both particle physics and nuclear physics.

The Faculty of Nuclear Sciences and Physical Engineering collaborates with more than 40 companies and applied research institutions, including ČEZ, NVidia, Honeywell, Škoda Power, Škoda JS, Siemens, IBM, Crytur, SÚJB, and GE Aviation. ■



## APPLYING THEORETICAL KNOWLEDGE IN STUDIO EXERCISES

**Not only graduates but also students of your faculty frequently win awards in various architecture competitions. Is this due to the support for creativity given by personalities recognized by the students, or is there some other cause?**

It's not possible to pick out a single dominant element that influences success in competitions. Of course, we attempt to provide support for creativity, and the number of recognized personalities concentrated in our faculty is obvious for anyone to see. Winning in competitions is of course a clear sign of the quality of the school, the students and the graduates, and it is very pleasing for us. However, the main thing is for students to establish themselves professionally. This is good for the graduates and also good for the quality of the architecture and the environment around us. Given the size of the faculty, it is important not to concentrate only on top performers, but also to pay attention to the overall quality of our graduates.

**How would you characterize the kind of graduate that can measure up to international competition?**

Our graduates are sought-after as colleagues, and work effectively in architecture studios abroad and at home, above all due to their versatility, and due to the comprehensiveness of their education, with its strong technical foundations. It can be the case that, in comparison with the most prestigious schools of architecture in Europe, our graduates do not have so great skills in conceptualizing and in communicating about their projects. However, doing well in the face of international competition in architecture

depends on many other criteria, and not just on the quality of the graduates. This is felt more in architecture than in purely technical fields.

**Is the concept of architecture education as a synthesis of art, science and engineering still valid, as it was in the mid 18<sup>th</sup> century, when it was first introduced at our university?**

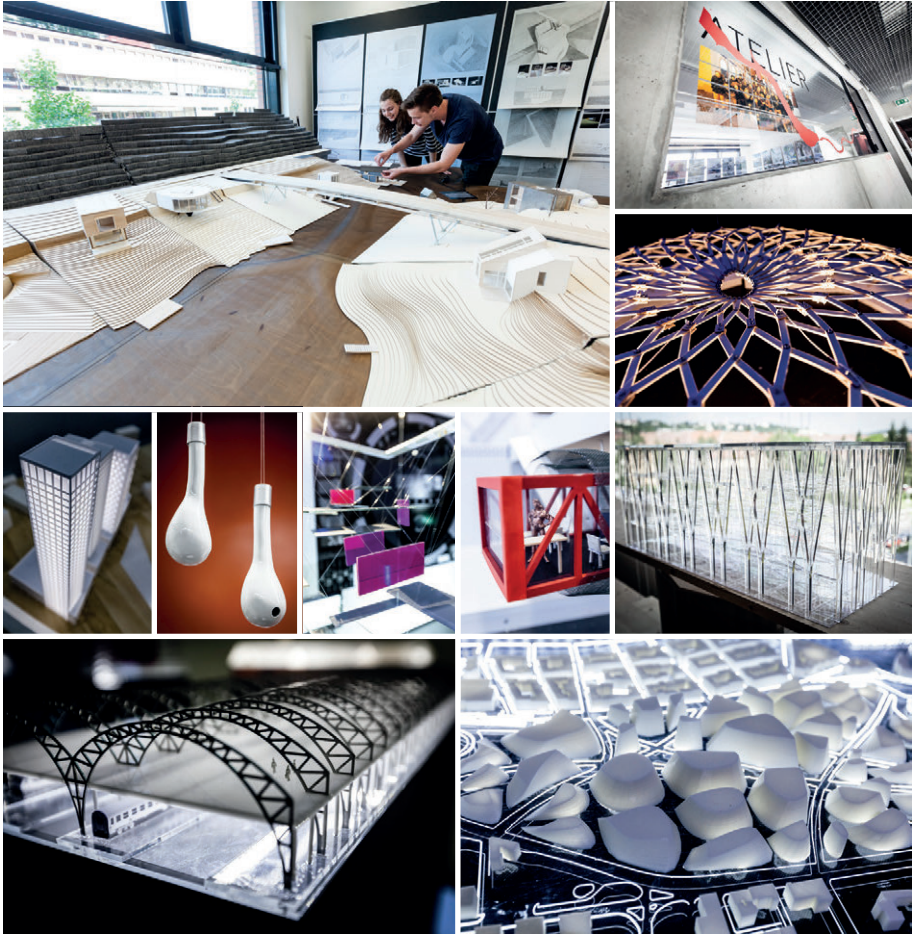
Despite the ever-greater specialization in all aspects of human activities, architecture has remained a profession where the education and the practical applications are wide-ranging, and where versatility is required. In the process of approving study programmes in the EU countries, attention is given to ensuring that there is no so-called premature specialization. Much attention is given to ensuring that the first four years of studies include all aspects and fields of architecture and urbanism.

**You are a recognized architect with international experience, and you received a prestigious award from the American Institute of Architects. In your opinion, how does the Prague faculty of architecture compare with other schools in the world?**

Within the European space, we are one of the faculties that are based on the traditional combination of a broad spectrum of theoretical courses, and on applying the knowledge that has been acquired in studio education. Due to the size of the faculty and the numbers of students, we keep to this traditional model, but at the same time, when evaluating our work, we attempt to strengthen the interconnectedness between taught courses and practical classes. ■







FACULTY OF ARCHITECTURE

**The Faculty of Architecture at CTU in Prague** is the oldest institution in the Czech Republic that offers university education with study programmes in Architecture and Urbanism, Landscape Architecture, and Design. The present-day range of study programmes covers a broad spectrum of courses on designing structures, residential

buildings, zones and landscapes, and also on industrial design. The system of structured studies is organized into three levels (bachelor, master and doctoral), with students not restricted to groups according to their year of study. This allows students to plan and carry out their studies individually, including study



abroad, internships and other educational activities.

A large part of the studies at the faculty is traditionally taught in a progressive manner through specific projects carried out in studios. The opportunity to choose the leader of a studio project for each semester ensures direct feedback between students and teachers. Students are taught in so-called “vertical” studios, in which students from the second year to the fifth year work alongside each other on various projects. The main advantage of this way of working is that students collaborate with each other while working on similar topics. They also learn to communicate well with the leaders of the studio. The projects are supervised by leading architects, urban planners and designers from the Czech Republic and abroad.

Students join in real projects and research studies, and work on current issues in housing, town planning, design and landscape creation. The Research Centre for Industrial Heritage of the Faculty of Architecture, CTU in Prague, is the only workshop in the country that systematically gathers the results of studies carried out on industrial monuments for the unique Register of Industrial Monuments in the Czech Republic. The Institute of Intermedia, a joint workshop of CTU and the Academy of Performing Arts, offers a platform for international collaboration involving students and teachers from technical and artistic fields of study. Building structures in relation to the needs and the development of society is a central topic in the research carried out at the workplace of the Institute of Building Science, which works on transforming big residential estates and on specific typologies

of social institutions. The MOLAB office for model projection collaborates with universities all over the world on computer-aided design, and participates actively and successfully in the eCAADe conference (Education and Research in Computer Aided Architectural Design in Europe).

Since 2011, the faculty has been housed in the CTU New Building, which is an authentic, vital space for studying and for intensive communication between students and teachers. The faculty building also functions as an exhibition and conference centre in which international congresses are held: the 2015 AESOP Congress in Prague (Association of European Schools of Planning), eCAADe 2012 (Education and Research in Computer Aided Architectural Design in Europe), and also regular or once-off conferences and workshops: Inventory of urbanism, Residential estates, what to do with them? Ageing populations, new trends, Design, Antidesign, The city park. Thanks to these events, the faculty functions as an academic platform for current social topics.

The vision underlying the teaching process at the Faculty of Architecture is that it should provide students not only with specialist knowledge in their whole broad field of study, but also with an image of the world in its entire context and with all the issues that have an influence on present-day architecture. The aim of our study programmes is help students to find knowledge in their field of specialization and in interdisciplinary linkages that meets the current demands for the work of architects and designers, and which they can implement in their professional work. ■

## TRANSPORTATION IS A TYPICAL MULTIDISCIPLINARY ENVIRONMENT

**Transportation affects just about everyone.**

**What is it that distinguishes the students and graduates of your faculty, who should be specialists in this field?**

A characteristic feature of our times is the ever-increasing demand for transport. It has to be reacted to in an appropriate manner, in accordance with the transport policies adopted at the different levels of public administration – the town, the region, the state, Europe.

Transportation is a typical multidisciplinary environment, and to gain a comprehensive understanding it is necessary to acquire knowledge from a number of areas and to learn how to put it all together. For this reason, our students are systematically led toward studying transportation with the aid of systems engineering instruments. The demand for transportation is closely dependent on urban planning, on the location of production plants, schools, etc. A transportation system cannot be designed and managed without some knowledge of construction, mechanics and IT. The behaviour of participants in the transport system also requires some knowledge of psychology, sociology and law. At the same time, logistics is closely linked with the principles of economics and management.

A successful graduate of our faculty should be able to combine all of this knowledge to work on projects that have a long-term effect on the whole of society.

**Movement of people and goods is a worldwide phenomenon. Do the students get involved in international projects?**

One of the advantages of transportation is its international scale, thanks to which our students are able to take part in a whole range of

interesting international projects. The double-degree master's study programme with the University of Texas at El Paso in the USA enables us to work on transatlantic transport issues, which often lead to comparisons with the business, operational and legislative conditions that are valid in Europe and in the USA. At the same time, we collaborate with the countries of the former Soviet Union and with China, because east-west traffic is going to play an ever-greater role in the future. Thanks to these opportunities, our graduates can find good jobs in the worldwide employment market.

**What new things are being prepared?**

We are currently working on getting some new fields of study accredited, and on making them attractive. In the field of science and research, we are preparing a series of research projects with our partners abroad, on topics ranging from transporting goods by pipeline to testing virtual transport signage. Thanks to the development of technology, people are beginning to talk of mobility services, for which we need to define the quality parameters, by analogy for example with telecommunication services.

**What has made you happy in recent times?**

From a personal point of view, I'm very pleased that the Association for Transport Telematics of the Czech Republic, of which I've been the president for several years, has been voted the leading ITS National Platform among the 27 national member associations. In my opinion, this is a high rating for Czech transport telematics, and at the same time for the activities of the Faculty of Transportation Sciences. ■





## FACULTY OF TRANSPORTATION SCIENCES

**In the 1950s**, university education in the field of transportation in Czechoslovakia was offered only in Žilina, in Slovakia, and the activities of the Faculty of Transportation Sciences at CTU in Prague were not restored until 1993, shortly after the separation of Czechoslovakia into two countries.

The mission of the faculty in its modern conception is to prepare graduates to work successfully on transport projects with a long-term impact on the whole of society. Transportation is a typical multi-disciplinary environment, and in order to acquire a comprehensive understanding of the issues, it is necessary to gain extensive knowledge and, mainly, skills in a range of fields, and to learn how to make linkages. Our students are therefore taught to investigate transportation using the instruments of systems engineering. The present era is characterized by an ever-increasing demand for transport, to which it is necessary to react in an appropriate manner, in accordance with the transport policies adopted at each level of public administration (town, region, state, all Europe). The demand for transport is closely

linked with urban planning, with the location of factories, schools, etc. A proposal for the design of a transportation system, and then controlling that system, requires knowledge of civil and mechanical engineering and information technologies. A study of the behaviour of participants in transport operations (travellers, drivers, pedestrians, haulage companies, etc.) also requires some knowledge of psychology, sociology and law, and is closely linked with knowledge of economic and management approaches. Studies and research at the faculty take place not only in the classroom but also to a considerable extent in laboratories and in specialized workplaces belonging to partners in a number of leading scientific institutions and in industry. The participation of staff and students in the European Framework Programmes in commercial research is ensured by the project-oriented education offered to students from the third semester of their bachelor study programme, in which they work on current problems in the field of transportation and telecommunications.





Topics currently under investigation include research and development in the field of vehicle simulators, which leads on to HMI (human-machine interface) modelling. On these simulators, students can study the placement of the control elements in a vehicle, and the effects of fatigue, alcohol and drugs on the behaviour of a driver/operator. We currently have a number of prototypes of simulators for cars, trucks, and also motorcycles and quad bikes. Another topic is intelligent transport systems, where the Faculty of Transportation Sciences works on applications, i.e. on specific uses of instrument-intelligent transport systems and safety equipment. In another student project, on Technology for Near Space, students work on progressive space technologies, such as satellite navigation, dedicated telecommunication and telemetric systems, energy extraction, and other topics, with support from the European Space Agency (ESA).

Smart Cities, a major theme in European research, is linked with these projects. We can summarize the issues in smart cities as follows: integrate the development

processes for people's housing, countryside, transportation of all types, protection of the environment, smart grids, electromobility, ICT and community services. Research is therefore carried out on a comprehensive heterogeneous system or alliance of systems. This is a meeting point for applications of systems architecture, strategic identity and organisation tasks, with the use of information outputs carried mainly by information and transportation subsystems. Our research partners are associations and institutions of the state administration in the Czech Republic and abroad, for example Škoda-Auto, Volkswagen, Dekra Automobil, SPEL, Eltodo, TÜV-Süd, RODOS, ESA, MD ČR, MMR ČR, AŽD, SFDI, České dráhy, KAPSCH, SKANSKA, and others. An important benchmark for our success is the jobs that our graduates find on the employment market. The Faculty of Transportation Sciences is proud of the very low level of unemployment of its graduates, and of the large number of recognized experts who are our graduates, working in key positions in transportation and telecommunications. ■

## TECHNOLOGY AND MEDICINE ARE MUCH CLOSER THAN PEOPLE THINK

**The Faculty of Biomedical Engineering has a highly interdisciplinary focus. Do you maintain a balance between focusing on technology and focusing on medicine, or does technology prevail considering the fact that you are a part of a technical university?**

We have more students of technically-focused fields of study, with the ratio being 1.5:1. Nevertheless, I would like to emphasize that during the course of her or his studies every engineer is sufficiently grounded in the fundamentals of medicine, and every medically-oriented student is exposed to a significant number of hours of mathematics, physics and other appropriate technical subjects. I believe that technology and medicine are much closer to one another than many people think. In some countries, they have progressed so far that some technical universities even have a faculty of medicine. Believe me, if we could manage to attain this kind of symbiosis here, there would be great benefits both for the faculties and eventually for patients as well.

**Medical equipment and devices have developed greatly and rapidly in recent years, and nowadays they help in situations where neither medicine nor engineering was able to help in the past. How is your faculty prepared for this pace of development?**

The progress of medicine depends on ever-improving diagnostics and therapy. However, technology and technological development play a great role in both of these aspects of medicine. Over the nine years of the faculty's existence, we have managed to establish numerous excellent research teams that cooperate with our top hospitals and also with the Czech Academy of Sciences,

the IKEM Institute, foreign research teams and institutes, etc. They follow the latest trends and are very successful at obtaining the required funding. I consider it a highly promising fact for the future that many of our graduates, after completing their doctoral studies, combine their professional life with our faculty. It is for young, starting researchers that we have made available the funds that we have managed to save from European projects in order to purchase research and scientific equipment worth tens of millions of crowns. This equipment will enable them to be more active in research, it will facilitate the formation of new research teams, and it will bring our faculty significantly closer to research-oriented institutes.

**Your students get to know state-of-the-art medical technologies not just on the theoretical level in your modern laboratories. They have practical internships in regular hospitals as well as in top facilities, such as the Proton Centre in Prague. Students with such experience must find it easy to get a job after graduating...**

I will respond by mentioning a report in the press. According to a table prepared by the Education Policy Centre of the Faculty of Pedagogy of Charles University, our Faculty of Biomedical Engineering took top place in a ranking of the success of students in finding jobs after graduating. The unemployment rate of the graduates of FBMI (2014/2015) was zero. This means that all our graduates found jobs after completing their studies with us. Our faculty has even outperformed the faculties of medicine of Charles University and the Faculty of Law at Charles University. ■







## FACULTY OF BIOMEDICAL ENGINEERING

**When the Faculty of Biomedical Engineering** was accredited in May 2005, no one would have expected it to develop so dynamically. Within a brief period of time, a modern university institution has been set up that has aroused exceptional interest among students. We have also been able to set up a number of internationally recognized teams of scientists around whom much of the scientific and research work of the faculty is concentrated.

There are three study programmes and thirteen study branches at bachelor, master and doctoral level, some of which are also offered on a part-time basis and in English or Russian language. This provides plenty

of choices for students who want to spend their professional life in an environment where they will need good knowledge and skills drawn from technically-oriented courses and also from courses dealing with theoretical and clinical medicine. Dozens of modern laboratories equipped for teaching and for research, together with months of practical internships in leading health facilities, in institutes of the Academy of Sciences and in production companies, are attributes that attract good numbers of applicants to study at the faculty. New fields of study have been accredited and existing programmes are upgraded in response to all the new findings in technical and medical



research. The fields of study that we offer are promising, exciting, and intellectually enriching. We currently have over 1 800 students, and about the same number of students have already graduated from the faculty. The faculty has a staff of 250. The scientific, research and development work carried out at the faculty is based on a combination of engineering and medicine. What kinds of research do we carry out? Let us mention research in the field of nanotechnology and nanomaterials for implants and tissue engineering. We work on the use of nanodiamonds in medicine. They will be used as nanosensors and markers for high-definition imaging of the cell structure, for detecting early stages of cell mutation, and as systems for targetted transportation of medicines. In the field of biotelemetric systems, we work on scanning, transmitting, online processing, displaying, archiving and offline processing of biological signals in real time. In the field of extreme ultraviolet radiation (electromagnetic radiation with wavelengths of 1–100 nm). Applications are anticipated through lithographic approaches to the production of electronic elements for high integration in cell imaging. Researchers working on evaluating the rehabilitation process monitor patients' movements during their rehabilitation, and the reaction of the cardiovascular apparatus. They use virtual reality for the rehabilitation of patients with balance impairments, and monitor the rehabilitation process after movement impairments. In the field of non-conventional artificial lung ventilation, research is carried out on the application of new ventilation techniques to overcome the respirational inadequacies

of child and adult patients. Our research on public safety deals with new trends in health care for dealing with catastrophies. We study chemical, biological, radiological and nuclear materials, and also pathophysiological processes in stressful situations. The scientific and research activities of the faculty also extend to evaluating the position of the eyes, the head, the limbs and the body, for example in Parkinson's sufferers, in clinical practice. Our investigations of bio-electromagnetism deal with instrumentation for so-called microwave hyperthermia, for use in combination with radiotherapy. This research group is also developing methods and a system for mapping the bioelectric activity of the heart. Researchers work on evaluating medical technology, systems for providing and funding health care, and the economics and management of health care. This group of scientists forms the institute at the faculty that elaborates expert opinions and expert reports, and also provides consultations in the field of biomedical engineering. Medicine in the 21<sup>st</sup> century is linked with highly-sophisticated instrumentation, complicated technical aids, instruments and equipment. Our task is to educate specialists able to participate in developing new medical technology, and also to prepare specialists ready to work with the latest medical technology. In addition, we must prepare scientists and researchers who will drive biomedical engineering forward. Everything that we do is directed toward providing more effective health care, with higher-quality diagnosis and better treatment. ■

## THE STUDENTS MASTER VERY COMPLICATED ICT TECHNOLOGIES

**In your classes, are you able to keep up with the enormous speed at which IT has been developing?**

I think we do succeed in this, and it's certainly one of the faculty's priorities. We can provide various examples as evidence that we are succeeding. Students' final bachelor and master projects typically involve solving technical problems using the latest technologies. The SAGELab classroom and laboratory provide a good example. New optional courses appear every year, in reaction to technological innovations: the Internet of Things, mobile applications, programming multicore processors, etc.

**Does the faculty collaborate with prestigious companies in the field of informatics?**

Collaboration with prestigious and high-quality companies provides important momentum for the faculty to meet the targets that I have just mentioned. Technologically mature companies have a unique infrastructure, and they come up with research topics that are currently of interest for specialists and that are at the same time motivated by practical requirements. The results of these projects are subsequently applied and developed. A broad range of topics in informatics are dealt with, for example processing and analyzing large data sets, implementing highly-reliable computation systems, predictive modelling, and information security. In 2013, we piloted the Collaboration with Industry portal, through which dozens of successful projects have already been established. We prepared a partnership program in 2014 for companies that want to work very closely with the faculty. A list of partners is available on our web pages.

**IT people are special types. What is it like when 2 000 of these personalities come together under a single roof, even while they are still students?**

I know that's how we are seen from the outside, but we're not really such a special kind of people. Informatics is a complex and demanding field, as the students are well aware. Most of them are demanding towards their teachers. We all, on both sides, make big efforts to improve the quality of the instruction. For example, we give questionnaires to the students and evaluate the results very carefully. The students observe the level of the information systems very closely, and are very critical of any shortcomings. Many of them help us to improve the IT support at the level of the Faculty of Information Sciences, and at the level of CTU. The students are very skillful in using and mastering extremely complicated ICT technologies. Every student has at the very least her or his own notebook, and they operate their own student servers. Enthusiasm for ICT is even transmitted into a special ICT slang.

**What do you consider to be the main challenges for the upcoming period?**

There is a whole list of priority topics that I could mention. For example, maintaining the high quality of instruction, and at the same time introducing a range of measures in support of the scientific growth of young academic workers, to motivate them towards achieving excellence on a global scale. Of course, one of the priorities is to obtain sufficient resources to support scientific work and research. We must maintain our belief in setting high requirements. ■





## THE FACULTY OF INFORMATION TECHNOLOGY

**The Faculty of Information Technology (FIT)** opened in 2009 with 500 students in the bachelor study programme in Informatics. It is the youngest faculty of one of the oldest technical universities in Europe. In the 2009/2010 academic year, a master's study programme and a doctoral study programme were accredited, and classes began to be taught in 2010. At the end of 2010, the faculty acquired modern office space and teaching facilities in the CTU New Building on the university's main Dejvice campus and other rooms in the adjacent A Block of the Faculty of Civil Engineering, which CTU then reconstructed extensively in 2013. The faculty, which already had a well-established staff, now also had good rooms and facilities to call its own. After five very dynamic years of constantly constructing, equipping and growing, FIT had grown into a standard medium-size faculty. There are about 100 members of academic staff in a total of five departments. Because of the low average age of the staff, the faculty needs to develop and promote its staff to become assistant professors

and professors. For this reason, it is very important that FIT was awarded the right to carry out habilitation procedures in 2014, and is now able to promote its own staff to senior academic posts. There are now 2200 students in the three stages of the study programme in Informatics. Each year, about 250 bachelor students and 150 master's students graduate. The bachelor and master programmes in Informatics are divided into six special fields. These cover most of the topics in informatics in a way that offers students a broadly-based education that meets the requirements of informatics in the 21<sup>st</sup> century. Some fields of study can now also be studied in English language. The faculty has been keeping pace with the dynamic speed of developments in informatics. It frequently introduces new optional courses and updates courses that are already offered. In addition to more established fields of study, such as Software Engineering and Computer Engineering, students can now study Knowledge Engineering and Computer Security. The





faculty places great emphasis on the quality of students' final projects, and its students take leading places in national competitions for the best bachelor and master's projects. FIT has been developing its international activities successfully. In relation to the number of students, it has the highest proportion of student Erasmus+ mobilities of all the university's faculties. Two courses are being taught by visiting professors from abroad. FIT is a member of Informatics Europe, the leading association of faculties and departments of informatics in Europe, and in 2010 the faculty organized the association's annual European Computer Science Summit in Prague. FIT also participates actively in organizing scientific conferences. In addition to the annual Prague Stringology Conference, the TOOLS 2012, ARCS 2013, EEWC 2015 and ECOOP 2015 conferences have also been held at CTU. The participation of the faculty's staff in organizing these major conferences reflects the strengthening of the research carried out at the faculty. There are nine research groups working at the faculty: Applied Mathematics,

Applied Numerics and Cryptology, Arbology, the Centre for Conceptual Modelling and Implementation, Digital Design and Reliability, Computer Intelligence, Computer Networks, Parallel and Distributed Computation, the Prague Stringology Club, the Intelligent Web and Network Security. FIT was the first faculty in the world to set up an Arbology research group. It works on elaborating tree structures using instruments from the theory of automata. This field of study continues to be developed actively by members of the faculty staff. The range of research topics investigated at the faculty reflects the structure of the fields of study included in the study programmes in Informatics. Last but not least, FIT has been seeking effective ways to collaborate with industrial companies. In 2014, the Portal for Collaboration with Industry was set up as a pilot project. Using modern data mining methods, this portal aims to get FIT students and staff into contact with companies and to start working with them on research projects. ■

## MASARYK INSTITUTE OF ADVANCED STUDIES

**The Masaryk Institute of Advanced Studies** (MIAS) was established as a separate academic unit of CTU in 1992, at a time of major social, economic and political change in Central Europe. It bears the name of Tomas Garrigue Masaryk (1850–1937), the founder and first president of independent Czechoslovakia. MIAS took over some of the activities of the former Research Institute of Engineering Pedagogy, and also revived the tradition of research and education in economics, which had been an integral part of CTU until the second half of the 20<sup>th</sup> century. Alongside the eight Engineering Faculties of CTU, and in close cooperation with them, MIAS has always focused on interdisciplinary and complementary disciplines, including economics, management studies, language studies, regional development, engineering teacher education and history of engineering. Since its inception, the core activities of MIAS have included teaching in publicly accredited university programmes, and awarding bachelor, master and doctoral degrees to its graduates. From 1994 through 2014, a total of 678 students, many of whom have attained key managerial positions in industry, in international business or in public administration, have also graduated from a highly successful joint MBA program with Sheffield Hallam University. In the early 1990s, MIAS acquired JASPEX, an experienced and prestigious provider of language education. This acquisition has helped MIAS to become a leading and certified institution in the area of general and specialized language training for professionals, academics and the general public.

MIAS currently has over 1 300 students enrolled in accredited bachelor, master's and doctoral study programmes, and over 50 in-house teaching and research staff, supplemented by a number of visiting lecturers, supervisors and professional consultants. In addition, hundreds of participants attend professional courses, qualification courses and language courses and seminars organized by MIAS and tutored by a well-formed blend of academics and practitioners. MIAS and its academic staff also participate in numerous research projects, both domestic and international, and provide advisory services and training programmes for companies, professional bodies and public agencies, and also for other academic and non-academic units of CTU.

Internationalization is a strategic priority of MIAS, and many of the services offered by the institute reflect this orientation. There are preparatory courses in English, and also in Czech as a foreign language, which are specially designed for foreign students aspiring to enroll at CTU or at other Czech universities. Rigorous foreign language training traverses the whole curriculum for undergraduate students, and enrolment in courses taught in English is compulsory for students in the Czech-language master's programme. MIAS also strongly encourages international mobility of its students and staff, receives incoming exchange students and develops full-time study programmes in English, targeting a broad international pool of talent with the ambition to cross cultural and professional boundaries and succeed in a global economy.



On the basis of its background, tradition and institutional foundation, MIAS is uniquely positioned to offer prestigious university degree programmes featuring a robust theoretical background, meaningful insights into particular industry sectors, and also a high level of communication proficiency and good intercultural skills. Its graduates are

well prepared for various professional roles in industry, project management, international business, innovation, and industrial and regional policy. At the same time, MIAS is not a large institute, and its lean organization contributes to a trusting and inspiring environment that is supportive of diverse dispositions, interests and talents. ■



## OTHER HIGHER EDUCATION INSTITUTES AND RESEARCH UNITS

### **Institute of Experimental and Applied Physics (IEAP)**

IEAP is a scientific-academic unit of CTU oriented on Physics of the Microworld and its applications. In its research, the Institute is deeply involved in the following long-term programs: Fundamental experiments in Physics of the Microworld, the ATLAS experiment at LHC at CERN, Cooperation with CERN, the Materials Analysis and Characterization Research Center, and the Astroparticle and Astrophysics Experimental Research Centre.

<http://www.utef.cvut.cz>

### **Klokner Institute**

This Institute (established in 1921) was the first research institute to be set up at CTU and one of the four oldest self-standing research institutes in Europe. Main goals: comprehensive assessments of the reliability and risks of civil engineering structures in response to the effects of exceptional loads and efforts of the environment; material engineering in the field of silicate and polymer composites; developing a system for long-term monitoring of the behavior of building structures.

<http://www.klok.cvut.cz/>

### **Czech Institute of Informatics, Robotics and Cybernetics (CIIRC)**

The mission of CIIRC is to create an environment for conducting internationally competitive research, to attract top quality personalities and to open the possibility for them to participate in educating excellent master level and PhD level students at several CTU faculties.

<http://www.ciirc.cvut.cz>

### **University Centre for Energy Efficient Buildings (UCEEB)**

The Centre is an interdisciplinary research facility of CTU. The main focus is on environment-friendly energy-efficient buildings providing a healthy indoor environment. The Centre will bring together a critical mass of knowledge from civil engineering, mechanical engineering, material science, electrical engineering and biomedicine needed to fulfill its mission: to support the introduction to the market of environment-friendly energy efficient buildings providing a healthy indoor environment.

<http://uceeb.cz>

### **Institute of Physical Education and Sport**

<http://www.utvs.cvut.cz/>



### CTU Board of Directors

The CTU Board of Directors expresses its views especially on the long-term plan of the university and on other basic issues concerning the university. The Board is made up of people from public life and from the engineering industry. The members are top managers of leading industrial companies and representatives of professional associations. The Board of Directors expresses its view on

the university budget, on the CTU annual activity report and the CTU annual financial report, and on the results of evaluations of the university's activities. Members of the Board are appointed and removed from office by the Minister of Education, Youth and Sport, in consultation with the rector of the university. People employed by the university may not be appointed members of the Board of Directors. ■



Address: The Czech Technical University in Prague  
Zikova 4, 166 36 Prague 6, Czech Republic

<http://www.cvut.cz>





# 2

Study and Student Affairs

## OUR TREND: PROGRAMMES TAUGHT IN FOREIGN LANGUAGES

**What defines the quality of the study programmes at CTU, and ensures that the University's graduates generally find good jobs?**

The quality of the study experience doesn't come only from the academic staff. It is also influenced by the infrastructure that is provided, by the modern laboratories for experimental work, by the support for student mobility, etc. These are elements that contribute to the personal development and the employability of our graduates.

**What changes have there been in the composition of the study programmes offered by the faculties of CTU? Which changes have interested applicants most?**

In 2014 and 2015, 140 study programmes and specializations were reaccredited, had their accreditation extended, or were newly accredited. Our faculties have close links with the private sector. New study programmes in the fields of Emergency Planning and Communication Technology in Medicine have been set up at the Faculty of Biomedical Engineering. The Faculty of Civil Engineering now offers a study programme in Power Engineering Structures. The Faculty of Electrical Engineering has introduced a study programme in Electronics and Communications. The Faculty of Mechanical Engineering is planning a study programme in the Construction and Production of Parts. The Faculty of Information Technologies now educates specialists in designing and programming embedded systems. The Faculty of Transportation Sciences offers study programmes in Logistics and

Management of Transport Processes and in Security Technologies in Transportation. The Faculty of Architecture has introduced a study programme in Landscape Architecture. The Faculty of Information Technology has also been registering a big increase in the numbers of applicants, even without changing its accredited study programmes and profiles.

**In the 2014/2015 academic year, fifty study branches were accredited in English language or in another foreign language. Will this offer be extended?**

In future academic years, we are reckoning to extend the number of programmes offered in foreign languages. However, one of the prerequisites is to have enough academic staff members who are qualified not only academically, but also linguistically. The faculties give their support to study programmes for self-funding students in a foreign language.

**Does the university use the potentialities of its expert staff for other educational activities apart from bachelor, master's and doctoral study programmes?**

The faculties offer further education courses for their students and staff, and also for others. In the framework of lifelong learning, the faculties provide teachers and facilities for courses open to all groups of people. The courses are professionally-oriented and lead to further skills and qualifications for the successful participants. There are also courses for seniors, and preparatory courses for the faculty entrance examinations for secondary school students. ■







## ORGANIZATION OF STUDY PROGRAMMES

CTU offers accredited bachelor, master and doctoral study programmes. Each faculty, and also the Masaryk Institute of Advanced Studies, offers and administers a range of its own programmes.

### Bachelor study programmes

The standard length of a bachelor study programme is 3 or 4 years. The study plan includes some optional courses and a final bachelor project. By their choice of optional courses and their final project, students are able to shape their studies in accordance with their own interests.

Bachelor students are required to pass language tests in two foreign languages. Students are recommended to spend at least one month of their studies within the framework of an exchange programme at a foreign university. A bachelor study programme is duly completed by the state bachelor examination.

All graduates automatically receive a Diploma Supplement, which specifies that the title Bc. is a bachelor degree.

### Master study programmes

Master study programmes are open to bachelor graduates. The standard length of a master study programme is 1.5 or 2 or 3 years. The obligatory courses in a master study programme ensure that the programme is challenging and of high quality. Work on a scientific project (or a creative project) forms an integral part of each master study programme.

We recommend students to study for at least one semester at another university, preferably abroad. Special attention is given to developing students' presentation, communication and managerial skills. Graduates are awarded the title Ing. (i.e. engineer). At the Faculty of Architecture and at the Faculty of Civil Engineering (study programme in Architecture and Construction) the title awarded is Ing. arch. All graduates automatically receive a Diploma Supplement, which specifies that the title Ing. or Ing. arch. is a master degree.

### Doctoral study programmes

The standard length of a PhD study programme is 3 or 4 years. In the education of doctoral students, the key personality is the supervisor, i.e. a teacher with research and teaching qualifications at the level of professor, associate professor or senior scientific worker. At least a one-semester study stay at a foreign university forms a recommended part of the programme. All doctoral study programmes at CTU are also accredited and offered in English language. ■

## NUMBERS OF STUDENTS IN ACCREDITED STUDY PROGRAMMES (DECEMBER 2015)

	Bachelor studies	Follow-up master's studies	Doctoral studies	TOTAL
<b>Faculty of Civil Engineering</b>				
technical studies	2 941	1 394	458	4 793
<b>Faculty of Mechanical Engineering</b>				
technical studies	1 908	694	293	2 895
<b>Faculty of Electrical Engineering</b>				
natural sciences	278	262	0	540
technical studies	1 424	727	412	2 563
<b>Faculty of Nuclear Sciences and Physical Engineering</b>				
natural studies	825	295	281	1 401
<b>Faculty of Architecture</b>				
technical studies	795	674	160	1 629
arts and cultural studies	122	33	0	155
<b>Faculty of Transportation Sciences</b>				
technical studies	803	429	142	1 374
<b>Faculty of Biomedical Engineering</b>				
technical studies	577	422	103	1 102
health care, medical and pharmaceutical studies	632	0	0	632
<b>Faculty of Information Technology</b>				
natural sciences	1 678	554	55	2 287
<b>Klokner Institute, Masaryk Institute of Advanced Studies</b>				
technical studies	0	343	23	366
social sciences, social services	0	0	12	12
economics	909	0	2	911
teacher education, special education and social care	156	0	0	156
	<b>13 048</b>	<b>5 827</b>	<b>1 941</b>	<b>20 816</b>





## FEATURES OF THE CREDIT SYSTEM AT CTU IN PRAGUE

**A unified credit system** is used to quantify the study load of each course that is taken. The credit system at CTU is compatible with ECTS (the European Credit Transfer System), which facilitates student mobility within the framework of European programmes. At CTU, ECTS is used mainly for credit accumulation; the transfer function of the ECTS system is used mainly for foreign students and for facilitation of credit transfer when CTU students go on exchanges in the framework of the Erasmus programme.

CTU has held the Diploma Supplement Label certificate since 2010. ■

## STUDY PROGRAMMES THAT ARE OFFERED IN ENGLISH

### Faculty of Civil Engineering

#### Bachelor Degree

- Civil Engineering

#### Master Degree

- Civil Engineering

#### Doctoral Degree

- Civil Engineering
- Geodesy and Cartography

### Faculty of Mechanical Engineering

#### Bachelor Degree

- Mechanical Engineering
- Master in Automotive Engineering
- Intelligent Buildings
- Nuclear Power Energy Equipment

#### Master Degree

- Mechanical Engineering
- Master in Automotive Engineering
- Intelligent Buildings
- Nuclear Power Energy Equipment
- Aerospace and Space Technology

#### Doctoral Degree

- Mechanical Engineering

### Faculty of Electrical Engineering

#### Bachelor Degree

- Electrical Engineering and Computer Science

#### Master Degree

- Electrical Engineering, Power Engineering and Management
- Electronics and Communication
- Cybernetics and Robotics
- Open Informatics
- Biomedical Engineering and Informatics

#### Doctoral Degree

- Electrical Engineering and Information Technology

### Faculty of Nuclear Sciences and Physical Engineering

#### Master Degree

- Application of Natural Sciences

#### Doctoral Degree

- Application of Natural Sciences

### Faculty of Architecture

#### Master Degree

- Architecture and Urbanism

#### Doctoral Degree

- Architecture and Urbanism

### Faculty of Transportation Sciences

#### Master Degree

- Intelligent Transport Systems
- Transportation and Logistic Systems

#### Doctoral Degree

- Technology in Transportation and Telecommunications
- Engineering Informatics

### Faculty of Biomedical Engineering

#### Bachelor Degree

- Biomedical and Clinical Technology
- Civil Defence

#### Master Degree

- Biomedical and Clinical Technology
- Civil Defence

### Doctoral Degree

- Biomedical and Clinical Technology

### Faculty of Information Technology

#### Bachelor Degree

- Informatics

#### Master Degree

- Informatics

### Doctoral Degree

- Informatics

### Masaryk Institute of Advanced Studies

#### Bachelor Degree

- Economics and Management of an Enterprise

#### Master Degree

- Innovation Projects Management

## SPECIAL STUDY PROGRAMMES

## ACADEMIC COOPERATION BETWEEN EUROPE AND THE REST OF THE WORLD

### Erasmus Mundus Degree Programmes

#### Faculty of Civil Engineering

- SUSCOS – Master in Sustainable Constructions under Natural Hazards and Catastrophic Events

The SUSCOS Sustainable Constructions under Natural Hazards and Catastrophic Events program is an Erasmus Mundus Master Course provided by six partner universities (Czech Technical University, University of Coimbra, University of Liege, Politehnica University of Timisoara, Lulea University of Technology, and University of Naples Federico II). Its aim is to provide students with the engineering ability and know-how to design and construct structures in an approach that balances economic, environmental and social

aspects, enhancing the sustainability and competitiveness of the steel industry. The language of instruction is English. The degree awarded is a Master Degree, provided as a multiple diploma. The MSc programme lasts three semesters and is held on a rotating basis among the partners.

- SAHC – Advanced Master in Structural Analysis of Monuments and Historical Constructions

The Advanced Master's in Structural Analysis of Monuments and Historical Constructions is a Joint European Master Programme. The higher education institutions involved in the MSc (consortium institutions) are:

University of Minho (Guimaraes, Portugal),  
Czech Technical University in Prague,  
Technical University of Catalonia (Barcelona,  
Spain), University of Padova (Padova, Italy)

### Faculty of Biomedical Engineering

- CEMACUBE – Common European Master's Course in Biomedical Engineering

The CEMACUBE (Common European MAster's CoUrse in Biomedical Engineering) Erasmus Mundus Master's programme started in September 2010. It had been set up by the University of Groningen and the University Medical Centre Groningen. The goal of the programme is to prepare students from Europe and outside Europe for professions in biomedical engineering. It is difficult for a single university to have enough knowledge of all sub-specialisations in biomedical engineering to teach their students on an adequate level. The required

European scope is also difficult to gain when students stick to a single university. A consortium of 6 universities was therefore formed to pool its knowledge and specific expertise and offer a 2-year European Master's in biomedical engineering.

#### *Partners:*

RWTH Aachen, Germany  
Ghent University, Belgium  
Free University of Brussels (VUB), Belgium  
Trinity College Dublin, Ireland  
University of Groningen, the Netherlands

#### *Co-partners:*

ETH Zurich, Switzerland  
University of Calabria, Italy  
Aalborg University, Denmark  
Université de Technologie Compiègne, France  
University of Strathclyde, UK  
University of Patras, Greece  
Technical University of Warsaw, Poland

## Other Double/Joint/Multiple Degrees

### Faculty of Civil Engineering

- Double Degree Master Program in Civil Engineering

#### *Partners:*

École Nationale Des Ponts et Chaussées (ENPC), France

- Double Degree Master Program in Civil Engineering

#### *Partners:*

Technische Universität München, Germany  
Fakultät für Bauingenieur- und Vermessungswesen, Germany

- Double Degree Master Program in Civil Engineering

#### *Partner:*

École Centrale de Nantes, France

### Faculty of Mechanical Engineering

- Double Degree Master of Automotive Engineering

#### *Partners:*

ENSTA, France  
HAN, the Netherlands  
IFP, France  
TU Chemnitz, Germany  
University of Bandung, Indonesia





### Faculty of Transportation Sciences

- A Master's degree (joint degree) in the field of Intelligent Transport Systems (ITS)

#### Partners:

University of Applied Sciences Technikum Wien in Vienna, Austria  
Linköping University, Sweden

- Transatlantic full-time joint degree program in Transportation and Logistic Systems

#### Partners:

The University of Texas at El Paso, USA  
Univerzita Žilina, Slovakia

### Faculty of Electrical Engineering

- Erasmus Mundus Master Programme – Joint European Master in Space Science and Technology (SpaceMaster)

#### Partners:

Luleå University of Technology (LTU), Sweden  
Julius-Maximilian's University of Würzburg (JMUW), Germany

Cranfield University (CU), UK  
Aalto University (Aalto), Finland  
Université Paul Sabatier Toulouse III (UPS), France  
University of Tokyo (Todai), Japan  
Utah State University (USU), USA

#### Co-partners:

Swedish Institute of Space Physics (IRF), Sweden  
Swedish Space Corporation (SSC), Sweden  
European Incoherent Scatter Scientific Association (EISCAT), Norway  
Honeywell s.r.o. (Honeywell)

- Double Degree Master Program in Power Generation and Transportation

#### Partner:

Tomsk Polytechnic University (TPU), Russia

- Double degree with Kazan University
- Double degree with NTUST – National Taiwan University of Science and Technology
- Double degree with RWTH Aachen







## NEW, MODERN AND UNIQUE STUDY PROGRAMMES

### **Faculty of Civil Engineering**

Two new study programmes illustrate the kind of programmes that are now being offered in reaction to the current requirements of employers. They are aimed at bringing the latest theoretical knowledge and specialist skills into the classroom. The professionally-oriented bachelor study programme in Implementing Building and Engineering Structures involves learning how to prepare building projects, how to build and operate them, and how to protect water resources for sustainable use. The master's study programme in Sustainable Constructions under Natural Hazards and Catastrophic Events, accredited within the framework of an Erasmus Mundus project, extends the range of study programmes offered in English language.

### **Intelligent Buildings master study programme**

This new interfaculty study programme leading to a Master's degree is offered at the Faculties of Civil, Mechanical, and Electrical Engineering. It has been designed to meet the needs of talented students interested in the issue of intelligent buildings. Students will take three obligatory courses at each of the faculties, and will select from a range of optional courses. In addition, they will attend a design project and lab courses.

### **Faculty of Electrical Engineering**

In 2014, a new bachelor programme in Electrical Engineering and Computer Science (EECS) was accredited. Combining Electrical Engineering (EE) and Computer Science (CS) in one joint program has been motivated by a strong demand for interdisciplinary experts

in information technologies, computer science and electrical engineering. Graduates from this EECS program will have a competitive advantage compared to students from traditional EE or CS study programs. The EECS program integrates theoretical and practical training and cross- and transdisciplinary aspects into a 3-year program.

### **Faculty of Nuclear Sciences and Physical Engineering**

In 2012/2013, the faculty started teaching some newly-accredited two-year master's study programmes. Increased emphasis has been placed on developing courses in innovative fields of study in which some courses began to be taught in recent years. For example, Physics and Technology of Thermonuclear Fusion, Optics and Nanostructures, Radiological Physics, and Applied Mathematical and Stochastic Methods.

### **Faculty of Mechanical Engineering**

Aviation and Space Technology, a constituent of the all-university follow-up master's study programme in Aeronautics and Cosmonautics, is a new and innovative field of study. Students deepen their knowledge of aerodynamics, flight mechanics, basic cosmonautics, theory of engines, strength and lifetime of flight structures, flight electrotechnology and electronics, flight materials, technology of aircraft production, etc. Students learn the basic principles of space technologies. This field of study also involves taking some more general engineering courses, for example operating aircraft technology, flight navigation and





control systems, aircraft instrument systems, aircraft technology maintenance, etc.

### **Faculty of Biomedical Engineering**

The newly set up faculty received accreditation in 2009–2012 for study programmes in Optics and Optometry, Biomedical Informatics, Physiotherapy, Radiological Assistant Studies, Biomedical Technician, Medical Laboratory Technician, Paramedical Studies, and in Planning and Managing Crisis Situations. Master's study programmes are offered in Civil Emergency planning and Biomedical Engineering. The faculty has received further accreditation for studies delivered in foreign languages (in English and in Russian), for master's studies in Biomedical Engineering, Systems integration of Processes in Health Services, and studies in Russian language for Biomedical technicians.

### **Faculty of Architecture**

In the 2012/2013 academic year, a master degree programme in Design was opened at CTU in Prague. Graduates will be specialists in designing machinery, transportation

technology, consumer products, and construction and interior elements. This interdisciplinary field of study links artistic knowledge and skills with technical and functional requirements, leading to the efficient design and manufacture of new products. Graduates from this programme will link up with specialists in developing new solutions and products. Emphasis will be laid not only on aesthetic values, but also on innovative functionality, progressive production and cost-effectiveness. This field of study is based on close collaboration linking the Faculty of Architecture, the Faculty of Mechanical Engineering and the Faculty of Transportation Sciences. The current development of technology in the advanced countries indicates that new and innovative solutions to technical problems emerge from bringing together knowledge and skills from various fields and specializations.

### **Faculty of Transportation Sciences**

The faculty offers a coherent education programme in intelligent transportation systems (ITS) and Transportation and Logistic

Systems (TLS). These programmes are closely linked with practical applications and are aimed not only at Czech students but also at foreign students. These programmes are taught only in English. The ITS programme offers two new fields of study: Safety of Transport Vehicles and Transport Routes, and Security of Information and Telecommunication Systems. By offering modern and innovative study programmes, the Faculty of Transportation Sciences has overcome lack of interest in technical education, and the faculty's graduates have no difficulty in finding good employment.

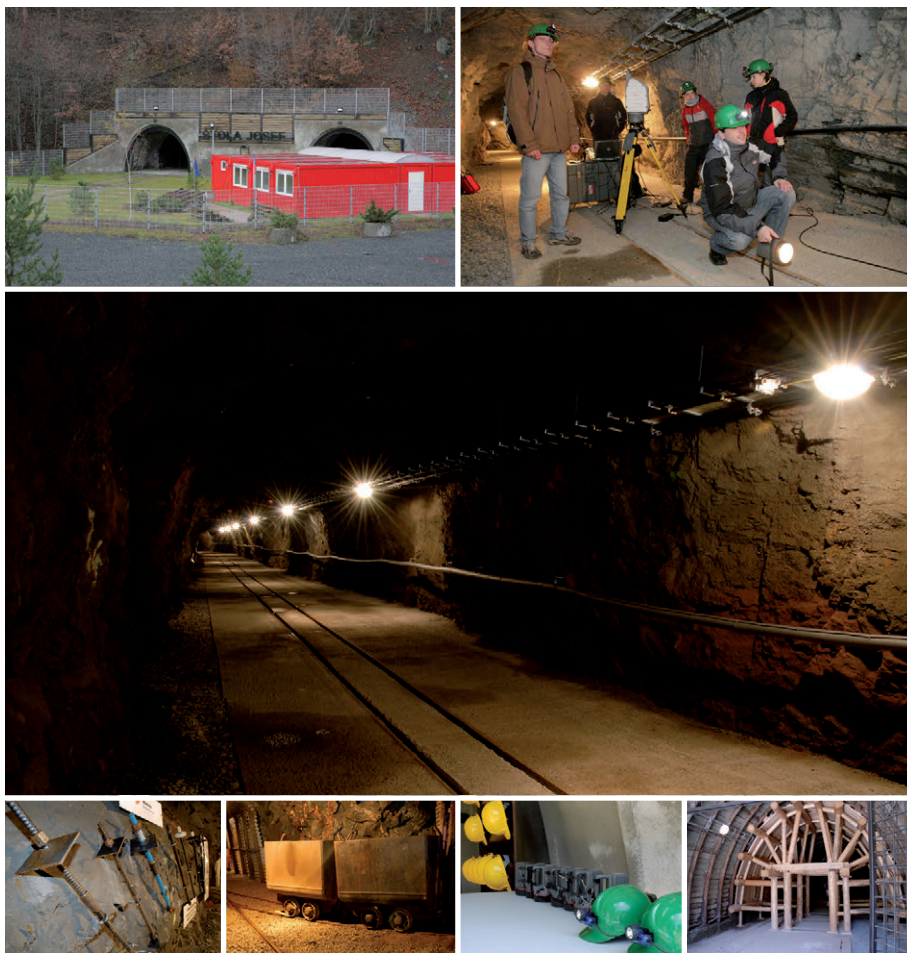
#### **Faculty of Information Technology**

In 2010, FIT was one of the first faculties in the world to start offering master's studies in Knowledge Engineering. In the years that followed, it has turned out that this was a far-sighted decision. Fields such as knowledge and data engineering have been undergoing massive development worldwide.

The emergence of more and more new intelligent computerized equipment, the beginnings of the technology for the Internet-of-Things, social networks with hundreds of millions of users, enormous quantities of data generated by scientific instruments, data on the operation and on the users of globalized services, and data from online shopping – all these developments bear witness to the unprecedented growth in the volume of unstructured data that nevertheless conceals important information. In order to reveal it and make use of it, many clever algorithms and approaches are needed. FIT continues to reflect modern trends in informatics in its study programmes, and to integrate new fields into the newly-accredited study programme in Informatics at bachelor level. Classes in knowledge and data engineering began in 2015. FIT also continues to place emphasis on information and computer security, and will be opening a new field of studies in Security and Information Technology. ■

## **MEASURES TO REDUCE FAILURE RATES**

At each faculty of CTU, there are ongoing actions aimed at reducing failure rates, especially in bachelor study programmes. The main measures have involved preparing candidates for the entrance examinations through preparatory courses in mathematics, physics, etc., and setting higher entrance requirements as regards candidates' knowledge, skills and aptitude (talent tests, written entrance examinations, more stringent secondary school leaving examination result requirements, selection based on successful results in mathematics and physics olympiads and other competitions, study aptitude tests, etc.). Evaluations are being made of the causes of failure in examinations and of dropping out, especially in the first semester and in the first year of bachelor programmes. On the basis of these analyses, adjustments may be made to the way the curriculum is presented, with the use of preparatory courses, specialized courses, recommended optional courses, etc. CTU also offers comprehensive counselling services for students, aimed at dealing with a wide range of study problems that they may have. Experience shows that students use these services above all during the examination period. ■



## THE JOSEF UNDERGROUND LABORATORY – A UNIQUE FACILITY

**The main** task of this facility is to provide practical on-site training for students, to support experimental research projects, and to contribute to better integration of university education, research and industrial experience.

The Josef Underground Laboratory is the first in the Czech Republic to provide underground research facilities:

- A working physical model that simulates the deposition of containers with spent nuclear fuel.
- A physical model will be made of Czech stoppers for sealing the entrance galleries to deep repositories for radioactive wastes, using sprayed bentonite. ■

## OTHER EDUCATION ACTIVITIES AT CTU (OUTSIDE THE ACCREDITED STUDY PROGRAMMES)

■ **The Faculty of Information Technology** organizes the Prague Stringology Conference every year. Over a period of more than 15 years, this conference has become a major, world-known meeting for informatics theoreticians working on stringology and automaton theory. The faculty also hosts the StringMasters follow-up workshop. In 2013, the faculty organized the ARCS (Architecture of Computing Systems) scientific conference in Prague. FIT also regularly organizes LawFIT, a national conference for specialists that deals with current issues at the interface between law and informatics. In 2014, FIT set up PESW (the Prague Embedded Systems Workshop), an international conference aimed at PhD students and young scientists in the field of embedded systems. For supporters of open-source software and open systems, the faculty organizes the annual Linuxdays developers conference, which is attended by about 500 participants, mainly students. A cycle of lectures on the history of mathematics, informatics and astronomy was organized for students and the expert public within the framework of the SEDMA seminar.

■ In 2014, **the Faculty of Electrical Engineering** offered a preparatory course for prospective students at the faculty, covering the material studied in mathematics at secondary school. Courses were offered by a branch of the Cech Association of Scientific and Technical Societies attached to the faculty. FEE organizes summer courses for newly-accepted students, consisting of consultation hours on mathematics and

also sports activities. FEL organizes lectures for specialists from inside and outside the university in the framework of Physics Thursdays, and also the POSTER conference for students. In 2014, the faculty was also a co-organizer of an international summer school on telecommunications technology.

■ **The Faculty of Transportation Sciences** regularly participates in the MEPS (Middle European Planning Seminar) international transport engineering seminar. It organizes this seminar together with the University of Technology and Economics in Budapest and the Technical University of Vienna. Once a month, the Institute of Air Transport organizes specialist lectures and discussions on topical issues with leading experts from the field for students and aviation specialists. The Institute also organized a two-week course, in collaboration with the Faculties of Electrical Engineering and Mechanical Engineering, under the title Spaceflight/Rocket Propulsion Lectures. In this course, some of the classes were taught by the outstanding American specialist Prof. John LaGraff, from the University of Syracuse, New York, a long-time NASA staffer. The faculty is a regularly organizing member of the European Transport Congress, and also collaborates with the European Platform for Transport Sciences (EPTS), and other specialist conferences.

■ **The Faculty of Architecture** organizes many specialized events for students and for specialists from the general public. In 2014, FA organized an international cycle under





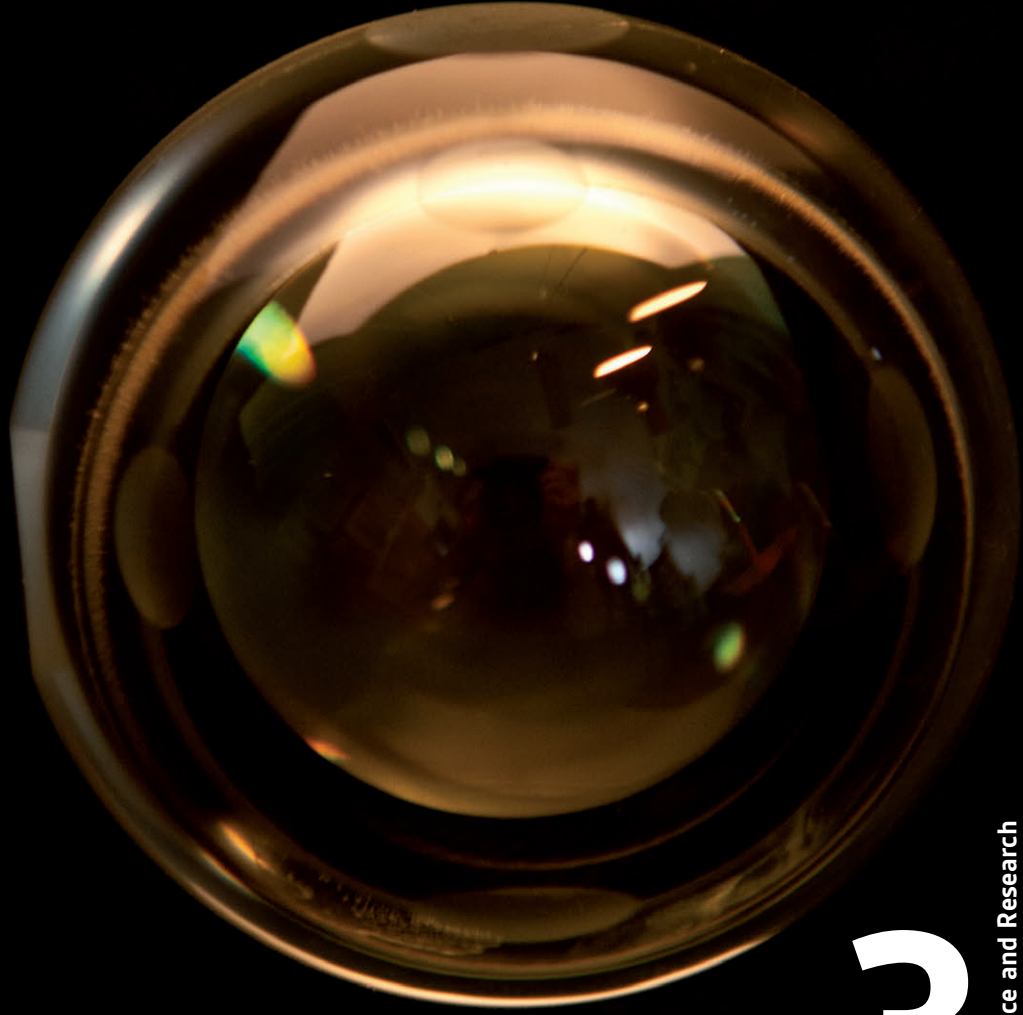
the title Housing Estates, What's Next?, an international conference on Transforming Urban Structures in a Globalized World, the Urban Sustainability workshop, Market Pressures and Urban Regeneration, Urban Project, and a colloquium under the title Urban Stories: Tools for Reading Contemporary Cities, an experiential seminar under the title We Will Overcome Barriers 2014, and, in collaboration with the Faculty of Electrical Engineering, a lecture cycle on technical innovations and experience with issues in providing an accessible environment. The faculty was a co-organizer of the European architecture exhibition for the Mies van der Rohe Award 2013 (National Gallery, December 2014 – January 2015), the Velkoměstské Paláce Conference on a Model of Sustainable Development in City Centres, etc.

■ **The Faculty of Biomedical Engineering** organizes specialized courses for undergraduates, master's students and PhD students on skills and practice in using software products such as Matlab, Comsol Multiphysics, Simulink and AutoCAD. The teaching staff and students organized Healthy Eyes Day, in which they presented their specialization and showed what the work of optometrists involves. In 2014, the faculty organized a conference with international participation under the title Civil Protection and Crisis Management. At the Respiration Days specialized conference, held in Přední Labská u Špindlerova Mlýna, research results were presented and there was a specialized discussion covering technical and clinical aspects of conventional and non-

conventional ventilation technologies. This event was organized by the non-conventional ventilation team at the Faculty of Biomedical Engineering, with support from the CTU student grant competition.

■ In 2014, **the Faculty of Civil Engineering** organized about 35 specialist field trips and excursions, including some lasting several days and visiting foreign countries. The faculty also organized a summer school in Telč on Architectural Drawing, and a summer school on Technical Equipment for Buildings, for students in the final year of their master's study programme and PhD students interested in technical equipment for low-energy systems. Workshops were organized, for example on student accommodation, as well as attractive meetings with specialists from abroad, such as a lecture by architect Eva Jiříčná, and a meeting on World Buildings, with representatives of the Bouygues Group.

■ **The Masaryk Institute of Advanced Studies** obtained funding from the Czech Technology Agency for two new projects related to regional development. It is also coordinator of the ICCAGE international project, aimed at improving intercultural communicative competence in higher education. History of Engineering scholars published a prestigious monograph on the history of steam navigation. Undergraduate students had a project to increase the financial literacy of the Czech public. Recently developed undergraduate and graduate programmes in English focus on Economics, Management and Innovations. ■



3

Science and Research

## SCIENTIFIC WORK AND TEACHING ARE INTERLINKED

### **At our university, can science and research be successfully combined with studying?**

CTU is definitely a university where scientific work and teaching are interlinked. I'm pleased to say that most scientific teams and research workplaces are not short of talented and enthusiastic young scientists.

### **Do the best students go on to study for their PhD, and do they stay on to work as academics?**

Our aim can't be just to ensure that our graduates become our young academic workers. We have to make efforts to ensure that most of our staff, and especially our young staff, gain some experience elsewhere in the world. We can't shut ourselves away behind high walls, boasting that we are the best, and meanwhile gradually slipping behind. CTU must be a university to which young scientists, so-called post-docs, from all over the world, come to gain experience – a university whose PhD students and graduates take up post-doc positions at top universities and institutes all over the world. A university that selects its future leading academic workers from among the best post-docs. We're not quite there yet, but that is the situation we must aspire to. We have already completed a large part of the journey, thanks among other things to the EU Operational Programme Education for Competitiveness. Under this programme we've been happy to receive dozens of post-docs from all over the world.

### **What support is there for young scientists and researchers at the faculties?**

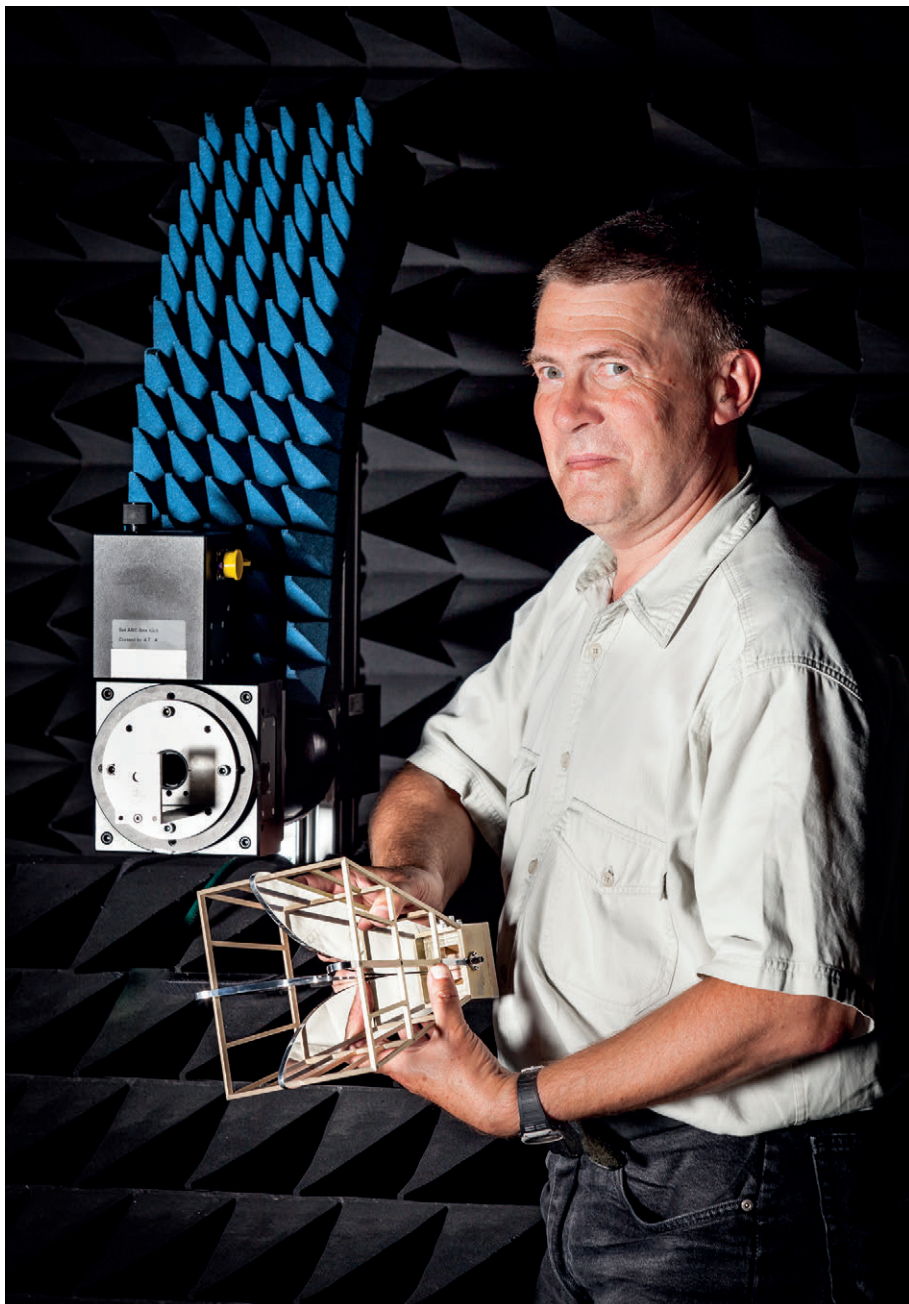
Young scientists and researchers receive visible support. Evidence for this is provided by the changing situation when young researchers do

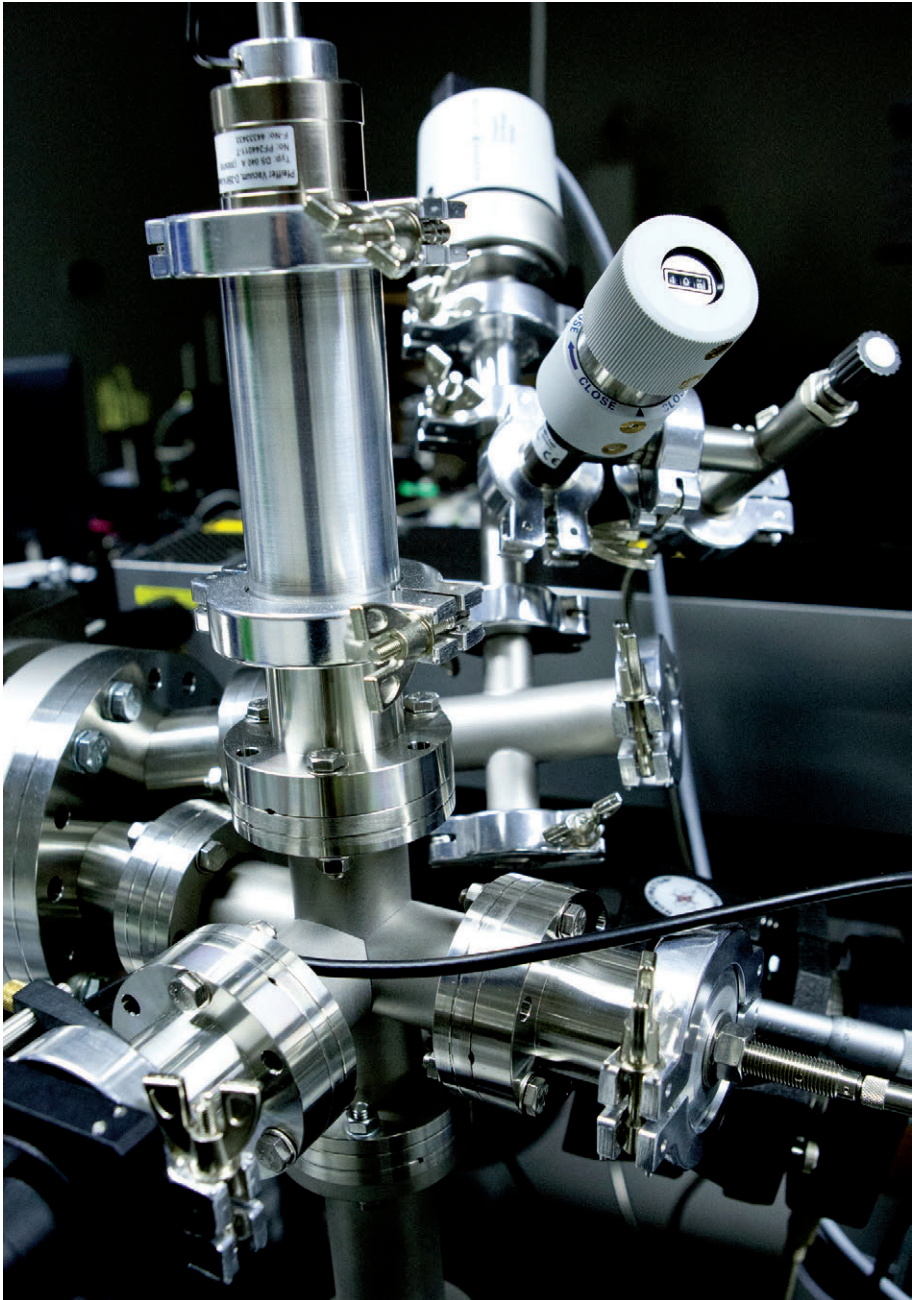
their habilitation to become a docent – that is, to become a senior lecturer. Evidence is provided by the fact that they have not been leaving for universities outside Prague, even though those universities can currently offer high salaries and modern instrumentation, thanks to funding from the European Research and Development for Innovation projects, which are aimed at regional development. Young scientists are not some kind of ciphers that need faculties as institutions to take care of them. What they need is good working conditions. They need opportunities to carry out their own research and get grant funding for it. Or funding from industrial companies. They have to believe that their work has a meaning, and that they are important for their faculties and can take part in their decision-making processes. They also need to be well recompensed financially for good results, out of the money that they themselves have earned for the research. These are the people who are carrying out the basic work of our faculties. CTU runs a kindergarten for parenting employees, and the Faculty of Electrical Engineering has set up a child-minding service. However, there are certainly things that can be improved. Young scientists and researchers are the people we have to ask what it is that needs to be provided, and what needs to be improved.

### **Is the university successful in linking itself with industry and with practical applications?**

We have attracted a number of projects aiming at real applications in industry. These include government as well as industry-financed research. Admittedly, we would not be against obtaining even more projects. ■







## SCIENTIFIC AND RESEARCH ACTIVITIES

We are among the largest research institutions not only in the Czech Republic but throughout the world. We cover a broad range of research in many fields of engineering. Basic and applied research have a long-term role at CTU. Research is carried out at all eight faculties, and also at the university institutes.

**CTU in Prague** harbors many excellent workplaces for cutting edge, international research. This is true not only for typical engineering disciplines such as combustion engines, (renewable) energy sources or (intelligent) buildings, but also in curiosity-driven research such as mathematics, as well as theoretical, experimental and applied studies in a broad range of fields of physics (nuclear physics, plasma physics, laser physics, physics of materials and solids, physical electronics, physical radiation and radiological physics, to name at least some examples). Major worldwide programmes and projects that CTU is involved in include collaboration with CERN (the ongoing ATLAS, ALICE, CERES and DIRAC projects), with the joint institute for nuclear research at Dubna, Fermilab (D0 project, Nova project), laser plasma projects (PALS), collaboration in the development of the ITER experiment, and others.

CTU with its over three hundred year history covers traditional technical fields as well as architecture. Being a vibrant, modern institution, new fields of interest develop and eventually form new institutes and faculties. However new they may be historically, at least two fields definitely deserve mentioning: informatics, from its mathematical roots up to applications in computer science, cybernetics and artificial intelligence, and biomedical engineering, making our lives better, longer and more productive.

Results of our research find applications in real life. They help to save and prolong human lives, protect computer networks from attack, enable artists to create cartoons, help to predict and prevent disasters, produce safe electricity, design nice buildings as well as urban plans, enable progress in communications, make transportation fast and reliable... And besides being extremely useful, they are pretty interesting.

### CTU Scientific Council

The tasks of the CTU Scientific Council include negotiating the long-term strategic plan, voting on new professors, and approving study programmes. Members of the Scientific Council are distinguished representatives of the fields of specialization in which the University carries out its teaching, scientific, research, development, artistic and other creative activities. The personalities on the Scientific Council come not only from CTU, but also from other universities in the Czech Republic and abroad, as well as scientists and researchers from the Academy of Sciences of the Czech Republic, and also managers of major companies and banks, and leaders in other fields of activity for which CTU is educating specialists to work in industry, in commerce, or in educating the next generation of scientists.

### **Rector of CTU's Prize for science and research**

The Fund in Support of Scientific and Research Work is one of the sources used to motivate researchers. Every year, the rector of CTU awards the Rector's Prize in the following fields:

- outstanding scientific results
- practical application of research results
- a prestigious scientific publication
- an outstanding PhD thesis.

### **Linking research and creative work with the education process**

A basic concept in the education process at CTU in Prague is that students are educated to carry out scientific and research work, and are integrated into these activities at the University. There is an individual approach to students. The education process has been internationalized, and student mobility is integrated into the process. From the third year of their bachelor study programmes, students are integrated into work on a specific topic within a research project, and the topics of student research projects, bachelor projects and master's projects are directly linked with a larger project at the student's faculty. Active participation in scientific and applied projects is a basic

requirement for students participating in a doctoral study programme. For master's programmes and doctoral programmes, this concept is being developed actively by means of funding through the successfully introduced Student Grant Competition. Students in master's study programmes can participate in the Student Scientific Competition for scientific and research projects. Talented bachelor programme students can work as student assistant researchers in one of the departments at their faculty. They can learn how to work on scientific projects and can help with experiments. Many of these students go on to study for a PhD.

### **Funding for Science and Research**

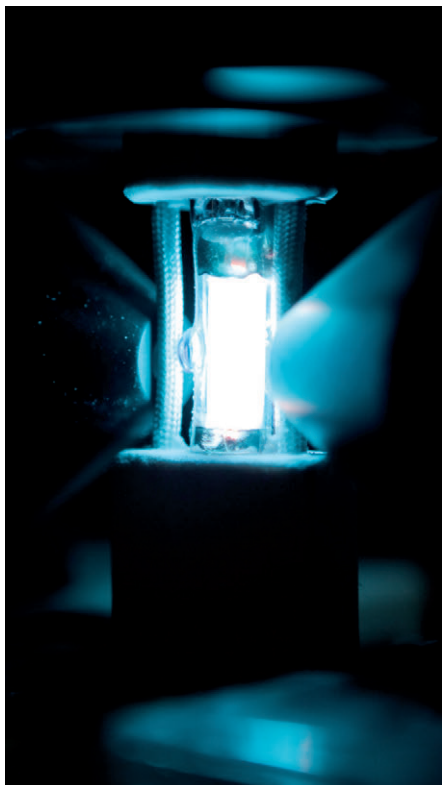
The annual revenue for R&D from external sources is close to CZK 1.7 billion. We attract funding from Czech, European, American as well as Asian companies and funding agencies.

### **Support for students in doctoral study programmes, and for post-docs**

The University makes a special effort to provide good conditions for promising young teachers and researchers. The aim is to improve students' skills and qualifications, and to enable them to earn scientific







and teaching titles. The most successful graduates are encouraged to supervise doctoral students, and in some cases to join the teaching staff. A major part of these efforts involves creating conditions and contacts aimed at integrating students into teams working on top international research projects, and sending them to study and do research at partner institutions. The University does its best to provide funding and to set up a remuneration system for this category of scientific and research workers that will enable them to dedicate themselves fully to research and/or to teaching.

Doctoral students receive scholarships, and are also supported by grants financed by the Student Grant Competition from funds for specific research.

### **Study programmes: to what extent do they deal with industrial and commercial applications?**

An important position of industrial and commercial applications in the faculties' study programmes is ensured by bringing top experts from industry and commerce into the work done by the scientific councils of the faculties, and of each field of study, and into the advisory councils for doctoral studies. Experts from industry and commerce also teach courses and give lectures to students in bachelor, master's and PhD programmes, supervise bachelor and master's projects, and advise and teach PhD students.

### **Commercialization strategy**

Close cooperation with industry and with other areas of public life forms a part of the long-term development plans of the CTU faculties. The University creates favourable conditions and provides long-term support for projects that can be applied in industry and commerce, and also for projects based on contracts with industrial and commercial companies. The commercialization strategy supports the provision of better and fuller information about the University's research projects, and about its research facilities that are available to be used for commercial purposes. This is an element in the CTU Strategy for Science, Research, Innovation and Creative Activities.

### **Database of CTU offers, experts and devices (DNEP)**

The DNEP database contains offers of results from research and scientific activities for industry in the framework of technology transfer, and for cooperation with other universities and research institutions in the Czech Republic and abroad. It provides an overview of experts in a wide range of fields of engineering, and of unique devices and instruments available at CTU. It is aimed at teachers, scientists and students of CTU, and also at the broader scientific community and other interested parties outside CTU (e.g., journalists). It is used inside and outside the University. The DNEP database program consists of two independent versions of the entries, in Czech and in English.

The database contains about 400 offers of collaboration.

### **CTU Patent Centre**

#### Services offered:

Advisory services, consultations, talks

Protection of industrial rights

Searches on technical state, name searches, appraisals of the patent situation of products, ensuring the validity of protective documentation

Elaborating and submitting applications for inventions, industrial models, utility models, trademarks; representation in dealings with the relevant authorities

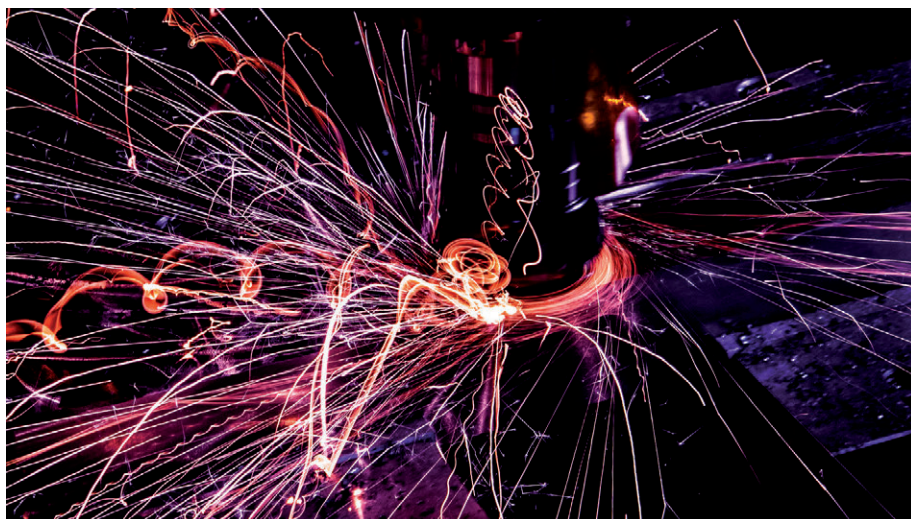
Observing deadlines for the protection of industrial rights, including deadlines for making administrative payments and maintenance payments

Applications for industrial rights abroad

Proposals for licensing agreements

Expert opinions – for individuals, for organizations and for courts of law, on the basis of authorization to provide expert opinions, evaluations of intangible assets.

The Patent Centre also provides services for clients from outside CTU in Prague. ■





## AIR HOUSE

**The AIR House** is an energetically self-sufficient house designed by a team of CTU students and entered for the Solar Decathlon 2013 competition, in which it won third place overall, as well as other distinguished awards.

The U.S. Department of Energy Solar Decathlon is a prestigious student competition for sustainable architecture, in which 20 selected university teams from all over the world are set the task of designing, constructing and operating a house that draws its energy only from the sun. The work carried out by a group of 30 students and young researchers at CTU began in spring 2012. Over a period of almost two years, they conceived the house, obtained funding, advertised the project in the media, and then built the AIR House themselves. A feature of the work was the unique degree of collaboration among the CTU faculties in the project. The multidisciplinary team was led by the Faculty of Architecture, in close collaboration with the Faculty of Civil Engineering. Students from the Faculty of Transportation Sciences, the Faculty of Electrical Engineering and the Faculty of Mechanical Engineering, as well as students from CTU's University Centre for Energy-Efficient Buildings, also took part in the project.

The AIR House is designed as a weekend chalet for ecologically-minded people at the peak of their productive life, and it can also serve as a full-time home for them in retirement. The energetic concept for it emerges from the philosophy of a "house within a house". In selecting the technology, the main consideration was that the house should function simply and naturally. In the fall of 2014, the AIR House won an ecological Oscar, the E.ON Energy Globe Award 2014 Czech Republic, in the Youth category. Since December 2014, the CTU Information Centre has worked out of the AIR House. It is located right in the centre of the university campus. It provides inspiration for students, and motivates the general public to take an interest in solar energy and in nature-friendly architecture. The AIR House continues to be available for students and for research. ■







## CZECH INSTITUTE OF INFORMATICS, ROBOTICS AND CYBERNETICS

The Czech Institute of Informatics, Robotics and Cybernetics (CIIRC) was established on July 1, 2013.

### The CIIRC mission is to:

- create a research and teaching institute and environment heading for excellence, for quality, and conducting internationally competitive research
- attract top quality personalities to CIIRC
- open the space for CIIRC personalities and CTU faculties allowing cooperation in top quality teaching and research with students, mainly at master and PhD levels
- introduce managerial procedures into the inner academic body, the CIIRC Assembly (of top personalities), which will enable faster progress toward top quality results
- create an atmosphere and procedures in support of transferring know-how to industry and elsewhere – and disseminate it.

CIIRC develops scientific disciplines in informatics, robotics and cybernetics in the broad sense, with an overlap between fields of study. CIIRC offers internships and jobs to foreign applicants. It also supports stays by staff and students of CIIRC abroad, especially mutual exchanges of master's and doctoral students. It informs the international professional community about academic vacancies at CIIRC. In the sphere of its activities, CIIRC cooperates with other universities, scientific institutions, research institutes, industry and other organizations, both at home and abroad. ■

## INSTITUTE OF EXPERIMENTAL AND APPLIED PHYSICS

**The Institute** is a scientific and academic unit of CTU working on the physics of the microworld and its applications. The Institute (founded in May 2002) has very close cooperation with CERN. The scientific cooperation partners are: ESA, Fraunhofer Institut, Friedrich-Alexander-Universität Erlangen-Nürnberg, the German Cancer Center, ILL Grenoble, SÚJV Dubna, University College London, the University of Alberta, the University of Heidelberg, the University of Houston, the University of Montreal, and others.

### Basic Research:

**Astroparticle & non-accelerator physics** – Neutrino physics (NEMO3/SuperNEMO, TGV), Cosmic rays (CZELTA), Dark matter (PICASSO)

**ATLAS at LHC** – SCT detection modules, Neutron shielding, Medipix radiation monitoring, Higgs boson physics

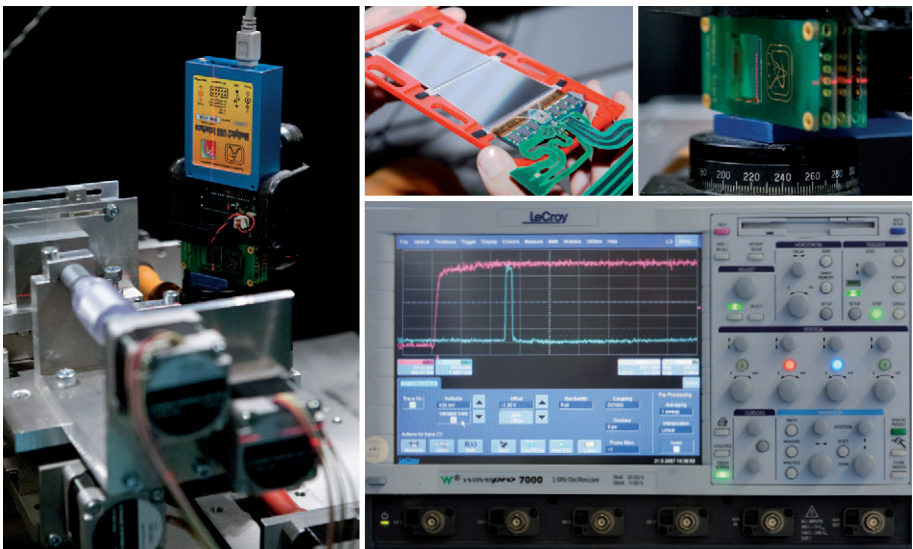
**Nuclear spectroscopy** – Fission fragment spectroscopy, Laser induced nuclear excitation, Ultra cold neutrons

### Applied Research:

**Radiation imaging** – Medipix pixel detectors: SW, HW, X-ray radiography and tomography, Charged particle & neutron imaging, Biomedical imaging, Material science and defectoscopy.

**R&D of semiconductor detectors** – 3D and semi-3D detectors, Thermal neutron detectors, Room-temperature detectors, Instrumentation for detector testing.

**Applied spectrometry** – Material analysis (CINAA, XRF, Radon), Particle tracking and spectroscopy, Radiation in space (gamma, neutron, micro-sensor). ■





## CENTRE OF VEHICLES FOR SUSTAINABLE MOBILITY

The main aim of the Centre of Vehicles for Sustainable Mobility project is to further enhance the level of applied research for the automotive industry by establishing the new premises of this Centre, which concentrates brains and new technologies at European level.



**The Centre** will provide facilities and resources for innovative research and for optimizing the concepts for automotive engines, including electric and hybrid units.

Work will be done on integrated control, fuel efficiency (concepts with the potential to reduce road vehicle fuel consumption by 15%), environment friendliness (EURO 6) and utility value.

The Centre aims to improve the competitiveness of Czech companies in the automotive sector. Specific applicable results will include: conceptual solutions for new internal combustion engines (ICE – downsizing by optimized boosting, new combustion systems, optimization of engines with a small number of cylinders), mechanical transmissions with power splitting, electric drives with power splitting and hybridization, and predictive or adaptive power control systems.

The Centre will enhance its collaboration and strengthen existing links with industrial and applied research companies and institutes. It will expand its range of activities, and will cooperate extensively in international R&D projects. ■



## UNIVERSITY CENTRE FOR ENERGY EFFICIENT BUILDINGS

**The University Centre** for Energy Efficient Buildings (UCEEB) is an interdisciplinary research facility of the Czech Technical University in Prague. The main focus is on environment-friendly energy-efficient buildings that provide a healthy indoor environment.

The Centre is a sustainable building research facility that is unique in the region, bringing together the critical mass of knowledge from civil engineering, mechanical engineering, material science, electrical engineering and biomedicine that is needed to fulfill the Centre's mission – to support the introduction to the market of environment-friendly energy-efficient buildings that provide a healthy indoor environment.

UCEEB is located at Kladno-Buštěhrad, just outside Prague.

### Research groups:

- Architecture and interaction of buildings with the environment
- Energy systems of buildings
- Quality of the indoor environment
- High performance building materials and structures
- Monitoring, diagnostics and smart control of buildings. ■







## KLOKNER INSTITUTE

**The Klokner Institute** was established in 1921 as the Research and Testing Institute of Materials and Building Structures. This was the first research institute to be established at CTU, and ranks among the four oldest independent scientific centres in Europe. The initiator, founder and first head of the institute was CTU Professor František Klokner.

The Institute has 4 specialized departments, an accredited laboratory and also a forensic department for diagnostics, failure analysis and tests of concrete, steel, timber and masonry structures and parts of structures.

### Scientific and research activities

Results achieved in recent years confirm the Institute's unique standing in the Czech Republic and worldwide, namely in the following fields:

- Reliability theory of building structures
- Diagnostics, monitoring and assessment of structures
- Mechanics of composite materials, development and verification of new concrete technologies and new structural materials
- Degradation of reinforced concrete and masonry structures due to exposure to the environment, and methods for redeveloping these structures and designing modern structures
- Seismic and wind engineering. ■

## EXAMPLES OF ACTIVITIES

### Faculty of Civil Engineering

The faculty is one of four faculties that set up the new University Centre for Energy Efficient Buildings (UCEEB). This is an interdisciplinary research project dealing with energy-saving buildings that have a healthy interior environment and, at the same time, are environment-friendly.

The CIDEAS (Centre for Integrated Design of Advanced Structures) centre is a major outcome of the faculty's collaboration with industrial partners in the area of applied research. In the period from 2005 to 2011, it carried out numerous research projects which led to specific industrial applications and also some patents. Close collaboration between CIDEAS and leading construction companies, such as SKANSKA CZ, Metrostav, Eurovia, ŽPSV and other industrial partners, has led to ongoing collaborative projects. The experience that the faculty has gained

from the CIDEAS research centre has now led on to two major activities. The faculty hosts the Grant Agency of the Czech Republic's Centre of Excellence for basic research. This is an outstanding and prestigious success for CTU in Prague. The project works on cumulative time-dependent processes in building materials and structures. The faculty also coordinates the Centre for Efficient and Sustainable Transport Infrastructure (CESTI) Centre of Competence. The project works on technological innovations aimed at eliminating the bottlenecks in the present-day transport infrastructure.

The Centre for Experimental Geotechnology (CEG) is the final element in the reconstruction of the Josef Underground Laboratory complex, which is used for in situ instruction on underground structures, geology, geochemistry and geodesy. CEG offers facilities for working on national and international research projects, and for collaborating with the construction industry.



### Faculty of Transportation Sciences

An agreement has been signed with the Florida International University in Miami (FIU), to establish a Center of Excellence in Co-operative Intelligent Transportation (CECIT), where work will be done on electronic toll systems, smart cities, and car-to-car and car-to-infrastructure communication. The faculty has implemented a number of FP7 international research projects.

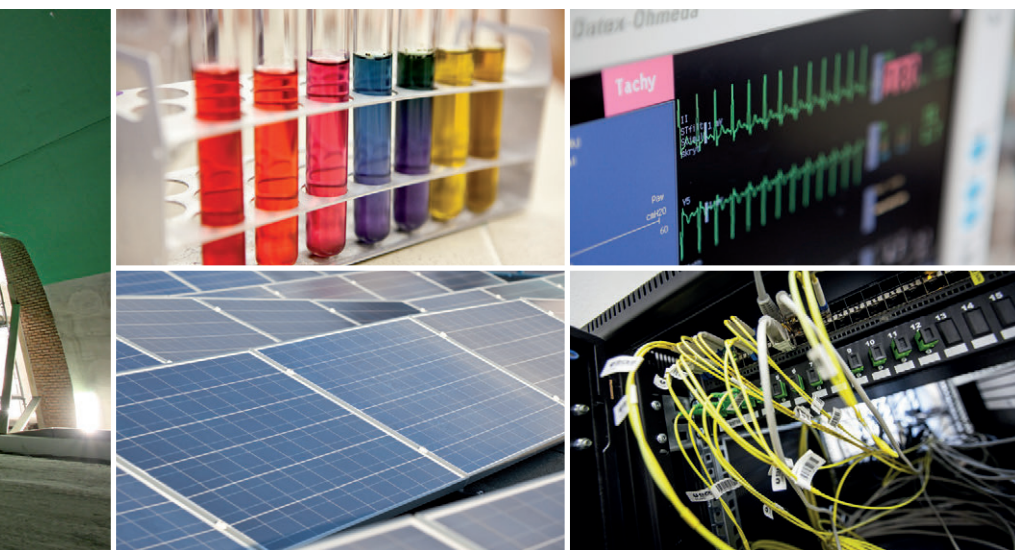
### Faculty of Biomedical Engineering

The quality of the new faculty's outputs has risen steeply. 142 high-impact papers and 52 books and book chapters were published in 2014. Nine Grant Agency of the Czech Republic projects, 4 Technology Agency of the Czech Republic projects, as well as numerous ministry grant-funded projects and international projects were won and then successfully implemented. The faculty co-organized 26 scientific conferences, 14

of them with international participation, and several summer schools. 11 research teams are working at the faculty. Many research results have been implemented commercially; 31 utility models and 5 patents have been recognized, and also 51 functional samples.

### Faculty of Information Technology

In its six years of existence, the faculty has won seven Grant Agency of the Czech Republic (GAČR) standard and post-doc grants, and three Technology Agency of the Czech Republic (TAČR) grants. There are ten research groups carrying out research at the faculty: Applied Mathematics, Applied Numerics and Cryptology, Arbology, the Centre for Conceptual Modelling and Implementation, Computer Design and Reliability, Computer Intelligence, Computer Networks, Parallel and Distributed Computing, the Prague Stringology Club, and the Intelligent Web and Network Security.





### Faculty of Electrical Engineering

The Faculty of Electrical Engineering successfully links work on research projects and delivering educational programmes. The faculty has been nationally and internationally recognized through numerous awards, highly cited research papers, and also awards for teaching and for scientific research. Every year, there are new and increasingly significant accomplishments. Best Paper Awards at conferences and the Werner von Siemens Award are examples of notable achievements of the faculty's scientists. Lukas Neumann and Prof. Jiří Matas, from the Centre for Machine Perception, Department of Cybernetics, presented a paper under the title Efficient Scene Text Localization and Recognition with Local Character Refinement. This won the Best Paper Award at the International

Conference on Document Analysis and Recognition (ICDAR), the premier international forum for researchers and practitioners in the document analysis community for identifying, encouraging and exchanging ideas on state-of-the-art technology in document analysis, understanding, retrieval, and performance evaluation.

The award-winning paper focuses on scene text recognition, also known as text-in-the-wild recognition or Photo-optical Character Recognition (OCR). Scene text recognition covers many areas of investigation, including translation, assistance to the visually-impaired, and searching large image databases, such as Flickr and Google Images, by their textual content. The authors presented an unconstrained end-to-end text localization and recognition



method which attempts to achieve greater accuracy and higher speed for practical applications than the traditional optical character recognition method. Their method detects an initial text hypothesis in a single pass by an efficient region-based method, and subsequently refines the text hypothesis using a more robust local text model. This deviates from the common assumption of region-based methods that all characters are detected as connected components. The authors also introduce a novel feature for text localization and recognition based on character stroke area estimation. This feature is efficiently computed from a region distance map. It is invariant to scaling and rotation, and allows text regions to be detected efficiently, irrespective of

the fragment of the text that they capture. A research team at the faculty, led by Prof. Filip Železný from the department of Computer Science, won the prestigious Werner von Siemens award in the “most important development and innovation” category. The team achieved its success with a project aimed at developing software for the combinatorial design of large systems of locks and keys. This will significantly facilitate the work of designers of key and lock systems. The CyberCalc research and innovation project originated as contract work in collaboration with the Czech affiliate of Assa Abloy (formerly FAB). The research team from the Faculty of Electrical Engineering is currently entering into collaboration with the entire European division of this major key maker.



### **Faculty of Architecture**

At the end of 2012, the Faculty of Architecture, representing CTU in Prague, won a research, development and innovation competition within a Prague Capital City programme project under the title “An innovative methodology for ordering zoning maps, together with their objective and formal aspects, the relationship to the strategic development of the city, and a way to elaborate plans with special reference to formulating the phenomenon of the image of the city.”

Research directed by the Institute of Urban Planning tests processes and relevant urban planning instruments, with reference to their sense and purpose, and also taking into account the validity of their legal basis.

The central theme of the research carried out at the expert workplace of the Institute of Building Science is Buildings in Relation to the Needs and the Development of Society. The Institute's expert workplace collaborates with a number of public institutions on seeking solutions to present-day issues in society: an ageing population, suburbanization, transforming large residential estates into full-fledged city quarters, changes to the present-day building typology, providing high-quality, accessible housing, and the overall standard of the built environment.

The scientific and research work of the Institute of Spatial Planning is based on GIS, mathematical modelling of land resources, communication and participation as means for sustainable development of urban and regional structures.

Two types of books present the results of research carried out at the Institute for the Theory and History of Architecture. One type regards architecture as an excellent artistic and technological achievement, and reports on studies of the history of outstanding buildings, in many cases iconic works of architecture in Prague. The second type of books and articles deals with everyday architecture.

Biomateriomics is a field of study that analyses the role of materials in the context of biological processes, investigates the transfer of principles from biological materials in the direction of biomimetic and bio-inspired uses, and studies the interface between living and non-living systems. The outcomes are construction materials and structures with properties characterized by self-assembly, self-organisation, the ability to adapt and develop, and to provide various functions that can be controlled by externally.

### **Faculty of Nuclear Sciences and Physical Engineering**

Research at the Faculty covers many promising directions in physical and chemical sciences together with related domains of applied mathematics. One important example is an investigation of the quantum properties of light. This includes such diverse topics as theoretical considerations about quantum walks (which led to a recent paper in Science magazine in collaboration with German experimental partners) and the development of unique solid state coherently pumped lasers, which find numerous applications in spectroscopy, medicine and elsewhere. ■

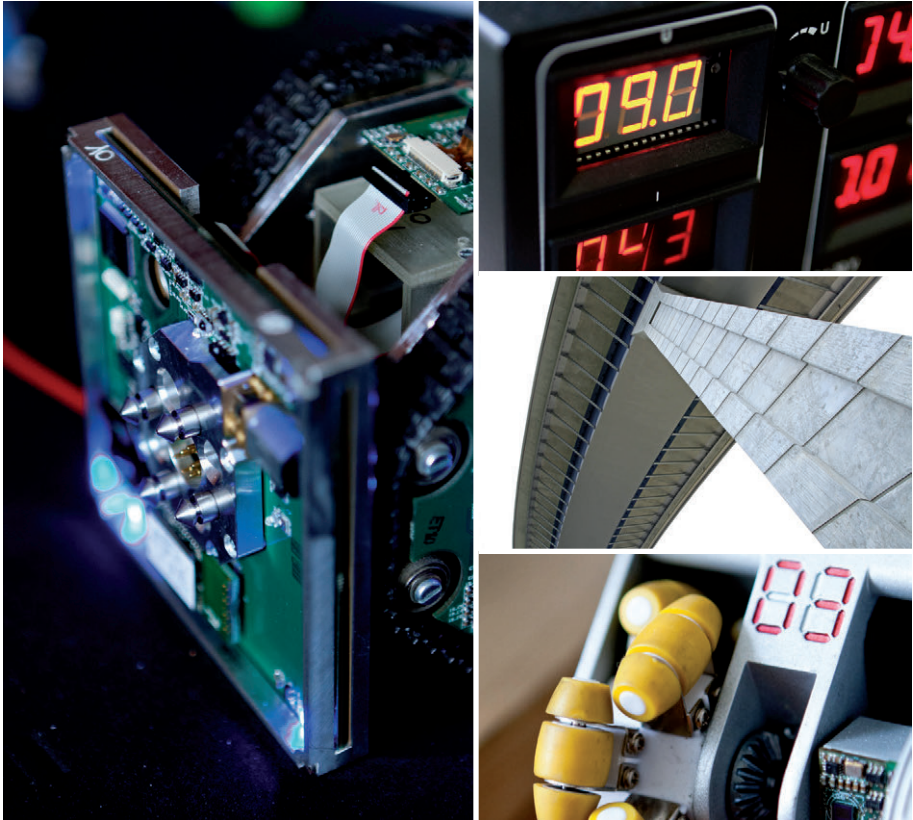


## SUN SCHOOL IN THE HIMALAYAS

**Zanskari children** have now been learning for five years in the Sun School that was built for the Himalayan village of Kargyak. The school is situated at an elevation of 4 200 metres, and it is energy self-sufficient for a considerable part of the year, thanks to its solar panels.

A photovoltaic system is used for lighting the classrooms and for charging the computers. Solar energy also assisted in the construction of this non-traditional building; two accumulators recharged the drill, and the current from the solar panels was used for the satellite telephone, the laptop, etc.

The school in the Himalayas grew out of the master's project of Jan Tilinger, Faculty of Civil Engineering, CTU in Prague (for further information about the school, see [www.surya.cz](http://www.surya.cz)). Jan Tilinger not only designed the school, but also constructed it. It is a passive structure that uses sunny days to heat the interior: the glazed corridor is oriented to the south, so that the classrooms are heated during the daytime. ■



## CENTRES OF COMPETENCE

**The new Centres of Competence at CTU** were opened in 2012, after the Centres of Competence programme was set up by the Technology Agency of the Czech Republic as a public competition for research, development and innovation. These Centres build on the tradition of long-term collaboration among universities, research institutes and industrial partners. The Centres support multidisciplinary research, development and innovation, and also greater horizontal mobility for researchers,

especially for early-stage researchers. We offer a brief overview of the Centres, and of the projects that they are working on:

### **Centre of Competence for Rail Vehicles**

This consortium consists of four research institutions and nine large industrial companies. A unique feature of the Centre is that it brings together practically all the Czech universities that teach and carry out research on railway vehicles and most of the Czech industrial companies that produce railway



vehicles and components for them. The Centre is thus a unique platform for sharing information and developing this branch of industry in the Czech Republic.

### **Advanced Technology for Producing Heat and Electricity**

The Centre reacts to basic problems, e.g. the need to optimize the technology for refining biomass and for producing biofuels. It works on extending the use of co-generation units to provide local heat generation and to meet the demand for electricity, and also on optimizing the technology for renewable energy sources, for saving fossil fuels, and for improving the energy self-sufficiency of the Czech Republic.

### **V3C – Visual Computing Competence Center**

The Center aims to produce interesting results and outputs in a very attractive field of science with a broad range of applications. It links two major fields of specialization – computer graphics and image processing – and in this way opens up new opportunities to develop efficient and demanding methods that can be applied in many fields. The Center also integrates research on user interfaces into its work.

### **Centre for the Development of Transport Systems**

The Centre brings together leading researchers and developers in the fields of intelligent transport systems, IT, economics, sociology and social geography, environmental engineering and safety engineering. In this way, it will raise the competitiveness of the Czech Republic in processes for introducing intelligent transport

systems and mobility control, and it will improve the position of Czech researchers and Czech industry on a European level and on world markets.

### **Centre for Integrated Satellite and Terrestrial Navigation Technologies**

The technology for integrated satellite and terrestrial radio navigation did not begin to develop until quite recently, but it has been expanding and innovating dynamically. To deal with the requirements in this sector, it is necessary to be able to go from basic research, through all the steps in the process, to the production of instruments and equipment. This will make a major contribution to the process of innovating the industry.

### **Centre for Effective and Sustainable Transport Infrastructure (CESTI)**

The Centre works on the road and rail infrastructure, including bridges and tunnels. It implements performance parameters to deal with environmental, safety and reliability aspects of structures and systems for effective management of the infrastructure. It responds to the requirements for a cost-effective transport infrastructure that is sustainable in terms of materials and energy, and is technically durable, reliable and permanently available.

### **Centre of Applied Cybernetics 3**

Cybernetics is an example of a field of science with high potential for applications that promises to make a major contribution to the growing competitiveness of the Czech Republic. The Centre has set itself the target of concentrating the leading research and application capacities of the public sector

and the private sector, with the aim of collaborating with each other in the long term.

The Centre involves foremost research teams from four universities, two large enterprises, and fourteen medium-size and small companies. The strategic research agenda is formulated for eight years and is structured into four topics:

- Modelling and control of electric power generation, distribution and conversion
- Intelligent man-machine interaction
- Machine perception and image analysis for industrial applications
- Optimization tools for industrial informatics.

#### **Radiation and Nuclear Safety Technologies Development Center: RANUS – TD**

The Centre concentrates the potential of university researchers, specialized companies and industrial manufacturers to investigate fields related to nuclear power production, radiation safety, etc. It works on developing, producing and exporting unique, innovative materials and systems for detecting radiation, aimed at solving current problems with the safety of nuclear sources and their impacts on the natural environment.

#### **Josef Božek Centre of Competence for the Automotive Industry**

The main aims of the Centre are to develop new solutions in the field of vehicle construction, engines, and performance improvement, in order to achieve reduced consumption of fossil fuels, and to bring CO<sub>2</sub> emissions within the EURO 6+ emission standards, while also aiming at maximum safety and comfort.

#### **Centre for Advanced Nuclear Technologies (CANUT)**

The Centre works on studies of nuclear energy, e.g. on developing instruments and structures for experimental facilities for new-generation nuclear reactors, on more reliable and safer nuclear instrumentation for current and new facilities, on innovative fuel cycles, and on all parts of the external fuel cycle, control systems, etc.

#### **Progressive detection systems for ionizing radiation**

There are only a few workplaces in the world that carry out research and development on advanced systems for detecting ionizing radiation as an integrated system using state-of-the-art submicron electronics, and the Centre is the first of its type in the Czech Republic. This is a very rapidly developing field, especially in connection with the development of detection technologies in the large international research centres.

#### **Centre of Research and Experimental Development of Reliable Energy Production**

The aim of this project is to raise the efficiency, extend the lifetime, and increase the operating reliability, safety and efficiency of the power production equipment of conventional and nuclear power plants.

#### **Centre of Competence – Mechanical engineering production technology**

Mechanical engineering production technology is the field that produces machine tools, moulding tools and new technology for all other fields of mechanical engineering. The main aim of the project is to carry out R&D on technical devices, solutions and technologies to improve the main useful

properties of the machines. These properties are: precision, quality, performance in production, reliability, cost-effectiveness and environment-friendliness. The aim of the project is to support excellence in this field in the Czech Republic, so that the Czech Republic can join the top ten producers of machine tools in the world by 2020.

### **Advanced Aerostructures Research Centre**

This research centre brings together a consortium of aircraft manufacturers and research institutions to develop a new generation of smart aircraft structures: composite structures, which are becoming the norm in the design of new large transport aircraft, and advanced metallic structures, which remain the main material for smaller general passenger aircraft. The centre covers the whole spectrum of aerospace manufacturing technologies, and also the associated research and test institutions.

### **Research Centre for Surface Treatments**

This research centre works on coatings for engineering and for building structures. There is special interest in developing and improving the properties of new materials and technologies for application in surface pretreatment. The main focus is on the application of new and modified polymers and appropriate organic and inorganic compounds to protect and modify various types of surfaces that will provide new features and new opportunities for their practical use.

### **Centre for Intelligent Drives and Advanced Machine Control (CIDAM)**

CIDAM is an interdisciplinary R&D center that brings together teams of leading research institutions and renowned companies in

mechatronics. It has established a system of long-term cooperation among the participants in R&D, and is enhancing technology and knowledge transfer between research organizations and participating companies. CIDAM is addressing new R&D challenges in power electronics, drives/actuators, machine control and complex mechatronic systems via vertical integration of these fields.

### **Smart Regions – Buildings and Settlements Information Modelling, Technology and Infrastructure for Sustainable Development**

The aim of this project is to create a multidisciplinary and interdisciplinary system of cooperation between companies and research organizations to develop energy-efficient and environment-friendly technology systems, equipment, components, methodologies and strategies for buildings in intelligent regions. The project is in line in the Czech Republic with the EU energy strategy based on Directive 2010/31/EU of the European Parliament and the Council of 19 May 2010 on energy performance.

### **Advanced Sensors and Methods for Processing Data from Sensors**

This Centre is an association of Czech sensor and sensing systems manufacturers and research institutes. The centre will develop advanced sensors and methods for sensor data processing for a wide range of industrial applications. The applications include advanced sensors and methods for navigation in aerospace and railways, and sensor technologies for health monitoring. The objective is to develop advanced sensor solutions up to the level of functional samples. ■

## CENTRES OF EXCELLENCE

**The Centres of Excellence** concept was established in order to support excellence in basic research in the Czech Republic.

The concept was first introduced by the Czech Science Foundation in 2011, and was extended in 2014.

The target was to achieve research excellence by promoting scientific cooperation in basic research among well-established top teams from research institutions working on the same research issues, or on closely related issues.

The first four Centres of Excellence at the Czech Technical University were established in 2012, and a fifth centre was set up in 2014.

### **Center for Large Scale Multi-modal Data Interpretation**

This center aims to exploit large collections of unlabeled multi-modal data, mainly video footage, to improve the state-of-the-art in video, audio and natural language understanding, interpretation, annotation and retrieval by combining unsupervised and semi-supervised learning. It will address problems that are very difficult (in some cases probably impossible) to solve in a single modality by adopting an interdisciplinary approach. Progress in individual areas – vision, language and speech – will be achieved by co-training and by exploiting results of other modalities as cross-training data. For efficient processing of large data collections, the project will also work on generic problems of organization, indexing and searching based on similarity. This is critical for building real-life applications. The consortium

comprises internationally-recognized groups with cutting edge expertise in the research areas. The project will benefit from sharing expertise, data, and methodologies. In addition to scientific results presented in publications, two demonstrators will be produced.

### **Cumulative time-dependent processes in building materials and structures**

Building materials and structures are subjected to many loads and actions which cause critical defects or failures not instantaneously, but due to many repetitions or by synergy with other physical and/or chemical effects. Knowledge in this field is still very uneven, and many important facts and interactions are little understood as a consequence of narrow and fragmented research into particular and highly specified problems. There is no broader and deeper insight into the complexity of the material or into the structural behavior within the surrounding environment. This project in support of excellence in basic research evaluates long-term monitoring of environmental effects on selected materials and structures, the influence of moisture and salt penetration into porous materials, fatigue problems related to climate loads and climate actions, and methodologies for reliability and risk assessment of the studied materials and structures.

### **Nanobiophotonics for future health care**

As modern medicine evolves toward quantitative and molecular-based science, biophotonics is expected to play an increasingly important role in many areas of medicine, contributing to the quality of health care, reducing health care costs,



and making medical care for an ageing society more sustainable. This centre aims to advance research in selected areas of nanobiophotonics, focusing on photonic molecular biosensors based on plasmonic nanostructures. The main areas of research in this project include studies of plasmonic phenomena on metallic nanostructures, developing novel tools for analysing and designing plasmonic nanostructures, fabricating and experimentally characterizing plasmonic nanostructures with potential for surface plasmon resonance (SPR), and surface-enhanced Raman scattering (SERS) sensing, interfacing biomolecules with inorganic nanostructures, investigating interactions between these biophotonic structures and biological samples, and realizing SPR and SERS biosensors for detecting biomarkers of onco-hematological diseases.

### **Center for advanced bioanalytical technologies**

The main objective is to establish a research center focused on new principles, instrumentation and technologies for bioanalyses applicable in the life sciences. An integral part of the work of the centre will be to educate young scientists and to formulate a new interdisciplinary PhD curriculum. The research will focus on: microseparations utilizing microfluidics and nanotechnologies with mass spectrometry and laser-based detection – molecular biorecognition – advanced feedback control (as used in robotics and in aerospace, but not so much in bioanalysis) – parallel non-contact manipulation by shaping the force and for

potential fields. The center will engage in international collaboration with top level partners. Organizing an international conference on bioanalysis [www.ce-ce.org](http://www.ce-ce.org) will be an integral part of the work. The ultimate aim is to develop a low-cost, perhaps disposable, lab-on-chip platform for applications such as analysing cancer cells, biomarkers, toxins in food and/or microorganisms related to bio-warfare.

### **Multidisciplinary research centre for advanced materials**

Six departments from four Institutes of the Academy of Sciences of the Czech Republic and two universities are collaborating in the Multidisciplinary Research Centre for Advanced Materials. The Centre will investigate ultrafine-grained (UFG) materials (prepared by advanced methods, such as severe plastic deformation and plasma technologies), functionally graded materials (prepared by plasma spraying), coated light-metal based composites, and functional materials with martensitic transformation. The investigations will focus on structural stability, plastic behaviour and relations between UFG structure and phase transformations, the effect of reinforcements in composites, and the influence of the microstructure on the magnetic shape memory effect. New advanced light composites with additional functionality and a new generation of functionally graded materials will be prepared by combining light metals and shape memory materials. Center members will share their expertise and the unique experimental facilities, and will develop the scientific skills of students and young researchers. ■

## UNIQUE SCIENTIFIC WORKPLACES

**Research** is carried out at a large number of scientific workplaces. We list here some of the most interesting laboratories, facilities and research groups.

### **FACULTY OF CIVIL ENGINEERING**

Josef Underground Educational and Research Facility  
Centre for the Integrated Design of Progressive Building Structures  
Experimental Centre  
Micromechanics Laboratory and the Nanolaboratory

### **FACULTY OF MECHANICAL ENGINEERING**

Josef Božek Centre of Vehicles for Sustainable Mobility  
Research Center of Manufacturing Technology  
Aerospace Research Centre  
Applied Cybernetics Research Centre  
Centre for Quality and Product Reliability  
Centre for Technological Information and Education  
Progressive Technologies and Systems for Energetics  
Centre for Welding Technologies  
Innovation Centre for Diagnostics and Application of Materials  
Research Center for Railway Vehicles  
Centre for Advanced Nuclear Technologies

### **FACULTY OF ELECTRICAL ENGINEERING**

Advanced Materials Group  
Antennas, EMC and Simulation of Electromagnetic Fields  
Biomedical Electronics and Biodata Groups  
Computer Graphics Group  
Free-space and Nonlinear Fiber Optics

High-current Discharges Group, and Plasma Theory Group  
Intelligent Data Analysis Research Group  
MAGLAB – Laboratory of Sensors and Magnetic Measurements  
Medical Image Processing  
Laboratory of Photovoltaic Systems  
Diagnostics  
Quantum Structures Research Group  
Signal Analysis, Modelling, and Interpretation  
Speech Processing Laboratory  
Radiowave Propagation  
Electromagnetic Field Theory  
Transmission Media and Systems

### **FACULTY OF NUCLEAR SCIENCES AND PHYSICAL ENGINEERING**

VR-1 Training Reactor  
Golem Fusion Tokamak  
Laser Plasma Center  
Doppler Institute for Mathematical Physics and Applied Mathematics  
Satellite Laser Ranging Station for ESA and NASA Satellites  
Laboratory for Quantitative Methods of Research of Historic Monuments  
Laboratory of Advanced Detection Technologies,  
AdMat Multidisciplinary Research Center for Advanced Materials, Research Center for Nanobiophotonics for Future Health Care

### **FACULTY OF ARCHITECTURE**

Department of Theory and History of Architecture  
Department of Monument Care  
Research Centre for Industrial Heritage  
Department of Spatial Planning

Department of Urbanism  
MOLAB – Department of model projection  
Department of Building Typologies

#### **FACULTY OF TRANSPORTATION SCIENCES**

Joint Systems Reliability Laboratory of the faculty and the Institute of Informatics at the Academy of Sciences of the Czech Republic  
Experimental Laboratory of the Faculty of Transportation Sciences  
Certification Organ for Production at the Faculty of Transportation Sciences  
Special Telecommunications Laboratory – a member of the Eurnex network  
Telematics Laboratory  
Experimental Mechanics Laboratory  
Laboratory for Electronic Identification Systems and Communication (e-ident)

#### **FACULTY OF BIOMEDICAL ENGINEERING**

Non-conventional Ventilatory Team  
Excimer Laser Laboratory  
Joint Workplace of the Faculty of Biomedical Engineering and the First Faculty of Medicine of Charles University  
Simulated Workshop for Intensive Care and

Medical Instrumentation  
Nanosensors for Biomedicine Research Group

#### **FACULTY OF INFORMATION TECHNOLOGY**

3DPrint Lab  
CISCO Lab  
Computer Engineering Lab  
Data Science Lab  
Digital Design and Dependability Lab  
Forensic Analysis Lab  
GPU Lab  
HW Lab  
Intelligent Embedded Systems Lab  
RFID lab  
SAGELab

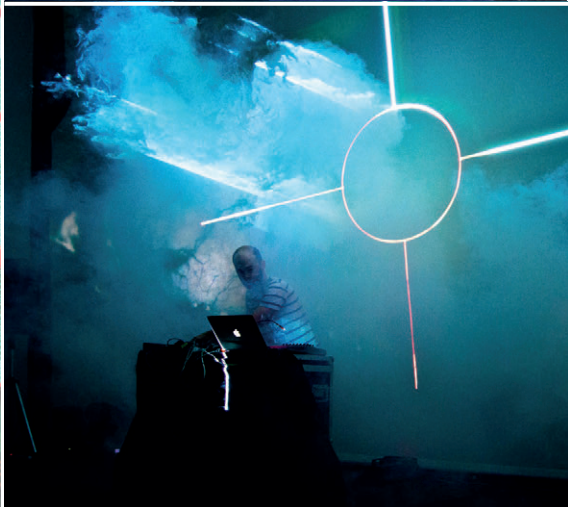
#### **INSTITUTE OF EXPERIMENTAL AND APPLIED PHYSICS**

Van de Graaff Laboratory  
Radiation Imaging Laboratory  
Detector Laboratory

#### **KLOKNER INSTITUTE**

Centre for Composite Materials and Structures ■









## THE INSTITUTE OF INTERMEDIA

The **joint workshop** of CTU and the Academy of Performing Arts in Prague (AMU), located on the main Dejvice campus of CTU, provides a platform for international collaboration among students and teachers from technical and artistic fields. The Institute has been developing and initiating a new interdisciplinary model of education and research, bringing together Czech institutions dealing with technology, the arts, science and the humanities, and also non-academic partners. It provides a space for dialogue across extensive areas of knowledge.

This interdisciplinary workshop focuses on multimedia and audiovisual creativity. It participates in teaching courses in the accredited study programmes of the partner universities, and in artistic and research projects. In its teaching activities, the Institute is involved in developing technologies for scenographic and dance projects, light design, sound design, special projection, and visualization in virtual reality. The Institute develops control systems for interactive and kinetic installations, with a strong outreach into architecture and design.

On the CTU side, mainly students and personalities from the Faculty of Architecture and the Faculty of Electrical Engineering are engaged in the work of the Institute.

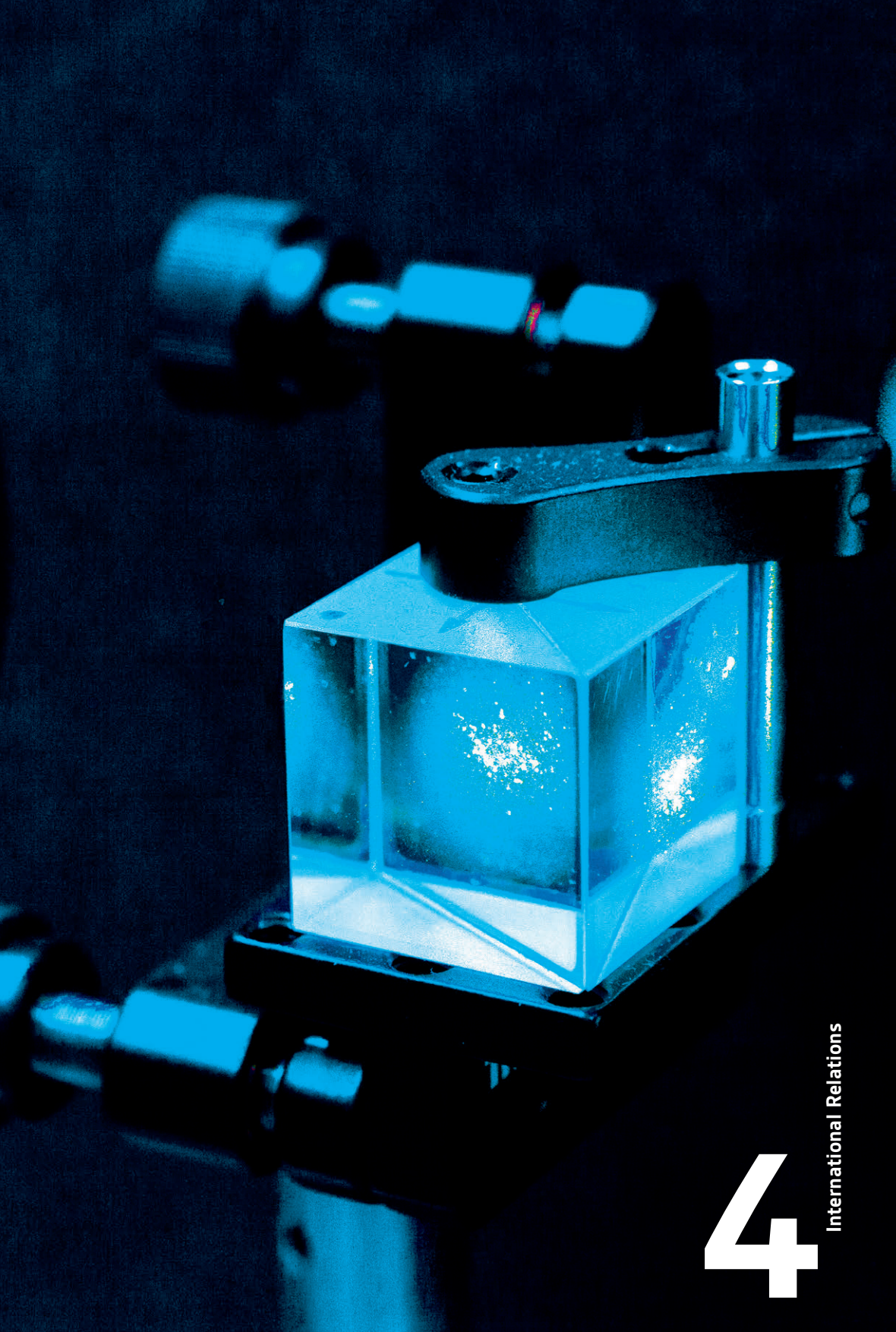
The aim of the Institute of Intermedia is to establish a creative environment for collaboration involving students, teachers, scientists and researchers from various fields, to develop new forms of collaboration with manufacturers and with the public, and to investigate the use of unconventional and innovative technical solutions in various areas of society. ■

PROMOTING SCIENCE AND RESEARCH

Since interest in studying engineering has dropped in recent years, CTU has been trying to promote itself by making attractive presentations of science and research. We have been making active efforts to influence secondary school students and primary schoolchildren. Since 2012, CTU has been working on a European project aimed at popularizing science and research on an ongoing basis. We organize events for science and technology circles, interactive field trips, competitions, summer science and technology camps, etc. For secondary school students, we organize individual specialized internships at the CTU faculties within the Junior Tech University project. Each year, we participate in the Day of Science at the Prague universities, where we present science from close up, in a non-traditional and interesting manner. ■







# 4

International Relations

## LINKS WITH LEADING UNIVERSITIES ALL OVER THE WORLD

### **Do CTU students have sufficient opportunities to do a part of their studies at a foreign university?**

CTU students have a wide range of opportunities to study in a foreign language at universities in the EU countries, in North America, in Latin America, in Russia, in South-East Asia and in Australia. About 600 students per year study abroad within the framework of bilateral agreements and the Erasmus+ programme, though in fact the capacity of our agreements is higher. We have very good links with a large number of prestigious universities, and we exchange students, for example, with TU Delft, RWTH Aachen and ETH Zürich.

### **Which destinations are CTU students most interested in?**

There is a lot of interest in the English-speaking countries. That is to say, the USA, Canada, the British Isles and Australia. In general, students are particularly interested in more distant, rather exotic countries, such as Indonesia and Singapore. In Europe, the greatest interest is in Scandinavia, the UK and Ireland. There is certain interest in the German-speaking countries, but participation is limited by our students' language skills. Most of our students have English as their main foreign language.

### **What does the management of CTU do to encourage more students to participate in studying abroad?**

At CTU, there are a range of opportunities to discover the attractions of studying abroad. Twice each year, the Athens programme offers a one-week course at partner universities, and a total of about 160 CTU students take part.

The Athens programme brings together fifteen

top European technical universities, including Paris Tech, which is an association of ten of the most famous Grandes Ecoles d'Ingénieurs in Paris, as well as TU Delft, KU Leuven, TU München and other excellent universities. The international office of CTU also organizes the Erasmus Information Fair with the participation of several partner universities. Other students make use of the opportunities provided by IAESTE and by BEST.

### **Which prestigious universities have recently shown interest in collaborating with CTU?**

MIT is probably the most prestigious technical university in the world. Our Institute of Intermedia at the Faculty of Electrical Engineering recently started collaborating with them. We have recently been invited by the rector of RWTH Aachen (145 in the QS rankings) to refresh our longstanding cooperation.

### **CTU is an attractive university for international students. Could you point out some of the reasons why students should choose to study engineering in Prague?**

In Asia and in many other parts of the world, parents are ready to invest quite a lot of money in their children's education. When deciding where they should study, they tend to look at the world rankings. We are therefore pleased that we have good positions in the QS World University Rankings. We have also initiated cooperation among the leading Czech universities and we are collaborating on the Study in Prague project. This project draws attention to Prague as one of the most attractive cities for university studies, and has in particular led to a considerable increase in the numbers of self-funding students. ■





## CTU HAS STUDENT EXCHANGES INTEGRATED INTO ITS STUDY PROGRAMMES

**CTU has been signing** and activating new collaboration agreements mainly with highly-ranked universities, and has been maintaining older agreements with valued and established partners. Most student mobility agreements are open to all CTU students (including non-EU citizens) who are approved by their faculty and who have adequate relevant language skills. The exchanges are supported by funding from the Ministry of Education, from the university, and from EU sources. While they are studying abroad, participants are required to earn credits towards completing their study programme at their home university. CTU facilitates credit transfer for incoming and outgoing exchange students.

### **CTU's collaboration with top universities:**

- Standard Memoranda of Understanding and/or Agreements on Collaboration with 90 universities from the Top 500 in the QS World Universities Ranking, focused on student exchanges and collaboration in teaching.
- 36 Agreements on Collaboration in Research with universities from the Top 500 in the QS World Universities Ranking.

**Between 2011 and 2015, CTU succeeded in establishing new cooperation** or renewing an old partnership with a number of universities from the Top 500 in the QS World Universities Rankings. Here we list only some of them: several universities in Australia, including Queensland University of Technology, Brisbane and the University of Newcastle; Beihang University in Beijing, China, and the Hongkong University of Science and Technology; universities in Korea, including Korea Advanced Institute of Science and Technology (KAIST); universities in Europe, including TU Delft and RWTH Aachen; universities in the USA, including the University of Wisconsin in Madison and New Mexico State University. We are also communicating with partners in Japan, with Tohoku University, Sendai, and with Kanazawa University, Kanazawa. Every year, we establish relations and start new collaboration on research and on student exchanges with a number of selected high-quality partner universities.

### **Destinations for student exchanges**

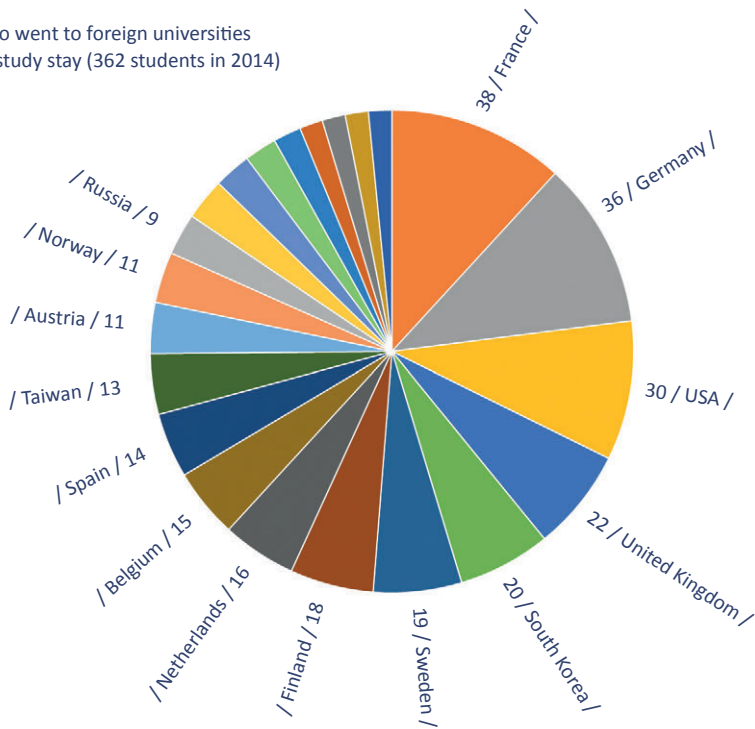
In the framework of Erasmus agreements and bilateral agreements, exchanges of students take place mainly with universities in the European Union member countries, in north, central and south America, in Asia, and in Australia. Russia is also an important partner. Student mobilities in the framework of the EU Erasmus+ programme are very popular. In the 2010/2011 academic year, 256 CTU students participated in these study stays. 304 students participated in 2011/2012, 271 students in 2012/2013, 425 students in 2014, and 458 students in 2015. Internships within the Erasmus+ programme are also developing well.



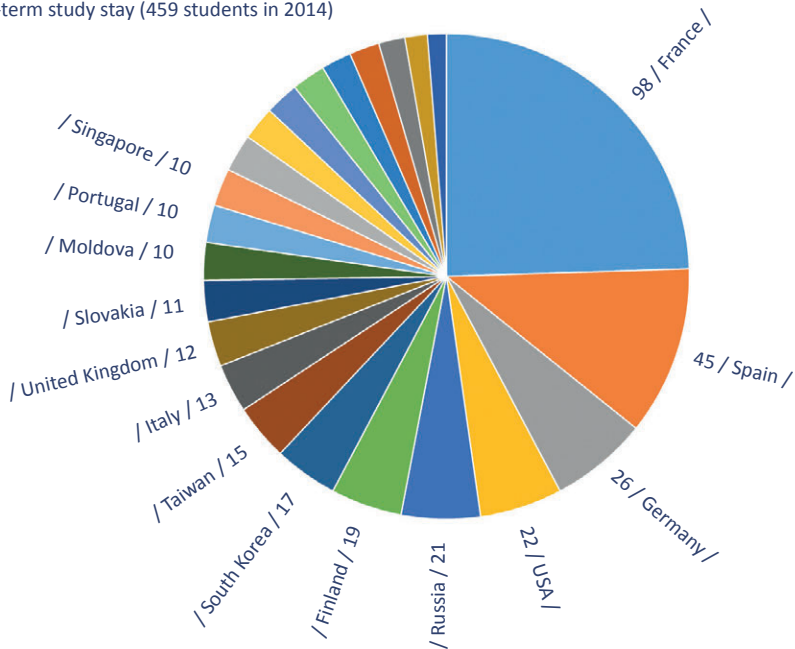
A good example of what we are doing is the promotion of studies at CTU on our website [www.studyatctu.com](http://www.studyatctu.com), and also on Facebook and on Twitter. We have also initiated cooperation among the leading Czech universities and we are collaborating on the Study in Prague project [www.studyinprague.cz](http://www.studyinprague.cz). This project draws attention to Prague as one of the most attractive cities for university studies, and has in particular led to a considerable increase in the numbers of self-funding students. In 2015/2016 there were 374 of them studying at CTU.



CTU students who went to foreign universities  
for a short-term study stay (362 students in 2014)



Students who came to CTU  
for a short-term study stay (459 students in 2014)





### Double degrees

A CTU student can obtain a double degree or a joint degree by taking one of the joint study programmes with foreign universities. CTU currently offers 12 joint and double degree programmes, the largest number being at the Faculty of Civil Engineering, where students can apply for one of five joint-degree programmes. Three joint-degree programmes are offered by the Faculty of Transportation Sciences, two by the Faculty of Electrical Engineering, while the Faculty of Mechanical Engineering and the Faculty of Biomedical Engineering offer one programme each. The partner universities include: University of Padova, Technical University of Catalonia, École des Ponts Paris Tech, École Centrale de Nantes, RWTH Aachen, TU München, Trinity College Dublin, University of Coimbra, Tomsk Polytechnic University, University of Linköping, the University of Texas at El Paso, and National Tsing Hua University Taiwan. The qualifications of joint-degree and double-degree graduates are recognized by professional institutions in both countries.

### Visiting professors

Short-term and long-term visits by professors from abroad, to deliver special lectures or lecture courses, and to collaborate on research projects, are a normal part of CTU university life. Unfortunately we do not possess a proper central database of visiting professors, so we are not able to give any numbers here.

### International students at CTU

The number of students from abroad is quite high. According to data from December 31<sup>st</sup>, 2015 there are currently 3 379 regular students and 831 short-term students, making a total community of 4 210 international students at our university.

### Self-funding foreign students

CTU has been taking measures aimed at further internationalizing the University and at increasing the numbers of self-funding students. One standard measure is to take part in major international higher education fairs abroad. Last year, CTU participated in higher education fairs organized in Asia (Kuala Lumpur, Bandung, Jakarta), in Brazil (Belo Horizonte, Sao Paulo), in China (Beijing), in the United Arab Emirates, in Italy, Spain and Germany. People interested in studying at CTU in Prague receive our full attention right from the start. Information about studying at CTU is provided, together with advice about problems that can arise when studying abroad. Current information is provided about opportunities to study in English language, the selection process, obtaining a visa, validation of previous studies, accommodation in student dormitories and in private flats, living costs, and also about cultural life in Prague and opportunities to travel.

You can address your questions to our Student Advisor by e-mail, by Skype or on Facebook, practically non-stop – see [www.studyatctu.com](http://www.studyatctu.com).



On social networks, which have been growing in importance in recent years, CTU is represented by its own Study at CTU facebook profile for foreign students. The information is updated daily. The facebook profile provides information about what is going on at the University, congresses and workshops in English language, job offers, technical innovations and stories about successful students and graduates of CTU.

Each year, we carry out a survey of the problems encountered by self-funding students. The questionnaire and the analysis of the responses help us to improve our services and raise the level of satisfaction of self-funding students. Of the self-funding students responding to the questionnaire, 80% nowadays state that CTU is their first choice for university studies, which indicates that our strategies and our work are producing good results.

### Membership of CTU in international institutions

CTU is a well-established long-term member of a number of prestigious international associations and networks, and joins new associations only when they fit into the University's strategy. In addition to many specialized associations that the faculties belong to, the University is a member of:

- The International Association of Universities (IAU)
- The European University Association (EAU)
- The European Association for International Education (EAIE)
- The European Association of Architectural Education (EAAE)
- The European Society for Engineering Education (SEFI)
- The Association of European Schools of Planning (AESOP)
- The Association of European University Public Relations and Information Officers (EUPRIO)
- Top Industrial Managers for Europe (T.I.M.E.)
- The Conference of European Schools for Advanced Engineering, Education and Research (CESAER)
- Die Internationale Gesellschaft für Ingenieurpädagogik (IGIP)

Care for students from abroad is provided not only by the International Office at the university rectorate and by the International Departments at each faculty, but in great measure by the university's outstanding International Student Club (ISC) <https://www.isc.cvut.cz/>. The cornerstone of ISC's care for international students is its so-called Buddy Programme, in which Czech students offer wide-ranging assistance to foreign students, helping them to deal with everyday problems in the new and unfamiliar environment. At the beginning of each semester, ISC organises an Orientation Week, which is aimed at preparing newly-arrived students for the upcoming semester. It includes meeting them on arrival, accompanying them to their accommodation, helping them to sign in and settle in, helping them to obtain a public transport pass, and helping them to register at their faculty, etc. Integration Day is a pleasant tradition in Orientation Week, with an informal party to meet and get to know other students. At the end of Orientation Week and in the course of the semester, ISC organises numerous highly recommended inexpensive day trips and two- or three-day trips to get to know the Czech Republic and also neighbouring countries. ISC also organises a wide range of sports events and physical activities, as well as cultural events, including National Presentations. ISC organizes prize-winning language teaching and language exchange courses, in which students teach their own language to other students. The final major ISC event each year is traditionally a boat trip on the Vltava. ■

More about study at our university on

<http://www.studyatctu.com/>

<https://www.facebook.com/studyatctu>

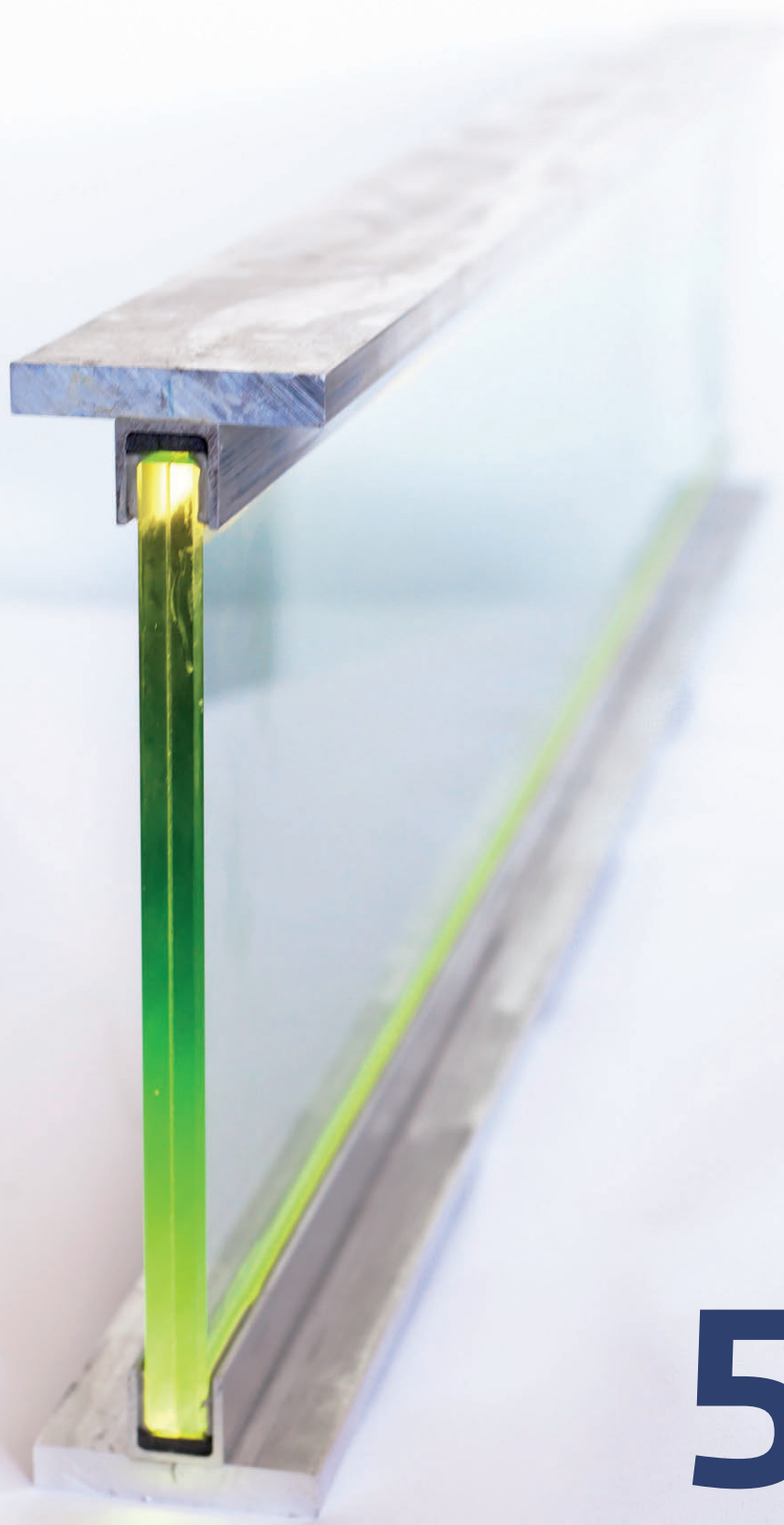
<http://www.studyinprague.cz/>

<https://twitter.com/studyatctu>









5

CTU Development

## TO KEEP CTU UP AMONG THE TOP UNIVERSITIES...

### **As Vice-rector for Development of the university, what priorities have you set for the near future?**

As I see it, the top priority is to develop the university's Dejvice campus. We've constructed the new building for the Faculty of Architecture and the Faculty of Information Technology. The reconstruction and extension of the former Blue Canteen building has almost been completed. This will be the seat of the university leadership, the Czech Institute of Informatics, Robotics and Cybernetics – CIIRC, and some other university workplaces. We are also preparing to reconstruct the laboratory buildings of the Center for Advanced Technology, increasing the usable space from 17 000 m<sup>2</sup> to more than 30 000 m<sup>2</sup>. As the oldest technical university in Central Europe and the leading technical university in the Czech Republic, we pay special attention to the quality of our graduates. A basic consideration is to have plenty of high-quality candidates entering the university. Leading positions in international and national ratings of universities provide good publicity. We regularly appear in leading positions in the Czech ratings. As far as the international ratings are concerned, we concentrate on the QS World University Rankings and the Times Higher Education World University Rankings, where we and Charles University are regularly classified among the 500 leading universities in the world.

### **For a public university, it is very important to join in EU-funded projects...**

We are at the beginning of a new programme period, in which the Prague universities will be able to apply for Operational Programme projects in support of research, development

and education. We've prepared 14 projects for excellent research teams, with total funding of more than two billion crowns (EUR 75 million), and we're still preparing more applications. We've joined the Industry 4 programme and the Horizon 2020 European programme. For our participation, we have been building up the staff resources and the built infrastructure at all eight faculties of the university, and also at our new research centres: the University Centre for Energy-Efficient Buildings, and the Centre of Vehicles for Sustainable Mobility in Roztoky, and also in our longer-established research institutes, such as the Institute of Experimental and Applied Physics, the Klokner Institute and, last but not least, in the new Czech Institute of Informatics, Robotics and Cybernetics.

### **With its highly specialized work, CTU has been a reliable and recognized partner for public administration institutions. Will this trend continue?**

Collaboration with public and state institutions has always been one of the missions of the public universities. Mutually advantageous collaboration will of course continue, and will develop further. This is a prestigious opportunity, which not only brings in a financial contribution but also brings the university to the attention of the general public as an expert institution, and helps us to win further projects and orders. For example, CTU is working on processing the outcomes of the Register of Information and Results for the Ministry of Education, and a Memorandum of Collaboration has been signed with the Ministry of Defence and the Army of the Czech Republic in the framework of which we are preparing new projects. ■





## CTU DEVELOPMENT

We aspire to be a significant, sought-after research university in the European higher education area, with a demanding but friendly approach to students.

### **Our strategy**

The development strategy of the university, in conjunction with the university development department, follows three main themes in the area of tertiary education and university research:

### **Quality and relevance**

In the field of education, our aim is to be a sought-after university in the Czech Republic and also at European and world level. We update the portfolios of the study programmes and study fields on an ongoing basis to ensure that, in particular, they cover selected promising areas of the work of engineers, while at the same time meeting the requirements of industry for graduates. Emphasis will be placed above all on the quality of the studies, enabling horizontal mobility between fields of study, including mobility between the faculties of the university and other universities in the Czech Republic and abroad. We will continue to develop new education technologies in support of the

education process, for example e-learning and e-teaching. The development of high-quality scientific work and research work has benefitted in particular from the newly-established and newly-built university centres, including the University Centre for Energy-Efficient Buildings, the Centre of Vehicles for Sustainable Mobility, the Czech Institute of Informatics, Robotics and Cybernetics, and other modern workplaces at the departments and faculties of the university. Integrating students at bachelor, master's and PhD level into our research activities is of course another aspect of the university's support for high quality.

### **Openness and international collaboration**

In order to be a well-recognized university at world level, we will support international exchanges of students and teaching staff, and also joint international scientific and research collaboration. Our aim is that every student should have the opportunity at least once during her or his studies to travel abroad to a partner university



for a semester within the framework of a study exchange programme. The university has joined international projects in the framework of the Horizon 2020 programme, numerous bilateral international projects and, of course, collaboration projects with major Czech and international companies. I can give as examples Škoda Auto, Porsche, the US Navy, Bosch, Siemens, Rockwell, Skanska, and others.

### Efficiency and funding

To improve the functioning of the university, we are working on developing the university information system, and on providing easy access to information for managing the university and its agendas in the fields of study, research and finance.

For efficient development of the university, it is essential to provide the necessary infrastructure based on

modern instrumentation, laboratories and classrooms. This includes support for students' free-time activities and interests (sports equipment, sports and cultural activities that are not directly study-related). An essential pre-condition is the development of information sources. For this purpose, we will continue to support the university library. The library is now located in modern spaces, but it is necessary to take constant care of the fund of books and electronic sources, and of course to provide access to all relevant electronic sources of information.

To fund these activities, we use money from the state budget, and also from other sources, including the EU Operational Programme funds, Horizon 2020, the Grant Agency of the Czech Republic, the Technology Agency of the Czech Republic, Industry 4, etc.





### Science

We want to be a worthy partner for leading workplaces in Europe and in the rest of the world, while at the same time continuing to deepen our collaboration with suitable research organisations and institutes in the Czech Republic, especially with the Academy of Sciences of the Czech Republic.

### Finance

The development of the University and its infrastructure receives support especially in the framework of the development programmes of the Czech Ministry of Education, Youth and Sport, the Fund for the

Development of Universities, and from CTU's own sources.

There has also been a significant growth in the funding that we receive from the EU structural funds.

### Development and innovation

We want to occupy a leading position in collaboration with industry and with the public administration, and to create conditions that will provide growing potential for innovation, artistic and other creative activities, technology and knowledge transfer, for the benefit of society. ■







# 6

IT system



## ON OUR WAY TOWARDS E-CTU...

**It would be impossible to imagine the university functioning without a high-quality IS/IT system. Are you satisfied with the present situation?**

CTU has been operating and at the same time developing an information system that is extensive, heterogeneous, and complicated to manage. A truly strong infrastructure and a wide range of applications are available. Some basic changes have been made with a view to modern methods for IS/IT management and systems integration. The system will continue to be developed in order to put the CTU information system on a level with the information systems of top universities abroad.

**CTU has an advantage – IT is studied here at several faculties, and well-known experts with practical experience work here. Do the teaching and academic staff of the university also participate in developing the university IT system?**

Yes, of course. A number of colleagues from various CTU faculties and from outside the university work on developing the university IT system. They are experts in various aspects of IT, and another very important consideration is that they have experience of practical implementations.

**Does the university have sufficient funds for its systems?**

High-quality IT support for the main processes running at CTU – studies, science and research, international relations, collaboration with industry and commerce, university management and financial management, etc. – is so important that the necessary development funding just has to be found.

The way in which information technologies are used is a significant factor in the competitiveness of the organisation, and the CTU strategy is to be on a comparable level with top international universities. The information system is also an instrument in support of a broad range of processes at CTU.

**Could you say a few words about the development strategy for the CTU information system? What is the priority area for the near future?**

The basis of the CTU strategy for developing the university's information system lies in linking the university's information system with the university's information strategy. The main short-term priority is to elaborate an information strategy and to assert and boost it. At the same time, it is necessary to ensure continuity of the development of the present key components of the information system. That is to say, the study support system, the system in support of scientific, research, artistic and creative activities, and the management system for economic activities and for financial management. Another important issue is to find funding for this development. Further priorities are to bring in program and project management of the development of the information system, and the principles of strategic IS/IT management.

**In your opinion, when will we be able to speak of our university as e-CTU?**

Personally, I am convinced that within the time needed to elaborate our information strategy, that is to say within the next 2–3 years, we will be able to define the final status of IS/IT at CTU, and this is what is referred to in brief as e-CTU. ■









## PROVISION AND DEVELOPMENT OF INFORMATION SERVICES

The Computing and Information Centre (CIC) is an independent part of the Czech Technical University in Prague that operates, coordinates, integrates and develops university activities in the ICT field. CIC cooperates with all CTU faculties and constituent parts, particularly on providing co-ordinated services for developing and operating central components and applications. Within its field of specialization, CIC also cooperates with external institutes to provide specific IT services. CIC holds the ISO 9001:2009, ČSN ISO/IEC 20000-1:2006, and ČSN ISO/IEC 27001:2006 Quality Management certificates.

**Within the framework** of the general information system, CIC provides three key types of services for CTU, in the areas of finance and administration, the study information system, and science and research. CIC develops the information system, and is responsible for providing security, integration and coordination for information services across the whole university. CIC also runs the basic server and database infrastructure, providing superior quality connectivity and administering the whole network. CIC also supplies the CTU web, intranet, and multimedia area with recordings of major events. Support for CTU information services is covered by the CIC service department, and by projects carried out jointly by CIC departments and CTU worksites.

**The Department of Finance and Administration** develops automated processes in support of the university

administration. The department's basic work covers accounting, billing, human resources management, assets and property management, information retrieval, and sales. Management superstructures are an important aspect of the services provided by the department. The focus is on unifying the database and on preparing aggregated information and data for use at various levels. The university environment operates the EDUPay payment scheme. Direct debit services and administration of financial claims and commitments between university and students come under this scheme. At present, the department is working on computerizing basic administrative tasks (absence lists, business travel orders, etc.) The support is applied at PKI (Public Key Infrastructure) level using chip cards.

**The Study Department** administers the Study component (known by the acronym KOS). This is the system of software support for students throughout their studies. The basic administration of the study agenda has been enhanced by services for administering scholarships, payments for studies and fees for entrance procedures. All the components are interconnected with the university financial system. The KOS component is currently being integrated with the electronic document service to provide a unified document administration system for studies. KOS is a basic resource that enables the national student registry office to distribute state subsidies for students. KOS is being enhanced and

updated on an ongoing basis, including the implementation of a more user-friendly graphic interface. In addition, the department administers the following applications: Mobility (originally intended only for administering students arriving/departing within the scope of the Erasmus programmes; this has now been supplemented by bilateral student exchange agreements and departures of academic staff and employees), Anketa (a questionnaire for students to evaluate the performance of lecturers), E-learning (for education support through online courses; dozens of new courses are added each year), and Book (in support of Czech Technical University publishing activities).

### **The Department of Science and Research**

administers two basic areas: science and research results, and supercomputer services. The science and research activities database has the following applications: VVVS (Science, research, international relations), SGS (Student grant competition), and EZOP (Projects). The annual integrated data exports processes for CTU as a whole, i.e. the main components, such as the R&D information system of the Czech Republic (the Results Information Register) for each department, processing statistical reports for the Czech Statistical Office, and exporting to other documents (tables for the Fund for Science and Research, and also budget support, calculating authors' awards for prestigious publications and citations, exporting department statistics, etc.). The supercomputer services provide powerful computer technology for scientific projects and for education at CTU, including applications for demanding numerical

calculations, software simulation, and parallel programming.

### **The Department of Integration and Coordination**

provides the service to provide unique personal and user identification across the CTU Information System, which contains approximately 120,000 users identified with the help of a unique personal number, user name, and a contactless chip identifier. The department provides the whole set of mechanisms for keeping records of CTU passwords used for access to most CTU systems. With the help of the Identity Management system (IdM) the department administers about 40,000 unique user roles in key systems.

The department also interconnects several hundreds of individual CTU systems and subsystems operated on data and procedural levels.

The department analyses, conceptualizes, prepares and implements requests for changes to all elements in the system.

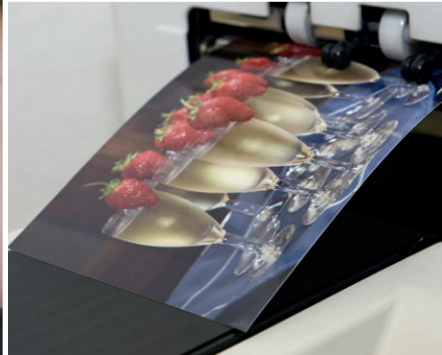
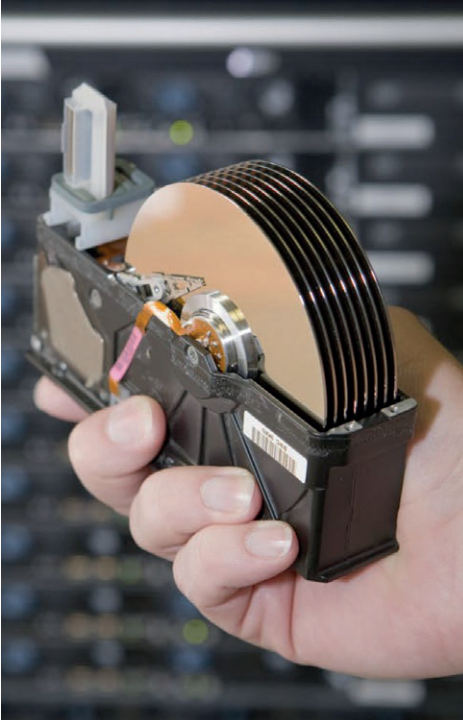
This involves close cooperation with the university management and with the IT departments at the faculties, the university institutes and other elements in the university structure.

### **The Department of Network and Computer**

**Administration** operates three independent telephone systems within the university. It is currently working on modernizing the CTU telephone networks, and on moving from the existing system to IP telephony.

### **The Department of Server and**

**Database Administration** operates the basic infrastructure for the whole CTU Information System. It provides the

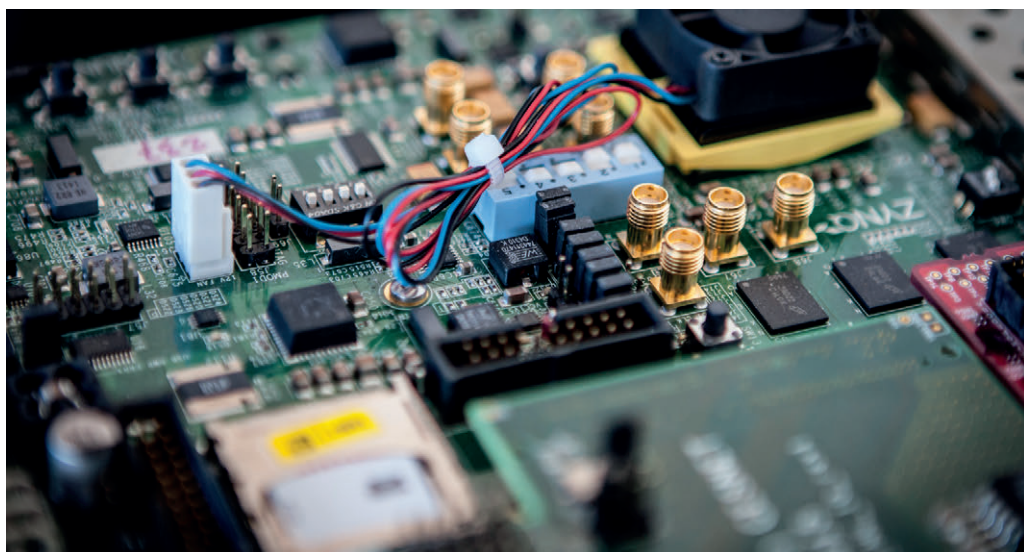


operative environment and the testing environment for the ORACLE, MySQL, and MS SQL platforms. It also provides server operation on the AIX, Linux, and MS Windows operating systems and data storage systems. The department also provides backup and system security, as well as the VMWare virtualizing platform and other services.

**The Development Department** works on developing, testing, and providing service support for the systems, and participates in creating, exporting, importing and analysing data, and also offers consultancy services in the field of technologies and system architecture planning. An important project that CTU has participated in has been the development of a Register of Artistic Outputs. The Register of Artistic Outputs is an R&D information system of arts courses taught at the public universities in the Czech Republic. Seventeen universities and 30 non-arts

faculties in the Czech Republic are involved in this project. The latest version of the system supports the collection of artistic outputs, certification of the outputs by two independent assessors, and an evaluation of the points awarded for them as data sources for the Ministry of Education, Youth and Sports.

**The Department of Multimedia and Web Presentation** provides a complete service for presenting CTU both for internal users (students, research workers, and employees) and for the general public (applicants for study programmes at the university, industrial enterprises, and the media). A range of services are provided, from multimedia recordings of university events to products such as photographs, audio recordings and video recordings. The department also works on presenting CTU on the web, providing technical support and also providing content. The general





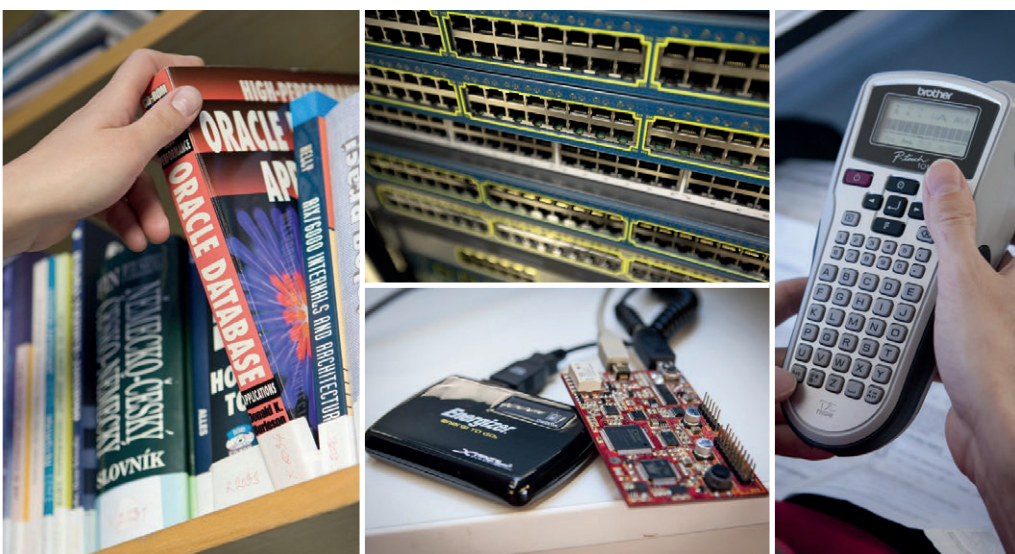
university website on <http://www.cvut.cz> is the flagship for presentation of the university. In 2015, the web portal was reconstructed, and it is now undergoing constant improvement to provide its users with high-quality, clearly presented information on CTU that portrays a modern technical university of the 21<sup>st</sup> century.

### The Department of Economics and Finance

provides comprehensive CIC administrative and operative support. This includes the **ID Card office**, which issues up to 6,500 new identity cards annually, and extends the validity of up to 15,000 ID cards. This office is also responsible for generating passwords and personal codes for hundreds of foreign students, as well as collecting, archiving or shredding out-of-date ID cards. In addition, it operates the cash deposit and withdrawal service in the Transaction Clearing System, as well as payments for season tickets for university car parks.

### Other selected activities

Since 2005, in cooperation with external contractors, CIC has operated and has been developing the R&D Information System of the Czech Republic (the Results Information Register) for the Office of the Government of the Czech Republic. This application is for use in searching openly available data in the information system for research, experimental development and innovations. At present, the application includes a total of 26 providers, 256 programmes, 524 competitions, 41,030 projects, 889 research proposals, and 823,216 results. Based on an evaluation of the results fed into this application, there was an investment of approximately CZK 40 billion from the state budget in 2013. The application is run on Java technology on the Jboss application server and on the ORACLE 11g database platform. ■

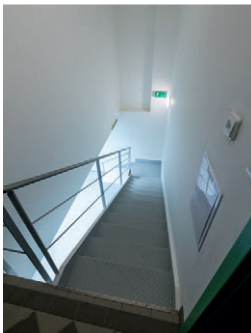






# 7

Construction and Investment



The rapid development of science and technology must have an impact on the teaching and research process at all technically-oriented universities. It is completely natural for our university to give priority to modernizing, refurbishing, reconstructing and extending the buildings and the spaces on its campuses in its development strategy and in its long-term plan. If we want to keep systematically maintaining and developing our study and research facilities, it is necessary to begin by systematically forming a realistic financial basis. Until now, we have been able to do this successfully.





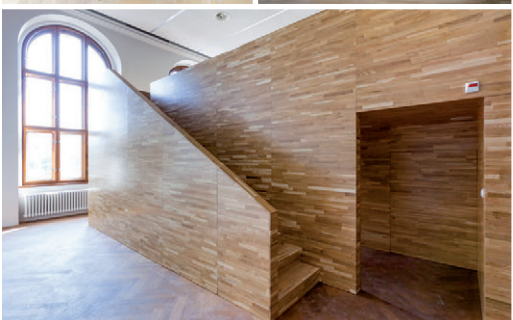
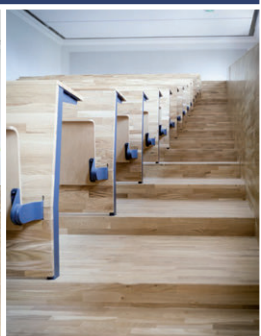
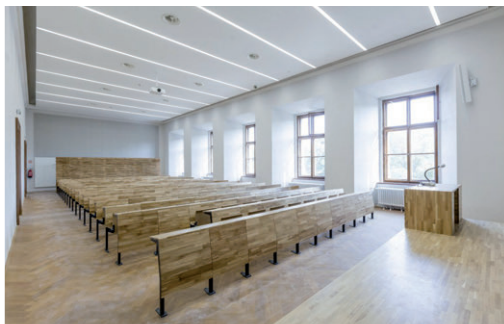






## MODERNIZATION ALSO FOR BARRIER-FREE ACCESS

Classes at CTU in Prague are held not only in newly-built modern structures but also in some historic buildings. The majority of the university's buildings and spaces come from the first half of the 20<sup>th</sup> century, while the oldest building dates back to the 17<sup>th</sup> century! In its investment and construction planning, the university therefore makes great efforts to reconstruct and modernize the spaces and make them suitable for present-day requirements. One aim is to make all of them accessible for people with disabilities.





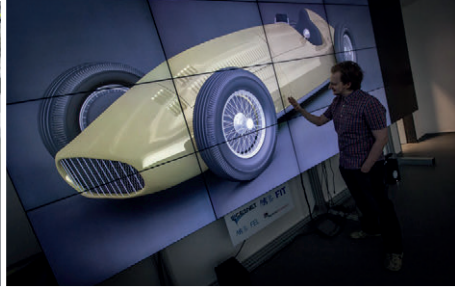


The CTU New Building (building costs: almost CZK 1.3 billion) has four lecture theatres (for 300, 180, 100 and 80 persons). There are spaces for architecture studios, seminar rooms, computer laboratories, and also facilities in the form of specialized workshops for architects and designers.





The Faculty of Biomedical Engineering (situated in the town of Kladno) – the education is held in laboratories with modern equipment and new lecture halls.



The Faculty of Information Technology has perfect conditions for study and research. The SAGELab laboratory is equipped with split panel LCD displays controlled by the SAGE system with 8K + resolution (9600 x 4320 px).







The Faculty of Civil Engineering buildings now have new cladding and facades and state-of-the-art technical equipment (the lifts are controlled by a new generation of microelectronics). A reconstructed lecture theatre bears the signature of the architect, Vladimír Gleich.

On the right: Studio D (Architecture and Building Engineering study centre)

This is CTU!



Construction and Investment

The Faculty of Mechanical Engineering – new drafting room and a reconstructed lecture theatre.







8

Finance



## ABOUT THE CTU BUDGET

The Czech Technical University in Prague is run in accordance with a budget that is approved by the CTU Academic Senate. A substantial part of the budget of CTU, as a public university, comes from funds provided by the state via the Ministry of Education, Youth and Sports for educating students, for specific research projects, and for student accommodation and catering. Significant funding also comes from grant agencies and from income from supplementary activities.

**The overall CTU** budget has been growing steadily in recent years at a rate of about 1,5–3 %. At the same time, the University has managed to raise its revenues from institutional grants and contributions. This is an outcome of the tendency of the Ministry of Education, which is the main source of CTU funding (see the attached pie chart), in recent years to place greater emphasis on the qualitative performance indicators for each university when allocating ministry funding. Since CTU occupies a leading position in terms of all quality indicators for education and for research among the public universities in the Czech Republic, this shift in the Ministry's philosophy has had a positive impact on the university's finances.

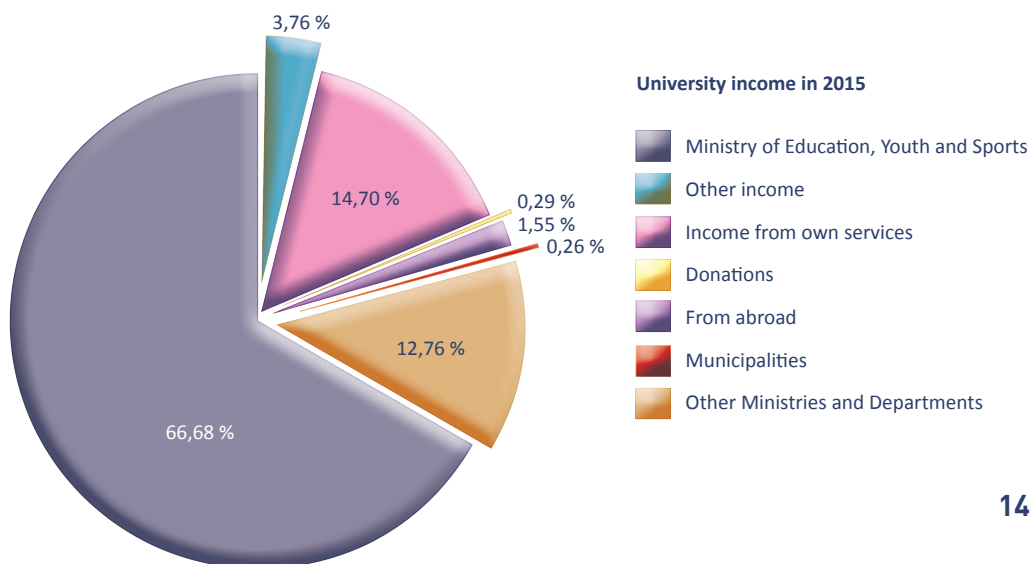


In 2015, in addition to income from teaching, CTU was able to earn almost 1,8 billion crowns from its research and scientific activities. Furthermore, there were over 726 million crowns of receipts from its own services, and almost 202 million crowns from knowledge transfer – income from licensing agreements, from research contracts, for paid education courses for workers in specialized fields, and for consultations and counseling.

CTU achieved favorable financial results in 2015. The structural problems that have troubled the Czech and European economy for several years have eased, and the fiscal shortfalls and cuts in funding that accompanied them abated. This led to a sharp increase in CTU's earnings, and the University ran a surplus of almost 98 million crowns. In addition, CTU raised its reserves by more than 206 million crowns. This money will be used in future as a source for co-funding and sustaining operational

programs and scientific projects. The University also plans to purchase several parcels of land needed for its further expansion.

CTU has also been making efforts to strengthen and improve its economic and financial management. This process has been taking place in broad discussions at all levels in the university, from the Academic Senate of the University, via meetings between the rector and the deans, and between the university registrar and the faculty bursars and the financial officers of university institutes and other elements of the University, and also in working groups set up to deal with specific issues. To make these efforts more effective, CTU decided to incorporate a number of economic and administrative themes into the Institutional Development Plan, which gives public universities access to funding to develop key areas of their activities, including funding aimed at improving the functioning of



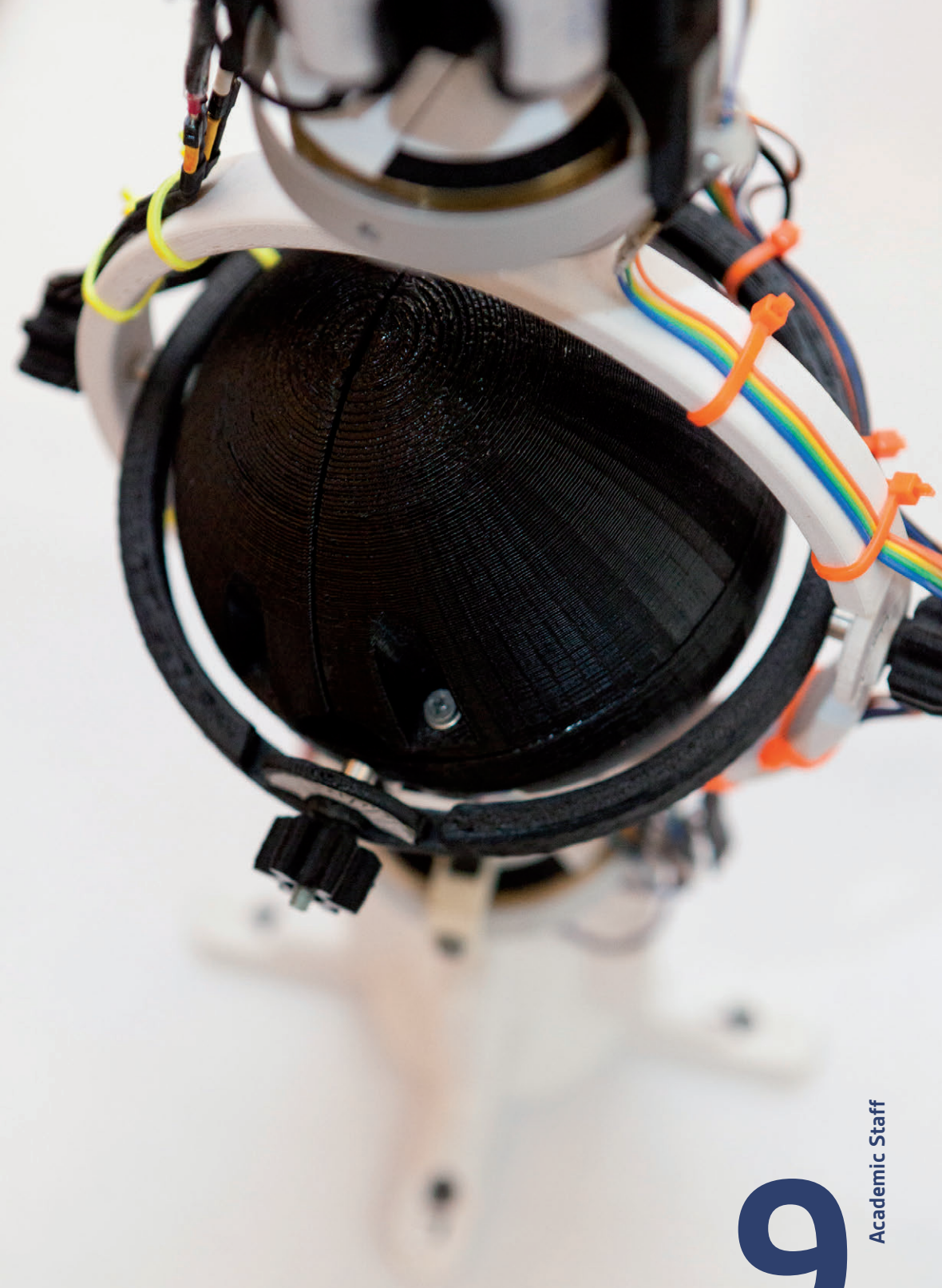
support activities for the main university processes.

A unifying tendency continued to be extended from methodology and information systems into purchasing. Electric power and gas are now routinely purchased through the commodity market for the combined demand of the faculties and other parts of the university, and in 2013 CTU put its cellular phone services to a new tender.

At all levels, CTU has affirmed its interest in establishing long-term binding rules for economic and financial management, which will allow each part of the University, and the University itself, to make efficient use of available funding. These measures will enable the parts to maximize their contribution to the University, and to society

in the broadest sense of the word. The need to redefine the rules for distributing contributions and funding inside the University has also been affirmed. The rules should reflect changes in the view of the Ministry on the position and the function of public state university education, and on how it is funded.

The basic philosophy of the whole university budget is that funding goes where the good things were performed that generated the funding. High-quality creative workers thus harvest almost all of the fruits of their work, and this is a strong motivating impulse for them. The university also supports quality directly. The budget sets aside reserves which are allocated directly to support for high quality. ■



## SUCCESSFUL PERSONALITIES AT CTU

While no current member of the CTU academic community is a Nobel Prize laureate, there are plenty of internationally famous personalities here. The people who are making their mark are not just distinguished scientists. Several students and young researchers who are now setting out on the academic path have already achieved recognition. We offer mini-portraits of some interesting and distinguished members of the university community. This mosaic introduces distinguished professors, as well as students in bachelor and master's study programmes at the faculties and institutes of CTU in Prague.



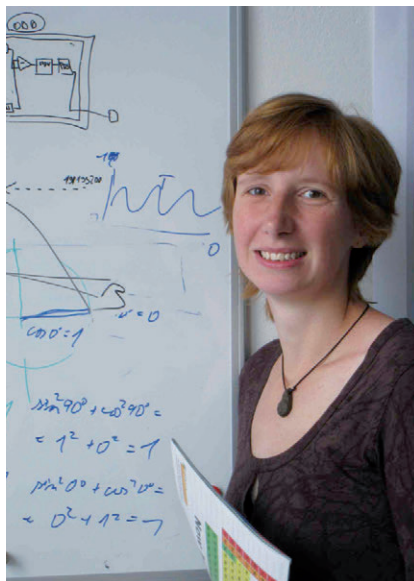
### **Bc. Vojtěch Ciml, Faculty of Electrical Engineering**

The Online Lectures project has impressed not only thousands of visitors to the SlidesLive.com web pages (more than 20 000 people have visited this site, where about 1 300 video recordings of lecturers on a range of topics are posted), but also experts at Stanford University. That is where Vojtěch Ciml, a student of the Faculty of Electrical Engineering, went in the summer of 2013 to develop online education. The SlidesLive project was initiated in 2011, when Vojtech was twenty years old, and in order to prepare for his exams he decided to use recordings of lectures, which he posted on the internet. He added further applications to make the lectures as useful as possible for students. Visitors to the site can follow a lecture, and then they receive further information, e.g. slides that the lecturer has prepared, or encyclopedia sources. The synchronization of the information that is provided is a particularly useful feature. For this project, Vojtech won the eClub MediaLab Foundation prize, and on the basis of this he and his team got to spend three months in Silicon Valley. "I have got a good basic background at the Faculty of Electrical Engineering," the student of Open Informatics says. "It is not just a matter of getting through the required courses: the university environment itself is what provides the real background. Out-of-school activities like the eClub, Physical Thursdays, and many other events, provide a perfect opportunity to meet the right people."



**Ing. Vladimíra Petráková, PhD, winner of the Young Investigator Award, Faculty of Biomedical Engineering**

Vladimíra explains “My doctoral work at FBMI, in cooperation with Institute of Physics of the Academy of Sciences of the Czech Republic, was on developing novel probes for in-cell detection based on nanodiamonds – tiny diamonds of nanometer size. I studied the luminescent properties of color centers in diamond, and developed a new method that can be used for visualizing some dynamic processes taking place in cells.” This work was selected for the Young Investigator Award for the best oral presentation at two international conferences (in the USA, and in Hungary) in competition with scientists from universities such as Harvard and Oxford, and has been published in high impact journals. There is a group at the Faculty that works on developing the field of nanotechnology and its applications in biology and medicine, and it aims to establish a new study program in Nanotechnology for Biomedicine that will provide a strong scientific and educational background for biomedical nanotechnology in the Czech Republic.



**Prof. RNDr. Vladislav Šimák, DrSc.**

**Department of Mathematics and Physics, Faculty of Nuclear Sciences and Physical Engineering**

Prof. Šimák says “I have spent some periods of time at CERN, at MIT, and at the Fermi Accelerator. Over the years, I have participated in numerous experiments on proton-proton interaction and antiproton (5.7 GeV)-proton interaction. In 1965, I set up the first collaboration of Czech physicists at CERN on antiproton-proton interactions in the hydrogen bubble chamber. When the Sepuchov accelerator produced an antiproton beam, we suggested an experiment with the Ludmila bubble chamber at JINR Dubna, in the former Soviet Union. The work lasted more than ten years, and many Czech physicists cut their teeth on this experiment at JINR Dubna and in Prague. I spent some time at CERN carrying out experiments on the UA2 collider with antiproton-proton interactions at 630 GeV.”

Prof. Šimák collaborated on the D0 experiment at the Fermi National Accelerator Laboratory in the USA with the antiproton-proton collider at 1.96 TeV. This experiment came to an end in 2011, but the data is still being analyzed. He has participated in the ATLAS experiment at CERN since it began. Scientists at the Faculty of Nuclear Sciences and Physical Engineering of CTU participate actively in the experiments at CERN, gaining new results in particle physics, and contributing to the investigations of the Higgs boson and the Top quark.

**Bc. Ivona Klímošová**

**Faculty of Civil Engineering**

How should the town of Mannheim, in Germany, develop in years to come? Ivona Klímošová submitted a proposal that makes use of tried and tested principles and technologies, and also some new urbanistic forms and non-traditional technical solutions emphasizing environment-friendliness and sustainable construction. With her design, she won the Czech national round of the ISOVER 2013 Multi-Comfort House Student Contest, and qualified for the international round. "I worked on it in my master's studio project, under the supervision of architects and engineers, which was useful for the project. Studying Architecture and Civil Engineering at the Faculty of Civil Engineering has the big advantage that you get a technical education and also an education in architecture. Graduates from our department can design a wider range of aspects of buildings, and are aware of the dependency between the technical, functional and aesthetic aspects of things," Ivona says. She designed a block of flats in the form of a seven-floor passive wooden structure, placing emphasis on the technical aspects of the design: heating, air conditioning, and the heating technology. She dealt with the development of the town by designing a project where an organically formed car-free city quarter with a park at the centre is inserted into the regular structure of Mannheim.



**Prof. Ing. Tomáš Zelinka, CSc.**

**Faculty of Transportation Sciences, Department of Applied Informatics in Transportation**

Professor Zelinka has been working at the Faculty of Transportation Sciences, CTU in Prague, since 2005. He coordinates research in the area of communications in the ITS and C-ITS networks. Students rate his classes highly, because he supplements his explanations of complex, dynamically-developing telecommunication systems with presentations from his practical experience acquired in the international telecommunications environment.

After graduating in Technical Cybernetics, Tomáš Zelinka joined the Geophysical Institute of the Czechoslovak Academy of Sciences, where he worked for 20 years. He worked on physical experiments as complex computer-controlled systems. He conceived a unique measurement system based on VSM for adaptive identification of Preisach-type rocks with a very low proportion of ferromagnetic components. When the Geophysical Institute joined the international INTERMAG project, which investigated the magnetic activity in the northern hemisphere, Tomáš Zelinka was able not only to carry out geomagnetic observatory measurements, but also to gather data from an extensive area with the use of a range of communication technologies.

His major achievements include the outputs of the VSAT overlapping satellite network. With support from his findings, the required performance parameters for the data services were achieved, and the costs for the VSAT network were kept to a minimum.

In the international environment of GlobalOne, he prepared the concept for an international system for linking voice operators, and then implemented the system with an international team. The system was commercially successful, and in Washington D.C. in 2000 Tomáš Zelinka received the G1 Award for the most successful EMEA project.

**Karel Roubík, a professor at the Department of Biomedical Technology, Faculty of Biomedical Engineering, investigates scientific and clinical problems related to mechanical ventilation and respiratory care.**

Mechanical ventilation is a life-saving technique, but at the same time it can cause serious damage to the ventilated lungs. He says, “The aim of our research is to find new protective ways to provide mechanical ventilation, to test them and to introduce them into clinical practice. High-frequency oscillatory ventilation seems to be very protective. However, a patient connected to a high-frequency oscillatory ventilator cannot breathe spontaneously, and this limits its clinical use. The so-called Demand Flow system is a novel device that may solve this problem. We have been developing it at the Faculty of Biomedical Engineering at CTU, in cooperation with colleagues from VU University Medical Center in Amsterdam, the Netherlands.”

Karel Roubík cooperates closely in his research with several companies in the USA on producing respiratory care equipment, and also with several American university research centers. He was the first researcher in the Czech Republic to become an International Fellow of the American Association for Respiratory Care, the world’s largest and most significant organization of more than 50 000 respiratory care professionals worldwide.



**Ing. MSc. Markéta Vavrová**  
**Faculty of Transportation Sciences**

Markéta Vavrová, a research associate and a PhD candidate at the University of Texas at El Paso (UTEP), conducted a research project while enrolled in the Transatlantic Dual Master’s Degree Program in Transportation and Logistic Systems. This is a collaborative study program offered by the Faculty of Transportation Sciences at the Czech Technical University, the University of Zilina in Slovakia, and UTEP. It allows students to attend and earn master’s degrees from both CTU and UTEP within two years. Thanks to the program, Markéta was able to spend her first year studying transportation at CTU, and her second year at UTEP. This gave her an opportunity to compare and contrast road use charges in the United States and in Europe. Markéta Vavrová was awarded the Friedrich List Award in 2012 by the European Transport Congress for her master’s thesis under the title Development of an Electronic Vehicle Miles Travelled Toll Model.



**Prof. Ing. Jiří Matas, PhD, Faculty of Electrical Engineering,  
Vice-Dean for Development, Department of Cybernetics**

Prof. Jiří Matas conducts high-impact research in the area of computer vision and pattern recognition – more than 15 000 citations of his publications have been recorded in Google Scholar. He is attracted to theoretical problems with application potential, which has led to long-term collaboration with high-tech companies like Toyota (computer vision for an autonomous car), Hitachi (biometrics) and Samsung (image retrieval). He co-founded Eyedea Recognition, the first spin-off company with CTU co-ownership. He enjoys working with students; many Master's and PhD theses supervised by him have received awards, including the most highly regarded in the Czech Republic: the Hlavka Prize and the Ceska Hlava Doctorandus Prize. This year he was pleased that one of his PhD students received a prestigious Google Doctoral Fellowship. He is one of the founders of the Open Informatics study program that in many aspects differs from a standard CTU program, and is proud of its student satisfaction level above 90%. He is the head of the Center of Excellence in Multi-Modal Interpretation funded by the highly selective Czech Science Foundation scheme.

**Mgr. Ing. Michal Jex, Faculty of Nuclear Sciences  
and Physical Engineering**

Michal Jex was awarded second place in the Siemens Prize competition for his master's project on Geometrically Induced Properties of the Ground State of Quantum Mechanical Hamiltonians with Contact Interactions. His study dealt with the dependence of energy in the ground state on the arrangement of point interactions in space and in graphs. Models with point interactions can be used for modeling systems with short-range interactions, for modeling the motion of electrons in organic materials and in crystals, in modelling quantum waveguides, and in many other applications. "I have an excellent background from my studies at the faculty, where I took high-quality courses in physics and mathematics. Students are prepared for future scientific research by taking part in international conferences and by being integrated into international research groups," Michal says. The topic of his doctoral dissertation in mathematical physics is the spectral properties of quantum graphs. "These models are widely used as suitable approximations for complex systems," Michal adds. He also teaches seminars on Mechanics and Thermodynamics, and on Statistical Physics.





**Prof. Ing. Vladimír Mařík, DrSc., Dr. h. c.**

**Director of the Czech Institute of Informatics, Robotics and Cybernetics at CTU**

"I carry out research on distributed intelligent systems, so-called agent systems, and I participated in forming the internationally recognized Prague School of Agent Systems. I have participated in forming the philosophical and theoretical basis for so-called light agent systems that function on PCs, and in work leading to a number of industrial applications, controlling the flight of Unmanned Area Vehicles, etc. I try to take theoretical research all the way to practically applicable solutions," says Prof. Mařík, who is a member of the board of governors of the IEEE Systems, Man and Cybernetics Society. He participates in linking CTU with the European Smart Cities initiative, and is the technical lead of the large EU ARUM research project, among other interests and activities. He collaborates with dozens of academic and industrial research institutions all over the world.



**Ing. arch. Mirjana Petrik, Faculty of Architecture**

The city and the child – how do they get along with each other?

The young architect Mirjana Petrik is finishing off her doctoral dissertation at the Faculty of Architecture on Designing and Planning Child Friendly Cities. She has included children between the ages of 3 and 6 in the planning process, and has spent several years studying the theme of children in the city from the point of view of architecture and other related fields, such as psychology, sociology and ecology. She has developed a special method for involving pre-school children in the process of analysing and designing public places in cities and buildings for children to live and learn in. She attempts to raise awareness of the need to perceive the city from the viewpoint of all of its residents, including children, and from a child's perspective, not only in the planning stage, but also in the area of designing public street furniture. With the help of a Fulbright-Masaryk scholarship for PhD students and scientists, she pursued her research in the Child, Youth and Environments Center for Research and Design at the University of Colorado. Since returning to CTU, she has worked on a project to link Prague with the international Child Friendly City network. In the 2013/2014 academic year, she coordinated the Child Friendly City project, which was carried out in collaboration between the Faculty of Architecture and the Prague 3 city district. Apart from her academic work, she gets involved in various community projects to improve school gardens, community centres and public spaces in general. She has set up an initiative to bring together local residents and experts in order to implement the Child Friendly principles at local level.



**Prof. Ing. Zdeněk Bittnar, DrSc.**

**Faculty of Civil Engineering, Department of Mechanics, University Center for Energy Efficient Buildings**

"Since joining the Faculty in 1990 I have initiated, processed and managed a number of research projects. These have provided funding for research mainly carried out by young scientists. Today, these people are associate professors and professors. They write their own excellent proposals," says Prof. Bittnar. "My recent initiative has led to the establishment of the University Center for Energy Efficient Buildings. The project is financed by the EU Structural Funds, and provides research opportunities for almost 100 people. Half of these are PhD students and postdocs. Experimental equipment has been designed to support innovation in the field of Smart Cities. The participation of four faculties in the activities of the center is something new to CTU, and enables a holistic approach to solving research problems related to energy saving, saving of raw materials and the use of IT to improve the quality of life. Such a large project could not have been set up without the experience gained from membership in the High Level Group of the European Construction Technology Platform. From the very beginning, the project aimed to encourage participation in the HORIZON 2020 program. I am glad that I have been able to motivate many people from the Faculty to do research. During my tenure as Dean of the Faculty, 26 associate professors were appointed professors and 54 assistant professors were appointed associate professors. This would not have been possible if they had not participated in research."

**Prof. Ing. Jan Macek, DrSc., Vice-Dean and head of the Department of Automobiles, Internal Combustion Engines and Railway Vehicles, Faculty of Mechanical Engineering**

"Until such time as people come to the view that we can live without personal mobility – and just use contacts mediated by information networks – personal and mass mobility by means of vehicles will continue to be a source of pleasant experiences, such as the joy of travelling, and also of problems such as pollution of the environment and deadly accidents. We work to minimize these problems in new vehicles, and thereby help our automotive industry to retain its competitiveness in world markets and continue to be a major element in the Czech GDP and in Czech exports," says Prof. Macek. He specializes in applied thermodynamics, internal aerodynamics and physical chemistry, applied to improving the efficiency and reducing the emissions of internal combustion engines through a combination of mathematical simulation and experimentation. "At the present time, there are opportunities to revisit some old ideas that can only now be developed and implemented after the introduction of flexibly controlled mechatronic elements, for example variable compression ratio, valve timing, etc., including the revival of electric cars. At the same time, efforts are being made to introduce innovative vehicles with new ways to store and release traction energy, for example hybrid internal combustion and electric drives, electric engines and fuel cells for hydrogen vehicles. At this juncture, research is highly desirable, because it can help to avoid making expensive mistakes," he adds. "I have to stress that I would not have achieved any success without collaborating with an excellent team. In the past, the team consisted mainly of people from my own generation, but today the rejuvenation process is in full swing. We do not work in isolation – we collaborate on projects with other institutes at the Faculty of Mechanical Engineering, with experts on mechanics and mechatronics, technical mathematics, fluid mechanics, etc., and also with the Faculties of Electrical Engineering and Transportation Sciences."





**Ing. Radek Tichánek, PhD, Faculty of Mechanical Engineering**

**Researcher at the Josef Božek Vehicle Centre for Sustainable Mobility, founder and leading personality in the CTU CarTech team**

How did the successful CTU CarTech team, set up by Radek Tichánek and now one of the leading teams in the world, come into being? “The idea of setting up a Formula Student team at CTU in Prague came up in 2007, when we heard how teams at universities abroad do it. There was encouragement from Prof. Macek, head of the Institute of Automotive Engineering, who pronounced that the time was right for an attempt to set up a Formula Student team here,” the young scientist recalls. The path from the idea to the present-day ever-improving team has not been straightforward. There was no infrastructure, no production area, no equipment, no money, and there were no partners to support the project to construct racing cars and take part in the Formula Student/SAE competition, which was at that time an unknown event here. One thing, fortunately, was not lacking, and that was the enthusiasm of many dozens of students, who volunteered to work in the team in their free time, and laid the foundations for the present-day results. The team that first started in the Formula Student Germany competition in 2009 with an internal combustion engine car has kept on achieving better and better results each year. In the worldwide table of more than 500 universities taking part in the competitions, CTU in Prague took 15<sup>th</sup> place in 2013. In 2011, the CTU CarTech team also entered a car for the electric engine formula competition, and this car now occupies 11<sup>th</sup> place among more than 60 competing universities from all over the world. “These placings present a very positive image of CTU internationally. The team would not have been able to achieve what it has without the university’s high-quality infrastructure as concerns, for example, the availability of the necessary software for constructing a car, and facilities for tests on materials and engines. Complicated components are produced in collaboration with industrial companies that support the students, give them consultations and implement their designs. In this way, students gain the kind of practical experience in manufacturing real products that universities are not usually able to provide. The competitions provide welcome feedback on the quality of students’ design and production work,” Radek Tichánek adds. The years of experience of designing cars and racing with them are reflected in the new specialized courses that the university’s faculties offer on technology for racing cars.

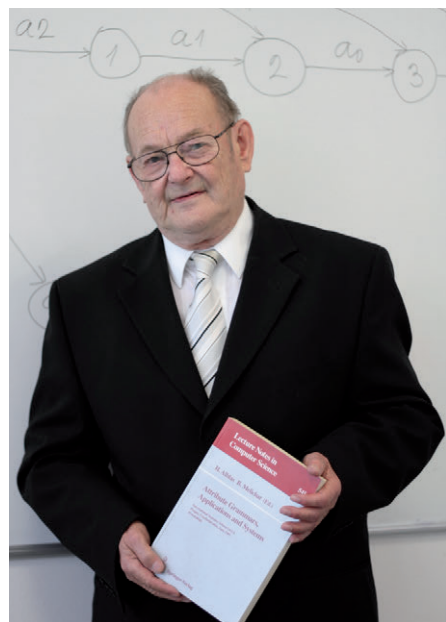


**Bc. Eliška Šestáková**

**Faculty of Information Technology**

Eliška Šestáková was awarded the Dean's Prize for an Outstanding Bachelor Project for her work under the title Implementation of the Game Tower Defense, in which emphasis was placed on the way artificial intelligence was used to direct and navigate units, and the work also included an analysis of methods for finding paths and evaluating them when implementing the game strategy. Eliška is now studying on the master's programme in Systems Programming (profile: Theoretical Informatics), and she is pleased that she chose to study at a technical university. "Before I came to FIT, I only knew basic programming, and I was more interested in creating graphics and web pages. Now making algorithms and exploiting the possibilities of programming languages is closer to my heart. I consider studying information technology to be not just very interesting, but above all highly applicable in the future. I enjoy discovering and researching the new things that this dynamic field of specialization keeps offering up."

**Prof. Ing. Bořivoj Melichar, DrSc.,** is a well-known researcher on the principles underlying the construction of software systems. His research interest is in the theory of algorithms for constructing compilers for various kinds of formal languages. He works on parsing, and on formal and attributed translations. He has used his strong background in the theory of formal languages and automata as a basis for his research in the area of text processing algorithms. He started his research in stringology 20 years ago, and soon after this he founded the Prague Stringology Conference, which continues to be held annually. The conference has an international program committee, and is nowadays recognized worldwide as a forum for presenting new ideas in stringology and related disciplines. Prof. Melichar's background in the theory of automata was then exploited and built on in the development of a new field of research on hierarchical structures represented by trees. This field is now known as arbology. Prof. Melichar's wide range of research interests extends to processing directed acyclic graphs (dags). This field is now known as dagology. He has formed a group of colleagues and doctoral students who are known for developing new ideas for solving complicated problems in a simple way. Prof. Melichar has published almost 50 tutorial scripts for students and more than 100 scientific publications. He is a respected member of the scientific community in several research areas. In the 1990s he was head of the Department of Computer Science and Engineering at the Faculty of Electrical Engineering, Czech Technical University in Prague, and in 2010 he moved to the Faculty of Information Technologies (opened in 2009).







### **Prof. Ing. Vladimír Kučera, DrSc., dr. h. c.**

Vice-Director and Distinguished Researcher of the Czech Institute of Informatics, Robotics, and Cybernetics is an internationally known researcher in systems and control engineering. He publishes in the leading journals of the field and is highly cited; his Hirsch index is 26. He is the first IEEE Fellow in the Czech Republic. He is an Advisor and a Fellow of IFAC; he was President of IFAC and brought the 16th IFAC World Congress to Prague in 2005.

He was appointed a Chevalier dans l'Ordre des Palmes Académiques by the French Prime Minister, and has received honorary doctorates from Université Paul Sabatier, Toulouse and Université Henri Poincaré, Nancy.

Professor Kučera combines research with teaching and involves students in his research projects. He is the manager of the Centre for Applied Cybernetics, which is currently a Competence Centre of the Technology Agency of the Czech Republic and has a strategic research plan till 2019. He has been the principal investigator of many other national and international research projects, with total funding of more than 1110 M CZK.

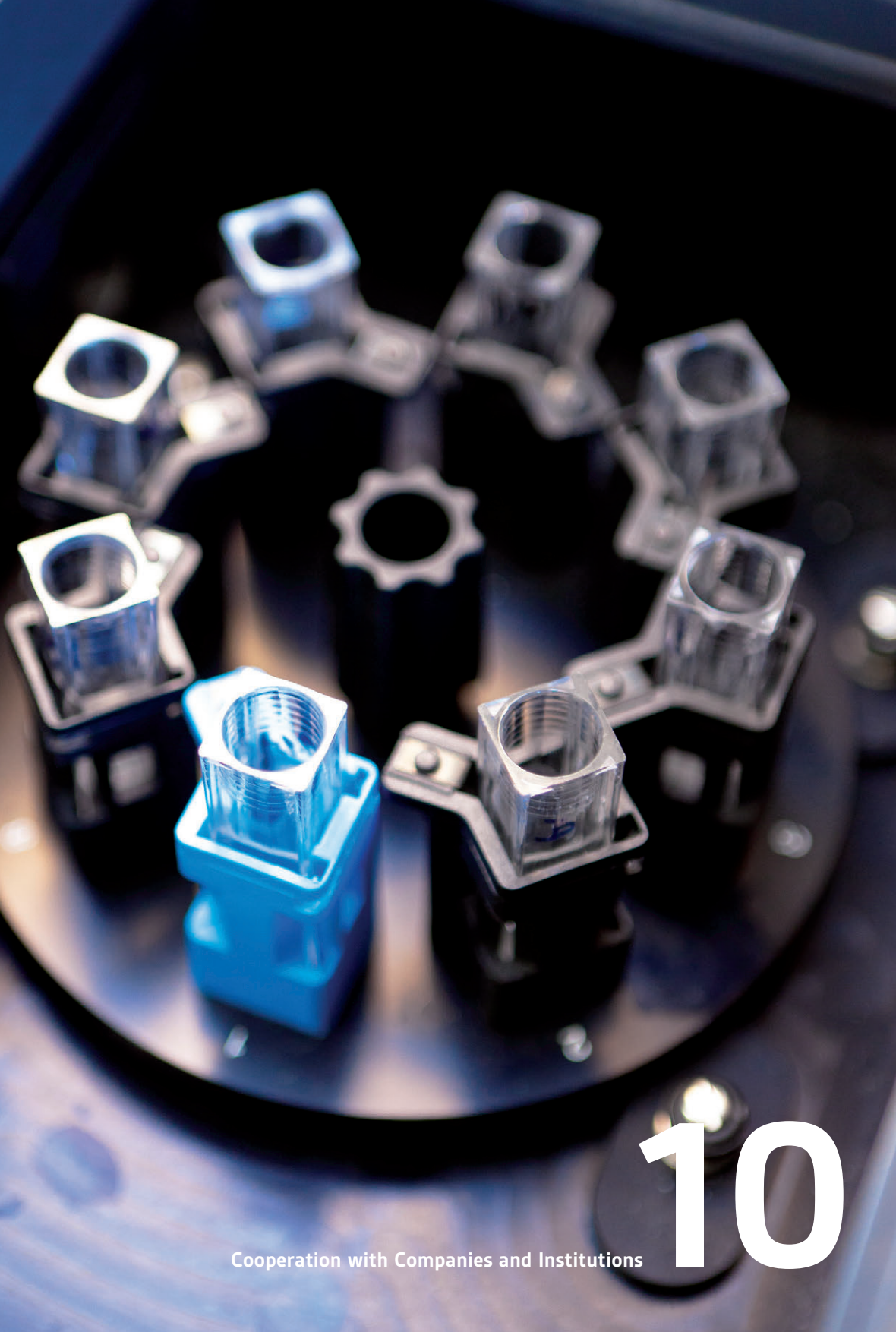
In the course of his career, Vladimír Kučera has had the pleasure and privilege to work with leading researchers from 20 countries. He contributed to the theory of Riccati equations and pioneered the use of polynomial equations in the design of control systems. His celebrated result, the parametrization of all controllers that stabilize a given plant, known as the Youla-Kučera parametrization, has become a new paradigm in robust and optimal control. These results are recognized worldwide as the Czech school of thought in control engineering.

### **Prof. Marian Karel**

Professor Marian Karel, a Czech glass artist and sculptor, heads the Institute of Industrial Design of the Faculty of Architecture at CTU in Prague. He is one of the most famous present-day Czech artists. His works are represented in many art collections in the Czech Republic and abroad (Gallery of the Capital City in Prague, National Gallery in Prague, Moravian Gallery in Brno, Musée des Arts Décoratifs, Palais du Louvre in Paris, National Museum of Modern Art in Tokyo, Corning Museum of Glass in New York, Glasmuseum Hentrich in Kunstmuseum Ehrendorf in Düsseldorf, and many others). One of his latest works, a plastic with special reflective glass and granite, was unveiled on the CTU campus in March 2015. Glass is a material that Marian Karel has worked with since he was a student. As a teacher, he started leading the Glass in Architecture studio at the Academy of Arts, Architecture and Design in Prague in 1992. He was appointed as a professor there in 1995, and headed the Department of Fine Arts. As an artist, he produces works for open spaces and works to be integrated into architecture.







Cooperation with Companies and Institutions

10

## BENEFICIAL FOR COMPANIES AND FOR THE UNIVERSITY

**On television** and elsewhere in the media, we quite often hear the words “according to an expert from CTU ... such-and-such methods should be used and such-and-such measures should be taken.” In recent times, these words have been used very often in connection with problems in transportation. Specialists from the Faculty of Transportation Sciences have been helping to modernize the motorways in the country and the transport system in Prague. Their colleagues from other faculties have come to attention, for example, through their collaboration with NASA, and with companies in the aerospace, automotive and other industries. CTU has plenty to offer in the field of practical applications. The day-to-day activities of a technical university involve not just teaching, but also applications-oriented research. Great potential is opened up by the capacities of the University. There is very extensive collaboration between the faculties, institutes,

departments and other elements of the University, on the one hand, and companies, state institutions, research workplaces, secondary schools and other organisations, on the other. The words of specialists from CTU carry weight, not only in connection with new materials and products, but also in investigations of accidents involving buses carrying tourists to the Croatian seaside. Other examples are specialists from the Faculty of Civil Engineering, who are called in for expert opinions on collapsing buildings, or on smaller matters like shoddily-constructed car parks in town centres.

Below, we offer some examples of collaboration with industry and with institutions in the form of providing useful practical expert opinions. This kind of work also makes potential students and potential partners for future research projects more aware of the quality of the work carried out at CTU. ■

### COLLABORATION WITH INDUSTRY AND COMMERCE ON CREATING INNOVATIONS AND ON TECHNOLOGY TRANSFER

Collaboration on creating and transferring innovations usually takes place on the basis of an agreement with industrial or commercial partners, or through collaboration in the framework of a joint application for a grant-funded project. The agreement, or collaboration agreement, stipulates the way in which the project outcomes will be handled, how intellectual property rights will be protected, and how the outcomes will be distributed.

Numbers of agreements signed with industrial and commercial companies on the use of research, development and innovation results in 2015:

Total number of valid agreements in 2015:	890
New agreements signed in 2015:	634





### Faculty of Mechanical Engineering

The issue of cooling, or of removing low-potential waste heat from processes for transforming heat energy into mechanical work, has recently been attracting great attention in a range of technical applications. The reason is that these processes are in most cases energy-demanding. With the major advances in automotive technology in recent decades, it was only a matter of time before each of the components in the cooling cycle in this field would be optimized. Tests on components and groups of components for cars in real conditions are time-consuming and very expensive. For this purpose, a dedicated workplace was set up at the Faculty of Mechanical Engineering at CTU by TechSoft Engineering, MECAS ESI and the Technical University in Brno. The work plan and the timetable for this workplace are coordinated and funded by Škoda Auto, the main project coordinator. Work is carried out on the aerodynamic properties of real exchangers, e.g. their pressure losses, their inferred power effect, and also their ability to remove waste heat into the environment. There is also collaboration with Škoda Auto in the Student Formula CTU CarTech project, and with specialists in the Faculty of Transportation Sciences on vehicle safety, etc.

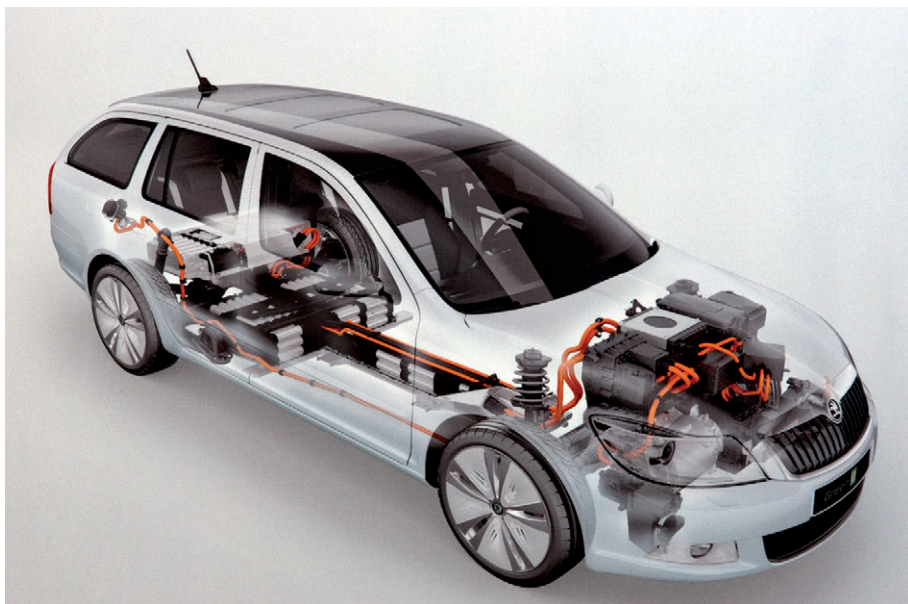
### Faculty of Electrical Engineering

Research collaboration with Cisco follows the success of Cognitive Security, a spin-off company created by young researchers from the Faculty of Electrical Engineering. Cisco acquired Cognitive, and supported research programmes at the Faculty of Electrical Engineering to boost the research in the area of network security.

The CTU CNR Laboratory operates at the Department of Electric Drives and Traction. The laboratory is fully sponsored by the Chinese company CNR. The research is directed towards new technologies for railway transportation.

### Faculty of Transportation Sciences

The concept of project-oriented education requires close collaboration with industrial companies on specific topics in the fields of transport projects, transport structures and transport operations. Setting up joint teams is also a good starting point for extracting as much as possible from the knowledge accumulated by the staff of the faculty. As specific examples of the faculty's collaboration, we indicate here the broad spectrum of our partner organizations: Volkswagen AG, Škoda Auto, Boston Venture Central Europe, AF-CITYPLAN, AMiT, ATEM, AŽD, CDV CGI IT Czech Republic, České dráhy, DEKRA AUTOMOBIL, Dopravný podnik Bratislava, Dopravní podnik hl. m. Prahy, Liberec Regional Hospital, Poyry Environment, ROPID, SŽDC, ŠKODA CITY SERVICE s.r.o., TSK Praha, SFDI, etc. Collaboration with industry enables students to participate in real projects, under the supervision not only of an experienced teacher but also of a well-educated expert in practical applications.



The faculty considers its growing links with the state administration at all levels to be very significant. It has links with ministers and ministries, and also at regional and municipal level, and with the local administration in city districts and rural communities in the Czech Republic. In accordance with partners' requirements, the faculty participates in resolving specific national-level and local-level transportation problems.

### Faculty of Nuclear Sciences and Physical Engineering

The Faculty staff collaborate with public institutions and companies, e.g. through cooperation on joint projects (mainly with institutes of the Academy of Sciences of the Czech Republic), and carrying out a range of supplementary tasks. Institutions and companies that have collaborated with the Faculty include the State Office for Nuclear Safety, the State Institute for Radiation Protection, the Radioactive Waste Repository Authority of the Czech Republic, DIAMO, ÚJV Řež, IKEM Prague, Honeywell, AERO Vodochody, NPP Temelín, VF Černá Hora, Proton Therapy Centre Czech, VZLÚ, a.s., ENVINET, etc.

### Faculty of Biomedical Engineering

One of the main partners of the Faculty is the Town of Kladno, which has cooperated in the development of the Faculty through major Education for Competitiveness and Science and Research for Innovation projects, and has also cooperated in extending the teaching facilities. Other main partners are the Ministry of Health of the Czech Republic and the Institute for Clinical and Experimental Medicine. The Faculty is an associate member of the NANOPROGRES cluster. The Faculty also cooperates with CleverTech s.r.o., the rehabilitation institute at Kladruhy, the Regional Centre of the rescue services for the Central Bohemia region, the hospitals in Kladno, in Slaný and in Rakovník, with LINET spol. s r. o. and BEZNOSKA, s. r. o., with hospitals in Prague, such as Všeobecná, Motol, Královské Vinohrady, Homolka, Thomayerova, the Institute of Hematology and Blood Transfusion, and other medical and health service institutions, including the Psychiatric Hospital in Bohnice and the Central Military Hospital. Other collaborating institutions include KPMG Česká republika, s.r.o., the Institute of Physics of the Academy of Sciences of the Czech Republic, the State Institute for Nuclear, Chemical and Biological Safety at Milín-Kamenná, the Association of producers and suppliers of health products, the BTL Group, Johnson & Johnson, ERILENS s. r. o., EMARK s.r.o., HZS ČR, AČR, PČR, and UCEEB at Buštěhrad near Kladno.

### Faculty of Information Technology

Thanks to collaboration with CISCO, a network laboratory has been equipped, in which not only courses in accredited study programmes are taught, but also CISCO Academy courses. The Faculty has obtained some applied research grants (from Profinit and from Altron), and also collaborates commercially with companies including Profinit, Agromont, and SGS. Collaboration with leading ICT companies, e.g. Seznam and Gooddata, and support from companies, e.g. Profinit, Barclays Capital, NVIDIA, Oracle and HP, helps to provide specialist literature and prizes for outstanding final projects presented by students.

**Faculty of Civil Engineering**

The fields of civil engineering embraced by the Faculty, and in which it collaborates with the construction industry, cover a broad range, from construction and materials, through architecture, water management and the environment, to fire safety, geoinformatics and development work for GPS applications.

Collaboration with companies and institutions in the framework of science and research brings new knowledge into the classroom, and provides opportunities for an ever-increasing range of stimulating student projects. ■





# NUMBERS OF EXPERTS FROM INDUSTRIAL AND COMMERCIAL COMPANIES TEACHING ON ACCREDITED STUDY PROGRAMMES

Numbers of external experts (2015)	
Faculty of Civil Engineering	141
Faculty of Mechanical Engineering	45
Faculty of Electrical Engineering	97
Faculty of Nuclear Sciences and Physical Engineering	17
Faculty of Architecture	68
Faculty of Transportation Sciences	118
Faculty of Biomedical Engineering	40
Faculty of Information Technology	24
Masaryk Institute of Advanced Studies	18
<b>Total</b>	<b>568</b>



## COLLABORATION WITH SECONDARY SCHOOLS

**The so-called** Road Show for secondary schools is an annual university activity aimed at school leavers. A specially-trained promo team consisting of students, including doctoral students, from each of the University's faculties visits schools that have asked through their education advisors for a presentation by CTU, and also other selected schools, mainly from regions where rival technical universities are not strongly represented. The promo team provides information for secondary school leavers about the study programmes and fields of study at CTU, about the attractiveness of science and engineering, and about the ease with which CTU graduates find jobs. On these school visits, the students fill in CTU questionnaires, giving their e-mail addresses and agreeing to have information sent to them in e-letters about study opportunities at CTU, about Open Days at the faculties,

the latest news bulletins, competitions and interesting information about science and engineering. This part of the information campaign is carried out by means of the special CTU Magnificent Seven web site ([www.sedmstatecných.cz](http://www.sedmstatecných.cz)), where a wide range of items about life at the University are published. Of course, we also collaborate with students via social networks, such as Facebook.

We arrange special individual internships, under the title Junior Tech University, for selected secondary school students. Following our publicity campaign and marketing activities, young people start applying for these internships and submit motivation letters. We select the best applicants and find a suitable mentor for them at CTU. The mentor gives them individual attention. Our aim is to demonstrate to students individually the opportunities for studying at CTU, and to



introduce them to the University while they are still studying at a secondary school. Some of our activities are specially directed at girls studying at secondary schools. There are various field trips, presentations, workshops and competitions, and, last but not least, a competition for the best scientific or technical project ([www.holkypozor.cz](http://www.holkypozor.cz)).

Every year, CTU is an exhibitor at the Gaudeamus post secondary school and lifelong learning fairs that are held in Brno and in Prague. Interesting displays show study opportunities, interactive exhibits constructed by CTU students, etc. Each year, we participate in the competitions at these fairs for the best display. The winner is chosen by the secondary school students who visit the exhibition. In recent years, we have twice won this competition, which shows that secondary school students rate CTU very positively.

We also make non-traditional presentations to young people in non-traditional locations. We make presentations in the framework of the Prague Museum Nights, in major museums, such as the National Museum and the National Technical Museum, where we set up so-called CTU Tech Zones, and interpret CTU science and technology in a variety of ways. We make presentations at multicultural festivals like Rock for People and Sázavafest, where we try to make an impression on young people, especially secondary school students, and to popularize engineering and engineering education. For gifted primary schoolchildren and for younger children at secondary schools, we prepare the Lion's Den, a year-long correspondence competition on the borderline between mathematics and informatics, which leads up to the high point – a summer camp. ■













## SPORT IS AN INTEGRAL PART OF STUDENT LIFE

At CTU in Prague, physical education activities are provided mainly via the Institute of Physical Education and Sport. There are regular sports activities in the framework of Physical Education courses in a wide range of sports (football, ice-hockey, volleyball, basketball, floorball, frisbee, table tennis, archery and many other sports). The Institute offers about 48 physical activities in regular courses, as well as once-off sports events.

**A**mong the students of CTU in Prague, there are some successful international sportsmen and women, who win medals in world and European championships, and in other major international events.

The Institute organizes summer and winter physical education courses mainly in outdoor sports that involve spending time in the countryside. In the summer months, the main courses on offer are canoeing, windsurfing, cycling, climbing, tennis, horse-riding, and various other sports (ball games, frisbee, archery, swimming, softball, etc.) In the winter months, students can do downhill skiing, crosscountry skiing and snowboarding. Each year, the Institute of Physical Education and Sport, under the auspices of the rectorate of CTU in Prague, organises a competition for the best CTU sportsmen and sportswomen. The winners receive sports scholarships.

Rowers and canoeists, who achieve outstanding results at international level, in university and other championships, are among the most successful CTU sportsmen and sportswomen.

Outstanding sportsmen and sportswomen linked with CTU are a good advertisement for the University. There are CTU students in the Czech national teams for rowing, canoeing and floorball. Ilona Hambergerová, CTU sportswoman of the year in 2011, competes successfully in taekwondo, and other students also do very well in other sports. The University helps students to combine demanding study programmes with top-level sport.

Not only individual sportsmen and sportswomen, but also CTU teams have been achieving outstanding results. The CTU ice-hockey team regularly wins university tournaments in Europe. The frisbee team won the Czech academic championship. CTU students regularly achieve good results at EURO ROMA, where more than a thousand sportsmen and sportswomen from dozens of European universities take part, and CTU teams take top places.

The University organises the traditional 17<sup>th</sup> of November Run and the Czech Academic crosscountry championships. The races are run in the magical environment of Hvězda Park in the Prague district of Bílá Hora.

The facilities for physical education at CTU have been extended and improved in recent years. The modernized sports centres are used by students and non-students in year-round activities organized by the Institute of Physical Education and Sport. They are also made available to university students and staff for recreational sport.

The main sports facilities of the University include indoor sports halls, multi-purpose gymnasiums, facilities for outdoor sports, climbing walls, an archery hall, a table tennis centre, artificial-surface tennis courts, and an inflatable tennis hall for winter use. ■

**Assoc. Prof. PaedDr. Jiří Drnek, CSc.**

Director of the Institute of Physical Education and Sport CTU, an A Licence handball trainer,  
Chairman of the Association of Leading Departments of Physical Education at Universities in the Czech Republic



## SUCCESSFUL SPORTS ACTIVITIES

**About one-third of the students at CTU (approximately 8 000) sign up for the physical education activities (required courses, optional courses, special courses, etc.) that are provided by the university's Institute of Physical Education and Sport. Is this because CTU has an excellent framework and facilities for sport?**

At other universities in the Czech Republic there aren't such strong links between sports activities and university studies. The participation rate is normally somewhere around 10%. The active participation in sport at CTU is because of the really rich range of sports and sports facilities that

we offer. There are 48 sports and physical activities, so there's something for almost everyone. This offer can attract even students who are not typical sportsmen and sportswomen. They can choose from a number of non-traditional sports, for example archery, yoga, wall climbing, geocaching and zumba. If we didn't have such a wide range on offer, these non-sporting students wouldn't sign up for optional physical education.

**The Czech team at the Olympic Games in London included several CTU students – the sisters Jitka Antošová and Lenka Antošová in the sculls, oarsmen Jiří Kopáč and Milan Bruncvík, and middle-distance runner Tereza Čapková. Do students who are active sportsmen and sportswomen have adequate conditions for combining their studies with top-level sport?**

We certainly try to help. For example, we help with negotiating dates for examinations, and we collaborate with the faculties over the award of special scholarships to enable students to compete for Czech national teams, and to represent CTU at national academic championships. I must say that the faculties fully understand and give their support.

Among our student sportsmen and sportswomen there are not only Olympic competitors, but also academic world champions and others who've achieved high positions in top competitions. Unfortunately we don't use these results as well as they do in the USA in the university's publicity campaigns. Over there, university sport has high prestige, and for many people it is the reason why they choose to study at a given university. Nevertheless, the slogan "Study



at CTU – Do Sport at CTU” is very well received by people interested in studying here.

### In which sports do CTU teams do best in the University environment?

The CTU ice-hockey team is regularly successful in European tournaments. They won the international ice-hockey tournament for the CTU Rector’s Cup, in which teams from eight European universities took part. We have other very successful teams, for example in futsal, softball and frisbee, which regularly win the Czech academic championships. We regularly get leading places in the EURO ROMA Games, in which more than a thousand sportsmen and sportswomen from several dozen European universities

take part. We also have some success at the Czech Academic Games, where CTU representatives are among the best, and we take top places in the overall classification.

### Can we say that sport has a green light at the University?

Definitely. I should mention the CTU sports facilities that have been built up in recent years. The Pod Juliskou indoor sports centre, with courts, gymnasiums, a table tennis area, an archery hall, a climbing wall and a fitness centre, would certainly be the pride of any modern European university. This area is supplemented by the artificial-surface tennis courts at Kotlářka, which are covered in winter, and by the university boathouse at Malá Chuchle. ■









## CTU AND SPORT

- regular termtime physical education
- once-off sports events for students and university staff: Rector's Day (all sports), CTU Rector's Cup (ice-hockey) and others
- university sports championships in the Czech Republic, Academic Games and international sports events



## THE CENTRAL LIBRARY

**An important milestone** for all CTU faculty and institutional libraries, and for the university as a whole, was the year 2009.

In this year the Central Library of CTU was founded as an independent part of the university aimed at providing information support for educational, research and creative activities at CTU. It is located in the new building of the National Technical Library in the center of the main CTU campus.

The university library is an integral part of this academic body. It provides a wide range of information support for the academic community's professional activities. It also helps to form the key competencies that engineers will need for their lifelong education, their future profession and their career.

The library's success and prestige is based on its ability to adapt itself to new conditions and needs. The starting points are cooperation within the university, cooperation with domestic and international university libraries, and creating the potential to innovate the library's services. The library reacts to new challenges in the global knowledge environment within and outside the university community, especially with respect to new models of scholarly communication. Key library activities can thus be divided into a number of closely interrelated areas:

### **Library collection management and services**

The library focuses on keeping and maintaining traditional and electronic collections that to a great extent cover the needs of the CTU community. The library

administers and maintains university-wide continuous access to prestigious electronic resources for scientific and technical disciplines essential for the educational and research activities of the CTU community. These include the IEEE/IET Electronic Library, the ACM Digital Library, the e-journal collections of scientific publishers Elsevier, Wiley, and Springer, and the Web of Science and Scopus citation databases. For easier information searches in multiple resources, unified user-friendly access to all resources is provided through the Summon online discovery service tool.

### **Information education**

Information support for the fields of research investigated at CTU focuses on improving students' and young researchers' information literacy. Support is carefully





targeted at particular user groups. The Central Library provides information and organizes seminars and classes focused on recommendations on writing research papers and theses, on publication and citation ethics, and on plagiarism for bachelor, master and PhD students. Information support for the fields of research investigated at CTU focuses on assisting with activities related to publishing research results, the national R&D assessment system, and services related to work with citation databases, and also help with submitting research outputs to citation databases. Another important new trend in scholarly communication is support for Open Access publishing, and for sharing scientific information through Open Access initiatives as well as identifying and using Open Access research resources. Building the institutional repository and defining the Open Access policy within the university is fundamental for keeping the university visible in the information environment. This is a key task for the library.

### Support for publishing activities

The library offers support to CTU publishers. It provides and administers the Open Journal System (OJS) journal management and publishing system which is, in turn, connected to the CTU information infrastructure, including the institutional repository. CTU is a member of CrossRef, and the Central Library is the administrator of DOI (Digital Object Identifier) and CrossRef, which are available for all university publications. A number of high-quality CTU journals use these tools. The system was piloted on the peer-reviewed university journal *Acta Polytechnica*, which has been

indexed by Scopus since 2011. Its editorial office is located in the Central Library and the team helps university publications with implementing these tools. The editorial team has also established AP CTU Proceedings journal, a platform for publishing high-quality peer-reviewed CTU conference proceedings.

### Communication with users

The main communication, marketing and promotion tool of the library is the Central Library website. The library provides its services to all university employees and students, and also to the professional public. The website is the main tool for addressing this large number of users, and we therefore place a lot of emphasis on administering and updating the website. It is the main starting point for all services, news and information. Above all, it is a space for presenting our library activities. The Central Library is wide open to international cooperation. It is a member of significant professional associations and is often visited by international professionals. It also participates in an Erasmus staff training project and frequently hosts visiting library professionals from various European universities. ■

### Library in numbers (2015)

Library collections: 482 605  
 Number of registered users: 29 174  
 Number of library visitors: 52 088  
 Number of loans  
 (physical documents): 69 327  
 Number of employees: 32; FTE: 29,40  
 Electronic information resources:  
 Bibliographic databases 4; Fulltext  
 databases 17; Citation databases 2

THE CTU PUBLISHING HOUSE

The Publishing House is a special-purpose CTU facility that issues study materials and scientific literature, new magazines, specialist journals, and other printed matter.

Over a period of more than 50 years (the Publishing House was set up in 1964), it has published about 11 700 specialist titles, an average of about 200 mainly technically-oriented texts for specialists each year. The main types of publications are study notes, specialized books, monographs and university textbooks. The Publishing House also prepares publicity materials and other printed matter, compilations, inaugural lectures, information brochures about university activities and events, etc. The printing house produces general all-university prints and also proceedings, textbooks, promotion materials and other printed matter for the university faculties and other institutions incorporated in the Czech Technical University. Work is also undertaken for external customers.

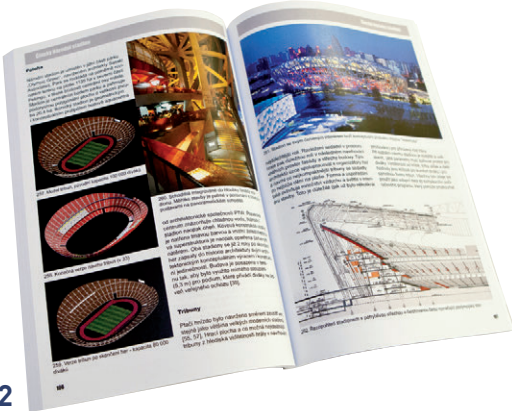


Pražská technika and TecniCall

The editorial and graphics studio of the Publishing House prepares two university news magazines. Pražská technika is a magazine that presents topical information about events at CTU. It focuses on news about studies and about research, presents successes achieved in the Czech Republic and abroad, interviews university personalities, and records a broad range of CTU activities and events.



TecniCall is a magazine that presents scientific and research results in connection with industrial and practical applications. Each issue focuses on a specific topic of current interest, for example CTU's collaboration with CERN, intelligent buildings, etc. In addition, the magazine carries descriptions of university workplaces, interviews with successful scientists, etc.

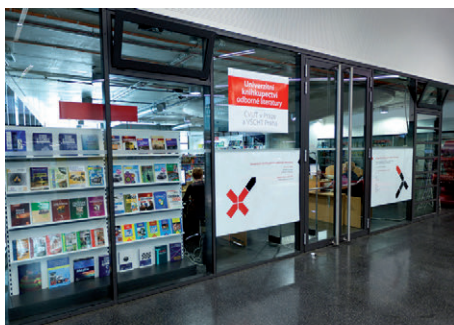




### New University Bookstore

The Technical Literature Shop (situated on the ground floor of the National Technical Library) supplies lecture notes as well as scientific and technical publications in many branches of science and technology. The University Bookstore is one of the largest specialized bookshops in the Czech Republic.

We sell lecture notes and textbooks for all faculties and facilities of CTU, monographs, scientific and technical literature, foreign-language publications and specialized technical journals, publications in various areas of fiction and non-fiction, language-learning materials, etc. ■





## WHERE WE EAT, SLEEP AND LIVE

**Any student** of CTU or any other university can apply for student accommodation and can take meals in canteens run by the Service Facilities Administration of CTU.

The Service Facilities Administration of the University offers accommodation for students in the dormitories it administers in Prague.

There are nine canteens where students and academic staff can take their lunch or dinner.

Some of them also offer breakfast. Students and staff can also take a break and eat in buffets, snack bars and other catering facilities in the dormitories and faculty buildings.

Meals can be paid for in cash, or in most cases also by employee card, by student ISIC card, and with TICKET RESTAURANT, SODEXHO PASS and Cheque Déjeuner lunch vouchers. ■





### Accommodation, board

Bed capacity of CTU in Prague dormitories in 2016	8 112
Number of applications for accommodation, as of 31/12/2015	9 687
Number of applications for accommodation accepted and administered, as of 31/12/2015	9 687
Number of bed/days in 2015	2 063 181
Number of main meals supplied to students in 2015	1 057 700
Number of main meals supplied to CTU staff in 2015	93 172
Number of main meals supplied in 2015 to other customers	522 896





**The dormitories** are located in the vicinity of the CTU campus in Dejvice (the Dejvická, Sinkuleho and Masarykova Dormitories), in Bubeneč, not far from Dejvice (the Bubeneč and Orlík Dormitories), at Strahov, in the Prague city centre (Hlávková Dormitory), and in the picturesque Podolí district of Prague.

Multi-purpose sports facilities with artificial grass and evening lights can be used at the Strahov, Podolí and Bubeneč dormitories, mostly for ball games such as tennis, handball, volleyball, basketball and netball.

At the Strahov Dormitory, there is also an outdoor climbing wall: height 20 m, width 4.6 m, overhang 2.1 m, 6 basic routes, difficulty degree 5 to degree 7. ■









## THE CTU ACADEMIC ORCHESTRA

**The CTU Academic Orchestra** is a unique musical ensemble in the Czech Republic that provides an opportunity for students from CTU, and also from other universities, to develop as musicians. The professional conductor is Jan Šrámek, who draws on long-term experience of working not only with professional musical ensembles but also as a director and in dramaturgy. The orchestra performs regularly in the Bethlehem Chapel, and also on stages elsewhere in the Czech Republic and abroad, with a classical and multi-genre repertoire. The orchestra enjoyed great success when it played a concert in Cambridge, where it presented a programme under the title *Jewels of Czech Music*. A number of renowned soloists have appeared with the orchestra. ■





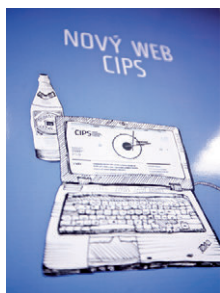
## THE CENTRE FOR INFORMATION AND CONSULTATION SERVICES

**The Centre** provides support for CTU students and staff in dealing with study, personal, family and legal problems, and also organizes personal development events and activities for students.

The Centre offers activities provided by staff members with relevant education and experience:

- expert consultancies for individual help (study counselling, psychological counselling, social and legal counselling, and spiritual counselling)
- immediate help in crisis situations
- an information service – comprehensive information about studies and events at CTU (e.g. help in selecting a faculty or a study programme)
- seminars, workshops, discussions aimed at personal development, support for creativity and for study skills
- studenti sobě – “Students for Themselves” – an opportunity for students to organize events for themselves and for their colleagues in the Centre’s multifunctional room
- free access to computers with internet, wifi
- the Tina printing system – a self-service system for copying and printing

In 2015, the counselling staff provided a total of 10 312 consultancies and contacts. ■





## THE ELSA CENTRE

**The ELSA Centre** helps students with special needs (people with a disability, dyslexia, dysgraphia, etc.). ELSA is a workplace attached to the department of studies and student affairs at the rectorate of CTU in Prague.

In support of students with special needs, ELSA provides services to ensure that they can benefit fully from their studies.

The digitizing and library service provides access to study literature, including adapting specialized symbols and transforming materials to a tactile form.

For students with hearing difficulties, there is a visualizing and transcribing service and also an interpreting service.

The assistance offered by ELSA covers assistance with studies, personal assistance and spatial orientation training.

Through the organisational and methodological service, students receive training in study and work strategies (if these need to be supplemented), as well as individual tuition when needed.

The technical service provides access for students to technical equipment in accordance with their type of disability, including the opportunity to loan certain equipment.

An integral part of the services that are provided is sufficient advice and help to ensure that students make effective use of the ELSA services and understand what ELSA can offer in the context of their studies. ■

## CTU CAREER CENTRE

**The CTU Career Centre** offers its services free-of-charge to CTU students and to recent graduates of the university for three years after they finish their study programmes. The Centre supports and develops students' soft skills, through

- seminars
- coaching
- employment and career advice
- mentoring
- personality testing.

In collaboration with companies, the Centre offers employment opportunities, internships, trainee programmes, and opportunities to find a topic for a bachelor or master project. Throughout its existence, the Career Centre has been able to find experts from companies who can pass on their experience to students in an amusing and attractive manner, and make them enthusiastic about researching the topic that has been selected.

The main aim of the CTU Career Centre is to prepare students for entering the world of work, and to help them find their way not only in the employment market but also in their personal life. This is done through an extensive range of seminars covering the whole spectrum of soft skills that a graduate should master. The seminars are created specifically for the needs of technically-oriented students, and are based on the current situation on the employment market, and on modern trends. Students can choose among three main fields of interest:

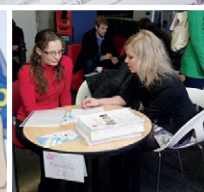
- efficiency
- career building
- personal development.

Under each of these headings, students will find seminars and other activities that will develop them in the chosen area. The seminars are supplemented by lectures in which successful graduates of the university working in supranational companies, and other well-known personalities, hand on their experience to the students, and in many cases also their know-how. Students are also offered the opportunity to have a consultation in the Employment and Career Advice Centre with a human resources expert on careers that might be suitable for them, personality testing to find their strengths and weaknesses, and the mentoring programme, where students have a unique chance to choose their own mentor, who is an expert in a certain field.

Last but not least, the CTU Career Centre has plenty of books on time management, thought maps, motivation, identifying strengths and weaknesses, improving one's presentation skills, etc. These books are freely available for students to borrow.

Throughout the existence of the CTU Career Centre, all these activities have helped students, and they will continue to help them in the future, to make a successful start to their working lives and to achieve a healthy work – life balance. ■











## THE BETHLEHEM CHAPEL

The Bethlehem Chapel is a national cultural monument and the first preacher's temple in Europe. It was founded by burghers Jan Křtíž, a grocer, and Hanuš of Mühlheim, a courtier. In the foundation deed dated 24 May 1391, both donors expressly stated that it was to be used for sermons in Czech language. It was built between 1391 and 1394, and between 1402 and 1413 it was used by Master Jan Hus. Since the very beginning it has been associated with a university.

**The interest of burghers** in reforming the church and progressive university trends met in the Bethlehem Chapel. Between 1638 and 1661, the chapel was owned by the university in Prague.

In 1786, a portion of the chapel was torn down, but in the 1950s it was restored to its original appearance based on a project by architect Fragner, who used masonry fragments that had been preserved.

In 1987, the chapel passed to the Czech Technical University in Prague, which restored it and reopened it to the public at the university's expense. The opening ceremony was held on 26 March 1992.

Following university traditions, the Bethlehem Chapel became the ceremonial hall of the Czech Technical University.

### Ceremonial Hall

The ceremonial hall is used for ceremonies, social and academic events such as graduation ceremonies, matriculation ceremonies and academic council meetings. It is also used for international conferences, congresses, concerts, literary evenings, etc.

The chapel is also used by the Office of the Czech Government for state events.

There is seating for 400 in the auditorium.

The hall has a manual organ. ■

## FORMULA STUDENT

CTU CarTech is a student project at the Czech Technical University in Prague that receives support from many companies in the Czech Republic and abroad. The aim of the project is to take part in the prestigious Formula Student/SAE international engineering competition, in which students from more than 500 universities all over the world participate. Our team contends for top results.

**Every year since 2009** a new car has been designed, built and raced by students. Thanks to this project, students can get experience with state-of-the-art technologies like those used in Formula 1. The strong background of CTU quickly brought the team among the elite of more than 500 Formula Student teams worldwide – in 2014 the team took 21<sup>st</sup> position.

The electric division of the team was founded in 2011 and it nowadays competes as the eForce FEE Prague Formula team, holding 22nd position out of 87 electric teams. Working in the CTU CarTech team gives students a great opportunity to gain a lot of experience and qualifications. Working in a team is very motivating, and there is always plenty of fun. Even dissertations and construction projects flow into the development of our car. CTU CarTech provides a great opportunity for the future generation of engineers. ■

**Design it, build it, race it! Students design the whole car, manufacture most of its parts at CTU and finally they compete with other universities on famous race tracks across Europe. All within one year!**







## THE LION CUBS KINDERGARTEN HELPS MOTHERS TO RETURN TO RESEARCH AND STUDIES

CTU tries to help university staff to resume working after maternity leave and to help students to complete their study programmes after starting a family before graduating. For this purpose, the University opened its own kindergarten in 2010.

**The university Lion Cubs kindergarten** is the first institution of its type in the Czech Republic. It is listed in the register of schools and educational establishments of the Ministry of Education, Youth and Sports, and provides education as a state kindergarten organized by CTU in Prague. Other universities in the country have been showing interest in this innovation, and some have very recently opened their own kindergartens. The kindergarten service offers CTU an advantage over other universities.

The University Lion Cubs kindergarten offers education for children according to their individual abilities. In addition to normal pre-school activities, the kindergarten offers the Healthy Alphabet programme. Children are stimulated to develop their reasoning skills through educational games, and gain much knowledge about the world around us. They can join a number of circles (for English language, art, music, etc.) The uniqueness and the usefulness of linking a kindergarten with a technical university has been shown from the beginning, not just through the main aim, which is to provide good care for the children and enable their parents to return to their work and studies at CTU, but also through collaboration on projects, dissertations and other papers and articles written by academic workers and students. The children get to look into the mysteries of technology through a wide range of activities. One project aims to introduce them to new sources of energy. In the garden, the children have a panel with three pairs of light-emitting





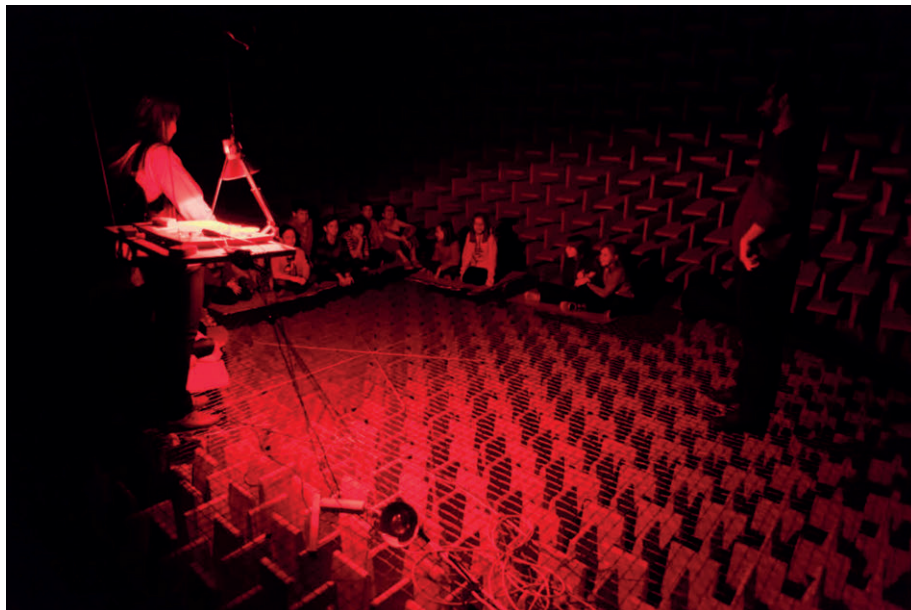
diodes placed in the eyes of the lion cubs, in the logo of the kindergarten. These can be lit up using three energy sources, which are conceived as a stand where children can play. Opening and closing the solar cell provides an example of energy directly from solar radiation. Energy from a water column is demonstrated by an apparatus where water is poured in and turns a wheel, and the children themselves can provide the energy for a dynamo to turn the model.

A further example of collaboration between the kindergarten and science at the University was the children's participation in the doctoral project of a PhD student from the Faculty of Architecture on pre-school age children's perception of public spaces. Child-friendly Cities is a study aimed at designing and planning public city spaces for children, and brings children right inside the planning process. Research with children at the Lion Cubs kindergarten compared two different city spaces, i.e. children's playgrounds (or places specifically intended for children) and other

public city spaces, e.g. squares, parks and streets. The aim was to investigate children's play, how children play in different types of city spaces, and their perceptions and preferences. The children visited eight different places in Prague with the young architect: three children's playgrounds, three public city spaces, and two other city spaces. The children were given cameras, with which they recorded their impressions, and they also spoke about their perceptions of public spaces.

"We are open to further collaboration with students and with university researchers. For example, a student from the Faculty of Civil Engineering recently asked if she could work on part of her master's project with us. We are always happy to find out something new. Our children really like technology. They take it in from their parents from birth. By the age of three they are able to explain the principle of hydraulic cutters, combustion engines and building materials," says Martina Hovorková, director of the University Lion Cubs kindergarten. ■





## UNIVERSITY LION CUBS PRIMARY SCHOOL

**CTU in Prague now has its own university primary school**, the first of its type in the Czech Republic. It was formally opened on September 1<sup>st</sup>, 2015. The studies at the school emphasize the technical and natural sciences. The school is intended for children whose parents want this kind of schooling for them. The children have access to leading laboratories and to technical experiments. They will also learn some technical English. "There were several reasons why we decided to open a primary school. The first was that it would be a logical follow-up to the children's education at our CTU Lion's Cub university kindergarten. We want them to have an opportunity to continue in an education with emphasis on technology. We also want to support the preparation of potential future students for CTU, and to provide the pupils

with a better preparation for studying at a technical university. Another thing is that we wanted to support technical education in the Czech Republic," says Martina Hovorková, director of the university primary school and the Lion Cubs kindergarten.

The CTU primary school is on the register of schools and education institutions of the Ministry of Education, Youth and Sport of the Czech Republic. The small number of pupils ensures that there is an individual approach in the teaching process, and allows the right rate of progress to be chosen for each pupil. CTU also intends to link the pupils at the primary school with its students. For example, the pupils and the students will be able to collaborate in specialized projects and experiments. ■



# 12

Alumni







## ALUMNI

The Association of Graduates and Friends of CTU was set up to establish links with graduates of the biggest and oldest technical university in the Czech Republic who completed their study programmes years ago. Through this Association, however, CTU is also interested in keeping in contact with people who have recently graduated or who are still students. Graduates and other members of the Association regularly receive information about what is happening at their alma mater, and can take part in special events (concerts, balls, courses, lectures, etc.) organised at CTU. They can also participate in regular meetings that the Association organizes. The members of the Association include not only CTU graduates, but also some students and member of the staff of the University. The rectorate of the University frequently prepares excursions, field trips and other interesting events for members of the Association of Graduates and Friends of CTU. They visit unique university workshops, and also some more standard laboratories. They have visited, for example, the University Centre for Energy Efficient Buildings, the Institute of Experimental and Applied Physics (where they were able to see the Van de Graaff accelerator), the Department of Sanitary and Ecological Engineering at the Faculty of Civil Engineering, and the Transport Hall at the Faculty of Transportation Sciences. In addition to these engineering-based events, there have been a series of less formal meetings, such as the Grill Party with students in the Strahov dormitory area and the advent meeting in December in the National Technical Museum.

The Association of Graduates and Friends of CTU has decided to give its support to the idea of installing a new organ in the Bethlehem Chapel, where CTU graduation ceremonies are held, by organising a public collection that will wholly or partially cover the costs. The Association wants to express its affinity with CTU, and its graduates have an opportunity in this way to express their gratitude for their education and for their years spent at the university (for further information about the collection, see <http://varhany.cvut.cz/>).

How do CTU graduates who have established themselves successfully and who like to return to their faculty and collaborate on projects and in the teaching process now see their alma mater? We will introduce some of them briefly and give their answers to two items in a questionnaire:

**1** Why do you like to return to your faculty, or to CTU?

**2** What did your faculty, or the university, give you for your professional development, and what have you found most useful in your work?

### Dalibor Dědek

Ing. Dalibor Dědek is the managing director of JABLOTRON s.r.o., a holding of companies that have achieved international success as producers of security and communications electronics. He graduated from the Faculty of Electrical Engineering at CTU. He then worked as a developer at Liaz Jablonec. After 1989, together with a group of enthusiasts, he set up a company, and they were able to establish themselves as developers and producers of electronic instruments. JABLOTRON s.r.o., based in Jablonec nad Nisou, exports its products all over the world. The JABLOTRON 100, a big mobile phone and home security system is the company's most famous product.

1 Perhaps because people like to go back to places from their youth, and also because there is an opportunity there to meet interesting and clever people – and I don't mean just among the academic staff.

2 I understood at CTU that everything can be made into a science, and also that most things can be explained comprehensibly, if there is good will and a capable teacher.



### Dominik Veselý

Software engineer Dominik Veselý is a successful businessman in the field of mobile applications. Despite his interesting work in the private sector, however, he decided to go and work at the Faculty of Information Technologies (FIT). He now teaches courses on creating mobile applications (a basic course and an advanced course), and he helps out in the course on BigData.

He was one of the very first cohort of students at FIT, when the faculty opened in 2009. He specialized in Software Engineering and took a special interest in mobile technology, which was on the way up at that time. In his master's studies, he worked on mobile applications and won a number of awards. For example, he won the AppParade competition and also a WWDC Student Scholarship from Apple, including an invitation to San Francisco. While he was still a student, he co-founded a company called Ackee (together with some CTU graduates). The company specialized in mobile applications.

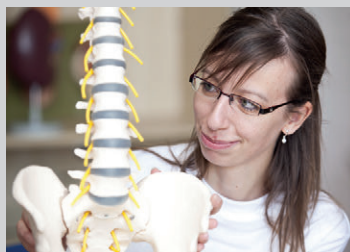
1 Because the faculty gave me a lot of opportunities. With my experience from the field of mobile applications, I can now give something back to the faculty. As a student, I had positive relations with the faculty leaders, and I still enjoy meeting these people, though now as a colleague. That would never have occurred to me a few years ago. Last but not least, I must say that I enjoy teaching.

2 The faculty taught me to weigh up problems and to find effective ways to solve them. FIT is a very young faculty, so it does not load the students with a lot of needless and old-fashioned material. This is a big plus, and above all it provides a lot of freedom for development. The faculty gave me a lot of experience, knowledge and contacts.



### Jana Žďárská

Ing. Jana Žďárská graduated from the Faculty of Biomedical Engineering at CTU, specializing in Instruments and Methods for Biomedicine. The topic of her master's project was Software for Comprehensive Rehabilitation of Patients in a Virtual Reality System. She now works at the Královské Vinohrady Faculty Hospital in Prague as a biomedical engineer. Her work involves providing technical support for ablation procedures carried out on heart patients (working with the Carto 3D heart mapping system), controlling and programming cardiostimulators and defibrillators. She is now working on her doctoral studies in medical biophysics at the 3rd Medical Faculty of Charles University in Prague.



1 My studies at the Faculty of Biomedical Engineering (FBMI) introduced me to many interesting and nice people, who never refuse to offer help when you ask them for advice on some problem that you are working on. I am still working on joint projects with some people at FBMI. This collaboration is very pleasant and very stimulating.

2 What I've appreciated most in my work has been the theoretical knowledge that I gained on processing biosignals. Above all, about preprocessing, spectral analysis, and ways of imaging biosignals for medical purposes. The principles of programming have also come in very useful when processing large volumes of data. When you can make your own program, it makes this kind of work a lot simpler.

### Tomáš Čoček

It was his interest in transportation, especially in rail transport, that led the present-day Deputy Minister of Transport, Ing. Tomáš Čoček, Ph.D., to this field of study while he was still at school. He attended the Industrial Middle School for Transport, where he studied electric traction in transportation, and then went on to the Faculty of Transportation Sciences at CTU in Prague. At CTU, he studied not only for a master degree, graduating in 2001, specializing in integrated transport systems, but also for a PhD in transport technology, where his work was on financing the transport infrastructure from foreign sources. He has been making use of his education in his work at the Ministry of Transport of the Czech Republic, and from 2009 to 2011 he was also a distinguished member of the board, and from 2011 to early 2015 a director of the State Fund for the Transport Infrastructure of the Czech Republic. In addition to his work as first deputy minister of transport, responsible for economics, EU funds and strategy, he is also a member of the management committee of Czech Railways.



1 Studying at the Faculty of Transportation Sciences was a part of my life, and it was a good part. When I give a lecture there, I still can sense this feeling of inspirational young surroundings, combined with respect for the history of the university. Discussions and debates from time to time with the professors and with recent graduates give me inspiration for new ideas, and show me existing problems from a different point of view.

2 Firstly, it was of course a high-quality education. There was not only all the necessary theory but especially an ability to deal with problems, to be flexible and to be part of a team, and to be able to manage others. Last but not least, we were taught how to sell our work, an ability that forms the basis of any success. There have been many opportunities to learn a lot of skills during my professional life, and a lot of the theory I that learned at the university will never be of any direct use. However, I am thankful for all the social skills and for the broad knowledge base that I acquired during my studies.



### Josef Pleskot

Josef Pleskot is a well-known Czech architect. He graduated from the Faculty of Architecture, CTU in Prague, in 1979, after which he spent three further years as an assistant in the Department of History and Theory of Architecture. He then worked until 1990 at the Regional Project Institute in Prague. In 1991, he set up the AP – ATELIER architecture studio. His best-known works include the town hall in Benešov, a villa in Vrané nad Vltavou, a nature trail along the Deer Moat and the Prašný Most rampart walkway in the Prague Castle area (in 2003, he received the Brick Award for the best brick structure in Europe), the Palmovka Park office building in Prague-Libeň, adjustments to the banks of the river Loučná, residential houses and reconstruction of the Castle Brewery in Litomyšl. The Czech architecture historian and critic Rostislav Švácha included five works by Pleskot out of a total of fifty in his book under the title The Strictness of Czech Architecture. He is currently working on a conversion project for the Vítkovice steelworks. His latest completed structure in this extensive project is the World of Technology Science and Technology

### Martin Hrdlička

Ing. Martin Hrdlička, Ph.D., MBA, head of development for aggregates and chassis at ŠKODA AUTO a.s., is a CTU graduate who has kept up a very close relationship with his university throughout his career as an engineer. He is a member of the Scientific Council of the Faculty of Mechanical Engineering at CTU, and he also collaborates with the faculty in many other fields. Before he went to work for ŠKODA AUTO, in 1993, he was a researcher for Mercedes-Benz AG, in Stuttgart, and a development specialist for Volkswagen AG, in Wolfsburg.

**1** I have always been proud to be a graduate of the Faculty of Mechanical Engineering at CTU, and of the Department of Automobiles, Combustion Engines and Rail Vehicles. I've always respected and admired the teachers and the professors who have headed this department- perhaps even more now than I did when I was a student. That's because, after many years of working experience, I am now even better aware of what they have done for the automotive industry in the Czech Republic.

I have many reasons for coming back to the Faculty of Mechanical Engineering. We've spent years collaborating on various specific topics and projects while developing new engines, transmissions and chassis parts. I'm a member of the state examination commission, where I represent the automotive industry, and every year I meet the newly-qualified automotive engineers. I am on the council of the Josef Božek Research Centre of Engine and Automotive Engineering, and my specialist sections have worked on a number of topics with this Centre of Competence.

**2** CTU gave me a solid foundation as a mechanical engineer, beginning with a tough immersion in mathematics in the first semesters, and leading up to specialized courses towards the end of my studies. I've met some genuine personalities, who have represented CTU and their faculties, and I still look up to them today. I consider mechanical engineering to be one of the most beautiful professions in the world, and I thank the Faculty of Mechanical Engineering at CTU for enabling me to join this profession.

Centre. He received the Architect of the Year title for this building in 2014. Josef Pleskot is a member of the Scientific and Artistic Council of the Faculty of Architecture, CTU in Prague, and he regularly sits on its commissions for students' master's projects.

1 I feel some gratitude, and that is why I come back. I also feel a responsibility to pass on what I know, although I am not directly a teacher.

2 The Faculty gave me a comprehensive overview of the field of architecture. The Faculty of Architecture at CTU has always been an erudite place for learning the basics of architecture in our country. I still appreciate the high-quality education in technical disciplines, in artistic theory and other theoretical studies. The studio work structured according to the typology of the buildings was on a good level. I greatly appreciate the fundamentals of design that were instilled in me, and that I have taken from the studios into my own work. It was not driven into our heads too much that architecture is some kind of elite field of work, only for the chosen few. I appreciate that.



**Milena Svobodová**

After graduating from the Faculty of Nuclear Sciences and Physical Engineering (FNSPE) at CTU, Ing. Milena Svobodová, Ph.D. chose to go into banking, like some other colleagues who had studied mathematical modelling. "The banking field offers quite a variety of activities – ranging from direct banking business, via support and risk management functions, to the sophisticated information technologies deployed within the bank. There are many interesting flavours to try out, as a manager or as an expert. At the same time, I maintain strong ties with my alma mater, especially through the research that I continue to do there. The modern field of theoretical computer science is at the centre of our interest. I study arithmetic operations, such as parallel addition and on-line multiplication," she says.

1 It is always pleasant to return to the faculty, as the people there maintain a creative atmosphere, inspiring us to explore mathematics not just as a practical tool, but also as an art form. Open and frequent contacts with the international scientific community form a natural part of the research process.

2 For our professional life, we take away from our education the necessary self-confidence and courage to approach any technical or analytical issue, and also the perseverance to go on until we reach a solution. The ability to rely upon one's own fact-based judgment, while also using common sense, is a good combination for many sorts of business. Studying mathematics at FNSPE is quite demanding, but it is certainly an adventurous experience that I can recommend!









