BASIC INFO

VŠB - Technical University of Ostrava, has a long tradition in high quality engineering with almost 20,000 students, and is located in Ostrava, in the Moravian-Silesian Region of Czech Republic.

EDUCATION

VŠB-TUO provides tertiary education in technical and economic sciences across a wide range of study programmes and courses at the Bachelor’s, Master’s and Doctoral level. Of the 124 accredited study programmes, 77 are available in a foreign language, including joint, double and multiple-degree programmes. While the quality of study programmes is of a high standard, tuition fees and living expenses are relatively quite low, creating excellent value for the education offered at VŠB-TUO. This is reflected by the rapidly growing number of foreign students in Ostrava (1,400 in 2014).

EDUCATION IN TODAY’S MOST SOUGHT-AFTER FIELDS SUCH AS NANOTECHNOLOGY, IT, MECHATRONICS...

Our study programmes stand on a tradition going back more than 165 years, but reflect current, state of the art technologies and the needs of industry and society. Education is organized within 7 Faculties and 2 All-University Study Programmes.
Research at the University can be grouped into six Research Areas, on which work is carried out in research centres and institutes, including the National Supercomputing Centre. The six Research Areas include:

- Raw materials, energy and environmental science
- Computational sciences and information technologies
- New materials, structures and technologies
- Modern engineering
- Safety technologies
- Modelling of economic and financial processes

VŠB-TUO offers a range of internships and post-doc positions. The Technology Transfer Centre supports scientists at VŠB-TUO and its related institutions to develop the commercial potential of their innovations, helping to bridge the gap between the academic and commercial spheres.

VŠB-TUO also runs a dynamic Business Incubator providing substantial support for startups, and complimentary services by the Centre for Innovation Support aid in the establishment of spin-off companies.

FOR MORE INFORMATION, VISIT:
VŠB - Technical University of Ostrava
www.vsb.cz

international@vsb.cz
www.facebook.com/vsbtuo
The Faculty of Electrical Engineering and Computer Science has been partner to the successful transformation of the post-industrial economy in the Region. Rapidly expanding local and international information technology companies, automotive industry as well as the electrical engineering needs that surround these fields have brought strong demand for graduates of the Faculty, which emphasizes cooperation with business for internship and practical training opportunities for students.

### Basic Facts

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Bachelor’s Students</td>
<td>2270</td>
</tr>
<tr>
<td>No. of Master’s Students</td>
<td>938</td>
</tr>
<tr>
<td>No. of PhD Students</td>
<td>332</td>
</tr>
<tr>
<td>No. of Academic Staff</td>
<td>189</td>
</tr>
<tr>
<td>Graduate unemployment rate</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>
**RESEARCH CHARACTERISTICS**

Faculty research teams are involved in collaborative research projects with groups from Germany, France, U.S., China, Spain, and many others. The VŠB-TUO campus is home to the National Supercomputing Centre offering opportunities exceptional in Europe for research and its connection to practice. Research at the Faculty and its associated facilities is focused on the following research topics:

- **Information Technology**
  - Computer Science
  - Computational and Applied Mathematics
  - Communication Technology

- **Electrical Engineering**
  - Electrical Machines, Apparatus and Drivers
  - Electrical Power Engineering
  - Technical Cybernetics
  - Electronics

**EDUCATION CHARACTERISTICS**

Students from over 30 countries study a wide variety of IT and electrical engineering topics at the Faculty. There is an emphasis in cooperation with practice in order to meet the real demands of business and give students the opportunity for internships as part of their practical education.

**Study programmes and branches:**

- **Information and Communication Technology**
  - Computational Mathematics
  - Computer Science and Technology
  - Mobile Technology
  - Telecommunication Technology

- **Electrical Engineering**
  - Applied Electronics
  - Biomedical Engineering
  - Control and Information Systems
  - Electrical Power Engineering

**STUDY PROGRAMMES IN ENGLISH**

The Faculty of Electrical Engineering and Computer Science provides opportunities for studies of Bachelor’s, Master’s, and Doctoral degrees in traditional and combined forms. All areas of the Faculty are accessible for disabled students.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Study Programme</th>
<th>No. Study Branches</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor’s</td>
<td>Electrical Engineering</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>Information and Communication Technology</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Master’s</td>
<td>Electrical Engineering</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Master’s</td>
<td>Information and Communication Technology</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>PhD</td>
<td>Electrical Engineering</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Computer Science, Communication Technology and Applied Mathematics</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

www.fei.vsb.cz/en | international@vsb.cz
The Faculty of Economics is one of the largest economic faculties in the Czech Republic with approximately 5000 full-time and part-time Bachelor’s, Master’s and PhD students. The Faculty has a wide variety of international study opportunities with numerous international partners around the world, including semester abroad and Double Degree programmes. The Faculty also provides an MBA program in conjunction with Liverpool John Moores University, United Kingdom. The Faculty has an attractive location on the riverbanks in the Ostrava city centre, and is a destination for students from around Europe, Turkey, China, Korea, and Vietnam, among others.

<table>
<thead>
<tr>
<th>Basic Facts</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Bachelor’s Students</td>
<td>2870</td>
</tr>
<tr>
<td>No. of Master’s Students</td>
<td>1506</td>
</tr>
<tr>
<td>No. of PhD Students</td>
<td>123</td>
</tr>
<tr>
<td>No. of International Students</td>
<td>124</td>
</tr>
<tr>
<td>No. of Academic Staff</td>
<td>250</td>
</tr>
<tr>
<td>Graduate unemployment rate</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>
STUDY PROGRAMMES IN ENGLISH

Within the Study Programmes listed below, the Faculty of Economics offers the following undergraduate and graduate study branches in English: European Business Studies (Bachelor’s level), Finance (Bachelor’s & Master’s levels), and Marketing and Business (Master’s level). In addition, the Faculty offers Doctoral studies in English in the following branches: Economics, Business Administration and Management, Finance, Public Economics and Administration, and Systems Engineering and Informatics.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Study Programme</th>
<th>No. Study Branches</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor’s</td>
<td>Economic Policy and Administration</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>Economics and Management</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Master’s</td>
<td>Economic Policy and Administration</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Master’s</td>
<td>Economics and Management</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>PhD</td>
<td>Economic Theories</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>Economics and Management</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>Economic Policy and Administration</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>System Engineering and Informatics</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

RESEARCH CHARACTERISTICS

The Faculty is involved in international and EU funded research, and publishes the international scientific journals Central European Review of Economic Issues (CEREI), and ECON Journal of Economics, Management and Business. The Faculty is a principal investigator of both applied and basic research, in which the main topics include:

- Macroeconomic and microeconomic theories and policies
- Financial analysis, management and modelling of financial and non-financial institutions
- European and international integration and its influence on the cohesion and competitiveness of regions
- Strategic management and innovation in the business sector
- Human resources development and management
- Market analysis, situational marketing studies, prediction of consumption, measurement of customer satisfaction
- Public sector development and administration
- European legal environment and dispute resolution, particularly international commercial disputes

EDUCATION CHARACTERISTICS

The Faculty of Economics is a top place to study economics in the Czech Republic. It offers a wide range of full-time and part-time study programs, attractive foreign internships for its students, and pays great attention to lifelong learning. The “Sunflower” centre for students with disabilities and special needs is an integral part of the Faculty, and the learning process is supported by the virtual learning environment, as well as international training centres Oracle Academy, Novell Academic Training Partner, European Computer Driving Licence, and Apple Authorised Training Centre for Education.

www.ekf.vsb.cz/en | international@vsb.cz
The Faculty of Mechanical Engineering was founded over 60 years ago with a focus on machinery and equipment for the mining and metallurgical industry. Based on rapid development of industrial production and societal needs, the Faculty evolved to offer a wide range of education and R&D. Today the Faculty is a trusted partner of local automotive and other manufacturing industries, with whom it cooperates to enhance industrial innovation through applied research and to provide practical opportunities for students through internships.

<table>
<thead>
<tr>
<th>Basic Facts</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Bachelor’s Students</td>
<td>1323</td>
</tr>
<tr>
<td>No. of Master’s Students</td>
<td>663</td>
</tr>
<tr>
<td>No. of PhD Students</td>
<td>244</td>
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<tr>
<td>No. International Students</td>
<td>90</td>
</tr>
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<td>No. of Academic Staff</td>
<td>213</td>
</tr>
<tr>
<td>Graduate unemployment rate</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>
The Faculty of Mechanical Engineering offers over 60 courses at the Bachelor's and Master's level to students all over the world in a broad range of fields of study. Master's and PhD degree programmes are organized within the Study Programme Mechanical Engineering in the following Study Branches.

**Research focuses on the following areas:**
- Robotics
- Mechanics
- Hydrodynamics and Hydraulic Equipment
- Mechanics of Materials
- Production Machines and Design
- Transport
- Mechanical Technology
- Working and Assembly
- Machine Parts and Mechanisms
- Control Systems and Instrumentation
- Energy Engineering

**EDUCATION CHARACTERISTICS**
Within full-time and combined study, the Faculty offers study fields specializing in robotics, mechanics, materials handling and transport, energy engineering and control of machines and processes, and specialized programmes in Aeronautics for University partners in France, China, and Vietnam. Most of the programmes are taught in the Czech language, however an increasing number are offered in English. Foreign students can take intensive courses of Czech language for foreigners, and then commence studies with a full range of programme choice from within the Faculty.

**STUDY PROGRAMMES IN ENGLISH**

The Faculty of Mechanical Engineering offers over 60 courses at the Bachelor's and Master's level to students all over the world in a broad range of fields of study. Master's and PhD degree programmes are organized within the Study Programme Mechanical Engineering in the following Study Branches.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Study Programme</th>
<th>Study Branch</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master's</td>
<td>Mechanical Engineering</td>
<td>Applied Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Transport and Material Handling</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Robotics</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Energy Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Mechanical Engineering Technology</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Control of Machines and Processes</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Applied Mechanics</td>
<td>4</td>
</tr>
</tbody>
</table>
The Faculty of Mining and Geology uniquely interconnects natural sciences with technical and economic fields of study, with a history dating back to 1716 and the founding of one of the oldest mining academies in Europe. Today over 4000 students pursue degrees in fields ranging from geology and geoinformatics to mining and environmental sciences. The Faculty actively cooperates with many domestic and foreign universities, research institutes and companies. The multi-disciplinary approach is evident from the educational and scientific research characteristics, where the framework of study supports practical application, and places an emphasis on a creative and innovative approach in education and R&D.

<table>
<thead>
<tr>
<th>Basic Facts</th>
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</thead>
<tbody>
<tr>
<td>No. of Bachelor’s Students</td>
<td>2078</td>
</tr>
<tr>
<td>No. of Master’s Students</td>
<td>895</td>
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<tr>
<td>No. of PhD Students</td>
<td>219</td>
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<tr>
<td>No. International Students</td>
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</tr>
<tr>
<td>No. of Academic Staff</td>
<td>136</td>
</tr>
<tr>
<td>Graduate unemployment rate</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>
The Faculty of Mining and Geology is committed to the offer of education programmes across different fields, utilizing the research and development potential of the University.

STUDY PROGRAMMES IN ENGLISH

The Faculty of Mining and Geology is committed to the offer of education programmes across different fields, utilizing the research and development potential of the University.

Research and development at the Faculty focuses on a wide range of fields, connected by earth sciences and the raw materials derived from mining activity, across fields of environmental studies and clean technologies, and the informatics that informs these related topics. The R&D and the innovative activities that spur progress at the Faculty focus on the following fields:

- Physics
- Geoinformatics
- Geological Engineering
- Mining Engineering and Safety
- Geodesy and Mine Surveying
- Economics and Management in the Field of Raw Materials
- Environmental Engineering

Within full-time and combined study, the Faculty offers 20 study fields specializing in the environment, geology, geodesy, biotechnology, geoscience and industrial tourism, geoinformatics, economy, automation in the area of the raw materials industry and applied physics.

Most of the programmes are taught in the Czech language, however an increasing number of programmes are offered in English. Foreign students can take intensive courses of Czech language for foreigners, and then commence studies with a full range of programme choice from within the Faculty.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Study Programme</th>
<th>No. Study Branches</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor's</td>
<td>Geodesy, Cartography and Geoinformatics</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor's</td>
<td>Geological Engineering</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor's</td>
<td>Mining</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Master's</td>
<td>Mineral Raw Materials</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Master's</td>
<td>Geological Engineering</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Master's</td>
<td>Mining</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Master's</td>
<td>Geodesy, Cartography and Geoinformatics</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>PhD</td>
<td>Physics</td>
<td>1</td>
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</tr>
<tr>
<td>PhD</td>
<td>Mineral Raw Materials</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>Geological Engineering</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>Mining</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>Geodesy and Cartography</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>Management of Industrial Systems</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
The Faculty of Safety Engineering combines a unique set of research areas and fields of study to meet the growing demand for highly educated professionals in the area of safety engineering. To meet the challenges of rapid technological advances of the machinery and processes of industry coupled with the wide use of hazardous substances, the Faculty carries out the following main activities:

- Pedagogical activities
- Research and development
- Expert consulting
- Contract research for the public and private sector

These education, R&D and consulting services are carried out broadly in the areas of:

- Risk research and management
- Fire protection
- Occupational and process safety
- Industrial safety
- Major accident prevention
- Safety and security planning
- Protection of population in natural disasters
- Protection of critical infrastructure
- Safety and security services
- Environmental safety and security
- Safety of nanomaterials and nanotechnologies

Basic Facts

<table>
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<th>Category</th>
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<td>No. of Bachelor’s Students</td>
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<td>No. of Master’s Students</td>
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<td>No. of PhD Students</td>
<td>115</td>
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<tr>
<td>No. International Students</td>
<td>25</td>
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<tr>
<td>No. of Academic Staff</td>
<td>58</td>
</tr>
<tr>
<td>Graduate unemployment rate</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>
RESEARCH AND TECHNICAL CONSULTANCY

The R&D orientation of the Faculty covers a broad area of safety and security engineering including:

- Fire protection
- Industrial safety
- Occupational and process safety
- Engineering safety of persons and property
- Civil protection

The Faculty is equipped with high quality and specialized equipment for R&D and contracted research and analyses services, including for example:

- 250 litre explosion chamber for pressure determination
- Testing area for water extinguishing systems
- Fire testing room to 100 kW limit output
- Equipment to determine explosive limits
- Equipment for measurement of explosion pressure waves in a free field environment with a high-speed camera

EDUCATION CHARACTERISTICS

The Faculty offers studies in Bachelor’s (4-year), Master’s (2-year) and Doctoral degree programmes in both full-time and part-time (combined form) modes. Graduates of the Faculty are in demand as members of fire protection services, designers, safety and security engineers. Their unique educational profile makes them sought after in both the public and private sector.

BACHELOR’S AND MASTER’S COURSES IN FOREIGN LANGUAGES

The Faculty of Safety Engineering offers a wide range of courses in English language, as well as a selection of courses in Polish, French, German and Russian.

| Communication Systems in Fire Protection | Crisis Planning |
| Fire Dynamics | Industrial Toxicology |
| Incident Handling | Technical Safety |
| Resistance of Building Constructions | Occupational Risks |
| Software for Mathematical Modelling of Fire | Hazard and Risk Analysis |
| Ventilation of Buildings | Safety of Technologies II |
| Blast Effects on Buildings | OHS management systems |
| Organisation and Management in Fire Protection | Toxicology |
| Fire Safety in Buildings I | Hazard and Risk Science |
| Firefighting Equipment I / II | Technological Process Safety |
| Risk Management | Dangerous Substances and Preparations |
| Fire Safety Equipment | Risk Analysis |
| Brigade Management | Discipline on Hazards |
| Building Constructions and Fire Safety | Modeling of Decision Processes |
| Current Safety and Security Threats | Population Protection I |

Hazard and Risk Analysis
Safety of Technologies II
Organisation of Occupational Safety
Testing and Certification
Dangerous Substances and Wastes
Analysis of safety risks
Environmental Impact Assessment
Territorial Risk Analysis
Machines and Equipment
Material Science
Accident Prevention
Enterprise Safety Management
Environmental Impacts of Accidents
Communication Systems BOM
Excursion CHMI for TBOM

www.fbi.vsb.cz/en | international@vsb.cz
The Faculty conducts research and provides a universal education in fields related to civil engineering, construction and architecture, while offering specialized areas informed by expertise gained from solving the needs of a region with a high concentration of mining and heavy industry. Graduates are in high demand as engineers and architects in construction and related companies, architectural firms, civil authorities, and a variety of organizations.

### Basic Facts

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Bachelor’s Students</td>
<td>1450</td>
</tr>
<tr>
<td>No. of Master’s Students</td>
<td>439</td>
</tr>
<tr>
<td>No. of PhD Students</td>
<td>141</td>
</tr>
<tr>
<td>No. International Students</td>
<td>54</td>
</tr>
<tr>
<td>No. of Academic Staff</td>
<td>115</td>
</tr>
<tr>
<td>Graduate unemployment rate</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>
STUDY PROGRAMMES IN ENGLISH

The Faculty offers study programmes taught in English and German to students from all over the world through bilateral exchange programmes and Erasmus+.

RESEARCH CHARACTERISTICS

Research at the Faculty is informed by the needs of the region noted for longstanding and significantly developed mining and industrial activities. The Faculty and its related research groups have significant expertise in such topics as undermined areas, smoothing of the effects of mining and industrial activity, production of building materials, transportation, geotechnical and underground structures, around which expert consulting and services are employed by public authorities and industry.

EDUCATION CHARACTERISTICS

The Faculty offers study at the Bachelor’s, Master’s and PhD levels with full-time and combined study, in many study fields related to civil engineering, architecture, and construction related topics. At the Master’s level these lead to designations of Engineer (Ing.) and Engineer Architect (Ing. arch.).

STUDY PROGRAMMES IN ENGLISH

The Faculty offers study programmes taught in English and German to students from all over the world through bilateral exchange programmes and Erasmus+.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Study Programme</th>
<th>No. Study Branches</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor</td>
<td>Civil Engineering</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Master’s</td>
<td>Architecture and Construction</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Master’s</td>
<td>Civil Engineering</td>
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<td>1.5</td>
</tr>
<tr>
<td>PhD</td>
<td>Civil Engineering</td>
<td>3</td>
<td>3-4</td>
</tr>
</tbody>
</table>

www.fast.vsb.cz/en | international@vsb.cz
The Faculty of Metallurgy and Materials Engineering traces its roots back to the founding of the University in 1849 when it was an integral part of the existing expertise in mining and metallurgy and a highly developed local industry. For over 60 years the Faculty has provided highly educated graduates for the metallurgical industry, and as well in materials engineering, chemical technologies, thermal engineering and industrial ceramics, economics and management in metallurgy, quality management, automation and control of industrial systems and environmental protection. The Faculty conducts basic and applied research and is a trusted consulting and research partner to a wide variety of industries.

**Basic Facts**

- No. of Bachelor’s Students: 1389
- No. of Master’s Students: 502
- No. of PhD Students: 174
- No. International Students: 35
- No. of Academic Staff: 138
- Graduate unemployment rate: <5%
RESEARCH CHARACTERISTICS

Research at the Faculty and its related groups focus on various branches of metallurgy, materials, and chemistry, and facilitates collaborative research with the steel and machinery industries in the region. The Faculty is closely associated with the new EU supported Regional Materials Science and Technology Centre. The main topics of research at the Faculty include:

- Metallurgy of metals (ferrous and non-ferrous)
- Chemical metallurgy
- Materials engineering
- Materials/metal forming and thermal engineering

EDUCATION CHARACTERISTICS

The Faculty offers programmes at the Bachelor’s, Master’s and Doctoral levels with full-time and part-time study. The Faculty also provides lifelong learning and a variety of non-degree courses for specializations, conducts trainings and innovation support for the technical and scientific community. Graduates receive a Diploma and Diploma Supplement, which documents the contents of the studies as well as the results achieved. The Faculty offers a variety of exchange programmes with universities around the world, including Erasmus+.

STUDY PROGRAMMES IN ENGLISH

The Faculty offers a wide variety of courses in English language at the Bachelor’s level, as well as the following Study Programmes at the Master’s and PhD levels.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Study Programme</th>
<th>No. Study Branches</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s</td>
<td>Metallurgical Engineering</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Master’s</td>
<td>Economics and Management of Industrial Systems</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Master’s</td>
<td>Materials Engineering</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>PhD</td>
<td>Materials Science and Engineering</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>Management of Industrial Systems</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
As the interdisciplinarity of science and engineering has increased over time, the organizational structure of education at the University is adapting to accommodate the real needs of both research and industry. Two University Study Programmes provide education in the areas Nanotechnology and Mechatronics, where different Faculties and research institutions within the University can provide various aspects of the education on these emerging disciplines.

<table>
<thead>
<tr>
<th>Basic Facts</th>
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</thead>
<tbody>
<tr>
<td>No. of Bachelor’s Students</td>
</tr>
<tr>
<td>No. of Master’s Students</td>
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<tr>
<td>No. of PhD Students</td>
</tr>
<tr>
<td>No. of Academic Staff</td>
</tr>
<tr>
<td>Graduate unemployment rate</td>
</tr>
</tbody>
</table>
STUDY PROGRAMMES IN ENGLISH

NANOTECHNOLOGY

Bachelor’s study in Nanotechnology prepares graduates for work in laboratories as technicians, physicists and chemists in industry, scientific research and technology departments of companies.

To gain knowledge of the principles of characterization and preparation of nanomaterials, Bachelor’s have a basic knowledge of:
- Mathematics
- Physics
- Chemistry

Master’s study programmes contain more advanced methods of structural and properties’ study of nanomaterials, theoretical and experimental approaches, and offer two specializations:
- Physical
- Chemical

Both orientations have common fundamental theoretical and experimental subjects including modelling and computer design of nanomaterials. Graduates can work in a wide range of industries, from pharmaceutical, physical and chemical engineering, to the electronics and automotive industries.

MECHATRONICS

The study programme Mechatronics has two specializations:
- Mechatronic Systems
- Automotive Electronics

Graduates have knowledge of complex systems with mechanical, electrical and control subsystems. The specialization Automotive Electronics prepares students for problems with automobile electronics and automation.

Graduates understand the principles of the design of:
- Control systems
- Measurement design
- Sensors and actuators
- CAD software
- Simulation methods

The background from electrical, mechanical and control engineering allows them to work with complex structured systems and to consider the interaction of different dynamic subsystems in the design phase of the new mechatronic system and using the suitable control to achieve the required behaviour of the final system.

STUDY PROGRAMMES IN ENGLISH

<table>
<thead>
<tr>
<th>Degree</th>
<th>Study Programme</th>
<th>Study Branch</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor’s</td>
<td>Nanotechnology</td>
<td>Nanotechnology</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>Mechatronics</td>
<td>Mechatronic Systems</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>Mechatronics</td>
<td>Automotive Electronics</td>
<td>3</td>
</tr>
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<td>Master’s</td>
<td>Nanotechnology</td>
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<tr>
<td>Master’s</td>
<td>Mechatronics</td>
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<td>2</td>
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<td>Master’s</td>
<td>Mechatronics</td>
<td>Automotive Electronics</td>
<td>2</td>
</tr>
<tr>
<td>PhD</td>
<td>Nanotechnology</td>
<td>Nanotechnology</td>
<td>4</td>
</tr>
</tbody>
</table>
As one of the first universities in Europe focusing on mining, VŠB-TUO has a long compiled institutional expertise in the mining of raw materials and associated technologies. Complimentary expertise in other disciplines of engineering gave rise to capacity in environmental technologies and energy equipment and technologies. Research centres such as ENET and the Institute of Environmental Technologies concentrate capacities and expertise in topics related to energy and environmental science. Close cooperation with industry has kept R&D at the forefront of international standards.
RELATED RESEARCH TOPICS

Raw materials
- Ores and coal processing
- Industrial minerals processing
- Mine ventilation and safety
- Development, preparation, mining and disposal of ore, non-ore and uranium mines
- Groundwater modeling applications in mininghydrogeology

Environmental technologies
- Material and energy recovery of waste
- Cleaning/treatment of waste gases, waters and solids, especially from waste disposal

Energy
- Research of renewable energy sources
- Biomass gasification and other renewables for efficient energy generation
- Diagnostics of the complex of energy and technology equipment
- Energy production and accumulation

RESULTS

Research Area output: Publishing in high-impact journals + Intellectual property protection
- Effect of TiO₂ particle size on the photocatalytic reduction of CO₂ emissions into the atmosphere
- Effect of potassium in calcined Co-Mn-Al layered double hydroxide on the catalytic decomposition of N₂O
- On airborne nano/micro-sized wear particles released from low-metallic automotive brakes
- Patented Method and Apparatus for a Wind Power Plant Control
- Patented Method and Apparatus and for Detecting Faults in Medium Voltage, Covered Conductors
- Patented equipment for the optimization of a drive unit

RELATED STUDY PROGRAMMES

Around the research area Raw Materials, Energy and Environmental Science, study programmes are focused on energy engineering, geoinformatics, aspects of mineral raw materials, geological engineering, and the geomechanics of mining.

PhD Courses
- Mineral Raw Materials Processing
- Mineral Raw Materials - Automation of Technological Processes
- Geological Engineering
- Mining and Mining Geomechanics
- Geoinformatics
- Energy Engineering
Safety Technologies are a multi-disciplinary topic born from many years of research and education across the fields of engineering at VŠB-TUO. Output of basic and applied research is transferred through collaborative R&D with public safety agencies, industry, as well as within various engineering branches of the University. In the framework of VŠB-TUO, the Faculty of Safety Engineering is the leader in this area.
Patented method and apparatus for removing radon dissolved in water, particularly groundwater.

LNG as a potential alternative fuel – Safety and security of storage facilities.

Time-Resolved Fourier Transform Emission Spectroscopy of CF(3)Br and CF(3)CFHCF(3) in a Pulsed Electrical Discharge.

Allan variance for optimal signal averaging - monitoring by diode-laser and CO₂ laser photo-acoustic spectroscopy.

Journal: Transactions of the VŠB - Technical University of Ostrava, Safety Engineering Series.

RELATED RESEARCH TOPICS

Safety of technologies and structures
- Safety of explosion processes
- Safety of construction works and constructions
- Safety of critical infrastructure
- Information and communication safety

Safety, medicine and engineering
- Development of technologies in urgent medicine
- Technical equipment for intervening in extraordinary events
- Health aspects of occupational safety

Safety of materials
- Managing the risks of hazardous chemicals
- Nanomaterials and their safety
- Materials used for safety

Population protection
- Protection of areas against natural disasters
- Fire protection
- Crisis management
- Decision support systems

RESULTS

Research Area output: Journal + articles in high-impact journals + Intellectual property protection

- Patented method and apparatus for removing radon dissolved in water, particularly groundwater
- LNG as a potential alternative fuel – Safety and security of storage facilities.
- Time-Resolved Fourier Transform Emission Spectroscopy of CF(3)Br and CF(3)CFHCF(3) in a Pulsed Electrical Discharge
- Allan variance for optimal signal averaging - monitoring by diode-laser and CO₂ laser photo-acoustic spectroscopy
- Journal: Transactions of the VŠB - Technical University of Ostrava, Safety Engineering Series

RELATED STUDY PROGRAMMES

The PhD study programme Fire Protection and Industrial Safety is focused on the theoretical and experimental problems of fire protection, industrial safety, occupational safety and health, protection of population, theory of crisis management, emergency planning, risk management and elimination of consequences of major accidents and chronic risks in the area of working environment.
For over 160 years the University and its related institutions have conducted research on materials linked to the highly developed mining and metallurgy industries located in the region at large. This research at VŠB-TUO has evolved into the fields of New Materials, and their related Structures and Technologies. The research is informed by the close connection between these industries and the University, ensuring applicability and relevance as well as a connection with tomorrow’s societal needs.
RELATED RESEARCH TOPICS

- Development of new technologies for preparation of high-purity materials
- Development of powder technologies for special materials production
- Control of intensive rolling and thermo-mechanical processing of materials
- New materials for exacting technology applications
- Nanostructured materials; optical diagnostics of materials
- Bulk materials transport and handling
- Mineral raw materials

RESULTS

Examples of the output of this research area at VŠB-TUO include publication in high-impact scientific journals and intellectual property protection status

- Effect of TiO₂ particle size on the photocatalytic reduction of CO₂ emissions into the atmosphere
- Effect of hydrogen on the properties and fracture characteristics of TRIP 800 steels
- Preparation and characterization of ZnS nanoparticles deposited on montmorillonite
- Effect of silver doping on the TiO₂ for photocatalytic reduction of CO₂
- Patented grinding equipment for mechanical processing of defined particles
- Patented method of simulation of kinetics movement of bulk solid particles and facilities to carry out the method
- Patented method of the preparation of fibrillar and lamellar porous microstructures and nanostructures by means of controlled vacuum freeze-drying of liquid nanoparticles dispersions

RELATED STUDY PROGRAMMES

The study programmes are focused on theoretical and experimental aspects of development and optimization of new technologies for preparation of high purity materials, special metallic alloys and inter-metallic compounds with defined structure and physical properties for application. In the frame of nanostructured materials the education is concentrated mainly on design, synthesis, characterization and testing of various nanomaterials for different application.

PhD Courses
- Material Sciences and Engineering
- Process Engineering
- Chemical Metallurgy
- Metallurgical Technology
- Transport and Material Handling
- Applied Physics
- Mineral Raw Materials
- Nanotechnology
Research in the area of computational sciences and information technologies, and its orientation towards cooperation with practice has played an important role in the successful post-industrial transition in the region. University research in this sphere places emphasis on generating quality scientific results and collaborative output for industry. Drawing on expertise in the Faculties, particularly in the Faculty of Electrical Engineering and Computer Science, and associated research Institutes at the University, and as evidence to the capabilities therein, the National Supercomputing Centre became Czech Republic’s Centre of Excellence in IT. The Centre provides amassed expertise and the very latest technology in high performance computing and embedded systems, modern soft computing and unconventional algorithms, big data analysis, networks and security, and computer graphics.
RELATED RESEARCH TOPICS

- Computer malware, cybersecurity, computer graphics in industry, big data analysis and storage, computer networks
- Astroinformatics, theoretical informatics
- Modern softcomputing methods theory, application in industry
- Disaster and Traffic Management: modelling and simulations in the field of traffic and hydrology
- Numerical modelling for engineering: development of efficient mathematical methods for engineering problems
- HPC libraries and supercomputing for Industry: CFD modeling, structural mechanics, geomechanics, and biomechanics
- Modelling for nanotechnologies: development of nanocomposites
- Knowledge Management: biomedicine, intelligent networks, and massively parallel calculations
- Soft computing methods with supercomputer applications
- Multimedia information recognition and presentation
- Secure and safe architectures, networks, and protocols

RESULTS

Examples of the output of this research area at VŠB-TUO include publication in high-impact scientific journals and intellectual property protection status

- Scalable TFETI algorithm for the solution of multi-body contact problems of elasticity
- An optimal algorithm for minimization of quadratic functions with bounded spectrum subject to separable convex inequality and linear equality constraints
- A theoretically supported scalable TFETI algorithm for the solution of multi-body 3D contact problems with friction
- Use of unconventional algorithms in astroinformatics and big data
- Applied computer vision for Volkswagen
- Both basic and applied research projects with Czech grant agencies
- International research projects with France, U.S., Vietnam, Finland and many others
- Substantial participation in EU projects in research and know-how dissemination
- Cooperation with companies such as Volkswagen, Tieto, T-Mobile, Czech emergency services

RELATED STUDY PROGRAMMES

Study programmes related to this research area are focused on theoretical as well as practically oriented topics with impact on real-life application. In the area of computer science, study concentrates on topics such as soft computing, computer graphics, big data and databases, data analysis, artificial intelligence and theoretical informatics. Related study programmes and branches of PhD study include:

Computer Science, Communication Technology and Applied Mathematics
- Communication Technology
- Computational and Applied Mathematics
- Informatics
Research in the area of Modelling of Economic and Financial Processes helps explain the interplay of exogenous variables, dependant variables, and the implications for the particular segment under examination. Modelling is informed by the needs of industry and the public sector, with whom collaboration takes place in topics of applied research. The research is applied in the financial, insurance, marketing, public and corporate governance spheres, and has broad implication for business intelligence, management and human resources planning.
RELATED RESEARCH TOPICS

Economics
- Econometric modeling of economic and macroeconomic processes
- Labor market: migration, wage determination, gender wage gap
- Regional economy analyses and models

Finance
- Financial and insurance modeling
- Financial assets, portfolio model simulations
- Derivatives valuation and simulation

RESULTS

Research Area output: High-impact scientific journals + Faculty publications
- Generalised soft binomial American real option pricing model (fuzzy–stochastic approach)
- Institutional Structures of Financial Sector Supervision, their Drivers and Historical Benchmarks
- Central European Review of Economic Issues (CEREI)
- ECON Journal of Economics, Management and Business

RELATED STUDY PROGRAMMES

PhD study oriented in this Research Area is available in English, with the Business Economics and Management specialisation also offered in German language. Study is designed with the basic goal of achieving quality scientific research and quality publication. The course of study is directed at the development of topics for doctoral dissertation, where a common core of study is first implemented, followed by a complex branch course and optional courses. Study concludes with a State doctoral exam, followed by the creation and defence of a doctoral dissertation.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Study Programme</th>
<th>Study Branch</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD</td>
<td>Economic Theories</td>
<td>Economics</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>Economy and Management</td>
<td>Business Administration and Management</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>Economic Policy and Administration</td>
<td>Finance</td>
<td>3</td>
</tr>
<tr>
<td>PhD</td>
<td>System Engineering and Informatics</td>
<td>System Engineering and Informatics</td>
<td>3</td>
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</tbody>
</table>
Modern Engineering covers many fields of engineering and science: Mechanical Engineering, Engineering Design Methods, Fluid Mechanics and Thermodynamics, Control Engineering, Robotics, Hydraulics and Pneumatics, Mechatronics, Transport Engineering, Manufacturing engineering, among others. The research activities reflect the range of interest and experience among the academic staff and corresponds to active cooperation with manufacturing industries.
RELATIVE RESEARCH TOPICS

- New manufacturing technologies, progressive methods of welding, forming, coating of materials and advanced machining technologies
- Innovative design of production machines, machine parts and equipment, virtual prototyping and innovative production technologies
- Machines and equipment construction with higher reliability properties, diagnostics of operational behaviour and research on fatigue of materials, measurement of mechanical quantities of machine parts
- R&D of mechanical gear units with tooth-wheels
- Robotics, biorobotics, production and service systems with robots
- Machine and operation control, measurement and signal processing, diagnostics, simulation, design and control of mechatronic systems
- Optimization of hydraulic and pneumatic components and systems
- Numerical modeling of complex fluid flows in engineering applications

RESULTS

Key papers published in high impact-factor scientific journals, monographs
- Twist-channel angular pressing: effect of the strain path on grain refinement and mechanical properties of copper
- Contact defects initiation in railroad wheels – Experience, experiments and modelling

Intellectual property protection due to uniqueness as patents
- New Tight Return Flap under the Coal Ball-ring Mill Classifier
- Radiofrequency operational tool for surface and subsurface semispherical application
- Devices for multi-axial combined loading of test samples

Collaboration with industry
- Cooperation with Škoda Auto a.s. in the field of gearboxes development
- Cooperation with Strojírny Třinec a.s., Fite a.s., Robotsystem s.r.o., etc.
- Cooperation with machinery, automotive and energetics clusters

Projects
- Joint project with the Josef Božek Competence Centre for Automotive Industry
- Active vibration damping of rotor with the use of parametric excitation of journal bearings
- Programmable high-performance machine for deformation-free punching and cutting of the profiles
- Axially and radially cooled brake disc with cover - G-Cooling System (GCS)

RELATED STUDY PROGRAMMES

The results of the research inform education within the Bachelor, Master and Doctoral Degree Programme Mechanical Engineering and Mechatronics. Master Degree and Doctoral Degree students are significantly involved in modern engineering research.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Study Programme</th>
<th>Study Branches</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor</td>
<td>Mechatronics</td>
<td>Automotive Electronics</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor</td>
<td>Mechatronics</td>
<td>Mechatronic Systems</td>
<td>3</td>
</tr>
<tr>
<td>Master</td>
<td>Mechatronics</td>
<td>Automotive Electronics</td>
<td>2</td>
</tr>
<tr>
<td>Master</td>
<td>Mechatronics</td>
<td>Mechatronics Systems</td>
<td>2</td>
</tr>
<tr>
<td>Master</td>
<td>Mechanical Engineering</td>
<td>Applied Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Applied Mechanics</td>
<td>4</td>
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<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Control of Machines and Processes</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Mechanical Engineering Technology</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Transport and Material Handling</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Energy Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>Mechanical Engineering</td>
<td>Robotics</td>
<td>4</td>
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</tbody>
</table>
Centre ENET is involved in the research and development of technologies for fuel transformation, especially of waste products and alternative fuels, into heat energy and electric power and their further effective use. The objective is the research and development of technology and energy units for treatment of both waste and other alternative fuels, intensification of transformation into heat energy and electric power with parallel ensuring of purity of combustion products, monitoring of quality and quantity of final products and monitoring of possibility of energy accumulation and parallel or serial cooperation of various resources.
related research topics

**Fuels and raw materials transformation**
- Modernized methods of energy excavation derived from biomass wastes and non-traditional fuels including high temperature raw material reduction
- Combustion, pyrolysis and gasification technologies and their modeling
- Anaerobic and aerobic processes, composting and landfiling
- Heat and mass transfer, heat storage
- Analytic and catalytic processes of non-traditional fuels
- Interpretation of energy and technological changes in the field of environment protection

**Accumulation and power balance management**
- Quality of electric power from non-traditional resources
- Reliability of electric power supplies from non-traditional resources
- Semiconductor power converter for non-traditional resources
- Hydrogen technologies for Smart Grids
- Accumulation of heat energy and electric power

**Treatment and transportation of bulk materials**
- Mechanical processes, production mechanisms and processes, transportation, storage
- Accredited laboratory for measurements of initial real parameters of bio-based materials
- The DEM method for the simulation of transportation, procedural and storage
- Optimization of constructions as concerns geometric shapes and construction materials of contact parts

**Diagnostics of energy sources**
- Verification and guarantee metering of boilers, turbines and related equipment
- Combustion tests, stability of combustion processes
- Boilers, mills and flue gases optimisation operation proposals
- Processes of separation of solid pollutants in combustion products from energy sources
- Research of the issue of the mercury concentration reduction from flue gases of fossil fuels

**RESULTS**

Research Area output: Publishing in high-impact journals + Intellectual property protection

- The European patent EP 2187225B1 Apparatus and method of detecting faults in medium voltage covered conductors
- The National patent 304329 Method and apparatus validation bucket elevator for modelling mechanical processes and method for modelling mechanical processes
- The National patent 304084 Method and apparatus for Wind Power Plant Control
- The National patent 304049 Construction into wet quenching towers coke
- Investigation of the effect of hygienization and moisture content of sewage sludge on pyrolysis products
- Characterization of organic matter released during analytical pyrolysis of PM10 samples obtained from biomass and oil combustion.

**RELATED STUDY PROGRAMMES**

Study programmes related to the research centre ENET are focused on mechanical energy engineering, electrical power engineering, particle size processes and materials for non-traditional energy sources.

**PhD Courses**
- Energy Machines and Facility
- Transport and Handling Equipment
- Electronics

- Electrical Power Engineering
- Electrical Machines, Apparatus and Drives

enet.vsb.cz/en
Innovation Support Centre (CPI) activity focuses on areas of the university project support, commercialization of R&D results including protection of intellectual property, business support and popularization of science and technology. Within these activities CPI cooperates with the Faculties and institutes of VŠB-TUO, other universities, research institutions and other organizations.

CPI successfully prepared the project for the National Supercomputer Centre IT4Innovations, is the main actor in supporting startups in the region, and coordinates the project Kids and Science to stimulate young students’ interest in technology.
Innovation Support Centre participates in more than 20 projects accounting to a sum of 30 million EUR.

Support of commercialization of new technologies in the fields of engineering, energy, materials research security and defense (e.g., the boiler for combustion of wet biomass, brake system for F1 racing cars, energy accumulation, decontamination technologies, coatings and nanocoatings for corrosion protection, etc.).

Within its popularization activities coordinated thousands of young science enthusiasts.

More than ten startup projects are developed annually.

ACTIVITIES

Activities of the Innovation Support Centre are divided into the four basic areas:

Project support in order to improve the preparation and implementation of university projects financed mainly from EU subsidies

Services provided:
- Information services
- Expert counselling and consultations
- Researchers mobility support (EURAXESS services)
- Project proposal preparation services
- Implementation of projects

Commercialization of R&D results to generate long-term revenue through their industry

Services provided:
- Methodological assistance to determine market need
- Verification of potential of the research knowledge for the commercialization and collaboration with a network of technology scouts
- Training of academics and researchers on protection of intellectual property rights
- Patents

Support innovative entrepreneurship through the Business Incubator

Services provided:
- Startup accelerator GREEN LIGHT
- Discounted leasing and services for startups in the Incubator
- Lectures and seminars focused on innovation and startup support (for example Apple Juice Meetings)

Coordination of popularization activities to foster interest in the study of technical subjects

Services provided:
- One week training for students aimed at development of technical creativity directly at schools
- Realization of popularization campaign Improve your Technique
- Courses of continuing education for academics
- Summer TechCamp with leisure activities and competitions

RESULTS

- Innovation Support Centre participates in more than 20 projects accounting to a sum of 30 million EUR
- Support of commercialization of new technologies in the fields of engineering, energy, materials research security and defense (e.g., the boiler for combustion of wet biomass, brake system for F1 racing cars, energy accumulation, decontamination technologies, coatings and nanocoatings for corrosion protection, etc.)
- Within its popularization activities coordinated thousands of young science enthusiasts
- More than ten startup projects are developed annually
Nanotechnology Centre (CNT) conducts R&D, analytical services for industry, and education at the bachelor’s, master’s and PhD levels. The equipment of CNT enables focus on tasks related to theoretical and computational chemistry, as well as preparation and properties testing of newly developed nanomaterials and composites. CNT is comprised of five departments:

- Department of Technology and Structure of Nanomaterials
- Department of Inorganic Analysis
- Department of Organic Analysis and Catalytic Processes
- Department of Bionanotechnology
- Department of Materials Testing
CNT provides education in the “Nanotechnology” study programme at the bachelor’s, master’s and doctoral levels. The study programme is focused on adopting theoretical knowledge from mathematics, physics and chemistry in order to enable students to prepare nanomaterials and evaluate their properties. State-of-the-art instruments and equipment for preparation and characterization of nanomaterials are available in the laboratories of the CNT. Theory is followed by practical exercises in laboratories. Mandatory components of student education include participation in research projects, as well as tasks originating from the commercial sector.

Nanotechnology – Bachelor, MSc., PhD program

**RELATED RESEARCH TOPICS**

- Magnetooptics, periodical structures, surface plasmon resonance, nanomagnetism, elmag theory, induced anisotropy, photonics crystals, new materials for anisotropic structures.
- Development, testing and characterization of friction composite materials for automotive brakes focused on eco-friendly materials.
- Nanomaterials and nanocomposites on the basis of clay minerals and nanocarbon, such as antibacterial nanocomposites with polymeric or ceramic matrix, polymeric nanocomposites with carbons for advanced batteries, nanocomposites for pigments and paints with advanced (e.g. photocatalytic) properties.
- Computer molecular modeling of nanostructures and intermolecular interactions.
- Physical and chemical characterization of materials and products, environmental analyses; design, preparation, characterization and testing of sorbents for removal of pollutants from the environment. Accreditation of laboratories according EN ISO/IEC 17025:2005.
- Chemical, microscopic and phase analysis of biological samples (tissues, body fluids) for detection and characterization of micro and nanosized particles.
- Biosynthesis of nanomaterials using microorganisms.

**ANALYTICAL SERVICE**

The CNT provides analytical service to other departments of VŠB - Technical University of Ostrava as well as for commercial partners. The quality system in laboratories of the CNT fulfills the requirements of quality management according to ČSN EN ISO/IEC 17 025:2005. Laboratories of the CNT provide inorganic, organic phase and structural analysis of various materials. The CNT has certificates for a number of test methods within the accreditation issued by ČIA (laboratory No. 1166).

**RESULTS**

Publications in high impact journal, national patents, international cooperation with academia and industry within EU, USA, Canada, Japan, and China.

**RELATED STUDY PROGRAMMES**

CNT provides education in the “Nanotechnology” study programme at the bachelor’s, master’s and doctoral levels. The study programme is focused on adopting theoretical knowledge from mathematics, physics and chemistry in order to enable students to prepare nanomaterials and evaluate their properties. State-of-the-art instruments and equipment for preparation and characterization of nanomaterials are available in the laboratories of the CNT. Theory is followed by practical exercises in laboratories. Mandatory components of student education include participation in research projects, as well as tasks originating from the commercial sector.

Nanotechnology – Bachelor, MSc., PhD program

www.cnt.vsb.cz
The mission of the Centre of Advanced Innovation Technologies (CAIT) at VŠB-Technical University of Ostrava is to carry out cutting-edge research and development based on long-term partnerships with a range of industrial companies, in order to drive innovation and technology transfer in the materials and mechanical engineering sectors. CAIT is involved in numerous R&D projects, working in close connection with other University departments as well as with research-focused workplaces and institutes throughout the Czech Republic and abroad. CAIT also plays an active role as an education provider at both the undergraduate and post-graduate levels.
The Structural Integrity and Materials Design Laboratory (SIMD) specializes in studying the mechanical behaviour of structures and analyzing the factors causing degradation processes in structural materials. The Laboratory is equipped with a set of testing machines used for determining strength and local mechanical characteristics. Tests can be carried out on miniature samples or on real-size structural components. The Laboratory can determine micro- and nano-hardness in localized samples of material as well as performing standard hardness tests. Resistance to crack propagation in structural components under real stress conditions is determined via toughness tests applying quasi-static and dynamic loading. Stress deformation and toughness characteristics are utilized to calculate the operational lifespan of structures subjected to extreme high or low temperatures, high-speed dynamic impact, or time-variable loading. Microstructural factors in material damage are studied using optical, confocal or electron scanning microscopy. The Laboratory draws up expert reports identifying the causes of damage to structures and structural components, including proposals enabling lifespan extension and safety improvements.

The Experimental Noise Research Laboratory (EHAKL) tests heating and cooling equipment and structural components. It is equipped with air-conditioned chambers incorporating technology which simulates air throughflow, enabling precise control of temperature and humidity. Tests are carried out to evaluate the functionality of products operating under limit conditions. The acoustic characteristics of structural components – primarily acoustic pressure, intensity and power – are tested in a semi-anechoic chamber equipped with acoustic sensors, measuring microphones and a sound intensity probe. The laboratory also has an experimental centre for vibration testing. Dynamic excitation in specimens can be induced by periodical or randomly timed mechanical signals. Vibration testing can include measurements of all standard kinematic parameters and noise measurements. Laboratory measurement results are used to optimize the acoustic design of products and to design acoustic workplaces to individual technical specifications. Noise and vibration measurements can be performed either at the laboratory or on-site, under real operating conditions.

**RESULTS**

**Research Area output : Publishing in high-impact journals**


**COOPERATION WITH INDUSTRIAL PARTNERS**

- Bonatrans Group, a.s.
- Vítkovice UAM a.s.
- Huisman Konstrukce s.r.o.
- Doosan Bobcat Engineering s.r.o.
- TK Profitech, v.o.s.
- TALPA-RPF, s.r.o.

www.cpit.cz
RESEARCH CENTRE

IET - INSTITUTE OF ENVIRONMENTAL TECHNOLOGY

IET conducts basic and applied research in the field of waste energy recovery including the disposal or processing of formed gaseous, liquid and solid products and evaluation of the impact of these technologies on the environment. An important task of IET is also to increase the proportion of students in research and innovation organized by the University, to improve the level of professional preparation of future R&D workers, improve the ability of graduates to use advanced technologies (BAT) and to apply the latest results of science into practice.
RELATED RESEARCH TOPICS

Energy Recovery of Waste

Research of waste incineration
- Continuous combustion furnace, system for flue gas cleaning, continuous measurement of flue gas
- Increasing the efficiency of the combustion process
- Research of waste incineration with specific parameters

Research of reduction and plasma processes for waste processing
- Optimization of the pyrolysis process (continuous and batch)
- Research and use of combined processes (reduction and plasma) and catalysis for enrichment of low calorific gases from other waste treatment processes
- Research of the conditions for using plasma for direct treatment of hazardous gaseous waste

Research of anaerobic biotechnological processes
- (Co)fermentation, wet or dry, in different scales (continuous/batch)
- Determination of the yield of biogas/methane in the specific process conditions
- Analysis of biogas
- Analysis of digestate

Waste and fuel analysis
- Determination of moisture contents, volatile matter, fixed carbon and ash in solid and liquid samples
- Determination of elemental composition of solid samples
- Calculation of net calorific value of solid samples

Protection of air and water, processing of solid residua

Research of cleaning of waste gases
- Catalysts in different scale for off gas cleaning (N₂O, NOx, VOC etc.)
- Adsorption of gases and vapors
- Powder and thin film photocatalysts for reactions in gaseous and liquid phase
- Conventional and non-conventional preparation of heterogeneous catalysts

Research of material utilization of solid residues
- Material utilization of solid waste
- Shaping of solid powder waste from steel production and utilization of color scale for preparation of coloring pigments

Research of waste water cleaning
- Analysis of waste waters mainly from scrubbing, waste treatment and thermic processes
- Basic inorganic analysis of aqueous solutions, aqueous extracts and solid matrices
- Chemical analysis of surface and waste water, including the optically dense suspensions
- Reduction of cyanides in waste waters

Research of pollution transfer
- Research using mathematical modeling of environmental phenomena and processes
- Pollutant transport and dispersion in the environment
- Measurements of air quality in the ground layer of the atmosphere up to 1000 m above sea level

RESULTS

Research Area output: Publishing in high-impact journals + Intellectual property protection
- Patent No. 300807 - Oxidic catalyst for N₂O abatement from waste industry gases
- Patent applicat. No. 1070 - Catalyst for N₂O abatement from waste gases and the method for its production
- Verified technology No. 005/25-02-2014_OT - Technological parameters of N₂O decomposition process on catalyst containing Co, Mn and Al and modified by potassium
- Operative mock-up No. 015/25-02-2014_F - Catalyst for N₂O removal containing Co, Mn and Al and modified by cesium
- Operative mock-up No. 100/24-11-2014_F - Mobile anaerobic bioreactor CERNIN MAB
- Operative mock-up No.095/19-112014_F - Preparation of glazes based on the agglomeration dusts
- Certified methodics No. CM -14-014 - Determination of volume stability of waste compound based on oxidic systems

RELATED STUDY PROGRAMMES

ICT is involved in the research and development of technologies for effective ways of obtaining raw materials that would have minimal impact on the environment. ICT is unique in Czech Republic researching problems in the area of extraction and utilization of energy resources and further exploitation of the geological environment.
RELATED RESEARCH TOPICS

Research priorities and objectives
- Research on methods of obtaining raw materials with minimal environmental impact
- Research on extraction and utilization of energy resources and further exploitation of the geological environment
- Sustainable development and maximum self-sufficiency in raw materials

RESEARCH PROGRAMMES

Multiphase rock environment
- Determination of mode of failure of geomaterials depending upon their internal structure, type of loading and physical conditions
- Utilization of mineral raw materials and waste for the production of modified clays and geopolymers with application in the construction industry using best available environmental technologies
- Identification of the origin of a gas in the rock environment and its use to increase the recovery of deposits

Environmentally friendly technologies
- Intensification of effects of high-velocity water jets in the course of disintegration
- Research phenomena in disperse systems and the application of membrane processes for water treatment and purification of mining and post-mining activities
- Development-induced stress and strain fields in underground rock mass usage
- Safety aspects of environmentally friendly technologies connected with the mining of mineral raw materials from the point of view of explosibility, combustibility, spontaneous combustibility and mine air conditioning

RESULTS

Research Area output: Publishing in high-impact journals + Intellectual property protection
- 1 Protected R&D results (according to R&D Council methodology)
- 177 Scientific publications (according to R&D Council methodology)
- 71 Applied research results (according to R&D Council methodology)

RELATED STUDY PROGRAMMES

Students of master’s and doctoral programs are involved in ICT through use of the created infrastructure centers in thesis or dissertation work, or through other activities such as work on grants.

PhD Courses
- Engineering Ecology
- Geological Engineering
- Mineral Resources
- Environmental Protection in Industry
- Mechanical Engineering
- Civil Engineering
- Physics
- Geodesy and Cartography

ict.hgf.vsb.cz/en
The ERC is an education and research institute focusing on combustion and gasification of solid fuels - especially biomass. The general objective of the centre is modernisation of energy devices, efficiency improvement of transformation processes and environmental protection. The ERC is also involved in identifying and solving problems related to the safety of production, storage, transport and the use of fuels, including non-traditional fuel, combined or prepared from waste or renewable sources. The Centre furthermore engages in commercial services in the design of power engineering equipment and consultancy on energy saving measures for industry.
**ACTIVITIES**

**Research and development**
- Research on the combustion process
- Efficiency improvement of the energy transformation processes
- Reduction of environmental impacts resulting from combustion of solid fuels
- Providing expertise in the use of biomass for production of electric power and heat
- Experimental investigation of gasification in a fixed bed autothermal reactor
- Design and innovations of gas purification systems
- Production of second-generation liquid biofuels by use of the Fischer-Tropsch process
- Identification of emerging risks in the field of alternative fuels
- Classification and governance of risks related to hazardous chemical substances
- Evaluation of thermokinetic properties of pulverised coal in a drop tube
- Testing of a separation technology for a zero emission steam cycle
- Design and verification of primary and secondary measures for reduction of NOx emissions
- Determination of lower explosive limits for gases and dusts in a 1000l autoclave
- Formation of nanoparticles in industry and transport

**Commercial activities**
- Energy audits and assessments
- Preparation of technical and economic feasibility studies
- Thermography measurements, analysis and data interpretation
- Inspections of air conditioners, boilers and hot water supply
- Implementation of an energy management system
- Cost-cutting measures and optimization of transformation processes
- Proficiency Testing – PM determination
- Notified Body n. 2078 – Heating Appliances for Solid Fuels
- Monitoring, recording and reporting of CHP units
- Monitoring and reporting of photovoltaic power stations from a dispatching centre
- Providing complete design services in the energy sector
- Author’s supervision
- Analysis of the current state of energy infrastructure
- Proposals of new conceptual solutions
- Performance of energy and economic calculations
- Risk assessment of investment projects

**RESULTS**

**Research Area output : Publishing in impact journals + Intellectual property protection**
- National patent 25851 Automatic condensation boiler for combustion of high moisture biomass
- National patent 304091 The method of gas production from at least partially gasifiable solid material and the equipment for implementation of this method
- Fine particle emissions from combustion of wood and lignite in small furnaces
- Analysis of gas purification technology from biomass gasification based on work of ceramic filter
- Experimental investigation of the heat transfer in a feedwater preheater for the decarbonizing steam generator

**EDUCATION**

The ERC participates in teaching students in bachelor’s and master’s degree programmes at Faculty of Mechanical Engineering. Lectures on a topic of combustion and combustion devices are conducted by senior researchers whereas exercises and seminars are organised by postdoctoral researchers.

The ERC also organizes an educational show “Smokeman in action” for children and adults in order to instruct the public in proper combustion practices in local heating.

[vec.vsb.cz/en]
The Regional Materials Science and Technology Centre was founded in 2010 based on a collaborative effort between VŠB – Technical University of Ostrava and MATERIAL AND METALLURGICAL RESEARCH Ltd.

- The Centre is focused on the preparation of highly pure materials, special alloys, biomedical materials, development of materials for high temperature applications and power engineering
- Preparation of materials by advanced powder metallurgy technologies (magnetic materials, friction materials, composite materials, etc.)
- Preparation of nanocrystalline materials based on non-ferrous metals, their alloys and steels prepared by severe plastic deformation, research of processes running in the liquid phase of reactors that affect the utility properties of materials
- Physical and mathematical modelling of processes materials forming, including forging
- Physical and mathematical modelling of processes during treatment of molten steel and casting of steel
- Application of the obtained findings in research and development of technology of forming the components for nuclear power engineering equipment.

The complexity of technological solutions of material-technological issues is further deepened by investigation of degradation processes of materials caused by corrosion, high temperatures, stress states and embrittlement due to the hydrogen effects, and their impact on degradation mechanism and safety at operational applications.
RELATED RESEARCH TOPICS

Research and development
- Development and optimisation of new technologies of highly pure materials, special metallic alloys and intermetallic compounds with defined structures and physical properties for applications in electronics, medicine, mechanical engineering and chemical industry.
- Development and optimisation of processes of powder technologies for production of selected types of materials and products.
- Control of specific properties of intensively rolled and thermo-mechanically processed materials using their structural potential.
- New sources of strength and toughness of materials for demanding technological applications.
- Research of metallic materials with ultrafine-grained structure (nanostructure), and development of processes for their preparation.
- Experimental verification of new technological procedures for metallic materials with high quality parameters.

RESULTS

Between 2010-14: 5 patents, 50 applied research results and 250 impact articles.

www.rmtvc.cz/en
IT4Innovations National Supercomputing Center provides state-of-the-art technologies and services in the fields of high performance computing and embedded systems and makes them available to Czech and foreign research teams from the academic and industrial sectors for a wide variety of engineering and R&D applications. The SALOMON supercomputer, with a theoretical computing performance of 2 PFLOPS, will be one of the 100 most powerful supercomputers in the world.
RELATED RESEARCH TOPICS

Research Programmes
• Disaster and Traffic management: decision support in disaster management; flood, fire and pollution modelling, traffic monitoring and simulation
• Numerical modelling for Engineering: development of efficient mathematical methods
• HPC Libraries and Supercomputing for Industry: scalable algorithms for the automotive, aerospace and energy industries
• Modelling for Nanotechnologies
• Knowledge management: research in areas of bioinformatics and intelligent networks

Supercomputing services
Member of the pan-European research infrastructure PRACE (Partnership of advanced computing in Europe).

Portfolio of provided services include provisioning of computing resources, code enabling and optimization and training.

European research groups use the supercomputer to simulate enzymatic reactions, design new drugs, analyze the problems in automotive and aircraft industries, etc.

RESULTS

Research outputs
• Scalable algorithms and libraries for the solution of extremely large scientific and industrial problems
• viaRODOS system for monitoring and control traffic in the Czech Republic
• FLOREON+ platform for monitoring, modelling and prediction of crisis situations
• Use of unconventional algorithms in astroinformatics and big data
• Basic and applied research projects with Czech and EU projects
• International research projects with Germany, Belgium, France, Denmark, U.S., Vietnam, Finland and others
• Publications in high impact scientific journals
• Intellectual property protection

RELATED STUDY PROGRAMMES

• Supercomputing – High Performance Computing

www.rmtvc.cz/en