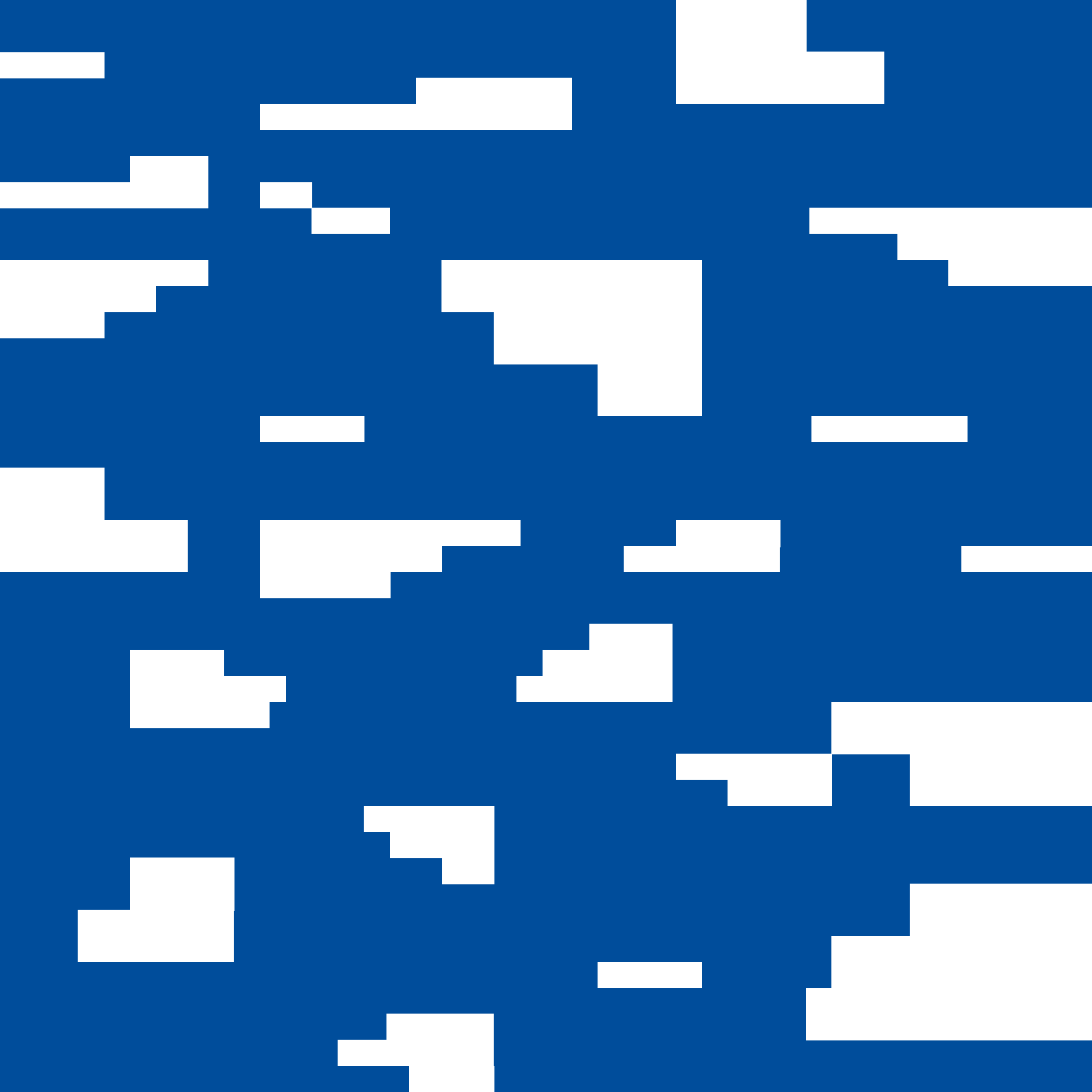
BRNO UNIVERSITY OF TECHNOLOGY

FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

ANNUAL REPORT 2022



FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

ANNUAL REPORT 2022

CONTENT

OPENING WORD OF THE DEAN

Dear readers,

the FEEC BUT Annual Report summarizes most important moments and events from the faculty life in 2022.

I am pleased to state that faculty activities in 2022 were not governed by the precaution measures against the Covid-19 disease as contrasted to the previous two difficult years. Yet we recovered from the pandemic, soon were we shocked by the Russian war aggression against the sovereign state of Ukraine. Our faculty immediately showed solidarity with Ukrainian citizens and it raised more than a million CZK as a financial help to our Ukrainian students. I also highly praise all those who volunteered to help Ukrainian war refugees.

In 2022 we participated in activities which helped to promote and develop our faculty both at the national and international level. As an example, we list an international scientific conference called "European Conference on Security Research in Cyberspace" hosted by the Department of Telecommunications where researchers presented the first interfaculty quantum connection in the Czech Republic. This represents a historic generation milestone in cybersecurity. Furthermore, researchers from the Department of Power Electrical and Electronic Engineering became members of Linz Center of Mechatronics, an excellent research centre at the Johannes Kepler Universität Linz, where they will participate at the research and development of electrical appliances. Another success in creative activities goes to the Department of Microelectronics which prides on winning the prestigious Golden Amper Prize for a soldering station with a heated template. Our faculty successfully participated at founding the Czech Battery Cluster, which groups the most important battery industry players. Organization of an autumn colloquium on "Technical challenges and visions for mobility in future" focusing on technological solutions of traffic now and in the near future is also worth mentioning.

Our students were also extraordinarily successful. In the Werner von Siemens competition Robin Filip, an Electrical Power Engineering graduate, was awarded. Patrícia Klobušiaková and Ondřej Kolář, both Electronics and Communication

Technologies graduates, were awarded with the "Nadání Josefa, Marie and Zdeňky Hlávkových" Foundation prize. A student of master study in Information Security, Willi Lazarov, ranked first in the Cyber Security Trophy competition, the category of Cyber Security Future Promise.

In educational activities we can proudly announce the newly accredited study programme "Space Applications" which will raise new cosmic engineers. Internal Evaluation Board of the BUT also consented on opening a new Master study programme "Automotive Electronics and Electromobility" and we also started preparations for accreditation of a professionally oriented interfaculty master study programme called "Nuclear Power Engineering".

I would like to thank cordially to all employees and students of the FEEC BUT for their work and study results, as thanks to them, the Faculty of Electrical Engineering and Communication ranks among the highly appreciated educational institutions not only in the Czech Republic, but also abroad, offering a wide range of study programmes and excellent laboratories.

Photo: Jakub Rozboud

prof. RNDr. Vladimír Aubrecht, CSc.
Dean

FACULTY MISSION, VISION AND STRATEGIC PLANS

The aim of the faculty is to raise professionals with complex scientific knowledge and skills, to develop high quality research on both national and international level and to produce results helping to extend further knowledge with high social impact.

Photo: Jakub Rozboud

F

Faculty

is an excellent educational institution preparing graduates ready to participate in the dynamical development of advanced technologies. Thanks to close faculty cooperation with the industry a vast majority of students finds their job even before the study completion

E

Excellent

scientific research is conducted not only at individual faculty departments, but also at two regional research centres SIX and CVVOZE. The faculty also takes part in the activities of the CEITEC BUT scientific research centre of excellence. Our scientific research is focused on a vast range of projects affecting not only everyday life, but forming also our future, such as the development of Parkinson disease early diagnosis tool, secure cyberspace or the Smart Cities project.

E

Engineering

Tradition of the faculty dates back to the second half of the last century. More than sixty years the faculty has been developing instruction and research activities in electrical engineering, electronics and other related fields. It was founded in 1959 by the Government Act no.58 which divided the Faculty of Energy into Faculty of Mechanical Engineering and Faculty of Electrical Engineering. Since 12 August 1959 the Faculty of Electrical Engineering has been working independently.

C

Campus

of the Faculty of Electrical Engineering and Communication is situated in Brno-Královo Pole. The construction of the modern educational and research complex was completed in 2013 and after more than 50 years of faculty existence it enabled to unite all faculty workplaces into one place located Pod Palackého vrchem.

FEEC in 2022 in numbers

3,247
students

1,079
courses

180+
solved projects

446
publications

73
prototypes, software or functioning samples

6
successfully completed habilitations and professorships

564
faculty employees

9
international conferences co-organized by the faculty

LIFE AT THE FEEC

A year at the FEEC is full of conferences, student competitions as well as events for employees and public. Let us name at least some of them.

PerFEECt year 2022

JANUARY

21.

A new faculty promotion video for applicants in English was released

Photo: Oto Jandušek

After a couple of years, a new promotion video was created to attract foreign students to our faculty, called “Technology is just a beginning”.

26.

Online Open Door Day for prospective students

Photo: Jana Valchová

This was the second round of the Online Open Door Day in a new format with a final talk show when prospective students could ask live questions to the faculty representatives.
The format included pre-filmed reports on individual study programmes with real students and presentations of study possibilities. The event was hosted by a student presenter.

FEBRUARY

11.

Open Door Day for prospective students

Photo: Jakub Rozboud

After several years an Open Door Day could be held in present form right at the faculty. Prospective students had the possibility to meet the representatives of individual bachelor study programmes and to visit laboratories and the faculty premises.

Photo: Jakub Rozboud

11.

Science Slam 13

The Scala cinema hosted the Science Slam on 11 February, the International Women in Science' Day, which attracted plenty of visitors. The 13th year was dedicated to women in science and it was co-organized by the Masaryk University and the Mendel University. Brno University of Technology was represented by women's scientists from the Faculty of Mechanical Engineering and Faculty of Electrical Engineering and Communication.

Photo: archive MUNI (contest Science Slam)

Science Slam is a contest where scientists explain and describe in an interesting way their projects and issues they are solving. One of the scientists who shared her research experience was Jana Kolářová from the Department of Biomedical Engineering at the FEEC, presenting her topic "How to see the heart from a different perspective". She described a perfectly synchronised heart work which is secured by cooperation of electric and mechanical energy, and she also covered some topics from the experimental cardiology research.

MARCH

1.

8th year of the Merkur perFEECt Challenge superfinals

Photo: Jakub Rozboud

After a gap year caused by the coronavirus epidemy it was the eight time the Faculty of Electrical Engineering and Communication held the superfinals of the Merkur PerFEECt Challenge contest. Four-member teams of secondary school students who proceeded in November from the final round were now asked to make a vehicle which would automatically follow a designated route and fulfil other tasks.

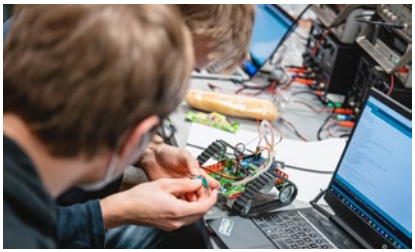


Photo: Jakub Rozboud

The winner of this year's round was the Jazdaa team from Střední průmyslová škola na Proseku, in Prague which also took a challenge cup to care for until next year.

31.

Presentation and discussion on Nuclear Power Engineering and the Current Situation and Presentation of the Dukovany Nuclear Power Plant

Photo: Jana Valchová

Department of Electrical Power Engineering at the FEEC and the Energy Institute at the FME prepared a presentation and a subsequent discussion with the head of the State office for Nuclear Safety, Dr. Dana Drábová, and with the head of the Dukovany Nuclear Power Plant, Dr. Roman Havlín. The presentation was held in Prof. Brauner Hall.

APRIL

1.

Start of the BDSat nanosatellite

At the beginning of April the SpaceX rocket Falcon 9 launched a BD SENSORS satellite called BDSat, which was developed together with researchers from the Department of Radio Electronics, FEEC BUT. At first it worked well, but unfortunately after a few weeks it stopped communicating due to a software failure on its radio component. BD SENSORS company then decided to launch another satellite BDSat-2 (which is the Czech 12th satellite) and it successfully started on 3 January 2023. After an hour the satellite was launched into the space and shortly afterwards a successful communication with the satellite was realized. The satellite's shape is 10x10x10 cm and it carries new technologies which will be tested in the space, such as special pressure sensors or alternative solar power system, a.k.a. supercapacitor bank.

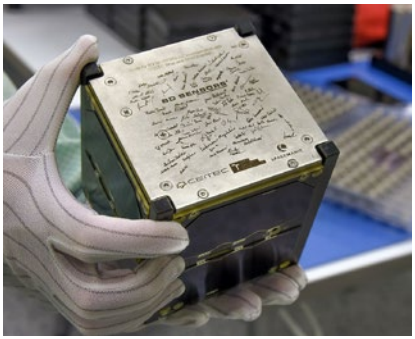


Photo: archive BD SENSORS

SatNOGS system was used for following both satellites, with the main control station at the Laboratory of Experimental Satellites of the Department of Radio Electronics. The department's team under the supervision of Prof. Miroslav Kasal cooperates with BD SENSORS and Spacemanics companies and it secures a land communication segment.

4.

Presentation of cyber arena at the SPŠ Třebíč secondary school

Cyber arena from the Department of Telecommunication as an educational platform in cyber security was presented to first representatives of secondary schools. During 2022 operation of the arena was piloted at the secondary school.

21.–22.

32nd International Conference Radio Electronics 2022

The conference was co-organized by the Department of Radio Electronics together with Czech and Slovak technical universities. The aim of the conference is to make a discussion forum for scientists, academics, professionals from the industry and students interested in the latest developments in electronics, signal processing, information technologies, microwave techniques and related fields of study. The conference was held at the Faculty of Electrical Engineering and Informatics at the Technical University in Košice.

26.

28th year of Student EEICT 2022 conference and contest and 3rd year of perFEECt JobFair 2022

Photo: Jan Prokopius

On 26 April 2022, under the auspices of the BUT Rector, a traditional contest conference STUDENT EEICT 2022 was held, after two years again in the attended form. Students presented in front of the committees results of their technical projects on topics ranging from electrical engineering, communication technology, biomedical engineering, and audio engineering to information security. This year there were altogether 174 student contributions in 23 sections. The total amount of prizes reached about 450 thousand CZK. In the committees there were 163 members out of which 52 represented industrial companies.

Photo: Jan Prokopius

Together with the conference, the 13th year of the vacancies fair, the PerFEECt JobFair, ran with 38 companies from the electrical engineering and related fields. The job fair was visited by more than 1200 visitors, both faculty and university students.

27.

Run for 53 bus

Photo: Jan Prokopius

After two years gap caused by the COVID-19 pandemic, eventually the fun event called Run for 53 bus was organized by the Students for Students´ Club. This legendary event is a small sporting celebration for all who have had the once-in-a-lifetime experience to run to catch the bus 53 in the Technological Park.

Photo: Jan Prokopius

The race was held during the whole day right in front of the Technická 12 building and it also included a VIP race relay in which also the management of the FEEC participated.

MAY

3.

Presentation on the AI Potential for the security

In respect to the Act on AI a presentation was held to discuss AI for security. The researchers from the Department of Telecommunications presented the potential of AI for security and examples of use for the Police of the Czech Republic. The presentation discussed the current security research projects by MVČR (Ministry of Interior), together with the finished projects, and suggestions for future cooperation with the Police of the CR in AG role.

5.

Discussion on Digital Future project

The Department of Telecommunications held a series of discussions with important personalities from South Moravia as a part of the Digital Future project supported by Vodafone Business. Discussions on

Automatization and Digitalization were presented by Václav Muchna (Y Soft), Martin Cígler (Solitea) and Pavel Mašek (BUT).

Photo: Nikola Čížková

The aim of the discussions was to present interesting regional companies and examples of modernisation.

9.

Secondary school students came to the FEEC to try out the cyber arena

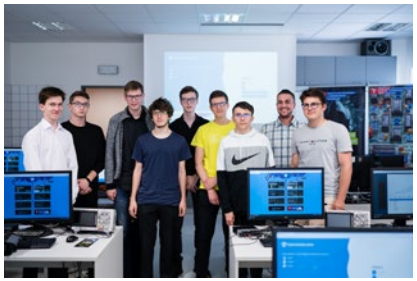


Photo: Jan Prokopius

Students from the Střední průmyslová škola v Třebíčl secondary school came to the Department of Telecommunications to try out the cyber arena and to test out a game which teaches them what the cyber security is about. "Students got to know the basic linux distribution tools for ethical hacking, they learnt the basics how to operate the terminal and they were also shown how easy it is to break a weak password," says Willi Lazarov, a bachelor student of Information security, who prepared the scenarios for cyber game.

10.

Bowling tournament

Photo: archive UAMT

The Department of Control and Instrumentation traditionally holds a bowling tournament which was won by Luděk Anděra and the Hana team.

17.–20.

AMPER 2022 fair

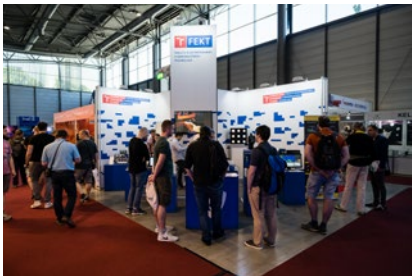


Photo: Jan Prokopius

It was the 28th international fair of electrical engineering, power engineering, automation, communication, lightning and security which the FEEC could not miss to participate at. The most attractive exhibit was a new soldering station with a heated template for reballing and it was awarded with the Golden AMPER 2022 prize.

26.

Final workshop of the Microcontrollers are in! 2022 contest

Photo: Jan Prokopius

Microcontrollers are in! is a traditional contest organized by the Institute of Experimental Technologies at the FEEC (IET) and by the Department of Theoretical and Experimental Electrical Engineering which is intended for students from secondary schools, grammar schools and university students. It can be approached by both individuals and teams from the South Moravian region and surroundings. Participants were to design and create a functional device with an implemented microcontroller. The contestants suggested for example a "wirelessly operated robots unit" or an "automatized peristaltic pump with a pressure

control". The contest is concluded by a presentation of the device in front of a committee including industry professionals and BUT academics. 15 competing devices participated at the 13th round of the contest. Many interesting projects were presented in front of the professional committee.

Photo: Jan Prokopius

Martin Petrek, who studies a bachelor study programme Microelectronics and Technologies at the FEEC, was awarded with the first prize for a project called "6 1/2 slope multimetre".

29. 5. – 3. 6.

3rd International Workshop of KOR-CZE R&D project – PWR strategies against design extension conditions

Photo: archive UJEEN

The workshop was intended to exchange knowledge and experience between Czech and Korean partners in heavy nuclear power breakdowns, their simulations, analysis and prevention. Korean partners from FNC, KHNP and KINGS University participated at the workshop. The workshop was organized by the UJEEN FEEC together with the TES company from Třebíč. The workshop included not only discussions on the above-mentioned topics, but also excursions to Czech nuclear power industry companies.

JUNE

1.

Foundation of the Czech Battery Cluster

Photo: Jakub Rozboud

Production of batteries is a crucial element for the development of electrical mobility as well as for sources of renewable energy. It is also crucial for the Czech Republic, as the automobile industry is an essential part of the Czech economy. In reaction to the need of battery production development the Czech Battery Cluster was founded in June 2022 and the FEEC is one of its representatives. Its aim is to unite public, academic and private spheres in terms of research and usage of batteries. "The Czech Republic lacked an equivalent of the European Battery Alliance which would focus on research, development and practical application of batteries. Companies had no partner for communication and discussion with professionals and researchers in this field," says Tomáš Kazda, from the Department of Electrical and Electronic Technology, who initiated the first meetings.

1.–3.

Off-site meeting of the SC AS FEEC

Photo: archive SK AS FEKT

An off-site meeting of the Student Chamber of the Academic Senate took place in the Sladovna Hotel in Černá Hora.

7.

Conference with a panel discussion Kyndryl

Thanks to a long-term cooperation of the BUT with the Kyndryl company the FEEC hosted a conference with a panel discussion for Kyndryl employees. The main host was Zoltan Zerenyi,

a director of Kyndryl Česko client centres, CEE and MEA, and the main guest was Martin Schroeter, CEO and the Kyndryl Chairman of the Board of Management.

Photo: archive Kyndryl

Other Kyndryl management members also participated there. The conference focused on Kyndryl strategic initiatives of the Brno branch.

15.

FEEC sweatshirts launched to the market

Photo: Jakub Rozboud

A blue sweatshirt, a new and long-time requested faculty promotion product, was launched to the market.

16.–17.

International conference on Mathematics, Information Technology and Applied Sciences – MITAV 2021

The conference is intended for teachers of all types of school and it aims to present the newest findings in mathematics, informatics and other sciences. It also strives to come up with innovations in teaching these sciences in different types and levels of schools including e-learning materials and other IT applications in the educational process. The main aim of the conference is to allow presentations of results in various research fields and to enable space for meeting and discussion of people from different types and grades of schools. The conference is co-organized by the Department of Mathematics.

20.

Sports technology study programme greeted its first graduates

Monday 20 June 2022 meant a small premiere at the BUT. The first bachelor final exams of the Sports Technology study programme took place at the FEEC. The study programme is the only accredited study programme in the Czech Republic joining sports and modern technologies and is taught by the Centre of Sports Activities together with the FEEC. Final state exams and final theses defences were run by two parallel commissions. The final exam was taken by 14 students, one of which, Tobiáš Goldschmidt, was awarded with the Red Diploma.

Photo: archive CESA VUT

The final graduation ceremony of the historically first graduates was held on 27 June 2022 in the Rectorate Hall at the BUT.

21.–22.

Advanced Testing Techniques training

Photo: archive UEEN

The Department of Electrical Power Engineering organized a professional training for 15 workers from the ČEZ Distribuce, a.s. The training was aimed at testing and diagnostics of devices and units of distribution systems comprising photovoltaic production,

protection of the grids, electricity metres, and HV and LV devices.

22.–24.

43th NZEE – Nonconventional Sources of Energy conference 2022

The 43rd year of traditional NZEE conference, organized by the Department of Electrical Power Engineering, offered a unique possibility to get the latest news from the renewable energy, photovoltaics, energy storage and electrical mobility.

Photo: archive UETE

Plenty of experts from the Czech and Slovak republics participated at the conference, including the most significant researchers in renewable resources, photovoltaics or battery storages.

Photo: archive UETE

This year´s topic was the current energy situation in the Czech Republic and the whole European Union. Many opinions and views on this topic were presented from different fields of study.

27.–29.

Summer school of sports technology

Photo: archive CESA VUT

The beginning of summer was a new start at the CESA for secondary school students. During three days they tried out how to work with sports technologies and what it feels like to study such a study programme.

Photo: archive CESA VUT

18 students from both near and far away parts of the Czech Republic came to Brno to enjoy workshops, lectures and practical trainings at the BUT sports premises. They tried out motoric tests, agility, tapping, optojump, blazepod, working with a location system, sporttesters, wattmetres, sensors in kinantropology, mobile applications for body functions monitoring, biosignal acquisition, 3D MOCAP, and many other sports technologies. Apart from practical knowledge gained from workshops students also enjoyed CESA sports premises equipped by the FEEC laboratories and a modern campus, which can be inspirational in their choice of a university encouraging their talent and interest in technology.

28.–29.

Graduation ceremony of master and bachelor study graduates

Photo: Jakub Rozboud

This year, after the Covid-caused break, graduation ceremonies traditionally took place in summer term, both for our new engineers as well as for bachelors.

JULY

13.–15.

45th International Conference on Telecommunications and Signal Processing (TSP 2022)

International conference for academics and researchers in telecommunications and signal processing was organized by the Department of Telecommunications at the FEEC in cooperation with IEEE Region 8 and IEEE Czechoslovak section. The conference proceedings are regularly indexed in international databases IEEE Xplore®, Conference Proceedings Citation Index (CPCI) – Web of Science by Clarivate, SCOPUS, DBLP and Google Scholar. Selected and extended papers are published in special issues of renowned scientific journals (Q2 according to AIS).

AUGUST

21.–24.

23rd Advanced Batteries, Accumulators and Fuel Cells (ABAF) international conference

The Department of Electrical and Electronic Technology organized another round of an international conference focused on modern batteries and electrochemical technologies. The conference was prepared together with the International Society of Electrochemistry (ISE) and Battery 2030+ European Research Initiative, coordinated by the University in Uppsala, Sweden.

Photo: archive UETE

Main conference interest areas are research and development of materials intended for modern electrochemical sources of energy, new research in materials for conventional batteries and their properties, ion liquids and their usage, nonconventional sources of energy including photovoltaic systems, corrosion of materials in various conditions, vast applications in transportation and energy storage, electrochromism and special electrochemical technologies. As a part of the conference, a Battery 2030+ section was included, which is intended for exchange of knowledge and reliable procedures for long-term battery research needs in Europe. About a hundred scientists from all over the world participated at the conference.

23.–26.

ETACS 2022 and SP2I 2022 workshops at the ARES 2022 conference

International workshops organized by the Department of Telecommunications were focused on cyber security.
At the workshops there were many representatives of foreign universities (e.g. Italy, France, Austria, Latvia, etc.) and of key institutions, e.g. ENISA (i.e. The European Union Agency for Cybersecurity) and American NIST (i.e. National Institute of Standards and Technology).

SEPTEMBER

1.–4. and 4.–7.

Pre-School BUT Party

Two so-called pre-school parties were organized as an introductory event of first year students who enrolled the

FEEC in September. This official four-day introductory event organized by student

Photo: Jakub Rozboud

clubs such as BEST Brno, Students for Students' Club, IASTE or ESN BUT, was held for the 12th time.

2.–9.

Summer school of nuclear power engineering 2022

Photo: archive UJEEN

A summer school for those interested in the future of nuclear power engineering is co-organized by the BUT and CVUT. The programme included lectures covering real-life experience, untraditional nuclear power topics, excursions, a nuclear power cinema, and both nuclear and non-nuclear related activities. All programme was guaranteed by professionals from the industry and from Czech universities. The summer school was supported by organizers and their industrial partners.

12.–14.

European Conference on Security Research in Cyberspace – EU-SecRes 2022

Photo: Jakub Rozboud

Cybersecurity was the key priority of the Czech presidency of the EU and also the main topic of the international scientific conference called European Conference on Security Research in Cyberspace. The conference was organized by the Masaryk University, Brno University of Technology (FEEC and FIT) and the Ministry of Interior as a part of the Czech presidency in the European Council. At the conference the Faculty of Electrical Engineering and Communication (FEEC) announced the launch of the first interfaculty quantum connection in the Czech Republic, which represents an important milestone in cybersecurity.

Photo: Jan Prokopius

The main aim of the conference was to deepen knowledge and to share information and experience in cybersecurity in the Czech Republic and abroad. On the occasion of the Czech presidency in the European Council the conference offered to unite excellent cybersecurity researchers from the BUT and the Masaryk University with the final users of the research results and representatives of the Czech state administration and from abroad.

Photo: Jakub Rozboud

Another aim was to present current challenges and possibilities of development to be discussed as well as to present excellent results of the security research of the Ministry of Interior. The discussion was intended to gather views on the current system of monitoring technological development and the process of implementation of research results into real life. The event gave a unique opportunity to present cybersecurity research as an integral part of the security research system in the Czech Republic.

13.

ELECTROJOBS 2022 meeting

Photo: Jana Valchová

The faculty hosted the third republic meeting of schools and companies called ELECTROJOBS 2022, which was organized by the Electrical and Electronic Association of the Czech Republic.
The event is aimed to make an opportunity for meeting and enabling cooperation between electrical and electronic engineering and IT companies and secondary schools and universities.

13.

BluEmi Amper Open

Photo: archive UREL

On Wednesday 13 September the third round of tennis tournament in doubles called BluEmi Amper Open was held. It was organized by the Department of Radio Electronics. This year's winners are David Kuřátko and Mohamed Aziz Lahiani, the second place was awarded to Otto Vodvářka and Jirka Dřínovský, and the third position went to Standa Hanus and Roman Maršálek.
Ten pairs altogether participated at the tournament, which was traditionally supported by the BluEmi company.

14.–15.

Off-site meeting of the FEEC at the Hotel Sladovna in Černá Hora

The aim of the off-site meeting, where the faculty management, the Dean office and the departments management participated, was to find solutions to key issues in instruction, research and development, foreign relations, marketing and the faculty development.

16.

Student matriculation ceremony

Photo: Jakub Rozboud

After the several years break caused by the Covid pandemic the matriculation ceremony was finally organized in its traditional attended form.
The ceremony then turned into introductory presentations for the first-year students and it followed with the PerFEECt start.

16.–18.

PerFEECt start

Photo: Jakub Rozboud

This is a traditional welcoming event for first year bachelor study students which is organized by the Students for Students' Club. New students had the opportunity to see the faculty premises and to meet their new fellow students. From the current students they also got tips on how to register courses and other useful pieces of advice for their study at the FEEC.

20.–22.

LUX EUROPA 2022 conference

At the international conference called Lux Europa 2022 researchers from the Department of Electrical Power Engineering presented a new type of brightness analyser called LumiDISP – LDA ML6, which they had been developing for more than 20 years.

Photo: archive UEEN

The device allows to make use of a commercially accessible camera for professional measuring purposes. The device beats other competing products from abroad by its precision and price.

21.

Music from the FEEC

Photo: Jakub Rozboud

The fourteenth round of the favourite student festival called Music from the FEEC was organized by the Students for Students' Club.

Photo: Jakub Rozboud

Student bands together with Redzed the headliner said goodbye to summer by their songs. The winner of the student bands was Abused & Neglected

27. 9. – 20. 12.

Technical Challenges and Visions for Mobility colloqium

Photo: Petr Baxant

The Department of Electrical Power Engineering, under the supervision of Dr. Petr Baxant, organized a series of 12 + 1 lectures on technological solutions for today´s traffic and visions for the future, seen by and discussed from the perspective of selected researchers. The colloquium was intended to fill in the gap before the prospective Automotive Electronics and Electromobility study programme scheduled to 2023/2024. The colloquium welcomed different speakers such as Mario Hirz from the Graz University, Lukáš Kadula from the Transport Research Centre or Jan Staněk (@electrodad) and Petr Beneš (@autonabijecka.cz).

30.

Night of Scientists 2022

Photo: Jakub Rozboud

The faculty participated as usual at the all-republic event called Night of Scientists. This year's topic were senses and thus visitors could stroke electric current or test what a cricket tastes like. Children could also find out how to make an aroma lamp without candles or how to make a rocket from a PET bottle.
The best part of the event was, as usual, a big Tesla transformer which provided visitors with its several-metres-high lightnings and made it an unforgettable light and music show.

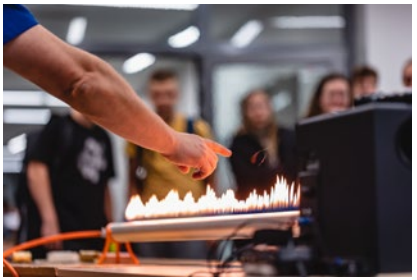


Photo: Jakub Rozboud

Apart from that, the Professor List Science Park was also opened. This is a place where we focus on the research of renewable energy resources, power

electrical engineering and electrical power engineering.

OCTOBER

4.–6.

Gaudeamus Bratislava 2022

The 25th year of European fair of postgraduate and lifelong learning tries to attract last year secondary school students, but it also aims at their teachers and educational counsellors.

4.–7.

63rd International Engineering Fair Brno

Photo: Jan Prokopius

The Czech National Exposition at the International Engineering fair was ceremoniously opened by Ladislav Janíček, the BUT Rector, and Vladimír Aubrecht, the FEEC Dean. As a part of the exposition, FEEC exhibits, created thanks to cooperation between the Department of Telecommunications and the Ministry of Industry and Trade, were also presented.

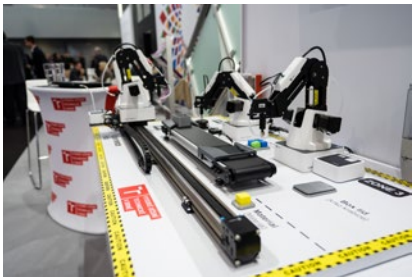


Photo: Jan Prokopius

There were several demonstrators reflecting the IEF leading topic, which is Industry 4.0 and a digital factory. One of the demonstrators was an automatized robotic assembly line using 5G mobile network for communication. Another was an intelligent electric metre used for remote reading and control.

7.

9th Conference of Academic Senators

Photo: Student Chamber of Universities Council

Student Chamber of the BUT Academic Senate together with the Student Chamber of Universities Council organized the 9th Conference of Academic Senators. Student representatives from all over the republic came to discuss topics related to university environment.

11.

Seminar on quality of electric energy in active LV distribution grids focusing on current trends

The Department of Electrical Power Engineering organized a professional seminar for 30 ČEZ Distribuce workers from the department of EE quality measurement. The seminar was focused on the development in running delivery points with sources and securing "zero" energy balance. The seminar discussed both currently accessible and advanced technical solutions from the perspective of reaching power and energy balance and impact on the quality of electric energy together with the quality of voltage in a distribution grid.

11.–12.

Workshop FOAN 2022 Security in Communication Networks

An international workshop was organized as a part of the ICUMT 2022 conference in Valencia (Spain). It is a special workshop focused on security in communication networks. The aim is to discuss and to identify security risks and to increase security of the current communication networks. The workshop hosted both important academic professionals (Boston

University, Feng-Chia University) and industry representatives (NTT Japan, BH Telecom).

11.–13.

ICUMT 2022

An international congress organized by the Department of Telecommunications in Valencia (Spain) was intended as an open forum for researchers in telecommunications, control systems, automatization and robotics. The aim of the event was to present original results from basic and applied research.

20.

A view into the research, development and application of advanced biomedical technologies

Photo: archive UBMI

A series of public presentations held by Czech manufacturers and suppliers of technology for medical purposes.
The event was co-organized together with the Association of Manufacturers and Suppliers of Medical Devices.

25.

The faculty enabled solar eclipse measuring

Photo: archive UEEN

Solar eclipse is always a great event for all astronomers. Scientists from the Department of Electrical Power Engineering monitored and recorded the whole process and observed the changes in the overall brightness of daylight as well as the solar eclipse impact on the whole illumination of the Earth surface.

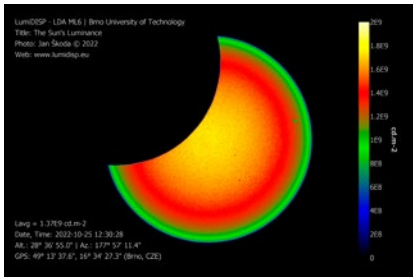


Photo: archive UEEN

The scientists made use of the recently launched brightness analyser which has a narrow angle of vision and is capable of soft details discerning.

26.–27.

IMAPS Flash Conference 2022

Photo: archive UMEL

IMAPS CZ & SK together with the Department of Microelectronics organized 8th IMAPS conference.
The conference topics ranged from a variety of microelectronic issues, circuit designs, encapsulation, and passive electronic elements to technologies used. The conference was concluded by a night visit to the Technical Museum in Brno.

27. 10., 3. 11. and 10. 11.

Clean and Limitless Energy series of lectures

Together with the Faculty of Mechanical Engineering and commercial partners, the Department of Power Electrical and Electronic Engineering organized a series of lectures on future development of thermonuclear power fusion systems. Lectures were intended for both a general and professional audience interested in modern technologies in electric energy production.

Photo: archive UVEE

An inherent part of the presentations was an introduction of research projects solved by the FEEC and FME BUT together with ATKEO, EXMONT-Energo a.s., Num solution s.r.o. and Spindrive Oy.

Photo: Jan Prokopius

Visitors could take a look at the winning exposition of the fair and apart from getting plenty of information they could also enjoy a robotic ice-hockey, chemical experiments, a formula simulator, a robot mixing drinks or a Skoda Kodiaq sectional view.

NOVEMBER

1.–4.

Gaudeamus Brno 2022

Photo: Jan Prokopius

Neither the BUT nor the FEEC could miss the opportunity to be present at the Gaudeamus Brno graduate education fair.

5.

VUT Junior at the FEEC

Photo: Jakub Rozboud

On Saturday 5 November we had 50 elementary and secondary school pupils visit us as a part of the BUT Junior programme. Participants could focus on one of five topics. Some could make an electronic dice to take home with, others focused on body signals and they could try out the lie detector. Another group tried out what it is like to work with robotic hands or they researched a hidden energy source in water. The programme also included a visit to our interactive Elektrikárium playground.

Photo: Jakub Rozboud

The aim of the event is to make visitors acquainted with the BUT and its premises and to make them enthusiastic about modern technologies.
Pupils thus were invited to visit one faculty every week where they could enjoy an interesting programme.
www.vut.cz/junior

7.–8.

Dr. Fernando Schlindwein from the University of Leicester' visit

Photo: archive UBMI

Dr. Fernando Schlindwein from the University of Leicester met biomedical researchers and gave a lecture on Engineering to Treat Cardiac Arrhythmias.

11.

ARTISEC

The Department of Telecommunications co-organized a workshop held under the auspices of the regional county president of the Královéhradecký region and with participation of other regions (Pardubický and Liberecký).
The workshop topic was cybersecurity of regions within the Smart City concept. The event gave a unique opportunity to present research in Smart City project and to get feedback from the municipalities.

14.–16.

Gaudeamus Nitra 2022

Photo: archive FEKT

Gaudeamus Nitra graduate education fair.

17.

Brno the Seventeenth

Fundamental democratic values such as liberty, tolerance and solidarity were not as common as they may seem now. Past generations had to fight for them. Thus, we keep remembering the 17th November events from 1939 and 1989 when it was students who fought first for freedom and democracy. BUT keeps remembering these events to make other people realize that democracy is not a common thing and many before us died fighting for it.

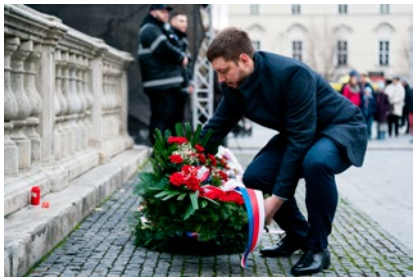


Photo: Jan Prokopius

Our faculty students helped to organize the Brno the Seventeenth celebrations and, as a part of the ceremony, they laid wreaths at the Náměstí Svobody Square.

19.–20.

BASTLfest in the VIDA centre

About a hundred people visited a workshop organized by the OK2KOJ radio club and the Department of Radio Electronics, which was held as a part of the BASTLfest, i.e. a festival for DIY fans. In Labodílna (i.e. a laboratory combined with a workroom) visitors could admire police beacons toolkits, sirens, electronic dice, simple lamps or flickering stars.

Photo: archive VIDA science centrum

Visitors could assemble the devices and take them home as a souvenir. Electronics is everywhere around and we were happy to show it not only to inquisitive children, but also to their parents.

21.

T-excursion biosignals

Photo: archive UBMI

Secondary school students from the South Moravian region were introduced at our faculty to the most useful biosignals and they could measure and evaluate them on themselves.
Students could also visit the best-equipped laboratories, and to meet enthusiastic lecturers and new friends who are as curious and willing to learn new things as they are.

23.

Opportunities in Space industry

In cooperation with the ESA the faculty hosted an event intended to raise awareness on space industry and its opportunities, stressing the possibility of an incubation programme for starting entrepreneurs, called ESA BIC CZ, which is primarily aimed at students and others.

24.

First round of the Merkur perFEECt Challenge 2022-23

Photo: Jakub Rozboud

The first round of the Merkur perFEECt Challenge 2022-23 contest took place. 216 students from 29 secondary schools all over the Czech Republic participated there.

Photo: Jakub Rozboud

As a rule, teams were divided into nine groups according to the set tasks and out of the 54 four-member teams only the winning team of each task proceeds to the super finals.

Photo: Jakub Rozboud

Contestants thus created, for example, an armadillo controlled by coloured marks or a vehicle guided by a muscle power.

30.

Projection of a video called On a woman scientist's life

A video called On a woman scientist's life was screened as a conclusion to the Science Slam 13 with the title Women belong to the science!

DECEMBER

3.

Presentation of an ELORYKS project at the Innovation in Law Enforcement conference (PČR, Europol, EuCB)

On request of the Police of the Czech Republic (PČR) as an application guarantor, a project called ELORYKS (Electronic vehicle speed limitation in exceptional and emergency situations by security services, VJ01010066) was introduced. At the presentation project aims and current state were introduced, including a practical demonstration of communication modules of cooperation systems.

7.

SPS punch

Photo: Jakub Rozboud

Traditional St. Nicolas's punch organized by the Students for Students' Club.

7.

Meeting students from the Department of Control and Instrumentation

Photo: archive UAMT

After the Covid break a tradition of an informal meeting of academics and doctoral students called "What advice I would like to give to my younger fellow students?" was renewed on Wednesday 7 November. As an introduction, doctoral students presented individual research teams topics and they shared their study experience. Afterwards, an informal discussion followed.

7.–9.

St. Nicolas' meeting of CYG ČNS/SNUS

Photo: archive UEEN

The faculty hosted the 22nd Czech Nuclear Society: Young Generation conference intended for young people studying or working in nuclear field. The aim of the meeting is to interconnect young people from all over the Czech Republic and to give the opportunity to present their work.

8.

Lecture of a Technical director of a Medical Solutions division of the OR company

Photo: archive UBMI

Ing. Jan Kelča, MBA, a technical director of a Medical Solutions division of the OR company, and also a former biomedical graduate, and his colleague shared their know-how on a lecture focusing on PACS and DICOM, i.e. system and data standard for archiving and visual data transmission in medical services.

19.–22.

Czech-Indian Christmas workshop InCzechNuc2022 focused on cooperation in science, research, development and education in nuclear power engineering and applied nuclear physics

Photo: archive UEEN

A week before Christmas the FEEC hosted the first Czech-Indian workshop on cooperation in science, research, development and education in nuclear power engineering and applied nuclear physics. Representatives of five Indian universities participated there together with online participants from three more universities and two research institutes. The workshop was opened by the Indian deputy ambassador in Prague, Mr Shri Abhijit Chakraborty, together with the Vice-dean for Research and PhD study, Prof. Jaroslav Koton.

Important awards and merits

Photo: Jan Prokopius

Golden AMPER

A soldering station with a heated template for the so-called reballing was among the five awarded exhibits of the AMPER 2022 fair. The HSR-01 soldering station was introduced at the FEEC stand by its co-author Alexandr Otáhal, a team leader from the Department of Microelectronics. "The innovative part in the station is usage of setting devices for soldering balls as well as for heating element in order to secure the recasting without manipulation with the casing. Main advantages of such a solution are a smaller heat strain for the soldered electronic casing and a possibility to make a more reliable soldering joint, which is normally the result of the more expensive laser soldering," explained the contest organizers.

The station can be used not only in fixing consumer and other electronics, but also in testing and development. The prototype design and construction enable an independent operation without using other devices which are used in other reballing methods. The FEEC soldering station contains a camera system with an LCD display for optical setting of apertures in the template, a temperature control regulator or vacuum pumps for fixing the casing and its subsequent setting.

Prize of the deputy regional council president of the South Moravian region in the natural environment

Martin Vrana, a Department of Electrical Power Engineering student, was awarded for his bachelor thesis called Design of a Photovoltaic Power System with Battery Storage for Household Purposes in Area of Brno-mesto. He won the Deputy Regional Council President of the South Moravian Region in the Natural Environment prize. A competition of student theses related to the natural environment is organized every year by the South Moravian region through the educational centre for environmental education called Lipka.

Brno Ph.D. Talent Award

A first-year doctoral student in Cybernetics, Automation and Measuring at the Department of Control and Instrumentation, Lukáš Zezula, won the Brno Ph.D. award for his research activities in methods of diagnostics in electric drives failures based on referential models.

Martin Ptáček, a doctoral student in Electronics and Communication Technologies at the Department of Radio Electronics, was also awarded with a Brno Ph.D. Talent prize for his project called Space and time function estimation in mobile scenarios.

Photo: EY Cyber Security Trophy

EY Cyber Security Trophy

Willi Lazarov, a master cybersecurity study programme student, won the first place in the EY Cyber Security Trophy competition in the EY ESO Cyber Security Future Promise category for his cybersecurity research. He was also awarded for his research and development and pedagogical activities with other merits. Willi also solves many Research and Development projects in cybersecurity at the Department of Telecommunications. The aim of the EY Cyber Security Trophy competition is to award companies, scientists and future talents in information and cybersecurity and ethical hacking in the Czech and Slovak Republics.

“Nadání Josefa, Marie a Zdeňky Hlávkových” Foundation Prize

University students were awarded for their exceptional capacities and creative thinking in their field of study at the Josef Hlávka’s Chateau in Lužany on 16 November. Two students from the Department of Radio Electronics, Electronics and Communication Technologies graduates, were among those awarded. Ing. Patrícia Klobušiaková was awarded for her work called “Evaluation of functional connectivity and brain structures in patients at synukleinopathy risk”. Ing. Ondřej Kolář, a current doctoral student at the UREL, won the Prof. Mayer Special Prize for best electrical engineering students.

Photo: archive Nadace Josefa, Marie a Zdeňky Hlávkových

Photo: archive of the Siemens Czech company

Werner von Siemens Prize

Ing. Robin Filip won the second place in the Werner von Siemens Prize in the Best Diploma Thesis category. His diploma thesis called “EV smart charging and BESS in increasing the PV hosting capacity of distribution networks“ was supervised by Dr. Martin Paar and Prof. Matti Lehtonen from the Aalto University.

The prize awarding ceremony was held on 19 May 2022 in the Betlémská chapel.

Competition called SDGs Prizes

No Panic! application won another prize. This time it was for fulfilling the UNO sustainable development goals in the Czech Republic. SDGs prizes were given to eight companies which help to make the world better.

This year's competition had an exceptionally high number of competing projects, namely 326. Veronika Kamenská, a FEEC BUT student, won the competition in Education, Health and Quality Life category with her application that offers a fast psychological help to children and young people. Over 400 users have downloaded it and it is accessible in 11 world languages.

No Panic! mobile application helps people with psychological issues such as depression, anxiety, self- harm, suicidal thoughts or eating disorders. Moreover, it provides its users with contact for help.

At first Veronika Kamenská cooperated with Tomáš Chlubna from the FIT BUT in developing the application. Today, they already have their non-profit organization and they are trying to run other projects. "The most important project, now a full-time job, is a chat and email counselling No Panic! In general, the message that we are trying to spread is that it is ok not to be ok and that mental health is equally important to physical health," Veronika Kamenská explains.

Photo: archive Soutěž Ceny SDGs

Veronika Kamenská (on the right) took over the prize for her application No Panic!

The application won the first place two years ago in the Gratias Tibi contest. In the category Under 30 our faculty students bet other nominated projects. Soon, another prize followed, this time it was from the Ministry of Education, Youth and Sports. The prize was awarded for extraordinary student feats in voluntary work and other activities related to the coronavirus pandemic.

ČEPS contest for the best diploma thesis

In the ČEPS contest for the best diploma thesis Karolína Čechová, a fresh FEEC graduate, won the first place with her thesis called Replacement of Electromechanical protections in TNS Vraňany.

Well-known figures

Drones will check the best harvesting time for corn

On the internet you can learn how to recognize a ripe corn, how much the cob hairs should be dry and how much the grain should be soft. However, if farmers with large areas to cover who sell corn to feed the animals fail to recognize the right harvest time, they can end up in loss in hundreds of thousands CZK every day. That is why many of them decide to make use of professional advice and modern technologies. It is the third year electrical engineers from the BUT have been investigating the best time for corn harvest.

You can see a big drone above a green corn field taking pictures. When it is ready, it lands and another part of research, less actional, begins. Jiří Janoušek checks the pictures taken by a multispectral camera and tries to decide if the best time to harvest the corn has already come or if it is better to wait a couple of days more.

Photo: Jan Prokopius

Jiří Janoušek chose a topic from agriculture for his dissertation thesis.

"Every camera lens takes a narrow-spectrum picture. With a human eye such a photo seems black and white, but when comparing it we can recognize big differences. I can rearrange them into reflectance maps and I calculate various vegetation indexes out of them," Jiří Janoušek explains the meaning of different colours in the field map. Different shades show health conditions of the plants. An infrared camera can recognize at the distance from the leaves if a plant started to go dry or not.

Nowadays farmers use satellite photos, but they have about ten times lower resolution than the ones taken by a drone, and if it is cloudy, they cannot be used. Moreover, a satellite orbits the place roughly once in five days and this can mean a substantial delay. Time delay is also an issue in chemical analyses when corn is harvested manually.

"After taking the samples we must wait for about a week for the results and to estimate the right harvest time. That is the reason why the farmers search for a method that would determine the harvest time just on the same day of taking the samples so that they knew the other day that the harvest time is optimal. Another option is to find a method that would be used for

measuring a week before and it would suggest that the optimal harvest time would come in about a fortnight. Such a method would also tell them that it is now too late for harvest," Janoušek stresses the importance of a time pressure. If farmers fail to find the best harvest time even within several days, it can result into a huge financial loss.

Janoušek, a doctoral student at the Department of Theoretical and Experimental Electrical Engineering, has been trying for the third year to discover the possibility to determine the exact chemical corn ingredients from photos taken by the multispectral camera. Fortunately, he succeeds in that.

And what is the essential element determining the best harvest time? "In corn the most important ingredient is the portion of a dry matter. Farmers are able of recalculating it into the milk yield, i.e. to predict the number of litres of milk," Janoušek explains enthusiastically. When I fly the drone above the field, I will learn its vegetation index and a farmer will be able to predict the amount of milk he will get if he feeds the cattle with such corn. They can immediately calculate the exact numbers."

Photo: Jan Prokopius

A big drone is equipped by multispectral camera with five lenses.

Jiří Janoušek chose the topic for his dissertation thesis and as he cooperates with the NutriVet company, which deals with chemical analyses in the long run, he has had ideal conditions for his research. "We took pictures of corn from its early growth, so that we could follow it since the very beginning. The most intensive time is about a month before harvest. We agreed with the farmers that they will leave a part of a field unharvested so that we could check the differences after the harvest. In the most intensive part of the research we went to the field twice a week, NutriVet always took the samples and I flew the drone above the field to take multispectral pictures."

He tried out his drone above the big companies' fields in Velké Bílovice, Letovice and Nový Jičín. Apart from various corn hybrids he also focuses on another feedstuffs. In the future he also plans to include grain harvest into his research.

Jiří Janoušek says that farmers need not to worry about the financial costs of the drone shooting. "A week delay in harvest can mean millions of CZK of loss, thus such measuring costs is a peanut for them."

Starlings are a nightmare for winemakers. Electrical engineers from the BUT offer their help

South Moravian slopes rejoice in the hot sun, vineyards are ripe with sweet fruit and winemakers cannot wait to try out the results of their hard work. Suddenly a growing shadow appears in the sky. Thousands of starlings flock down in the vineyards and within ten minutes most of the harvest is away. Huge losses could be prevented by an intelligent system of shooing which is being developed by the researchers from the FEEC BUT. Not only Czech, but also French winemakers are interested in the results of their research.

"A starling is a very clever bird, thus it can get used to gas cannons and the shot ceases to frighten it," Eliška Vlachová Hutová points to the birds intelligence. Being the head of the research project focusing on starlings shooing she has been researching the topic at the FEEC BUT for two years.

If you ever passed through vineyards during grapes harvest time, you could definitely not ignore blunt cannon-like shots. And indeed, it is really a gas cannon intended to shoot in regular intervals in order to shoo birds away from ripe grapes. Such cannons, however, disturb other animals, are a nuisance for the locals and starlings can get used to it, which then loses its original sense.

"We decided to shoo away a starlings flock only when they appear above the vineyard. As soon as the camera sees a flock, the AI recognizes that birds have arrived, an optical detector sends a signal to the repellent to start it," Petr Marcoň describes the principle of the new system.

A repellent need not necessarily mean a gas cannon, it can also make use of birds of pray recordings. "We wanted to avoid gas cannons as they are hard to operate, they must be covered for night and they make really big noise. We tried to use acoustic repellents which send different signals, mostly ultrasound, which is inaudible for people," Janoušek lists the alternatives. "We also tried laser repellents as they are talked much about. We designed our own green laser which is safe for human sight, but we found out that starlings do not react to it," Marcoň adds.

And how can a camera detect the starlings? "We record the vineyard space including the sky above. Cameras are trained to recognize starlings by models which we taught the AI to recognize," Janoušek describes the detection principle. He also tries to prevent the system from mistaking a large bird of pray, a distant plane or mosquitos too near the camera for a potential threat.

The computer which evaluates the data is an integral part of the cameras. The whole system can be controlled remotely, it can be powered by a solar panel with a battery or it can be plugged in. Despite the initial investment costs the researchers believe that it will return the investment costs quite soon. Moreover, smaller winemakers can share the system and guard the slopes all at once. Electrical engineers tested the detectors last year in the vineyard in Bořetice and at

Photo: archive UTEE

the Sonberk vineyard. "There they use more ways for protection, they have repellent cannons, but also workers who go round the vineyards and shoot in the air, so they have bigger costs. Visitors are disturbed by shots," Janoušek shares his experience.

As starlings fly only several times a day, it is not necessary to shoot the cannons all day long. If the system switched on at the right time, it can shoo birds away and they will not reappear the same day again.

And how to prove that it is not a good idea to underestimate starlings? "Some winemakers put a net over the vineyards, but starlings are capable of getting to the ground and go underneath the net. Some flocks may also fly down on the ground before the vineyards, thus they are missed by the camera and hop to the grapes on the ground. In such a way they could also outsmart our system, "Eliška Vlachová Hutová admits.

The system has already been commercialized by a company which intends to produce and sell it. It has also been praised by French winemakers who would like to set the cameras in Burgundy.

Photo: Jan Prokopius

Authors of the ApiVčelař were awarded with a prize in the Visionář contest which evaluates innovations in business and applied research

BUT sensors will protect bee hives from starvation and theft

Do you like honey? And are you aware of all potential risks of its successful making? Bees must survive winter and in spring they need to start gathering nectar without freezing to death. Not even warm weather and a strong bee colony is a guarantee of successful honey making. Bees can swarm and fly away, they can starve to death or they can be stolen.

Nevertheless, there is a help. It is called ApiVčelař 4.0. It contains smart scales and sensors sending beekeepers data and these were developed by BUT researchers. "A hive is a closed unit. It is a black box inside which many things happen and a beekeeper can learn about them only when he opens it. The aim of the research was to make the hive transparent enough so that the information needed by the beekeeper is accessible immediately by a mobile or a computer," Petr Sadovský, the main FEEC researcher, explains.

Frequent opening and checking hives is harmful and beekeepers have to commute to check the hives about once a week, which need not be sufficient, as some beekeepers' stories show. The research team has managed not only to develop the system, but also to

commercialize it. "During strong wind hives fell down. Normally, a beekeeper would not find out, but the application scales suddenly showed zero weight. The beekeeper arrived to see what had happened and after a couple of hours he got everything in order.

Without the application it would probably take him a week to discover and it would be too late," Sadovský gives a direct beekeeper's experience as evidence. The above-mentioned scale is one of the accessories the researchers designed. They also kept in mind that Czechs are DIY fans and thus, hives definitely do not need to look as if they were commercially produced.

"We developed a universal construction for any hive type and size. The scale monitors the bee colony weight and it transmits the data online. Some older beekeepers used to use a decimal scale right on the spot. But it still meant arriving at the place. We see online what is happening in the bee colony," Jakub Podivínský from the Faculty of Information Technology names the biggest system advantage.

He was the one to meet Petr Sadovský and invited him to cooperate on something that would be enjoyable for both of them and which would have some real-life results that can be helpful to other people. As they are both beekeepers, the topic was decided soon. A scale was the first step, as beekeepers can recognize from the weight how fast bees bring nectar inside the hive, and thus they learn immediately if it is necessary to add another frame inside. Or it tells them if the bees have eaten all winter supplies and they are starving. Together with the data from humidity and

Photo: Jan Prokopius

Bees cover the small box and if a thief steals a hive with this device, a beekeeper can trace it.

temperature sensors they can also learn if bees have swarmed out.

Petr Sadovský claims that even if bees decide to swarm suddenly, it can be detected online. Every half an hour a mobile phone gathers data from sensors installed inside the hives. "On a warm day around noon the temperature inside the hive starts rising, which shows how much bees are looking forward to fly out. Suddenly, the hive weight decreases by several kilos and a beekeeper knows immediately that a problem has arisen. Which results in an immediate leave from work and rushing to catch flown away bees," the researcher, who in the past helped to revive a Mendel´s bee hive in Brno, laughs. "About a week ago our customer told us that a warning had popped up just when he was at work. Thus, he sent his wife to check the garden and she found the bee colony in a tree. Thus, he could immediately set out to catch the bees," Jakub Podivínský adds.

Beekeeping is unfortunately not only interesting for those who inherited the hives or they took it out as a new hobby, but also for thieves. The system developed by the BUT can also help in such a situation. Before the season starts, a small box gets inserted in the hive, which was called ApiStopař (ApiTracker). Bees will cover it wax, so it is almost invisible. If the hive does not move, the tracker sleeps. In case someone takes the hive away and puts it in a car, the tracker wakes up and it starts tracking the route on a map.

Photo: Jan Prokopius

A scale is one of the main parts of smart beekeeping. According to a graph a beekeeper can recognize what is happening inside the bee hive and if bees bring nectar there.

"Bee colonies are sold after winter for about 4,000 CZK. This year the gathering is excellent and a bee colony can give about 50 kilos a year, which would be another loss. And a hive costs some money too," Podivínský evaluates the loss. A hive theft means about 10,000 CZK.

Young beekeepers are most numerous among the smart beekeeping fans. ApiVčelař (ApiBeekeeper) can help to raise honey yield to both advanced and beginning beekeepers, but also to professionals. Thanks to the Artificial Intelligence the system should be able to predict some situations in the future and, it would be able to evaluate them based on experience. The system enables beekeeper novices without anyone to ask for help to feel more confident.
"Older beekeepers tend not to trust technologies much.
They have long-term expert experience, they are simply experienced enough to arrive to the hives, to observe nature and learn everything important even without opening the hive. Thus, they do not need to rely on the AI, they have their own intelligence," Petr Sadovský concludes.

Antibiotics resistance in poultry microbiome has been researched at the FEEC BUT

The Darina Čejková's team investigates how resistance causing genes are transferred to other generations. The researchers try to explore chick microbiota as in the past poultry industry was considered one of the biggest sources of antibiotics resistance genes due to the plentiful antibiotics usage. A three-year project conducted also in cooperation with the University of Veterinary Sciences Brno and the Technical University in Denmark should bring new analysis methods and their optimization.

We learn more and more about the lack of antibiotics impact due to their excessive use or about resistant bacteria which are, for example, resistant to disinfectants. "They can cause problems even in uncomplicated operations like appendicitis, especially in persons with immune deficiency," Darina Čejková from the Department of Biomedical Engineering explains.

This is the reason why this topic is investigated under her supervision. She focuses not only on hospital environment, but also on agriculture. "We would like to explore what the source of resistance genes or resistant pathogenic organisms is. One of the possibilities is agriculture and cattle farming. It is said that a gram of intestine cavity hosts about ten to the power of twelve bacteria," Čejková explains and adds that these bacteria can then inherit resistance genes.

According to her information the poultry industry has used antibiotics since the beginning of commercial usage. Although the European Union has enacted strict curb on antibiotics use since, microbes have been still transferring resistance genes. "For instance, farming chicks are bred without contact with hens, which is the source for a healthy microflora, which results into their poor ability to resist intestine pathogens. The chicks thus lack their own microflora and they get it randomly from the environment. Thus, a farmer can easily bring a pathogen carrying resistance which can spread fast," she says.

This is the reason why the team researches which resistance genes can be found in poultry appendices and how these genes are transferred to other bacteria. The scientists thus research both faeces and appendices from both commercial and private poultry farms. "We are trying to see the whole problem in the bigger picture. We are trying to find new tools for analysis and new approaches to evaluating information. For instance, we are trying to isolate the so-called mobilome, which is the transferrable part of genetic information," Darina Čejková explains. They cooperate together with the University of Veterinary Science Brno and the Technical University in Denmark. Apart from new analysis tools and methods for optimization they also want to explore the development dynamics. "In particular, we would like to learn how the amount of transferred genetic material changes over the time, and if the amount of resistance bacteria increases or decreases meanwhile," Čejková sums up. That is why she hopes to have a follow-up project in the future and they will be able to focus on the problem in the long-run.

Photo: Darina Čejková's archive

The research team tries to find new analysis methods. Jana Schwarzerová in the picture.

Photo: Jan Prokopius

FEEC BUT researchers developed a smart watch detecting a Parkinson disease risk

First signs of the Parkinson disease start appearing about ten years before its outbreak. They can be signalled by sleep disorders accompanied by unease. Thanks to the EU niCE-life project FEEC BUT researchers developed a special watch that can detect them. The watch can be lent to patients by GPs and care centres. The sooner the Parkinson symptoms are revealed, the more effective are the drugs decelerating its progress. "Together with the neurologists from the St. Anne's University Hospital Brno and the CEITEC MU we explored the first signs of the Parkinson disease. The progression is very slow, before the disease first becomes evident, e.g. by the typical hand shaking, it can take even 10 years. One of its very first manifestations can be sleep disorders such as unease, frequent turning of the body and its general movement or frequent waking up," Radim Burget, the head of the FEEC research team, explains.

If a person suffers from a sleep disorder, it can be revealed by a sleep laboratory examination which lasts one night. The examination is, however, unpleasant and laboratories have a limited capacity. "It is a busy device which can hardly be used without grave reasons. Moreover, few people will use it just for prevention reasons, if they do not suffer from serious symptoms," Burget summarizes the reasons which led him and his colleagues to design a device monitoring sleep. The watch is equipped with smart sensors including accelerometer which evaluates patient's movement and hand turning at night. It can also measure the pulse and thus it can evaluate patient's emotional state. Researchers took the data acquired from the watch by neuron networks and compared them with the ones taken from sleep laboratories. "The accuracy of the watch compared to the sleep laboratory is very good, it reaches 87%," Burget commented.

The device was already tested by St. Anne's University Hospital Brno patients, in Olomouc and in the Samariter Bund social centre in Austria. Compared to the commercially produced watch the developed device is much more accurate and easier to use. It can be charged just once a week. The watch has already got a medical certification and doctors from the University Hospital Olomouc have already started using it for diagnostics.

"We cooperate with GPs and senior care houses. A patient is lent a watch which they wear during night for one week. Then they bring it to the doctor and the doctor uploads the data to the system. We created an AI which tries to detect potentially risky factors in the sleep curves. And if it discovers some deviation in the data, the patient is then sent to the sleep laboratory examination where they make a more detailed examination," Burget concludes.

STUDY AT FEEC

The faculty offers a wide range of study programmes focusing on electronics, electrical engineering and all related branches from microelectronics, telecommunications, cybernetics and power engineering to interdisciplinary studies such as biomedicine or audio engineering.
It offers 12 three-year bachelor study programmes, 25 two-year follow-up master study programmes and 32 four-year doctoral study programmes.
Our faculty thus provides a comprehensive offer of electrical engineering study programmes, both in combined and attended form, in Czech and English.
Moreover, we are a faculty with more than 3,000 students, which makes us the largest electrical engineering faculty in the Czech Republic and Slovakia.

Photo: Jan Prokopius

Excellent premises

Since 2013, the Faculty of Electrical Engineering and Communication has been situated in the newly constructed and modernly equipped campus area Pod Palackého vrchem. After more than 50 years it compounds the background for both instruction, excellent research and students' life, where students can enjoy both advanced technologies, perfectly equipped laboratories, lecture halls, canteens and libraries together with places for relaxation and sports.

Practical skills and job perspectives of the graduates

Thanks to faculty' s cooperation with commercial subjects and industrial partners students can enjoy not only an excellent theoretical preparation, but it also gives them opportunity to try out their practical skills in real life, which is crucial for their future job career. Based on current graduates' poll, 82% of FEEC students secure their job positions during their studies. 97% of graduates finds their job within 3 months after their successful completion of studies. Thus, we can see how successful our students are at the job market.

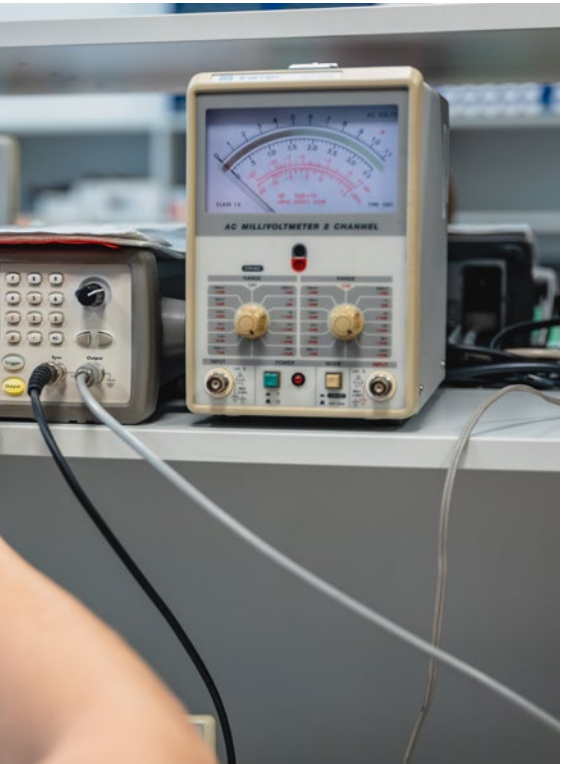


Photo: Jakub Rozboud

FEEC graduates have the highest starting salary at the BUT

Our students are not only highly attractive for potential employers, but they are also highly appreciated, compared to other BUT graduates, having their average gross starting salary at 39 611 CZK, based on the data from 2019–2020. Currently, it amounts to 54 189 CZK.

Instruction focusing on study programmes innovation

Study programme offer and content also undergo continual innovations. They reflect and comply with trends in industry in order to make students easily fit the job market demand. Our researchers cooperate with industrial partners on different projects and thus they can apply their practical experience and skills to instruction and content of courses.

Study programmes

Bachelor studies

Attended form:

- English in Electrical Engineering and Information Technology (CZ)
- Audio Engineering – Acoustics and Audiovisual Technology (CZ)
- Audio Engineering – Sound Production and Recording (CZ)
- Automation and Measurement (CZ)
- Biomedical Technology and Bioinformatics (CZ)
- Electronics and Communication Technologies (CZ)
- Information Security (CZ)
- Microelectronics and Technology (CZ)
- Power Electrical and Electronic Engineering (CZ)
- Telecommunication and Information Systems (CZ)
- Electrical Engineering – Electronics and Communication Technologies (EN)
- Electrical Engineering – Power Systems and Automation (EN)

Combined form:

- Electronics and Communication Technologies (CZ)
- Microelectronics and Technology (CZ)
- Power Electrical and Electronic Engineering (CZ)
- Telecommunication and Information Systems (CZ)

Master studies

Attended form:

- Audio Engineering – Acoustics and Audiovisual Technology (CZ)
- Audio Engineering – Sound Production and Recording (CZ)
- Bioengineering (CZ)
- Biomedical Engineering and Bioinformatics (CZ)
- Electrical Power Engineering (CZ)
- Electrical Power Engineering and Communication Technologies (CZ)
- Electronics and Communication Technologies (CZ)
- Electrotechnical Manufacturing and Management (CZ)
- Information Security (CZ)
- Cybernetics, Control and Management (CZ)
- Microelectronics (CZ)
- Power Electrical Engineering and Electronics (CZ)
- Telecommunications and Information Technology (CZ)
- Bioengineering (EN)
- Communications and Networking (EN)
- Electrical Power Engineering (EN)
- Microelectronics (EN)
- Power Systems and Communication Technology (EN)
- Space Applications (EN)
- Telecommunications (EN)

Combined form:

- Electrical Power Engineering (CZ)
- Electronics and Communication Technologies (CZ)
- Electrotechnical Manufacturing and Management (CZ)
- Power Electrical Engineering and Electronics (CZ)
- Telecommunications and Information Technology (CZ)

Photo: Jan Prokopius

Doctoral studies

Attended form:

- Biomedical Technologies and Bioinformatics (CZ)
- Electronics and Information Technologies (CZ)
- Information Security (CZ)
- Cybernetics, Control and Management (CZ)
- Microelectronics and Technology (CZ)
- Power Electrical and Electronic Engineering (CZ)
- Teleinfomatics (CZ)
- Theoretical Electrical Engineering (CZ)
- Biomedical Technologies and Bioinformatics (EN)
- Cybernetics, Control and Measurements (EN)
- Electronics and Communication Technologies (EN)
- Electronics and Information Technologies (EN)
- Microelectronics and Technology (EN)
- Power Systems and Power Electronics (EN)
- Teleinformatics (EN)
- Theoretical Electrical Engineering (EN)

Combined form:

- Biomedical Technologies and Bioinformatics (CZ)
- Electronics and Information Technologies (CZ)
- Information Security (CZ)
- Cybernetics, Control and Management (CZ)
- Microelectronics and Technology (CZ)
- Power Electrical and Electronic Engineering (CZ)
- Teleinfomatics (CZ)
- Theoretical Electrical Engineering (CZ)
- Biomedical Technologies and Bioinformatics (EN)
- Cybernetics, Control and Measurements (EN)
- Electronics and Communication Technologies (EN)
- Electronics and Information Technologies (EN)
- Microelectronics and Technology (EN)
- Power Systems and Power Electronics (EN)
- Teleinformatics (EN)
- Theoretical Electrical Engineering (EN)

Number of students

(Sum total 3,247)

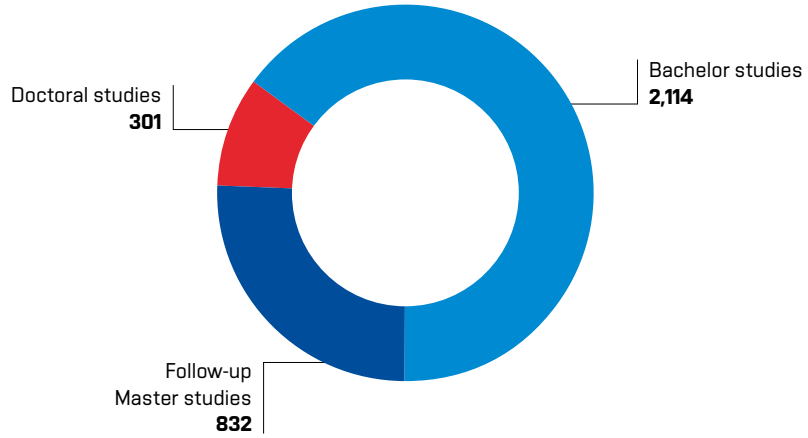
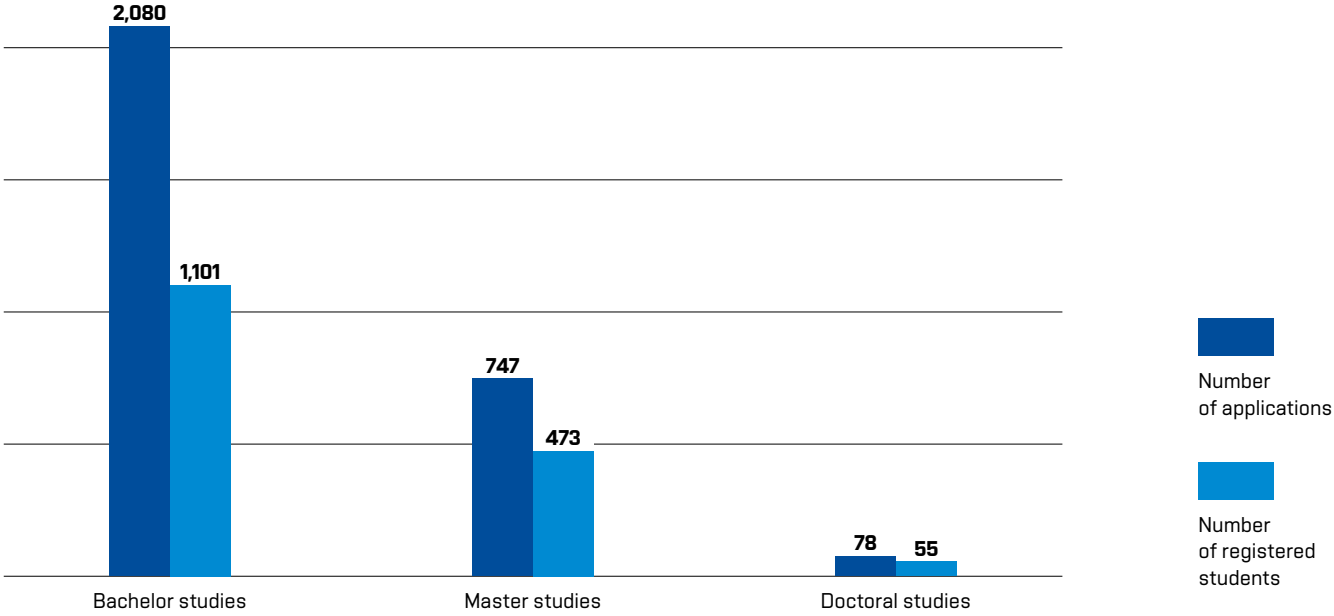


Photo: Jakub Rozboud

Interest in study



Students for Students' Club

The Students for Students' Club (SPS) has been an inherent part of the Faculty of Electrical Engineering and Communication for almost 17 years and recently it has become more and more popular thanks to its help to students, the first-years in particular. It also functions as an intermediary between students and the faculty management.

Throughout the years it has changed its form. A small group of enthusiasts transformed into a perspective organisation comprising more than 40 active members. This change includes also a dramatic increase in women members which, compared to two previous years, has risen by almost 200%. Their current ratio is 30% now and it substantially exceeds a faculty ratio.

This year the club organisation functioned without any limitations caused by pandemic restrictions. After 3 years the club organized a legendary prank event called "Run for 53", which is rooted deeply in the faculty history. Despite a very difficult situation, including the cost increase, the club managed to organize another round of one of the biggest student events ever, the so-called Music from the FEEC, which was very popular despite all difficulties.

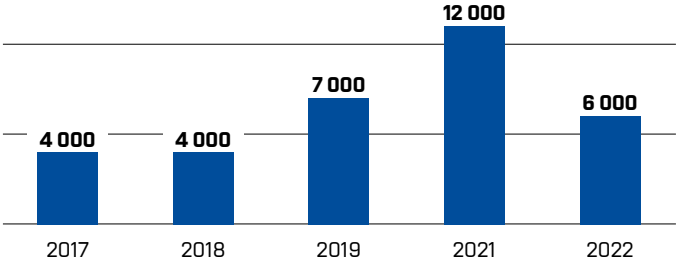
Over the year the club continued to help students, organized other entertaining and instructional events for students and it also cared for its own development. The club also organized several intern events including and off-site meeting and self-development lectures.

Photo: Jakub Rozboud

Selected event organized by the Students for Students' club:

- PerFEECt Start
- Music from the FEEC
- Tournament in CS:GO FEEC vs FIT and a League of Legends
- Run for 53
- Board Games Day

Music from the FEEC visitors



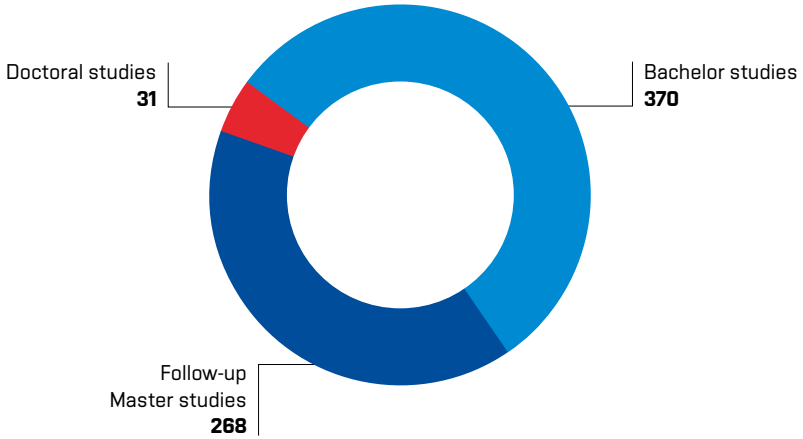
Note: in round numbers of thousands

Photo: Jakub Rozboud

Graduates

Number of graduates in 2022

(Sum total 669)



FEEC graduates are very attractive at the job market. They can work in a wide range of professions and fields, e.g. experts in advanced or managerial positions in power electrical engineering, electronics, robotics and applied informatics, as well as in manufacturing and controlling medical technology, cybernetics diagnostics and natural environment protection as engineers in electronics.

FEEC EMPLOYEES

Faculty of Electrical Engineering and Communication (FEEC) Management

Dean
prof. RNDr. Vladimír Aubrecht, CSc.

Vice-Dean for Study Affairs, statutary representative of the Dean
prof. Ing. Jarmila Dědková, CSc.

Vice-Dean for Development and Strategic Planning
doc. Ing. Petr Fiedler, Ph.D.

Vice-Dean for International and Public Relations
prof. Ing. Tomáš Kratochvíl, Ph.D.

Vice-Dean for Research and PhD study
prof. Ing. Jaroslav Koton, Ph.D.

Financial officer
Ing. Tomáš Rosenmayer, Ph.D.
(from 1. 9. 2022)

Note: Financial Officer Ing. Miloslav Morda till 31. 8. 2022

Organisational Structure

DEAN'S OFFICE

- Organising Department
  - Library
- Student Affairs Department
- Department of Science and International Relations
- Personnel and Legal Department
- Accounting and Finance Department
- Information Systems Administration Department
- Branch Facilities Management Technická

ACADEMIC SENATE

Chairman

- doc. Ing. Miloslav Steinbauer, Ph.D.

ACADEMIC STAFF CHAMBER OF THE SENATE

Chairman

- doc. Ing. Vlasta Sedláková, Ph.D.

STUDENTS' CHAMBER OF THE SENATE

Chairman of the Chamber

- Ing. Daniel Janík

SCIENTIFIC BOARD

Chairman

- prof. RNDr. Vladimír Aubrecht, CSc.

STUDY PROGRAMME BOARD

Chairman

- prof. Ing. Jarmila Dědková, CSc.

DISCIPLINARY COMMITTEE

Chairman

- Ing. Helena Polsterová, CSc.

ETHICS COMMITTEE

Chairman

- doc. Ing. Jana Kolářová, Ph.D.

DEPARTMENTS AND RESEARCH CENTERS

- Department of Control and Instrumentation (UAMT)
- Department of Biomedical Engineering (UBMI)
- Department of Electrical Power Engineering (UEEN)
- Department of Electrical and Electronic Technology (UETE)
- Department of Physics (UFYZ)
- Department of Foreign Languages (UJAZ)
- Department of Mathematics (UMAT)
- Department of Microelectronics (UMEL)
- Department of Radioengineering (UREL)
- Department of Telecommunications (UTKO)
- Department of Theoretical and Experimental Electrical Engineering (UTEE)
- Department of Power Electrical and Electronic Enginering (UVEE)
- Centre of Research and Utilisation of Renewable Energy Sources (CVVOZE)
- Cenre of Sensor, Information and Communication Systems (SIX)

OTHER ACTIVITIES

- Trade Unions-ZO 2698
- Club 'Elektron'
- Faculty interactive playroom 'Elektrikárium'
- Multifunctional room for students 'Studentárium'

Habilitations and Appointments to Professorship

New FEEC professors appointed by the President of the Czech Republic in 2022

BIOMEDICAL ENGINEERING

- prof. Ing. Martin Augustynek, Ph.D.

New associate professors at the FEEC appointed by the BUT Rector in 2022

ELECTRICAL AND ELECTRONIC TECHNOLOGY

- doc. Mgr. Zdenka Fohlerová, Ph.D.
- doc. Ing. Vilém Kledrowetz, Ph.D.
- doc. Ing. Alexandr Knápek, Ph.D.

TELEINFORMATICS

- doc. Ing. Zdeněk Martinásek, Ph.D.

POWER SYSTEMS AND POWER ELECTRON

- doc. Ing. Jan Bárta, Ph.D.

Photo: Jakub Rozboud

Number of faculty employees in 2022

Number of faculty employees:	564 (429.21 recalculated number)
Number of academic and scientific staff:	302 (234.11 recalculated number)
Average age of FEEC employees:	43.2 years (as of 31. 12. 2022)
Ratio of women employees at the FEEC:	23.6 % (as of 31. 1. 2022) – calculated from FTE

FEEC DEPARTMENTS AND RESEARCH CENTERS

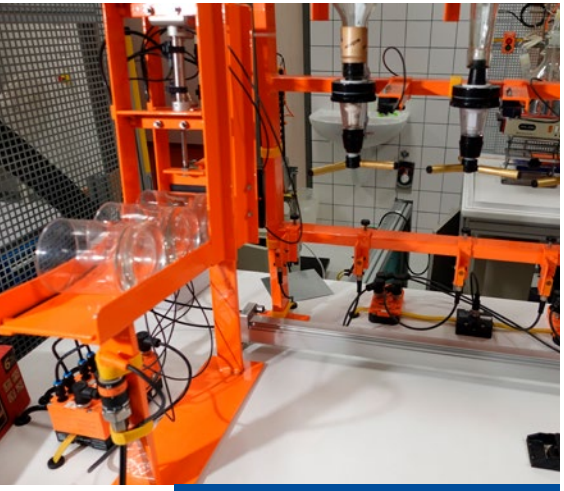


Photo: archive UAMT

Department of Control and Instrumentation (UAMT)

Department of Control and Instrumentation focuses on instruction, research and development in control, measurement, industry automatization, artificial intelligence, robotics and computer vision. In 2022 it provided instruction in the bachelor, master and doctoral study programmes.

Research was conducted in close cooperation with the CEITEC BUT which included preparation of EDIH-DIGIMAT and TEF AI-MATTERS projects funded by the Digital Europe programme. From 2023 it will provide services in digitalisation, robotics and AI to production companies of smaller and medium scale.

The department research focused mainly on algorithms of predictive electric drive control and their computationally effective implementation in electric driven control systems and methods of electric drives diagnostics using AI. Advanced methods of dynamic systems identification were also studied.

In 2022 department staff and doctoral students started cooperation both in instruction and research with the Lappeenranta-Lahti University of Technology in Finland, and they managed to establish a doctoral double-degree programme. A similar cooperation is being negotiated with the university in Tampere.

A National Competence Centre of Cybernetics and Artificial Intelligence project was successfully completed with planned results in identification and advanced drives control. A follow-up project called NCK CAMAT will be started in 2023.

Head:	doc. Ing. Václav Jirsík, CSc.
Number of research teams:	5
Number of employees (recalculated):	31.0
Average age of employees:	43.8 years
Ratio of women employees:	17.1 %

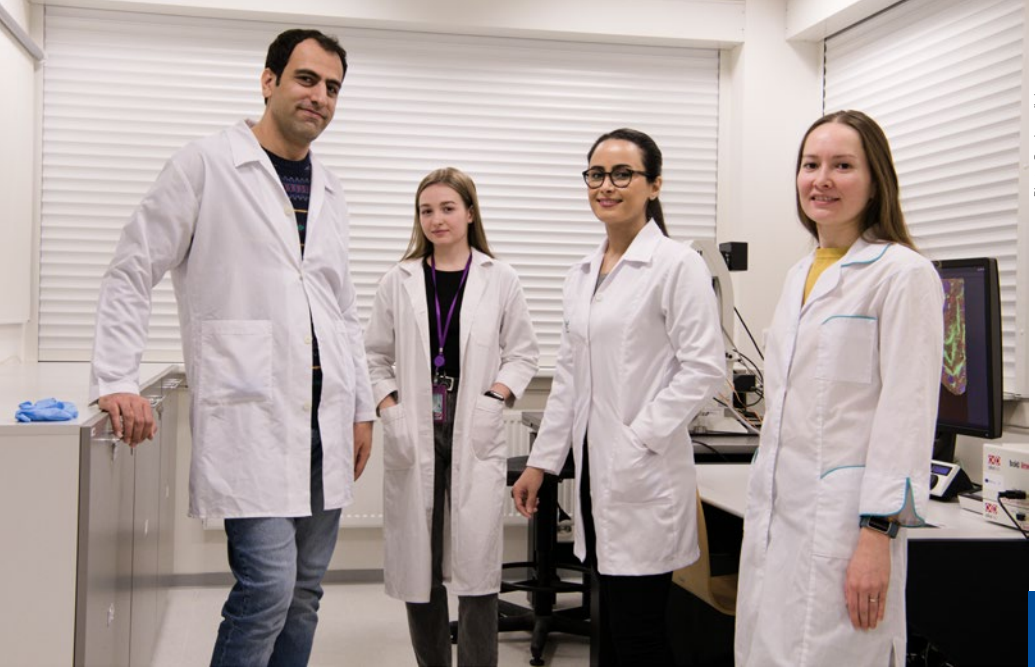


Photo: Oto Jarouškek

Department of Biomedical Engineering (UBMI)

In 2022 the Department of Biomedical Engineering completed its mission in raising professionals in medical technology and bioinformatics. As a part of the mission, employees and doctoral students participated at lectures and workshops broadening their knowledge portfolio. New laboratory tasks were created as a result of innovation of educational laboratories.

Excellent relationships of the department and its graduates, who regularly come back to the department and share their experience with current students, are a demonstration of a long-term striving for a good quality instruction.

A unifying feature in this year's innovations was a focus on internationalisation. The department actively educated foreign students, which was enabled by launching several courses in English, and it broadened Czech students' knowledge by organizing lectures given by foreign lecturers. In research biomedical engineers excelled at prestigious international conferences and many doctoral students went on foreign internships (USA, Germany) at research centres of excellence.

Head:	prof. Ing. Valentine Provazník, Ph.D.
Number of research teams:	9
Number of employees (recalculated):	30.1
Average age of employees:	40.5 years
Ratio of women employees:	44.3 %

Photo: archive UEEN

Department of Electrical Power Engineering (UEEN)

The department practises instruction in power electrical engineering in bachelor, master and doctoral study programmes. To support instruction in power electrical engineering and communication technology, the department managed to obtain a financial donation of 2.3 mil. CZK for scholarships and laboratory equipment.

The department participated at the preparation of big projects for National Centre for Energy II and Centre for Advanced Nuclear Technologies II which were successfully won in TAČR NCK II.

Research of the department deals with production, transmission, distribution and usage of electric power. In 2022 the list of most important solved activities included checking compliance of manufacturers with electric grids, testing and optimisation of switches for connection of diffused energy sources, failure localisation in electric grids, and research of accelerator-controlled nuclear reactors and brightness analysis performance.

The laboratories were equipped with a 18kW regenerative DC source which can work both as a source and appliance. Apart from basic setting of constant voltage, current or resistance the unit enables advanced modes of use, e.g. FV panels simulator, various battery types simulator, a battery tester, or a user can set VA characteristics and create time waveforms in changing quantities.

The appliance enabled students to discover interactively grids with embedded production, which will be more and more frequent according to the future energy concept.

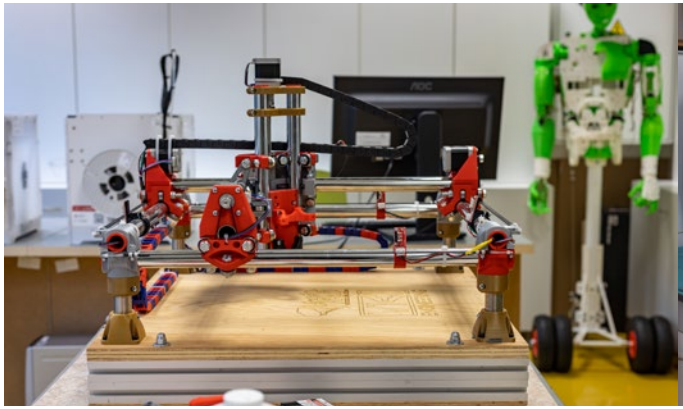
Head:	prof. Ing. Petr Toman, Ph.D.
Number of research teams:	8
Number of employees (recalculated):	33.6
Average age of employees:	39.1 years
Ratio of women employees:	13.4 %

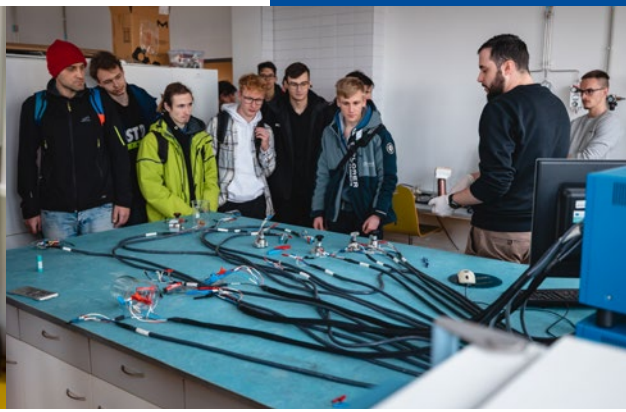
Department of Electrical and Electronic Technology (UETE)

The Department of Electrical and Electronic Technology provides instruction in courses related to electro technical materials, their manufacturing processes, diagnostics, testing engineering, management and quality control. Most first year students in the newly accredited bachelor study programmes are taught subjects of Technical Documentation, Materials for Electrical Engineering, and Introduction to Materials for Electrical Engineering.
The department, together with the Department of Microelectronics, provides instruction in a bachelor study programme Microelectronic and Technology, and it teaches on its own Electrical Engineering Production and Management in a master study programme. In cooperation with the Department of Microelectronics and the Department of Physics it teaches a doctoral study programme called Microelectronics and Technology. Apart from material-oriented subjects the department also provides instruction on subjects oriented at alternative energy sources and ecology.
The department deals with electron microscopy, photovoltaics and electrochemical current sources (batteries and accumulators). In electrochemical sources the department researches lead accumulators, new materials in Li-Ion batteries, electrocatalysts and ion change membranes for fuel elements. Regarding photovoltaic systems the department studied the issue of non-destructive diagnostics of defects and quality, reliability and service life of solar cells.
The department was developing a system of detection of signal electrons and methods of environmental rastering electron microscopy and microscopy of atomic powers.

Head:	doc. Ing. Petr Bača, Ph.D.
Number of research teams:	5
Number of employees (recalculated):	24.0
Average age of employees:	45.8 years
Ratio of women employees:	21.3 %

Photo: Jakub Rozboud





Department of Physics (UFYZ)

The department provides instruction of basic courses of physics and other physics courses in bachelor, master and doctoral study programmes, both in attended and combined forms, not only at the Faculty of Electrical Engineering and Communication, but also at the Faculty of Information Technology and Centre for Sports Activities.

The department research focuses on basic and applied research of physical parameters in semiconductor and dielectric materials and components, and in nano sensorics. The main areas included mechanical transportation of electric charge, noise spectroscopy, local characterization with nanoresolution, and designing indicators of quality and reliability of components. Other research focuses on methods of acoustic and electromagnetic emission. The department also cooperates with industrial partners on development of a device enabling to check and control production processes.

Head:	doc. Ing. Vladimír Holcman, Ph.D.
Number of research teams:	3
Number of employees (recalculated):	20.6
Average age of employees:	44.3 years
Ratio of women employees:	23.8 %

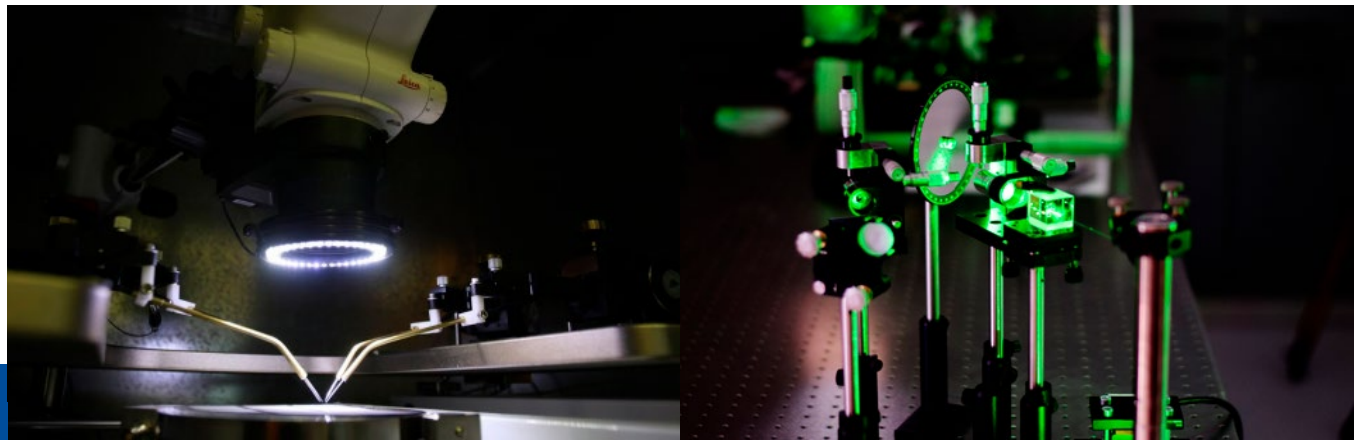


Photo: archive FEKT

Photo: Jakub Rozboud

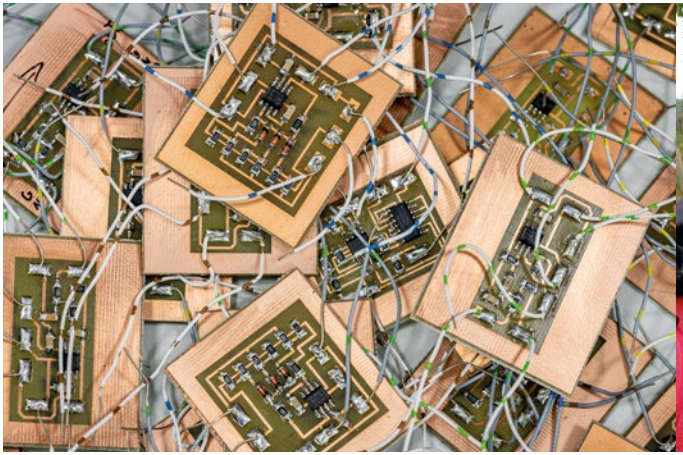


Photo: archive UJAZ

Department of Languages (UJAZ)

In 2022, the Department of Languages provided and guaranteed linguistic and popular sciences courses at three faculties of BUT: the Faculty of Electrical Engineering and Communications, the Faculty of Business and Management and the Faculty of Information Technology. In the study programme English in Electrical Engineering (AJEI-H), guaranteed by the department, 21 students successfully passed their final state exams. The study programme provides its graduates with linguistic knowledge essential for advanced English skills and competences useful for experts in numerous specializations of electrical engineering and information technology. Apart from instruction in its own study programme, the department continued to offer courses for all other technical bachelor, master and doctoral study programmes of three faculties. As a novelty, the department substantially increased the capacity of teaching other foreign languages. Newly there is a course of French and capacities of already existing courses of Spanish and German have been greatly increased. It has been the third year of teaching Czech for foreigners, which helped Erasmus and foreign students of English study programmes to accustom to life in the Czech environment.
Apart from the prevailing professional language instruction, the department offers optional subjects from law and economy (accounting, taxes, financial services), psychology, pedagogy or soft skills. Students can also acquire, after completing an accredited supplementary pedagogical study, a Certificate of Pedagogical Competence allowing its graduates to perform pedagogical activities at all secondary schools in the Czech Republic.

Head:	Ing. Martin Jílek
Number of research teams:	3
Number of employees (recalculated):	18.9
Average age of employees:	52.0 years
Ratio of women employees:	73.5 %

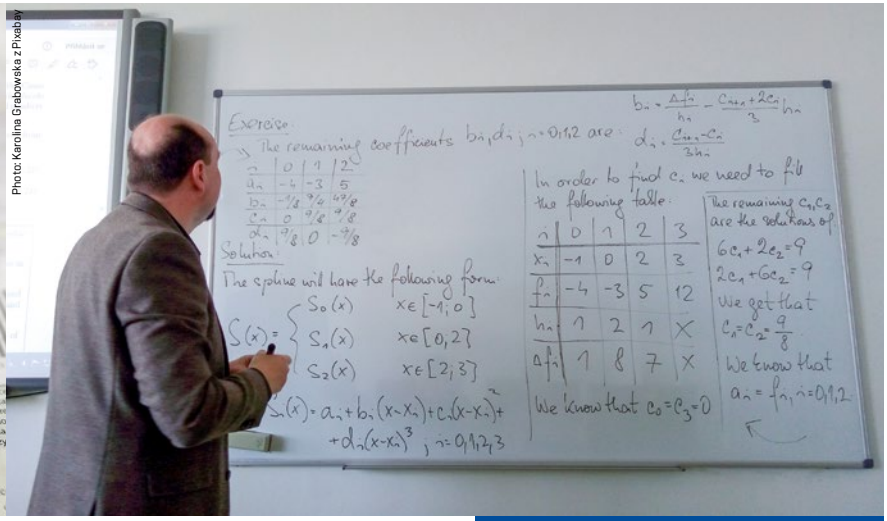


Photo: Karolina Grabowska z Pixabay

Photo: archive UMAT

Department of Mathematics (UMAT)

In 2022 the department taught plentiful courses of mathematics not only for the FEEC, but also for other BUT institutes (FIT, ÚSI, CESA). Apart from its own instruction the department also focused on giving support in mathematics. It organized Mathematics Emergency and a preparatory course for entrance exams. The attention which the department pays to a quality instruction has resulted in winning two categories in students' poll on the BUT best teacher, namely doc. RNDr. Edita Kolářová, Ph.D, in the FEEC bachelor study and doc. RNDr. Dana Hliněná, Ph.D., in the FIT bachelor study. Another big topic for 2022 was securing an international cooperation.

The department managed to organize short-term visits and lectures of several foreign colleagues one of which is prof. Vincentiu Radulescu, who repeatedly ranks among the world's most cited mathematicians.

The department started cooperation with colleagues from Montenegro and Island and thanks to several-months-stay of one of the department employees it also strengthened collaboration with Norwegian fellow mathematicians. The department, together with the ÚSI, solved one TA CR project and thanks to cooperation with the CEITEC a GA CR project was won, starting from January 2023.

Head:	doc. RNDr. Michal Novák, Ph.D.
Number of research teams:	3
Number of employees (recalculated):	14.8
Average age of employees:	54.4 years
Ratio of women employees:	33.1 %

Department of Microelectronics (UMEL)

The Department of Microelectronics, after two-year restrictions in teaching due to Covid-19, returned back to the normal instruction of its guaranteed study programmes. The year 2022 was exceptional from the perspective of the number of excellent diploma theses and graduates with the Red Diploma. There were 9 of them, out of the 30 successful graduates. The department also focused on the accreditation on a new doctoral study programme called Electrical Engineering in English. In a scientific field, the department practised applied research in integrated circuits, electronic systems for space applications, sensors and micro/nanotechnologies. Main areas of focus included circuit design in voltage, current and mixed modes, special electronic circuits for space applications or complex Smart systems. Furthermore, it dealt with modern semiconductor technologies, e.g. SiC and GaN, or modern embedding technologies and nanotechnology. Many solved projects and direct commercial contracts dealt with up-to-date topics such as smart access systems, design and implementation of electronic systems into manufacturing processes according to the Industry 4.0 policy, electronics for meteo-satellites or a lunar lander, fast detection of COVID-19 and many other. The department became one of the working teams preparing legislation related to the EU Chips ACT.

We were happy to learn that the research laboratory called Mikrobastlírna was frequently used for scientific research of our students.

Head	doc. Ing. Jiří Háze, Ph.D.
Number of research teams:	4
Number of employees (recalculated):	21.8
Average age of employees:	46.3 years
Ratio of women employees:	16.5 %

Photo: Jakub Rozboud, Jan Prokopius

Department of Radioelectronics (UREL)

UREL dedicates to research, development and instruction in wireless systems and related fields.

Among main application areas you can find communication, sensing, location and navigation. Based on their frequency, applications are divided into low frequency (sensing and processing of biological signals), millimetre waves (local wireless systems for ISM band of 60GHz) and optical frequency (optical communication in free space). Attention is given to system view (television and multimedia systems, electromagnetic compatibility) and partial subsystems (electronic circuits, signal processing, antennae and microwave structures).

Recently, the UREL focuses on space applications. In April 2022 a BDSat satellite was successfully launched to the orbit, which was developed together with the UREL staff.
The ground station that receives satellite radio signals and remotely controls it is placed in our Laboratory of Experimental Satellites. Concurrently, another satellite, BDSat-2, was being prepared, which was successfully launched 3 January 2023.

In September 2022 9 students enrolled our new master study programme Space Applications which is taught in English and where companies from Brno and surroundings focusing on space applications participate. On 22 November 2022 a new master study programme "Automotive Electronics and Electromobility" was accredited.

Ing. Ivana Jakubová was awarded with the Medal of Honour for her excellent work results at the Faculty of Electrical Engineering and Communication.

Head:	prof. Dr. Ing. Zbyněk Raida
Number of research teams:	6
Number of employees (recalculated):	39.5
Average age of employees:	44.0 years
Ratio of women employees:	15.3 %

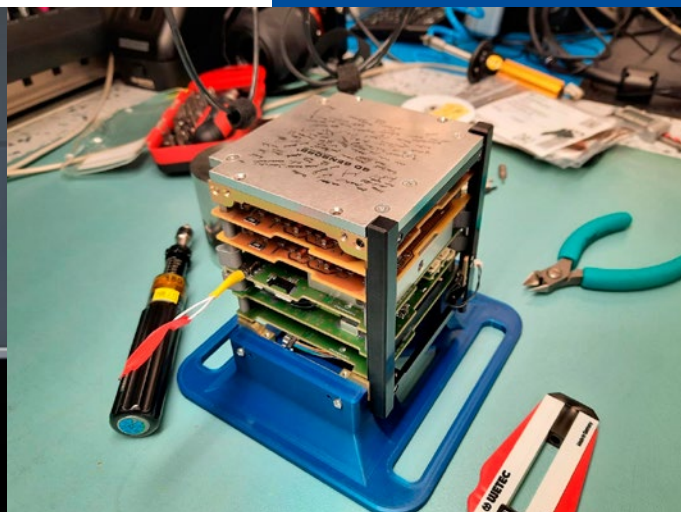


Photo: Jan Prokopius, archive BD SENSORS

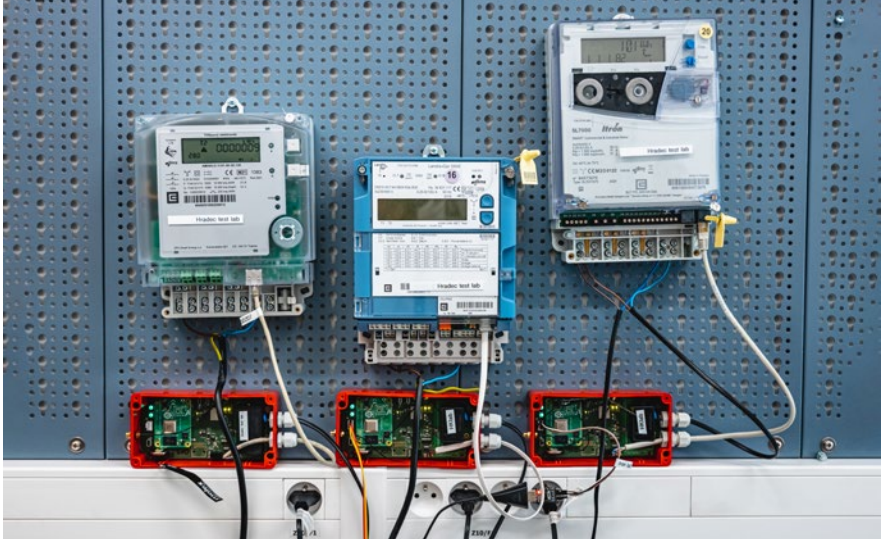


Photo: Jakub Rozboud

Department of Telecommunications (UTKO)

The Department of Telecommunications continued in innovations of its excellent laboratories focused on instruction and research, mainly of those used for cybernetic security and 5G networks. During 2022 works at the Cyber Arena were completed. Cyber Arena is an educational platform in cybersecurity where cyber games were gradually being implemented. In the third quarter of the year the first interfaculty quantum connection in the Czech Republic was opened to connect the Laboratory of Quantum Security at the UREL to the Faculty of Information Technology BUT, at the length of about 7.5 km.

In research and development activities UREL employees and doctoral students participated at the whole range of projects focused on applied research and contractual orders. Among those most important we can list the development of unique communication units for static electric meters for checking communication parameters and security demands for the intended smart electric meters roll-out in the Czech Republic. Furthermore, research and development of two software tools enabling complex security penetration tests for commercial subjects IT security was carried out. We can also include another software tool capable of analysing patients' data and prevent their health complications. The software was developed together with the University Hospital Olomouc, where it is implemented in the information system used by doctors as a decision-making support.

The Department of Telecommunications also promoted research activities. The most important event for promotion was definitely the International Engineering Fair in Brno where the department, together with its commercial partner Vodafone, presented a 5G demonstrator as a part of the Czech national exposition. Another important activity with an international impact was hosting the European Conference on Security Research in Cyberspace held during the Czech presidency in the Council of the European Union.

Head:	prof. Ing. Jiří Mišurec, CSc.
Number of research teams:	8
Number of employees (recalculated):	92.5
Average age of employees:	38.0 years
Ratio of women employees:	15.7 %

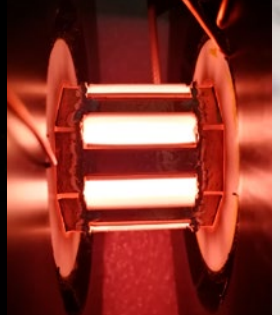
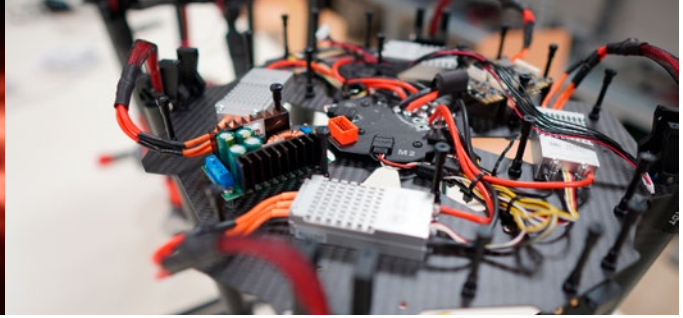




Photo: archive UTEE

Department of Theoretical and Experimental Electrical Engineering (UTEE)

The department research focuses on three main areas:

Use of numerical methods for modelling physical fields, nanostructures, nanotechnology engineering in organics and inorganics, plasma research and its parametric generation,

research into special measurement methods including techniques of nuclear magnetic resonance (NMR) and nuclear quadrupole resonance (NQR), measuring plasma parameters,

research area of experimental and applied electrical engineering and electronics focusing on detection of short, high power electromagnetic impulses, fast repeated as well as single processes and non-standard sources of electric energy and unmanned aerial vehicles.

In 2022 the Department of Theoretical and Experimental Engineering, together with SpaceLab and PlasmaSolve, started the development of a new type of plasma source with a wide range of outputs, and it won a project called Scalable ioniser for space technologies and laboratory applications. Together with the Faculty of Military Technology of the University of Defence it also carried out a project called Robotic System controlled by AI algorithms for intelligence purposes where new ways of research focus are being prepared. It successfully completed the development of a device intended for evaluation of surface conditions on a cave interior and a system of shooing starlings off based on a passive optical locator. At the end of the year the department, together with its partners, successfully finished the System for sampling and detection of coronavirus and other respiration diseases. During the year the laboratory for unmanned aeroplanes and sensorics was fully equipped. As a part of security in electrical technology instruction, a preparation of a new course for private payers was prepared, intended for those who need to get a certificate in electrical engineering aptitude according to the Act No. 250/2021 Coll.

Doc. Ing. Miloslav Steinbauer, Ph.D. was awarded with the BUT Silver Medal for his extraordinary merits in the development of quality university activities at the BUT.

Head:	prof. Ing. Pavel Fiala, Ph.D.
Number of research teams:	7
Number of employees (recalculated):	19.8
Average age of employees:	41.9 years
Ratio of women employees:	21.0 %

Photo: archive UVEE

Department of Power Electrical and Electronic Engineering (UVEE)

In 2022 the department employees went on internships to universities in Austria (Johannes Kepler Universität), Italy (Politecnico di Torino) and France (Institut de Mathématiques, University of Bordeaux), where they actively participated at the scientific and publication activities. In power electrical engineering a new compact version of an electroporation generator for myocardia ablations was completed.

As a part of the TRANSFORM European project, the department realized functional samples of a single-grade three-phase AC/DC switch (5 kW and 20 kW) with a PFC function, a soft switch, a galvanic compartment and a fully regulated DC output. The input is 3 x 400 V / 50 Hz and output 5 kW. In electric machines field a new master course in English called MPA-SPM – "Selected Problems of Electrical Machines" was introduced, which deals with selected advanced parts of electric devices and it trains language verbal skills. Furthermore, another project was finished, which focused on development of linear electromechanical actuators for the control of primary landing and take-off areas for category CS23 planes. The researchers finished the development of a synchronous reluctance engine powered directly from the grid. For all the year, they kept working on the development of a high-revolution generator with working revolutions of 150 000 r.p.m.

In electric machines the department innovated laboratory tasks related to electric devices as a part of a new course in English. The employees carried out preparatory works related to the accreditation of the Laboratory of Switch Machines in the CVVOZE according to the ČSN EN ISO/IEC 17025. Together with the EG.D. an educational video on electric arc risk was created, which will be used together with tasks handouts in the secondary schools instruction. Employees actively participated at lectures given to the ČEZ Distribuce workers.

Head:	doc. Ing. Ondřej Vítek, Ph.D.
Number of research teams:	8
Number of employees (recalculated):	32.7
Average age of employees:	38.6 years
Ratio of women employees:	5.5 %

Photo: Jakub Rozboud

Centre for Research and Utilization of Renewable Energy Sources (CVVOZE)

CVVOZE focuses its research, developmental and innovation capacities on solving a complex problem of renewable sources of energy. Its research teams deal with problems in chemical, and photovoltaic energy sources, electromechanics, electrical technologies, electric drives, power electrical engineering, nuclear power plants and industrial electronics in 5 main research areas: optimization of electromechanics energy transformation, chemical and photovoltaic energy sources, production, transmission, distribution and usage of electric energy, automatization and sensorics technologies, and research in switching-off mechanism in switching-on devices.

In 2022 the CVVOZE solved contractual orders at the volume of 15.6 mil. CZK, which makes about 43% amount of all non-public finances received from the faculty contractual research.
An inherent part of the research centre is the infrastructure called CVVOZE Power Laboratories which comprises of the Laboratory of High Currents and the Laboratory of High Voltages, placed in the Professor List Science Park.
Such infrastructure was motivated by the research community needs to realize experiments in advanced diagnostics of electric charge in switch devices in power electrical engineering and a precise diagnostics of isolation materials used for high voltage devices.

Contact:	prof. RNDr. Vladimír Aubrecht, CSc.

Centre of Sensor, Information and Communication Systems (SIX)

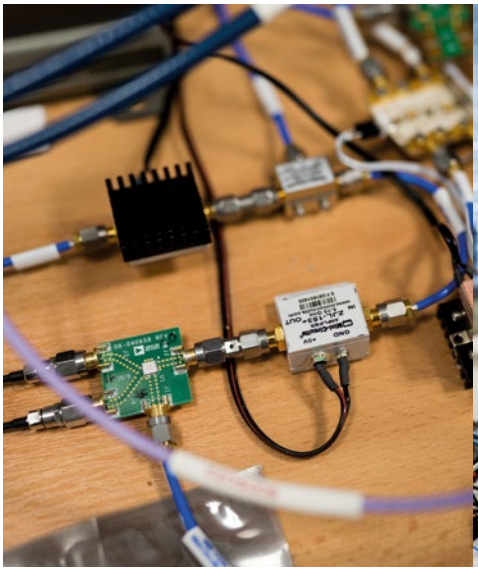
SIX Centre started in 2010 as a common initiative of the FEEC BUT departments engaging in research and development of sensorics systems, information and communication technologies and advanced technology platforms applicable in various areas of life. By uniting the above-mentioned fields, synergy and complexity was achieved, which helps to solve important research and development projects as well as contractual orders. More and more industrial partners are interested in cooperation with the SIX and the same applied for year 2022. Demand for economic cooperation, which was influenced negatively by pandemic restrictions in two previous years and stagnated, was now renewed and opened new directions in collaboration.

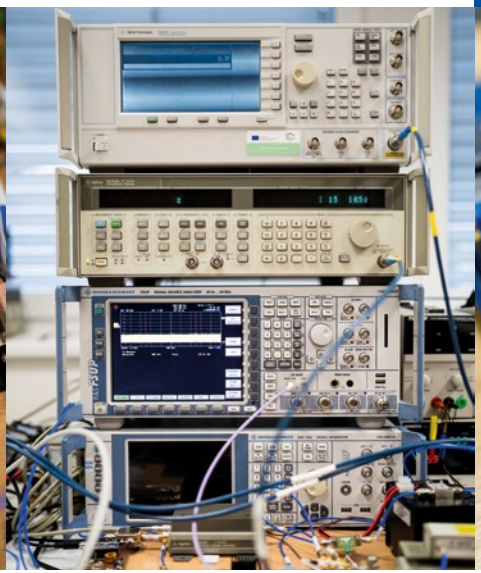
This is reflected in a high number of commercial contracts realized this year in cooperation with industrial companies, which again made about 30% ratio of all non-public finances from the faculty contractual research.

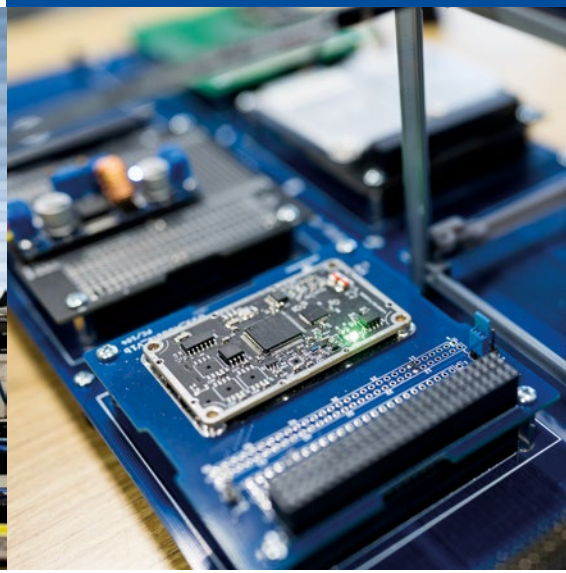
Complexity, expertise, and scientific and knowledge basis are the main foundations of the SIX Centre, that is why it is much appreciated by industrial partners, and this is the reason why the SIX Centre is considered a reliable and renown regional research centre.

Contact: Ing. Jiří Kouřil

Photo: Jan Prokopius







RESEARCH AND DEVELOPMENT AT THE FEEC

Photo: Jan Prokopius

Projects

The Faculty of Electrical Engineering and Communication is a unique place dedicated to research and development focusing on electrical engineering and other fields, such as biomedical engineering or material engineering. Our research teams work on solving research and development problems not only individually, but also in cooperation with other universities or with our partners from industry when participating in national or international projects and consortia funded by European Union programmes.

Fields of research

At the faculty there are many scientific teams focusing on research and development activities in projects solved with faculty partners from industry.

They also focus on contractual research commissions where they achieve important and valuable results.

Research Teams:

- AUTOMATION, ROBOTICS AND SENSORICS
- MICRO- AND NANOELECTRONICS
- BIOMEDICINE AND SIGNAL PROCESSING
- RADIOELECTONICS AND COMMUNICATION TECHNOLOGY
- ELECTRICAL AND ELECTRONIC TECHNOLOGY
- TELECOMMUNICATIONS AND INFORMATION ENGINEERING
- INFORMATION AND CYBER SECURITY
- POWER ELECTRONICS AND ELECTRICITY

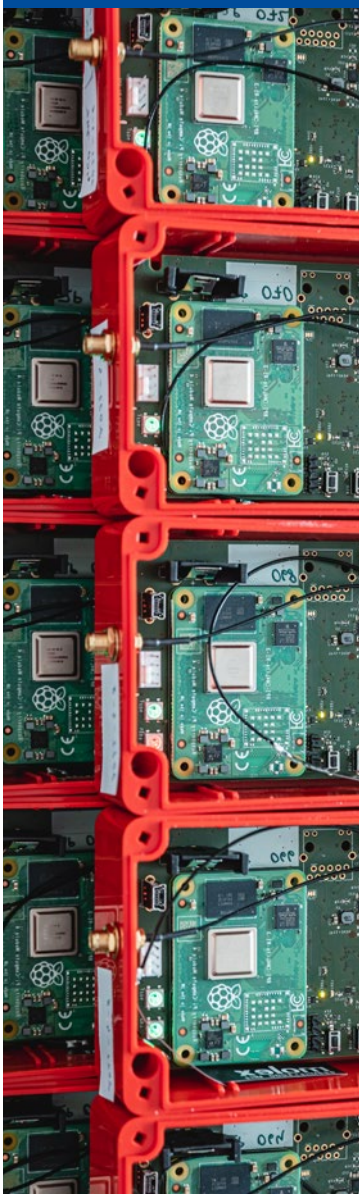


Photo: Jakub Rozboud

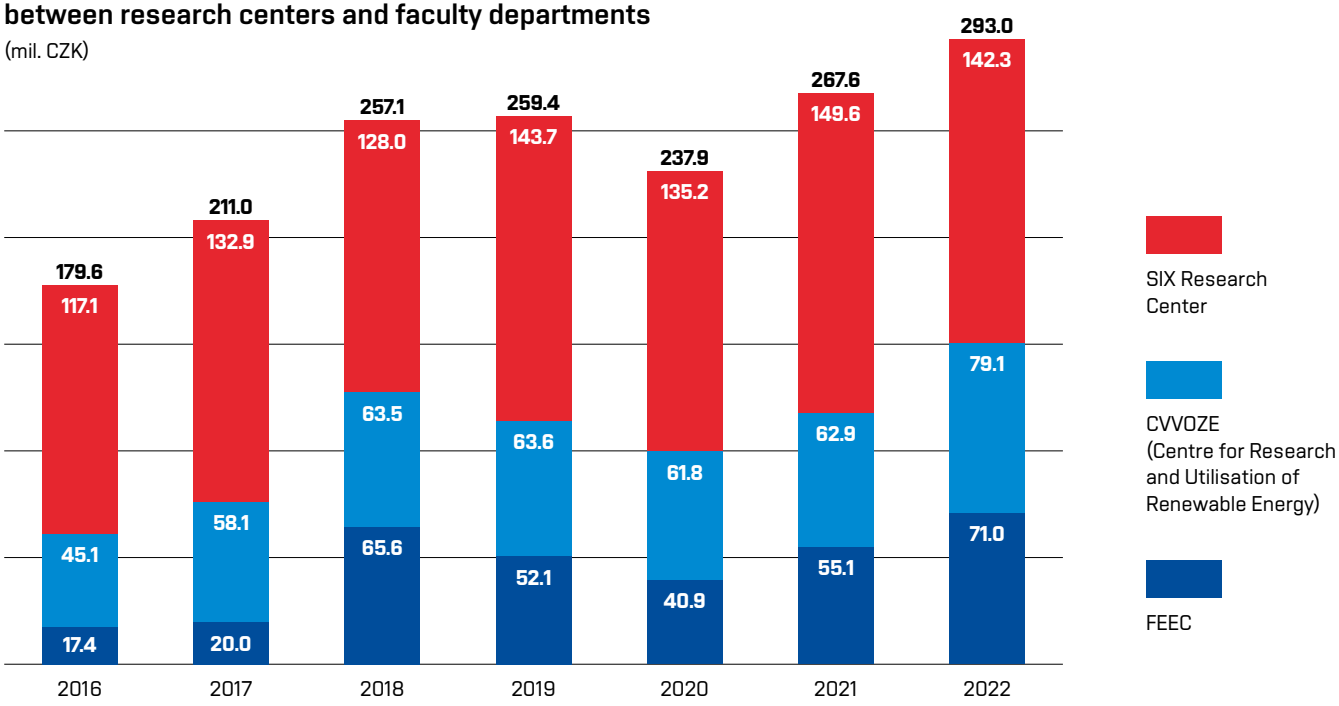
Research and development in 2022

In 2022 FEEC researchers, together with industrial and foreign partners, solved more than 180 projects, whose overall value of the financial support exceeded 266 mil. CZK. Main providers of financial dotation for project of basic and applied research are Technology Agency of the Czech Republic (TA ČR), Ministry of Interior of the Czech Republic (MV ČR), Ministry of Industry and Trade (MPO) and the Czech Science Foundation (GA ČR).

The biggest grant projects carry out research in e.g. active network elements for a deep detection of transmitted data structures in optical access and distribution grid XG-PON, an identification of security risks of optical fibres networks, research in high-revolution electric machines intended for helium cooling circuits in fusion reactors, development of new types of Natrium-Ion or Lithium-Sulphur accumulators used as advanced electrochemical energy storages, and research in systems for securing critical communication networks applying post-quantum cryptography. It also comes up with new methods and tools for increasing reliability in electric distribution grids.

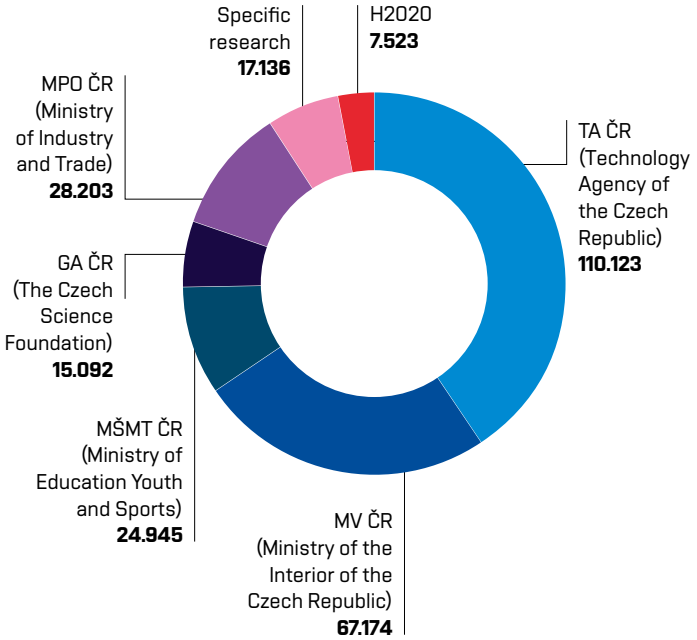
The distribution of financial support of research and development between research centers and faculty departments

(mil. CZK)



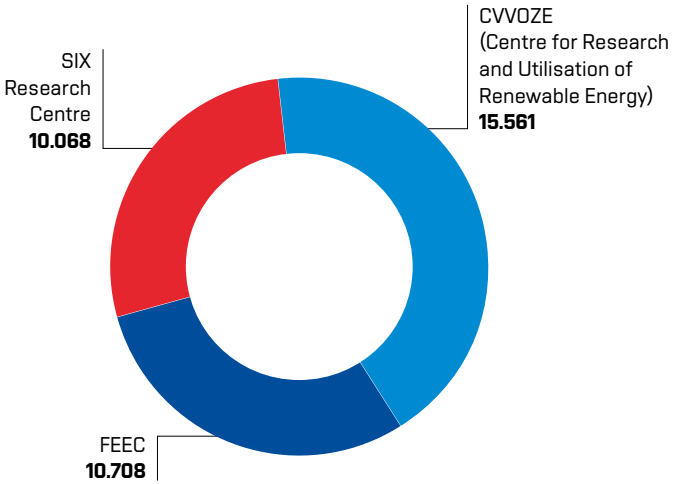
Main providers of R&D financial support in 2022

(mil. CZK, sum total 270.196)



Commercial contract research at the FEEC in 2022

(mil. CZK, sum total 36.337)



Commercial Contracts Research

Financial revenues from commercial contracts in 2022 were almost 36 mil. CZK, including regional research centres CVVOZE and SIX.

Contractual research was carried out both based on direct commercial contracts and on students' diploma and doctoral theses.

Numbers of final works with a topic related to industry in 2022:

Bachelor theses:	27
Diploma theses:	46

Important projects

Estimating a specific real-estate capitalisation rate according to analogical investment from capital markets (UMAT)

The aim of the project is to find a tool to estimate a capitalisation rate for the purposes of fixed property valuation in situations when it is impossible to judge from the market data related to a market segment including other adverse specifications. Nevertheless, it is still necessary to carry the valuation out. International valuation standards (IVS 2017) allow to use in such cases a so-called build-up method which is, though, necessary to be adjusted correctly based on financial market transparent data. A tool for capitalisation rate estimate will solve transparently an absolute lack of market data including a local differentiation and thus it will result in substantial increase in transparency re-investigation and in increase in estimate credibility with minimising a factor of subjectivity in valuation reports of the target group.

Provider:	Technology Agency of the Czech Republic
Principal investigator:	doc. Ing. et Ing. Martin Cupal, Ph.D. et Ph.D. (ÚSI VUT)
Start date:	1. 5. 2021
End date:	31. 12. 2022
Total funding:	1,853,501 CZK

Photo: archive UEEN

Implementation of certification processes to ensure the integration of distributed power generating plants in compliance with the requirements of the EU Regulation (UEEN)

If we want to ensure an adequate, sound and sustainable operation and development of an electric system when decentralizing output, it is essential to transfer also fundamental properties and behaviour responsible for a proper system operation regardless of its size. The project carried out in cooperation with the Engineering Test Institute focuses on the research and development of methodology and techniques for testing and evaluating processes for power generating plants compliance verification with the connection network code requirements on the basis of certificates.

The aim of the project is to implement certification processes for securing a functional integration of distributing power generating plants in compliance with the EU Regulation 2016/631 requirements. The results will include:

1) methodology for testing power generating plants compliance verification with the connection network code requirements, and

2) processes and techniques to verify power generating plants, units and modules compliance and monitoring power generating plants compliance in operation (planned for 2023).

Provider:	Technology Agency of the Czech Republic
Principal investigator:	prof. Ing. Jiří Drápela, Ph.D.
Start date:	1. 1. 2022
End date:	31. 12. 2023
Total funding:	6,390,000 CZK

Photo: archive UTEE

An artificial Intelligence-controlled robotic system for intelligence and reconnaissance operations (UTEE)

The project is solved together with the Department of Control and Instrumentation and the Faculty of Military Technology at the University of Defence. The team is designed to investigate drone swarm flying in cooperation with terrestrial robots. Artificial intelligence will be used for dynamic reconfiguration of drone swarm. Based on the research a complex demonstrator of an adaptable drone swarm collaborating with terrestrial robots will be created. The aim is to support combat and action readiness in security and emergency forces to handle large scale security threats and to raise investigation efficiency. The outputs will be applicable in personal detection and intelligence and reconnaissance operations.

Provider:	Ministry of Interior
Principal investigator:	doc. Ing. Petr Marcoň, Ph.D.
Start date:	1. 1. 2022
End date:	31. 12. 2025
Total funding:	21,486,818 CZK

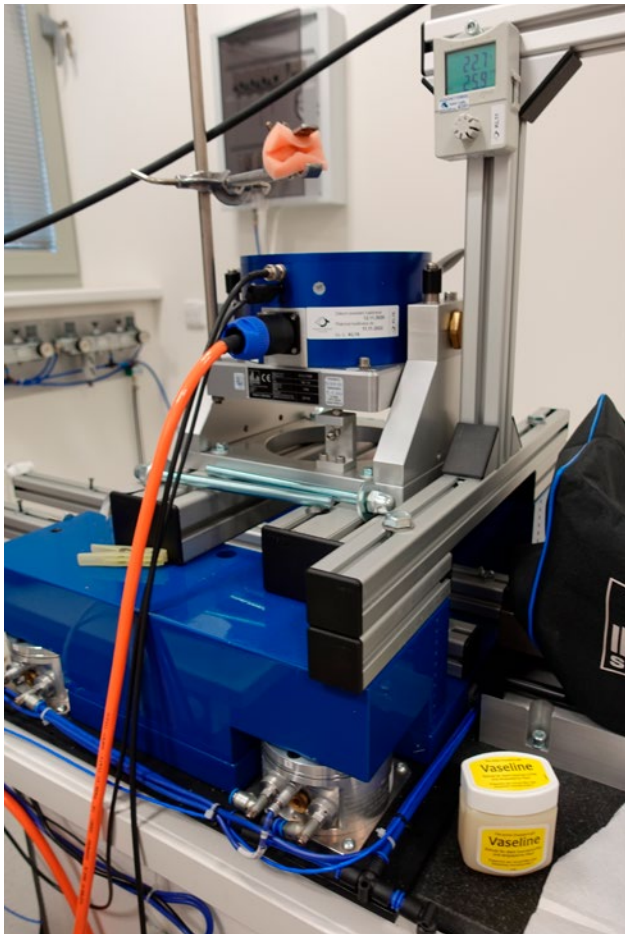
Monitoring system of powers using IoT technologies (UAMT)

The aim of the project was to develop in cooperation with the Utilcell company a brand-new product: a device monitoring powers affecting span of restraining systems of shuttering at big land buildings. The result is a system enabling continuous monitoring of restraining system condition and prompt warning in case of construction overload due to e.g. terrain flooding behind shuttering.

A prototype of a power 1000 kN sensor was developed, with a connected evaluating unit and a subsequent secured data transmission into cloud via wireless technology NB-IoT.

Provider:	Technology Agency of the Czech Republic
Principal investigator:	Utilcell, s.r.o., co-investigator at the FEEC BUT doc. Ing. Petr Beneš, Ph.D.
Start date:	1. 1. 2021
End date:	31. 12. 2022
Total funding:	7,476,951 CZK

Photo: archive UAMT

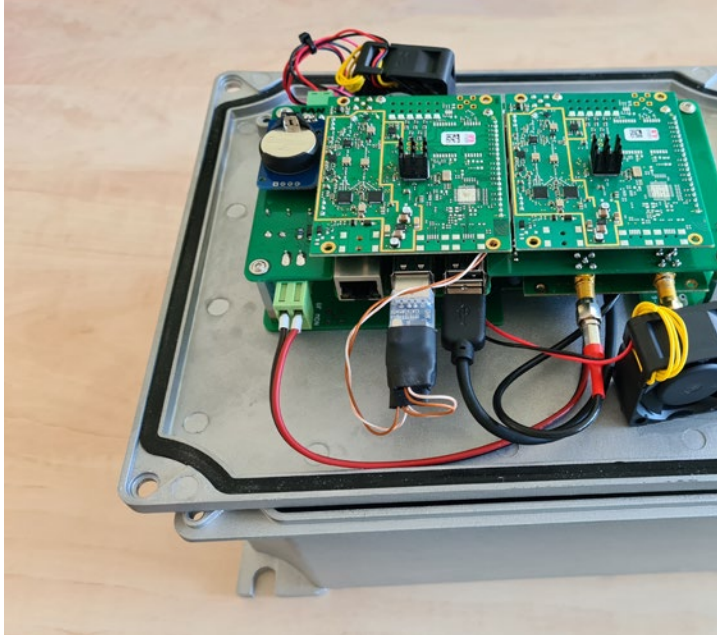


Electronic speed limitation of vehicles in emergency and crisis situations triggered by security forces (UTKO)

The main goal of the project is research and development of the electronic system providing the remote speed limitation of vehicles that will be activated exclusively by security force during security situations. The primary purpose of the system is to safely stop persecuted vehicles without the use of destructive coercive means (vehicle displacement, firearm strike, stopping belt, etc.), thereby increasing the safety of intervening security forces and reducing property impacts. The project will result in the design of the novel concept of the system and its verification by functional samples of communication modules. Due to the sensitivity of data communication, the project will be solved with an emphasis on information and system security with protection against cyber threats.

Provider:	Ministry of Interior
Principal investigator:	prof. Ing. Kamil Vrba, CSc.
Start date:	1. 1. 2021
End date:	31. 12. 2025
Total funding:	39,310,000 CZK

Photo: Jan Král's archive

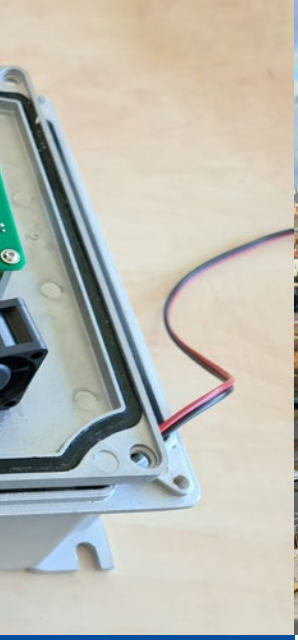


LoRaWAN Sniffer electronics.

Analysis for a system determining soil types (UFYZ)

The aim of the project is to implement machine learning elements in a SW application analysing and evaluating types of soil which will help to automatize irrigation and optimise agricultural production. For an automatized irrigation and nutrition, it is crucial to know the soil type, properties and a current state of nutrition in order to optimise production, to manage the agricultural production effectively or to maintain quality urban green areas and sports places.

Provider:	Ministry of Industry and Trade – OP PIK
Principal investigator:	doc. Ing. Vladimír Holcman, Ph.D.
Start date:	1. 5. 2022
End date:	1. 5. 2023
Total funding:	2,600,000 CZK



LoRaWAN Sniffer device developed by the project, on the top of the T12 building roof, monitoring LoRaWAN networks in Brno.

Adaptive mesh for secured communication of control systems and sensors (UREL)

Ing. Jan Král, Ph.D. won, together with ACRIOS company, a TACR Theta grant focused on improving communication networks properties based on LoRaWAN. The aim of the project is to develop a functional sample of the System for Adaptive Mesh Communications (SAMC) and to test it on the newly developed testing polygon. The system will use a current communication protocol Long Range Wide Area Network (LoRaWAN), which will increase its robustness and availability while preserving the current security level. This property is essential for usage in key systems in energy production and industry. The current specification of the LoRaWAN protocol will be expanded for a new class of mesh communication (Class-M). The new class will automatically secure connections in case of a partial infrastructure failure. Compared to existing systems, the suggested system combines modulation with a distributed spectrum and a mesh topology robustness, which gives it an advantage over competitors and soon we can expect customers to buy the SAMC system.

Provider:	Technology Agency of the Czech Republic
Principal investigator:	Ing. Jan Král, Ph.D.
Start date:	1. 12. 2021
End date:	31. 12. 2024
Total funding:	17,468,000 CZK

Innovative linear electro-mechanical actuators (UVEE)

The shared goal of the consortium is, within two years, to develop, produce and verify electromechanical actuators of two different load ratings, intended to be used for primary flight control surfaces of CS-23 and Urban Air Mobility aircraft. Another objective is to increase share and global competitiveness of products and to this end, to strengthen Honeywell's research, development and production activities in the Czech Republic. Cooperation between VUT Brno and ATAS Náchod aims to further develop the aviation industry in the Czech Republic and strengthen its position in the future. Another goal is to establish a new Center of Excellence, focusing on research and product development (including testing) of highly advanced electromechanical actuators for various load ratings.

Provider:	Technology Agency of the Czech Republic (TA CR)
Principal investigator:	doc. Ing. Jan Bárta, Ph.D.
Start date:	1. 1. 2020
End date:	30. 9. 2022
Total funding:	48,000,000 CZK

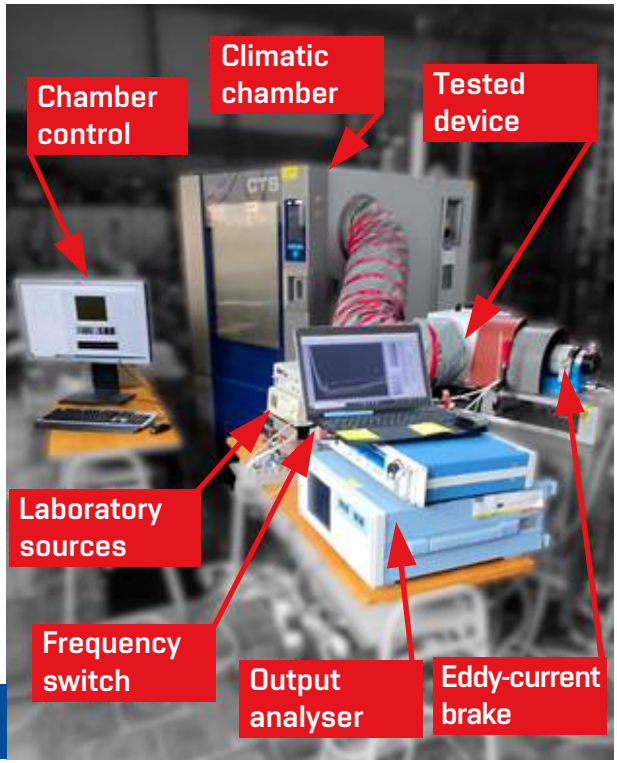


Photo: archive UVEE

Fast detector of genetic information damage caused by radiation (UMEL)

The project focuses on fast bio-dosimetrist detection of the amount of radiation of a person exposed to a high ionising radiation from a body liquid sample. A blood sample is electrochemically analysed and within minutes a rough estimate on organism damage is given, by measuring an 8-hydroxyguanin molecule concentration. The method enables a fast primary sorting of vast spectrum of radiated population for a subsequent time-consuming detailed analysis of radiation damage on an organism. The result of the project is a functional sample of a manually operated miniature detection device that establishes the absorbed dose of high amount of radiation damage on an organism. It will be complemented with software for analysis, fast online evaluation of a sample and a supplementary system for complex evaluation and archiving.

Photo: archive UMEL

Provider:	Ministry of Industry and Trade – OP PIK
Principal investigator:	UJP PRAHA a.s., co-investigator at the FEKT VUT Ing. Alexandr Otáhal, Ph.D.
Start date:	1. 3. 2021
End date:	31. 5. 2023
Total funding:	13,449,287 CZK

Advanced materials for electrolytes for lithium and post lithium batteries (UETE)

During 2022 a TACR Theta project was solved – (TK04030083). The project is under the supervision of the University of Pardubice and cooperating with Central Glass company which is one of the biggest producers of electrolytes for Li-ion accumulators.

During its first year the project tested methods of electrolyte quality analyses from the perspective of a working window and stability in electrodes systems and it chose the ones with the best detection at the minimum technical and time demand. It synthesised 5V cathode material for Li-ion accumulators and a cathode material on the basis of Ni and Mn for a Na-ion accumulator.

Provider:	Ministry of the Interior of the Czech Republic, TA CR
Principal investigator:	doc. Ing. Tomáš Kazda, Ph.D.
Start date:	1. 1. 2022
End date:	31. 12. 2025
Total funding:	6,399,869 CZK

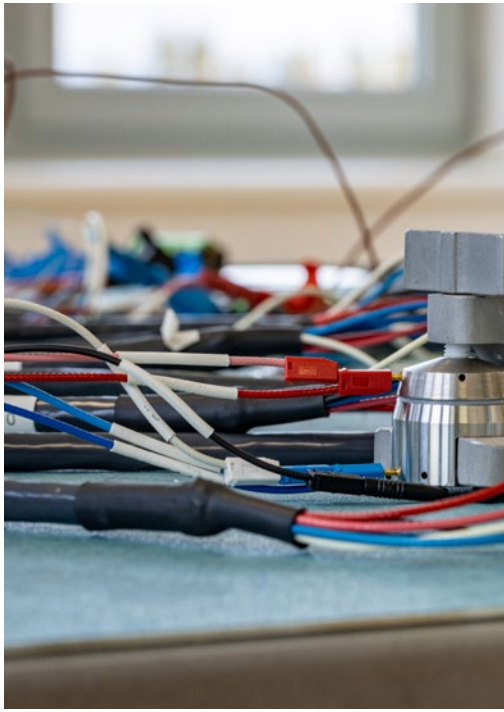


Photo: Jakub Rozboud

Horizontal gene transfer network in chicken gut microbiome: detection and prediction of antibiotic resistome and mobilome (UBMI)

The project solves a pressing topic of excessive antibiotics administering in commercial poultry breeding which results into bacteria resistance. The so-called multi-resistant bacteria pose a global threat to human society as well.

Using modern microbiologic and molecular-biological methods and subsequent computer analyses, researchers will trace presence and spread of genes responsible for bacteria resistance in the breeding.

A three-year project carried out together with the University of Veterinary Sciences Brno and the Technical University in Denmark should bring new methods of analysis and their optimisation.

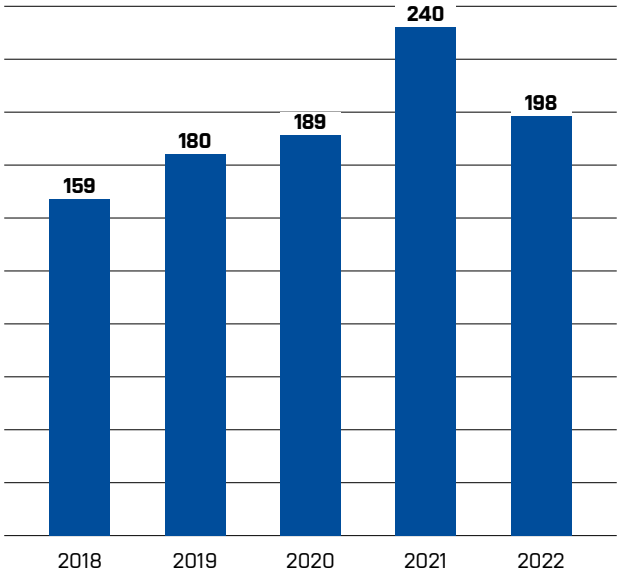
Photo: Darina Čejková's archive

Provider:	Czech Science Foundation (GA CR)
Principal investigator:	Mgr. Bc. Darina Čejková, Ph.D.
Start date:	1. 1. 2022
End date:	31. 12. 2024
Total funding:	10,089,000 CZK

PUBLICATIONS

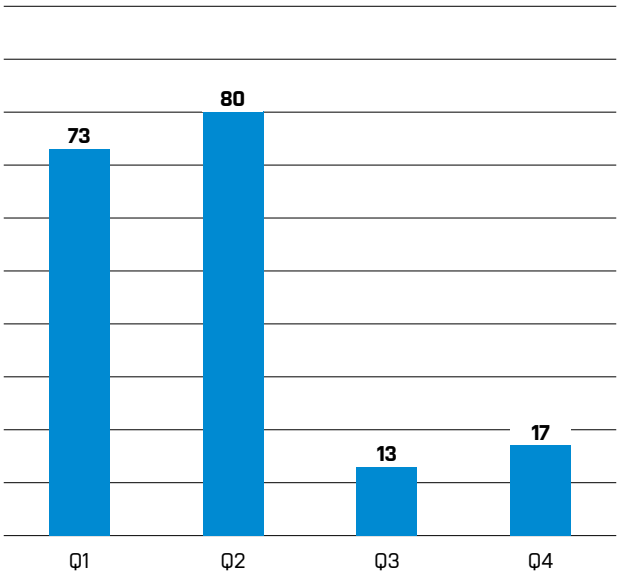
Number of WoS journal publications

(Without quartile specification)



FEEC publication profile in 2022

(Number of WoS journal papers)



Note: unsorted publications (17 pcs) not included

14
books or book chapters

198
papers in Web of Science Core Collection (WoS)

248
conference proceedings indexed by WoS or Scopus

73
prototypes, software or functioning samples

Utility models in 2022

- Detection equipment
- Space mapping system
- Assembly for creating navigation maps and displaying them and supplementing them with additional information in augmented reality
- Real-time image sharing assembly with detection features

Patents in 2022

PHOTOVOLTAIC SYSTEM INCLUDING ELEMENTARY RESONATOR FOR USE IN POWER ENGINEERING

Document number:	309259
Authors:	doc. Ing. Pavel Fiala, Ph.D.
Patent holder:	Brno University of Technology (100 %)

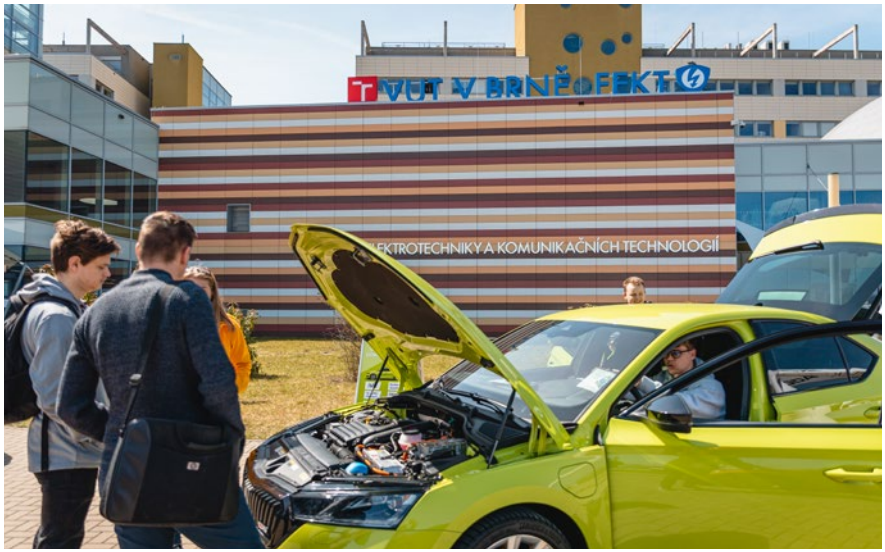
Photo: Jakub Rozboud

INTERNATIONAL RELATIONS AND FEEC

After almost two years of COVID-19 pandemic restrictions the faculty finally managed to realize student and employee mobilities in the EU thanks to the ERASMUS+ programme. Several doctoral students also went out for short-term internships abroad. The overall number of mobilities reached almost 30. With the new BUT management some new challenges in internationalisation were initiated.

The faculty also engaged in preparation of common consortium of European universities called EULIST and in a project to be financed by the Erasmus + under the call "European universities". The consortium now comprises of ten EU partners (Czech Republic, Finland, France, Italy, Germany, Austria, Greece, Slovakia, Spain, and Sweden). The project regarding financing will be ready for application by the beginning of 2023. As far as the internationalisation is concerned, the faculty received a new accreditation for a new master study programme in English called Automotive Electronics and Electromobility. Graduates will find jobs in research, development, design, construction, operation and testing of automobile electronics. The instruction in English will make the graduates ready to work in foreign and international companies.

Photo: Jakub Rozboud



Negotiations on a new common double degree doctoral study programme with the US Northern Illinois University are still in progress. The faculty already cooperates with the university in the Microelectronics master study programme. A MoU cooperation has been contracted with the Indian Madanapalle Institute of Technology & Science (MITS).

Brno International Summer School on Electronics and Communication Technologies – BISSECT was unfortunately postponed again because of a low number of applicants from abroad. The war in Ukraine, unfortunately, negatively influenced the number of students and study applicants from warring regions and it also resulted in an essential financial help to current students from Ukraine and Belarus.

BUT hosted US electrical engineering students for three months

In May US electrical engineering students from the university in Alabama set out to Brno, attracted by the possibility to participate at the research in excellent conditions of the FEEC laboratories.
Thanks to the American grant agency called National Science Foundation students had the possibility to work on a research project much sooner than their fellow colleagues.

In the Czech Republic, students encounter individual research later in their doctoral studies. In this case, each of the five US students got a mentor with whom they consulted their research weekly.

Young researchers investigated, for example, food maturity based on impedance. "It was a completely different experience from what we know in the USA. We could see they trust our opinion, and we could focus on researching own staff, which was great," twenty-year-old Storm Gale is enthusiastic about her three-months internship.

The University of Alabama is the biggest and oldest public university in Alabama, with a very high rating in research. About 40,000 students can choose a variety of topics including technical fields, law, arts and others.

Photo: archive Brno University of Technology

Photo: Jakub Rozboud

Visit from the University of Sarajevo

The Department of Telecommunications hosted a delegation from the University of Sarajevo. The head of the Department of Telecommunications in Sarajevo introduced the fields of research they focus on. One of the topics to discuss was strengthening the cooperation between the two departments including the possibility of exchange stays for both students and academics.
The delegation visited laboratories and the researchers from the University of Sarajevo expressed their interest in cooperation in quantum cryptography and development of 5G network devices.

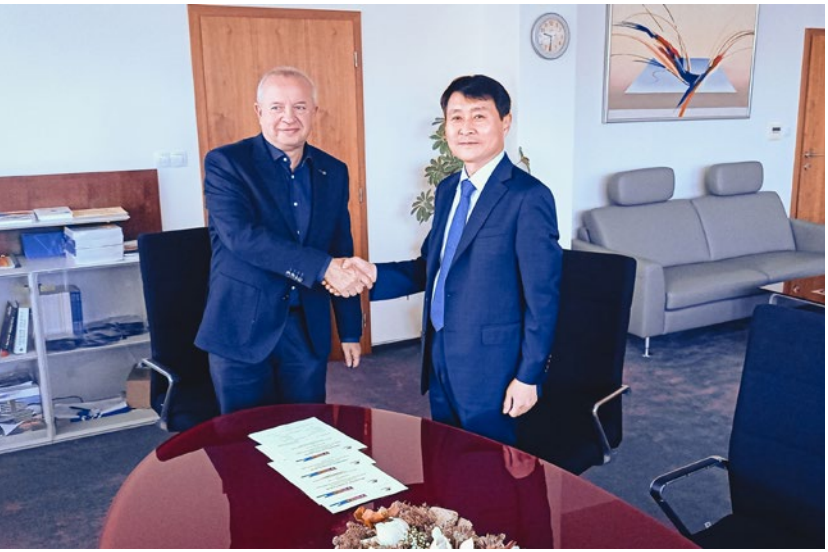


Photo: archive FEKT

The Dean of the faculty signed a Memorandum of Understanding with the Korean Hydro and Nuclear Power – Central Research Institute and a Korean company FNC Technology Co. Ltd.

The Dean of the faculty signed a memorandum of understanding with an important Korean engineering and research company called Central Research Institute, which is a part of a state-owned energy concern KHNP (Korea Hydro and Nuclear Power).

Furthermore, he signed a Memorandum of Understanding with a Korean company FNC Technology Co. Ltd., which is a leading Korean private company offering services in nuclear power plant engineering. The company also has its own research department and it cooperates with Korean universities in educating and training students and doctoral students.

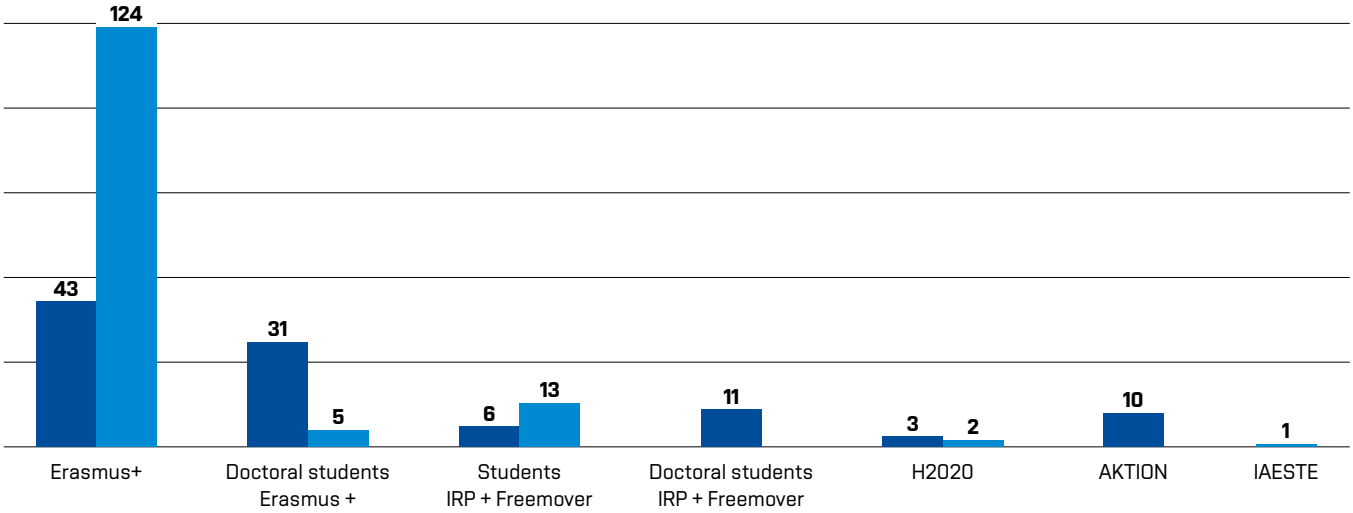
A new possibility to study at the South Korean KEPCO International Nuclear Graduate School

On Wednesday 9 November 2022 the BUT representatives met a Korean delegation from the KEPCO International Nuclear Graduate School, with prof. Karel Katovský from the FEEC being the contact person. He has been collaborating with the KINGS university for over five years, focusing mainly on students exchange. BUT agreed with the Korean delegation on sending 4 students instead of usual two to South Korea every semester for an exchange stay.

Photo: Jan Prokopius

Number of FEEC mobilities in 2022

Incoming and outgoing students by programmes

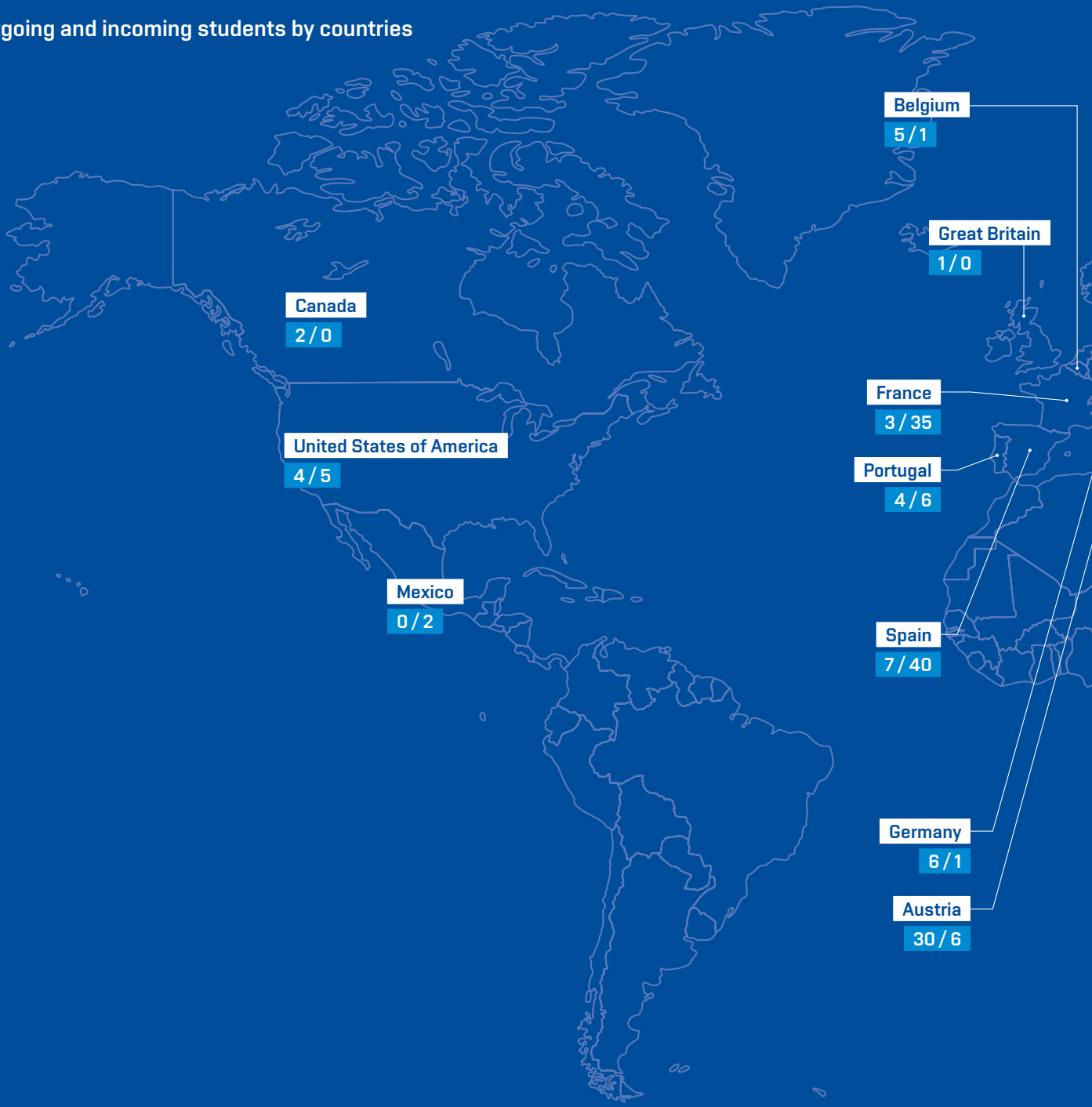


Number of outgoing students:	105
Number of incoming students:	145
Number of outgoing academic and scientific staff:	73
Number of incoming academic and scientific staff:	30

Number of outgoing students

Number of incoming students

Outgoing and incoming students by countries




Norway
1 / 0
Finland
15 / 3
Sweden
1 / 0
Estonia
6 / 0
Latvia
2 / 1
Denmark
3 / 0
Poland
0 / 1
Slovakia
3 / 6
Romania
0 / 7
Korean Republic
6 / 1
Israel
1 / 0
Thai-wan
0 / 2
Turkey
0 / 14
Greece
1 / 6
Slovenia
2 / 0
Italy
2 / 7
Tunisia
0 / 1

INDUSTRIAL PARTNERS

The faculty is an important partner for many international as well as Czech companies in joint research and pedagogical projects.

How to cooperate with us

- Applied and research projects
- Cooperation in teaching, supervision of diploma theses
- Joint preparation of grants
- Commercial contracts
- Support of faculty events
- Partner promotion in faculty premises
- Participation at the PerFEECt Jobfair and Student EEICT

If you are interested in cooperation with us, see our webpage or contact Vice-Dean for International and Public Relations.

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FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

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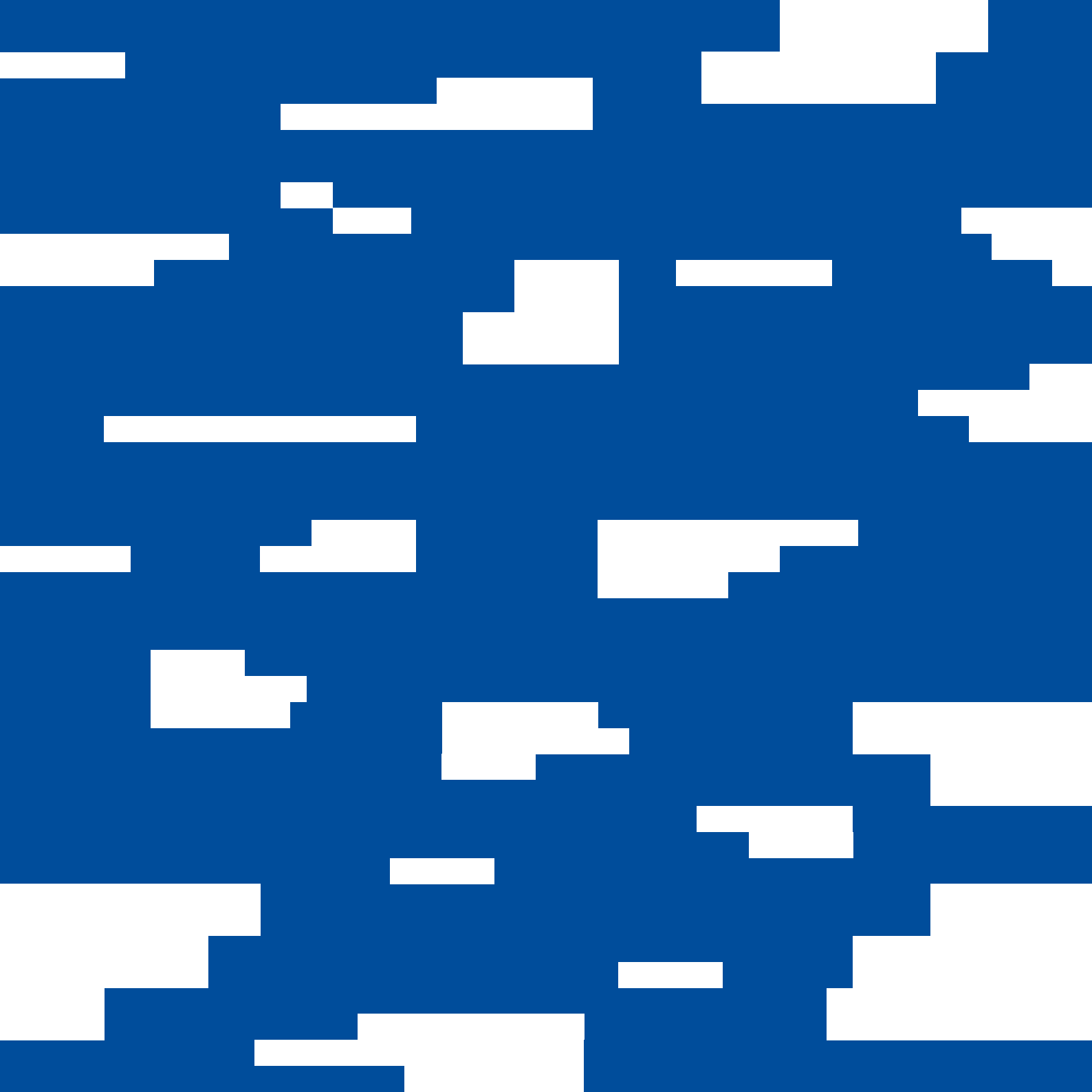

www.feec.but.cz