# Faculty of Mechanical Engineering

# ANNUAL REPORT 2018

# OBSAH


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# INTRODUCTION

# 1 INTRODUCTION

The Faculty of Mechanical Engineering is the oldest Faculty of the Liberec University. In 2018, it celebrated its 65th anniversary. The Faculty of Mechanical Engineering has always fulfilled the goals, visions and tasks that have been imposed on it not only by the state, but also by the Technical University of Liberec. The Faculty of Mechanical Engineering has always strived for its development and related to it the development of the university. The Faculty is an integral part of this university and since it was established it has always been responsible for the development of the university as a whole, although this has sometimes led to a weakening of the Faculty in terms of individual activities or in terms of personnel, space, research.

The Annual Report on the Faculty of Mechanical Engineering of the TU Liberec for 2018 provides information on the Faculty, pedagogical activities, scientific research and creative activities, international cooperation, partnership and internationalization and presents information on the fulfilment of the Strategic Plan of Educational, Scientific, Research, Development, Artistic and other creative activities of the Faculty of Mechanical Engineering of the Technical University of Liberec for the period 2016–2020 and its Implementation Plan for 2018.

For the development and sustainability of the Faculty, it is necessary that every Faculty employee performs quality, responsible and competitive activities for the benefit of the Faculty. At present, the Faculty of Mechanical Engineering must also make maximum use of internal (academic community, inter-Faculty cooperation) and external (international creative activity, industrial practice) cooperation for its development. All those activities should be based on sufficient knowledge and competence of the Faculty's academic staff, on the development of personalities and teams and on the willingness to work for the benefit of the Faculty.

This is also the reason why I would like to thank all members of the academic community and other Faculty employees for the fact that by their work they not only contribute to the good results and position of the Faculty and the University on a national and international scale, but also to the development of the Faculty in all three areas of activity.

*prof. Dr. Ing. Petr Lenfeld*
*Dean*
*Faculty of Mechanical Engineering TUL*

# FACULTY STRUCTURE

# 2 FACULTY STRUCTURE

In December 2017, the Dean of the Faculty of Mechanical Engineering TUL was being elected for the term of office 2018–2022. For the term of office from 1 February 2018 to 31 January 2022, prof. Dr. Ing. Petr Lenfeld was elected to his second term of office.

## 2.1 Faculty Bodies

| Faculty Bodies | Members |
|---|---|
| **Dean** | prof. Dr. Ing. Petr Lenfeld |
| **Head of Dean's Office** | Ing. Anna Benešová |
| **Academic Senate of the Faculty of Mechanical Engineering TU in Liberec** from 30.6.2017 | |
| Chair | prof. Ing. Iva Nová, CSc. |
| Vice-Chair for the Chamber of Academics. | Ing. Aleš Lufinka, Ph.D. |
| Vice-Chair for the Chamber of Students | Ing. Tomáš Kořínek |
| Secretary - member of the Academic Senate | Assoc. prof. Ing. Jiří Machuta, Ph.D. – till 23.10.2018 |
| Members of the Chamber of Academic Staff | prof. Ing. Jaroslav Beran, CSc. |
| | Ing. Luboš Běhálek, Ph.D. |
| | Ing. Martin Lachman, Ph.D. |
| | Ing. Rudolf Martonka, Ph.D. |
| | Assoc. prof. Ing. Lubomír Moc, CSc. |
| | Assoc. prof. Ing. Jaromír Moravec, Ph.D. |
| | Assoc. prof. Ing. Pavel Solfronk, Ph.D. |
| | prof. Ing. Ladislav Ševčík, CSc. |
| | Ing. Petr Zelený, Ph.D. |
| Members of the Chamber of Students | Jan Bayer |
| | Ing. Ondřej Baťka |
| | Ing. Martin Borůvka |
| | Ing. Petr Kulhavý |
| | Ing. Pavel Srb |
| Delegate for AS FS TUL for participation in meetings of AS TUL | Assoc. prof. Ing. Lubomír Moc, CSc. |
| **FS TUL representative of the Higher Education Council** | Ing. Rudolf Martonka, Ph.D. |
| **Academic Senate TU Liberec** | from 30.6.2017 |
| Academic representatives for FS TUL | prof. Ing. Jaroslav Beran, CSc. |
| | Ing. Vlastimil Hotař, Ph.D. |
| Student representative for FS TUL | Ing. Petr Kulhavý |
| **Scientific Board of the Faculty of Mechanical Engineering TU in Liberec** | from 9.4.2014 till 8.2.2018 |
| Chair | prof. Dr. Ing. Petr Lenfeld |
| Members from TUL | Assoc. prof. Ing. Martin Bílek, Ph.D. |
| | prof. Ing. Jaroslav Beran, CSc. |
| | Assoc. prof. Ing. Karel Fraňa, Ph.D. |
| | Assoc. prof. Ing. Josef Janeček, CSc. |
| | prof. RNDr. David Lukáš, CSc. |
| | prof. Ing. Petr Louda, CSc. |
| | Assoc. prof. Ing. Miroslav Malý, CSc. |
| | Ing. Ivo Matoušek, Ph.D. |
| | prof. Ing. Iva Nová, CSc. |
| | prof. Ing. Miroslav Olehla, CSc. |
| | prof. Ing. Lubomír Pešík, CSc. |
| | Assoc. prof. Ing. Iva Petríková, Ph.D. |
| | Assoc. prof. Ing. Ludvík Prášil, CSc. |
| | prof. Ing. Jan Skalla, CSc. |
| External members | |
| UP DFJP Pardubice | Assoc. prof. Ing. Ivo Drahotský, Ph.D. |

| | |
|---|---|
| FJFI ČVUT Praha | prof. Ing. Nikolaj Ganev, CSc. |
| FS ČVUT Praha | prof. Ing. Stanislav Holý, CSc. |
| FAV ZČU v Plzni | prof. ing. Vladislav Laš, CSc. |
| FT UTB ve Zlíně | Assoc. prof. Ing. David Maňas, Ph.D. |
| ÚT AV ČR, v. v. i. Praha | prof. Ing. František Maršík, DrSc. |
| Magna Exteriors (Bohemia), s.r.o., Liberec | Ing. Pavel Neumann |
| FS VŠB-TU Ostrava | prof. Ing. Petr Noskievič, CSc. |
| SjF STU Bratislava | Assoc. prof. Ing. František Palčák, CSc. |
| ÚT AV ČR, v. v. i. Praha | prof. Ing. Jaromír Příhoda, CSc. |
| profesor emeritus | prof. Ing. Jaroslav Purmenský, DrSc. |
| profesor emeritus | prof. RNDr. Miroslav Raab, CSc. |
| FSI VUT v Brně | Assoc. prof. Ing. Pavel Rumíšek, CSc. |
| FS ČVUT v Praze | prof. Ing. Milan Růžička, CSc. |
| Rieter CZ, s.r.o. | Assoc. prof. Ing. Jiří Sloupenský, CSc. |
| FS ČVUT v Praze | prof. RNDr. Petr Špatenka, CSc. |
| ČEZ, a.s., Jaderná elektrárna Temelín | Ing. Pavel Šimák |
| Benteler ČR, s.r.o. | Assoc. prof. Ing. Jiří Vejvoda, CSc. |

**Scientific Board of the Faculty of Mechanical Engineering TU in Liberec**

| | |
|---|---|
| | from 9.2.2018–2022 |
| Chair | prof. Dr. Ing. Petr Lenfeld |
| Members from TUL | prof. Ing. Jaroslav Beran, CSc. |
| | Assoc. prof. Ing. Martin Bílek, Ph.D. |
| | Assoc. prof. Ing. Karel Fraňa, Ph.D. |
| | Assoc. prof. Ing. Josef Janeček, CSc. |
| | Assoc. prof. Ing. Dora Kroisová, Ph.D. |
| | prof. RNDr. David Lukáš, CSc. |
| | prof. Ing. Petr Louda, CSc. |
| | Assoc. prof. Ing. Miroslav Malý, CSc. |
| | prof. Dr. Ing. Pavel Němeček |
| | prof. Ing. Iva Nová, CSc. |
| | prof. Ing. Miroslav Olehla, CSc., do 2.10.2018 |
| | prof. Ing. Lubomír Pešík, CSc. |
| | Assoc. prof. Ing. Iva Petríková, Ph.D. |
| | prof. RNDr. Jan Picek, CSc. |
| | prof. Ing. Zdeněk Plíva, CSc. |
| | Assoc. prof. Ing. Ludvík Prášil, CSc. |
| External members | |
| UP DFJP Pardubice | Assoc. prof. Ing. Ivo Drahotský, Ph.D. |
| FJFI ČVUT Praha | prof. Ing. Nikolaj Ganev, CSc. |
| FS ČVUT Praha | prof. Ing. Stanislav Holý, CSc. |
| FAV ZČU v Plzni | prof. Ing. Vladislav Laš, CSc. |
| UO FVT Brno | plk. prof. Ing. Martin Macko, CSc., |
| FS VŠB-TU Ostrava | prof. Ing. Petr Noskievič, CSc. |
| SjF STU Bratislava | Assoc. prof. Ing. František Palčák, CSc. |
| ÚT AV ČR, v. v. i. Praha | prof. Ing. Jaromír Příhoda, CSc. |
| profesor emeritus | prof. Ing. Jaroslav Purmenský, DrSc. |
| profesor emeritus | prof. RNDr. Miroslav Raab, CSc. |
| FSI VUT v Brně | Assoc. prof. Ing. Pavel Rumíšek, CSc. |
| FS ČVUT v Praze | prof. Ing. Milan Růžička, CSc. |
| Rieter CZ, s.r.o. | Assoc. prof. Ing. Jiří Sloupenský, CSc. |
| FS ČVUT v Praze | prof. RNDr. Petr Špatenka, CSc. |
| ČEZ, a.s., Jaderná elektrárna Temelín | Ing. Pavel Šimák |
| Benteler ČR, s.r.o. | Assoc. prof. Ing. Jiří Vejvoda, CSc. |

**Disciplinary Committee**

| | |
|---|---|
| Chair | Assoc. prof. Ing. Václav Dvořák, Ph.D. |
| Members | Assoc. prof. Ing. Martin Bílek, Ph.D. |
| | Ing. Jan Hujer – till 28.2.2018 |

| | |
|---|---|
| | Ing. Petr Kulhavý – till 28.2.2018 |
| | Ing. Martina Češková – from 1.3.2018 |
| | Ing. Martin Ďurák – from 1.3.2018 |

**Committee for Economic Affairs**

| | |
|---|---|
| Chair | Ing. Anna Benešová, Head of Dean's Office |
| Members | Ing. Luboš Běhálek, Ph.D. |
| | Assoc. prof. Ing. Martin Bílek, Ph.D. |
| | Assoc. prof. Ing. Lubomír Moc, CSc. |
| | prof. Dr. Ing. Pavel Němeček |
| | Ing. Jitka Havlíková |

**Industrial Board** – representatives of companies
AGC Automotive Czech a.s., Bílina, Chudeřice; Benteler ČR s.r.o., Chrastava; BOS Automotive Products CZ s.r.o., Klášterec nad Ohří; Continental Automotive Czech Republic s.r.o., Jičín; EDAG Engineering CZ spol. s r.o., Mladá Boleslav; Faurecia Emissions Control Technologies, Mladá Boleslav, s.r.o., Mladá Boleslav; Foxconn CZ s.r.o., Pardubice; GDK, spol. s.r.o., Kolová; Grupo Antolin Turnov s.r.o., Turnov; Kamax, s.r.o., Turnov; KOH-I-NOOR PONAS s.r.o., Polička; KSM Castings a.s., Hrádek nad Nisou; Magna Exteriors & Interiors(Bohemia), s.r.o., Liberec; Preciosa a.s., Jablonec nad Nisou; Rieter CZ s.r.o.; Ústí nad Orlicí; Škoda Auto a.s.; Mladá Boleslav; TOS Varnsdorf a.s., Varnsdorf; TRW Automotive Czech, s.r.o., Jablonec nad Nisou.

**Concept and quality of the Faculty of Mechanical Engineering TU in Liberec activities**
Dean's advisory working group

| | |
|---|---|
| Chair | prof. Dr. Ing. Petr Lenfeld |
| Members | Assoc. prof. Ing. Václav Dvořák, Ph.D. |
| | Assoc. prof. Ing. Štěpánka Dvořáčková, Ph.D. |
| | Ing. Vlastimil Hotař, Ph.D. |
| | Assoc. prof. Ing. Petr Lepšík, Ph.D. |
| | Assoc. prof. Ing. Jaromír Moravec, Ph.D. |
| | Ing. Petr Zelený, Ph.D. |
| | Assoc. prof. Ing. Pavel Solfronk, Ph.D. |
| | Ing. Adam Hotař, Ph.D. |
| | Ing. Jan Valtera, Ph.D. |
| | Mgr. Radka Dvořáková |
| | RNDr. Iveta Lukášová |

## 2.2 Faculty Structure

The Faculty is organizationally divided into the Dean's Office, the Study Department and ten departments.

| Organizational unit | Members |
|---|---|
| **Dean's office till** 28.2.2018 | |
| Dean | prof. Dr. Ing. Petr Lenfeld |
| Vice-Dean for Doctoral Studies and Development | Assoc. prof. Ing. Martin Bílek, Ph.D. |
| Vice-Dean for Education and Student's Affairs | Ing. Ivo Matoušek, Ph.D. |
| Vice-Dean for International and Public Relations | prof. Ing. Karel Fraňa, Ph.D. |
| Head of Dean's Office | Ing. Anna Benešová |
| Dean's Secretary | Pavla Kholová |
| **Dean's office from** 1.3.2018 | |
| Dean | prof. Dr. Ing. Petr Lenfeld |
| Vice-dean for Science, Research and Cooperation with Indrustry | prof. Dr. Ing. Pavel Němeček |
| Vice-Dean for Doctoral Studies and Development | Assoc. prof. Ing. Martin Bílek, Ph.D. |
| Vice-Dean for Education and Student's Affairs | Assoc. prof. Ing. Dora Kroisová, Ph.D. |

| | |
|---|---|
| Vice-Dean for International and Public Relations | prof. Ing. Karel Fraňa, Ph.D. |
| Head of Dean's Office | Ing. Anna Benešová |
| Dean's Secretary | Pavla Kholová |

**Department of development and projects**

| | |
|---|---|
| Development and projects manager | RNDr. Iveta Lukášová |
| Financial manager | Ing. Tomáš Kysilka |
| OP projects adminmistrator | Ing. Zuzana Horčičková |

**Study Department**

| | |
|---|---|
| Head of the Study department | Mgr. Radka Dvořáková |
| Study department officcer | Ing. Mgr. Dana Semotjuková |
| International relations | Ing. Marcela Válková |

**Departments**

| | |
|---|---|
| Department of Applied Mechanics / DAM | Assoc. prof. Ing. Iva Petríková, Ph.D. |
| Department of Engineering Technology / DET | Assoc. prof. Ing. Jaromír Moravec, Ph.D. |
| Department of Material Science / DMS | prof. Ing. Petr Louda, CSc. |
| Department of Power Engineering Equipment / DPE | Assoc. prof. Ing. Václav Dvořák, Ph.D. |
| Department of the Design of Machine Elements and Mechanism / DMM | prof. Ing. Ladislav Ševčík, CSc. |
| Department of Machining and Assembly / DMA | Assoc. prof. Ing. Jan Jersák, CSc. |
| Department of Vehicles and Engines / DVE | Ing. Robert Voženílek, Ph.D. |
| Department of Glass Producing Machines and Robotics / DGR | Assoc. prof. Ing. František Novotný, CSc. |
| Department of Textile Machine Design / DTD | prof. Ing. Jaroslav Beran, CSc. |
| Department of Manufacturing Systems and Automation / DMA | Ing. Petr Zelený, Ph.D. |

## 2.3 Personnel Structure of the Faculty

In 2018, a total of 148 employees (115.9 FTEs) were working at FS TUL, of which 104 were academics (77.8 FTEs). The total number of teachers decreased year-on-year by 2.55 FTE.

Teaching in Bachelor's, Master's and Doctoral degree programs was provided mainly by 20 internal professors and 27 associate professors in the position of study subjects guarantors, tutors, lecturers and supervisors of final student theses. 51 senior lecturers and 8 lecturers were also involved in the fulfilment of the pedagogical tasks.

See annexed tables 2.3.

## 2.4 Procedures to the Appointment of a Professor and Associate Professor

In 2018, one professor and one associate professor were appointed, both procedures commenced in 2018. In 2018 another procedure for the appointment of a professor and one procedure for the appointment of Associate professor were commenced.

See text appendix 2.4.

# EDUCATIONAL ACTIVITY

# 3 EDUCATIONAL ACTIVITIES

The Faculty carries out and guarantees the professional level of all three types of study programs.

## 3.1 Accredited Degree Programs and Fields

The Faculty guarantees instruction in 6 degree programs that are finishing. All programs are accredited both in Czech and English, in full-time and part-time form of study.

In 2018, new study programs were approved by the National Accreditation Office: 6 DSP (3 CZ, 3 AN), 2 NMSP (1 CZ + 1 AN) and 2 BSP (1 CZ + 1 AN).

Overview is provided in table annex 3.1

## 3.2 Offer of Degree Programmes in English

- In 2018, the Faculty of Mechanical Engineering offered studies in English in the follow-up Master's degree program in full-time form and in all doctoral degree programs.
- Teaching in English also took place in the short-term ERASMUS +, CEEPUS, IAESTE and IP TUL programs in all study programs. See Chapter 5 below for details.

## 3.3 Interest in Studies and Admission Procedures

651 applicants showed interest in studying at the Faculty of Mechanical Engineering (compared to 2017, it is by 39 applicants fewer). Of the total number of applicants, 398 students enrolled, i.e. approximately 61% (compared to 64% in 2017). 823 students enrolled in all years of study in the academic year 2018/19 (i.e. by 34 students leww than in 2017).

The structure of students does not change, the proportion of students in individual types of studies remains approximately the same. The Bachelor's program, 65% of the students are enrilled, in Master's programs it is approximately 24%, and in doctoral programs 11% of the total number of students are enrolled.

**BSP (Bachelor's Study program)** 463 applicants, 310 enrolled. Approximately 50% of students enrolled in the first year of Bachelor's studies are from secondary technical schools and 15% from grammar schools. The remaining students of the 1st year of BSP are from other secondary schools, including foreign secondary schools.

**MSP (Master's Study Program)** The admission procedure for 2018/19 was not open.

**NMSP (Follow-up Master's Study Program)** 161 applicants, 73 enrolled. Of these, 94 applied and 17 enrolled in an English-language program. 83% of the applicants enrolled in the Czech program were graduates of the Bachelor's study program at the Faculty of Mechanical Engineering, while the others were graduates of other mechanical faculties.

**DSP (PhD Programs)** 27 applicants, 15 enrolled. Eight enrolled applicants were graduates of the Faculty of Mechanical Engineering TUL, while the others had completed their previous degree at another Czech university or abroad.

## 3.4 Numbers of Students and Graduates

The number of unsuccessful students during the first year of studies is still high, especially in the Bachelor's degree program. Students are admitted according to their study results at secondary school.

During the first year of studies in the academic year 2017/18, 165 BSP students and 14 NMSP students finished their studies unsuccessfully. The average duration of studies that lead to graduation exceeds the standard length of study.

**BSP**
In the academic year 2018/2019, 537 students were enrolled (of which 438 in full-time study and 99 in part-time-study form). The share of BSP graduates decreased compared to 2017. In 2018, 45 students successfully completed their studies (33 % of the total number of graduates, in 2017 it was 42 %). The average duration of BSP graduates in 2018 was 4.78 years.

**(N)MSP**
In the academic year 2018/2019, 200 students were enrolled (129 in full-time study and 71 in part-time study form). In 2018, 78 students successfully completed their studies (58% of the total number of graduates – in 2017 is was 49%). The average length of study of NMSP graduates was 2.32 years.

**DSP**
86 students enrolled to studies in the academic year 2018/2019 (of which 44 in full-time study and 42 in part-time study). In 2018, 12 students successfully completed their studies (9 % of the total number of graduates). The average length of study for graduates was 8 years.

## 3.5 Credit System and Study Evaluation

For the evaluation of the course of studies in Bachelor's and follow-upMaster's degree programs, the credit system ECTS (European Credit Transfer System) is used.

Bilingual Diploma Supplement, supported by consistent use of the credit system, has been automatically received by each TUL graduate since 2005 as a supplement to his/her diploma.

For successful completion of the studies in 2016 it was required to obtain:

- 180 credits in BSP.
- 120 credits in NMSP.
- 300 credits in MSP (five-year).

## 3.6 Scholarships

Scholarships paid in 2018 were awarded in accordance with the Scholarship Regulations of the Faculty of Mechanical Engineering TUL and in accordance with the valid directives of the Dean of the Faculty of Mechanical Engineering.

- In total, scholarships were paid out to 821 students.
- The total amount of scholarships paid was CZK 10.95 million.
- The amount of scholarships paid in 2018 increased by CZK 1 million compared to 2017.

**Preciosa Foundation Jablonec nad Nisou Scholarship**
A total of 7 students of the Faculty of Mechanical Engineering received scholarships amounting to 36,000 CZK.

## 3.7 The Students' Creative Activity

**Follow-up studies**

**Prize of the Governor of the Liberec Region**
Ing. Jan Hušek
Branch: Engineering Technology and Materials
Thesis topic: Production and verification of a prototype of a two-component part for A-pillar gap sealing

**Preciosa Foundation Award**
Ing. Jakub Taich
Branch: Machines and Equipment Design
Theme DP: Design of compact DLP 3D printer

**FS TUL Dean's Award**
Ing. Ashraf Salem
Branch: Machines and Equipment Design

Thesis topic: Experimental and numerical investigation of metal sheets for automotive
Ing. Radka Jírová
Branch: Innovation Engineering
Thesis topic: Innovation of a golf cart design to improve driving comfort

**Graduated with Honours**
Ing. Brych Petr
Ing. Friš Daniel
Ing. Gracl Filip
Ing. Charvát Lukáš
Ing. Jírová Radka
Ing. Macháček Jakub
Ing. Malý Vratislav
Ing. Řeřuchová Ivana
Ing. Salem Shebab Ashraf
Ing. Seidel Filip
Ing. Soni Rakeshkumar Durgashankar
Ing. Stehlík Michal
Ing. Svobodová Jana
Ing. Šmrhová Lenka
Ing. Taich Jakub
Ing. Vaníček Daniel

**Bachelor's Studies**
**Dean's Award**
Bc. Michaela Štípková – Branch: Mechanical Engineering
BP topic: Influence of aging time on mechanical properties of AW 2024 Aluminium alloy

**Graduated with Honours**
Bc. Rydlo Josef
Bc. Vomáčko Václav

**Prototype of the new vibro-insulated seating of the golf cart seat**
Radla Jírová, a student of the Faculty of Mechanical Engineering, proposed a simple construction solution, which is currently under patent procedure. She won the poster section at the prestigious international conference EAN 2018 held in Harrachov.

**Student Grant Competition at the Faculty**
Within the student grant competition, 20 projects amounting to the total volume of CZK 6.3 million were being solved. See table in annex 4.5 for an overview.

**Student Scientific and Professional Activities of SVOČ 2018**
The ninth annual competition to encourage talented students in Bachelor's, Master's and PhD study branches was organized by the Faculty of Textile Engineering, Mechanical Engineering, Mechatronics, Informatics and Interdisciplinary Studies and the Faculty of Economics. The aim of the competition is to support creative types of students who have the prerequisites for scientific and development activities at TUL technical faculties. 54 students participated in the competition, including 15 students from the Faculty of Mechanical Engineering. The event was supported by IP TUL 2018.

**Mechanical Engineering Section – placing in the Bachelor's and follow/up Master's study program section:**
Jakub Ježek – Design of suction tract for Student Formula Markette FME TUL Racing team
Rakeshkumar D. Soni – Dimensional stabuility of parts manufactured by additive technology
Jan Bělík – Analysis of sopurces of noise and vibration of the student Form

**Mechanical Engineering Section – placing in the PhD study program section:**
Ing. Tomáš Kořínek – Modeling turbulent heat transfer
Ing. Andrii Shynkarenko – Automatic production of coaxial Nanofiber Structures
Ing. Petr Kulhavý – Application of advanced engineering methods in the manufacture of frame structures welded from pre-impreged carbon fibres

**Extra prize:**
Václav Vomáčko – Microstructural design and analysis of 2D architexture with negative poisson number

**Competition for the Best University Start-up 2018**
Organized by Student Business Club at the Faculty of Economics TUL. The Priye in category III in the amount of CZK 100,000 will help develop František Manlig and Martin Klesal's company, who are students of the Faculty of Mechanical Engineering. They introduced a product with a patent application for a rescue parachute for multicopters which is both economical and the lightest on the market.

**StudentFormula TUL**
An international competition involving more than 500 university teams from around the world. The aim of the competition is to design and construct an innovative formula that will stand up against other teams in challenging races and disciplines testing the car's characteristics and the capabilities of the entire team. FS TUL team was established in 2016.
In 2018, the FS TUL Racing team took part in races in Italy at the Riccardo Paletti circuit and in the Czech Republic at the Most circuit. Other activities of EF students were finding partners, marketing, organization of events and meeting the discipline of presenting the fictitious business plan of the Formula. In Italy, the team ranked 32nd out of 52 teams and in the Czech Republic they ranked 23rd out of 32 teams. The construction of the student formula is sponsored by companies and industrial partners. See Text Annex 6.6.

**Study in the Czech Republic**
Dům zahraniční spolupráce announced the student photo competition Study in the Czech Republic for foreign students studying in the Czech Republic. The competition was also attended by a student of the Faculty of Mechanical Engineering, Mr. Virakboth Khut from the Republic of Cambodia, a government scholarship holder of the Bachelor's degree program.

## 3.8 Educational Promotion Activities

**Open days for those interested in studies**
- Open Day at FME TUL – February 2018.
- Open Day at FME TUL – December 2018.
- Open Day TUL – November 2018.

**Education Fairs**
Study in degree programs and opportunities for graduates were promoted at education fairs (organized by TUL/active participation of FME):
- XI. European Fair of Higher Education Gaudeamus – Prague, Letňany – January 2018 (TUL, FME).
- Study Opportunities Fair – Ukraine / Kiev – April (TUL, FME).
- XXV. Fair of Post-Secondary Education Gaudeamus in Brno – October (TUL, FME).
- Begin Edu Fair – Tbilisi – October (TUL, FME).
- Begin Edu Fair – Baku – October (TUL, FME).
- EHEF 2018 – European Higher Education Fair in the Philippines – October (TUL, FME).
- EEFT 2018 – European Education Fair in Taiwan in Taipei and Taichung – October (TUL, FME).
- Fairs in Moscow – Exhibition "Education and Career", Exhibition "Education in the Czech Republic", November (TUL, FME).

**T–Forum 201 8**
The 24$^{th}$ annual event of the Job Fair T–Forum for Students was attended by representatives of 60 industrial companies. The fair is traditionally organized by a branch of the IAESTE organization at the Technical University of Liberec in co-organization of the Department of Vehicles and Engines of the FS TUL. The fair is one of the largest personnel events in the region. December 2018.

**Study Promotion**
- The promotion of studies at FME TUL in 2018 was realized mainly in a virtual form.
- Promotion through FB and Faculty websites.
- FB campaigns for selected age groups of secondary school students – DOD, applications for study.
- For the purposes of promotion on the website, via other virtual channels and for the presentation of the university and laboratories during visits to foreign universities, the videos "A Student's Day" and "Presentation of the FS Departments" were shot, both in Czech and English.

- A new promotional website was created and launched - the information website “Come and study at the Machinery Faculty in Liberec” – it expanded its information content.
- Students of selected grammar schools and of the Technical Lyceum Liberec were invited to the lecture by Dr. Dana Drábová from the State Office for Nuclear Safety on April 4, which was followed by a visit to the laboratories of FME TUL and information on the offer of studies in technical fields.
- Promotional files with the topic of studies at the Faculty of Mechanical Engineering were handed over to the secondary technical schools and grammar schools.
- Workshop for students of 8th and 9th grades of elementary school Ruprechtice Liberec in laboratory KMP workshop was focused on promotion of study in technical fields, active tour of laboratory of mechanics (testing of materials, gyroscopes, smart materials, composite materials) on 19 October.

**Promotion of Studies at the FS TUL for foreigners**

- Welcome Days to TUL
  From 13 to 18 February, the traditional Welcome Days for newly arrived international students took place in the SS of 2017/2018. The follow-up accompanying program, including registration at faculties, lasted until 18 February 2018. 27 new students from France, Portugal, Spain, Turkey, Poland, Slovakia and Hungary as part of the Erasmus+ program arrived for the SS 2017/2018. Another 3 students from Turkey, 5 students from Spain and 1 student from Poland extended their studies at the Faculty from the winter semester, 1 student from Turkey extended the internship from ZS and 1 new student from Slovakia and 1 student from a university of Finland started their internships at FS. Other trainees from Turkey, France and Lithuania were still arriving during the SS 2017/2018 and summer months.
- BSc WING / SWEEK-Liberec 2018
  From 22 to 28 April, the study trip of students from FHS St. St. Gallen who study a program combining economics and technical disciplines took place. As part of their program, they also attended selected lectures by representatives of KSA, KSR, KMT and KVM departments. Students also visited TUL laboratories and took part in excursions to Magna and DGS Druckguss Systeme s.r.o.
- Welcome Days to TUL
  Traditionally between 11 and 16 September, before the start of the winter semester 2018/2019 Welcome Days for foreign students of the Erasmus + program were held. In total, 38 students from France, Portugal, Spain, Turkey, Lithuania, Slovakia, Hungary, Germany and newly from Finland were enrolled to studies at FS TUL in the winter semester 2018/2019. In addition, two students from Canada and two students from Vietnam joined the Erasmus+ Credit Mobility project. 1 foreign student from Brazil started a short-term internship at the Faculty of Mechanical Engineering in the category of free-mover in the winter semester, at the same time 3 new students from Poland carried out hteir internshipos here as well as in the category of free-mover, two new students from Turkey started their Erasmus+ internship and students from Turkey who arrived in the summer months continued their internships under Erasmus+ as well.
- Orientation Week
  It was organized by the TUL International Office in cooperation with ESN and held for students who are government scholarship holders as well as for self-paying students from India, who started studying NMSP, DSP at the Faculty of Mechanical Engineering in WS 2018/2019. During the Orientation Week, the students were introduced to the university, they were provided with practical information about studying at the Faculty, students were enrolled to studies and other administrative tasks related to the admission of students were carried out.
  International Day 2018
  On 6 November, International Day was held at the University under the auspices of the International Office of TUL. In the framework of this event, a fair of opportunities to work and study in foreign countries took place. The aim was to promote the mobility of students abroad. In addition to lectures by students with experience from studying abroad and presentations of agencies enabling various types of stays abroad, the program also included a lecture “Why do Slovaks like Euro and Czechs do not?”. The fair also opened an exhibition of photographs and posters from the stays of TUL students abroad as part of the Erasmus+ program.

- In cooperation with the Institute of Vocational and Language Training at the Charles University, Centre in Liberec, foreign students preparing for their studies in the Czech Republic paid their visit to the Faculty of Mechanical Engineering on 12 December.

- FME TUL – seminar for students of the Faculty of Mechanical Engineering on the possibilities of studying within the ERASMUS+ program, in December 2018.

**Presentation of the departments of the Faculty of Mechanical Engineering to students of the second and third years of the Bachelor's study program**
In March, a presentation of the activities of FME departments and laboratories was held with the representatives of the individual departments introducing the activities of departments. The event was designed for Bachelor's study programs students who are about to make a decision and thinking about their final thesis or professional work experience; and are deciding at which department they will carry out their activities. In the framework of the event, a questionnaire survey of students on the quality of Bc. study was conducted.

**European Heritage Days at TUL**
- As part of this event, the Department of Engineering Technology opened a laboratory for the public in Building G on behalf of FS on September 8.

**Promotion of studies within the GreK project**
Cooperation Program of the Czech Republic – Free State of Saxony 2014–2020. The events were organized by the Department of Engineering Technology.
- Joint excursion of TUL and HSZG students to RCS GmbH, Königsbrück (10.1.2018).
- Joint excursion of TUL and HSZG students to LAKOWA GmbH, Sohland / Spree (5.4.2018).
- Joint excursion of TUL and HSZG students to DENSO MANUFACTURING CZECH s.r.o., Liberec (27.4.2018) .
- Scientific practice at TUL: "Injection process and control of injection molding machines in relation to the final quality of injection parts" (18.4.2018) .
- Scientific practice at HSZG and Fraunhofer-IWU: "Introduction to digital microscopy" (2.5.2018) .
- Scientific practice at TUL: "Technology of injection, blowing and extrusion of thermoplastics" (28.11.2018).
- Scientific practice at HSZG and Fraunhofer-IWU: "Additive technologies and composites with textile reinforcement" (5.12.2018).
- Practical workshop at HSZG and Fraunhofer-IWU: "Development process of small wind turbine components" (30.11 and 5-6.122018) .
- Seminar for students of HSZG (Luboš Běhálek: Bestimmung des MFI und der Temperaturabhängigen Viskosität , 11.4.2018) .
- Seminar for TUL students (Ondřej Kotera: Making planar laminates based on fiber reinforced plastics, 18.4.2018) .
- Seminars for HSZG students (Ondřej Kotera, Sebastian Scholz, Luboš Běhálek: Generative Bauteilherstellung und Fertigung Textverstärkter Thermoplastbauteile, 19. and 20.6.2018).

## 3.9 Quality of Teaching

Teaching is organized in accordance with accredited study plans and is guaranteed by educators who prove their professional competence through professional and publishing activities.

Lecturers are mainly professors and associate professors of the Faculty of Mechanical Engineering and in selected cases other experts from the ranks of university academic staff. External workers from industry and the CAS are also involved in the teaching, see the table annex 6.4.3.
In the context of professionally focused seminars and lectures, other experts from the application and academic areas have presented here, see chapter 5.6

Activities to support the quality of teaching are specified in detail in the annual reports of each department. In summary:
- There was a significant investment development of classrooms and laboratories from the funds of FRIM, IP TUL and OP RDE projects in the amount of approximately CZK 127 million, see chapter 7.2.
- In support of teaching, 9 study materials were published, of which 7 in English (of which one was the 2nd edition). One monograph (Czech) and one professional book (English) were published.
- Functional models and didactic aids for instruction are implemented on an ongoing basis, documented in detail in the annual reports of the departments.

**Quality Assessment of Teaching and Learning**

- A system of evaluation of teaching quality in IS STAG was introduced. Students have the opportunity to evaluate courses in the IS STAG system anonymously. The event is organized by the Student Chamber of TUL. In the winter semester 2017/18, 168 students participated in the evaluation, in the summer semester 2017/18, 68 students of the Faculty of Mechanical Engineering got involved.
- A system of Bachelor's studies evaluation at the end of the third semester was introdiced. In February 2018, it involved 51 students.
- In 2018, the evaluation of Bachelor's and Master's studies by graduates was piloted. It will be introduced as a standard as part of the system of evaluation of teaching and study quality.
- Some departments carry out evaluation of the lessons within the end of instruction period for their own feedback.

## 3.10 Lifelong Learning

In the context of lifelong learning, i.e. non-accredited training courses, the Faculty conducts traditionally a wide range of professional seminars and training that are content-structured according to the requirements of industrial firms and companies.

Lifelong learning is an important item of cooperation with industry:

- A total of 31 professional seminars and courses were organized.
- Courses were attended by 244 participants.
- The volume of funds received was CZK 1.31 million.

# SCIENTIFIC-RESEARCH ACTIVITIES

# 4 SCIENTIFIC-RESEARCH ACTIVITIES

## 4.1 Focus of Scientific and Research Activities

The scientific and research base are traditional fields that accentuate the needs of applied research and development in the Czech Republic.

Areas that are being developed:

- Competitive machines and equipment.
- Material engineering.
- Progressive technological and production processes.
- Energy storage and transfer.

It mainly reflects and accentuates the needs of applied research and development in the Czech Republic, with an emphasis on:

- Research and development of traditional and modern materials.
- Research, development and innovation of standard and progressive technologies.
- Reducing energy intensity.
- Weight reduction.
- Construction of special machines and equipment.
- Sustainable transport.

In 2018, scientific and research activity of the Faculty continued as well as in research programs of the Centre for Nanomaterials, Advanced Technology and Innovation (hereinafter referred to as “CxI”(NATI). 2018 was the last year of the 'sustainability of the CxI project'. In terms of project sustainability, the Faculty develops two research programs:

- Competitive engineering.
- Material research.

## 4.2 Institutional support

In the year 2018, the Faculty obtained funds for institutional support in the amount of 30,463 mil. CZK, which represents 54% of the R&D activities of FME TUL from the CR budget. This amount was allocated to the departments to support research and stabilize research teams.

## 4.3 National Competence Centres

In 2018, two centres/projects were supported/approved with the participation of the Faculty of Mechanical Engineering with the date of commencement of the solution in January 2019. The National Centre of Competence of Mechanical Engineering, led by VÚTS a.s., participants on behalf of the Faculty of Mechanical Engineering are teams from the Department of Textile Machine Design and from the Department of Applied Mechanics. Josef Božek National Centre of ground vehicles led by the Czech Technical University in Prague, the participant for the Faculty of Mechanical Engineering is the Department of Vehicles and Engines. See appendix 4.3.

## 4.4 Research Projects

The scientific and research activities of the Faculty were mainly focused on applied and experimental research and development. The Faculty was involved as co-beneficiary in TA CR, MIT CR and GA CR projects and in the role of beneficiary in MoI ČR projects supported from the Czech Republic budget. In the role of co-beneficiaries, it was involved in projects H2020, OP RDE and OP EIC supported from the EU budget.

In 2018, 11 projects supported from the Czech budget were solved at the Faculty. One international project H2020, two projects supported from call OP RDE (TUL the researcher, FS TUL the coordinator) and three application projects supported from OP EIC were solved here.

The volume of grant support from the Czech budget obtained by the Faculty for the solution of science and research projects amounted to approximately CZK 19.80 million, which represents approximately 35% of the total volume of earmarked financial resources.

The volume of support from EU funds for the solution of science, research and applications projects was CZK 65.7 million, of which CZK 41.5 million was investment support.

For overviews of projects and financial subsidies see table and text appendices 4.4.

### 4.4.1. Overview of Scientific and Research Projects Supported from the Czech Budget

- TA CR: TH02020799 Product development of AlSi5Mg alloy for the automotive industry
- TA CR: TH03010378 Development of a new range of fire pumps for extreme conditions
- MIT CR: TRIO: FV10709 Welding numerical simulation including fatigue prediction of welded construction in ground transportation, steel constructions and energy industrial section –high and low fatigue, thermal fatigue and hot tearing
- MIT CR: TRIO: FV10467 Development of progressive fulling technology in hat production
- MIT CR: TRIO: FV10215 Highly efficient air-jet weaving machine for production of leno fabrics
- MIT CR: TRIO: FV20241 Modular range of machine tool holder
- MIT CR: TRIO: FV20547 Special transformation mechanisms in drives with electronic cams
- MIT CR: TRIO: FV30091 Research and development of a new generation automatic machine for the production of self-supporting bobbins
- MI CR: VI20172020052 Applied research in the field of the new generation of personal protective quipmentfor the demands of joint rescue service
- MI CR: VI20172019055 Application of geopolymer composites as fire barriers
- CSF: GA16-16596S Optimization of pulsatile jet actuation in fluid mechanics

**Projects submitted and solved by the academic staff of FME under CxI(NATI)**

- TA CR: TA04011009 Research of utility properties and application possibilities of light polymer composites for body building
- TA ČR: TH01031152 Increasing the efficiency of machines and equipment by reducing friction losses of the machine and its components

**Project of commercialization of R&D results submitted and solved under CxI(NATI)**

- TAČR-GAMA: TG01010117 – PROSYKO – 2 sub-projects solved by the academic staff of the FME

### 4.4.1 Overview of Research, Development and Application Projects Supported by the EU Budget

- H2020: A novel process for manufacturing complex shaped Fe-Al intermetallic parts resistant to extreme environments
- EU/MEYS CR: OP RDE. EN.02.1.01/0.0/0.0/16_019/0000843
  Hybrid materials for hierarchical structures
- EU/MEYS CR: OP RDE. EN.02.1.01/0.0/0.0/16_025/0007424
  3D printing in construction and architecture
- EU/MIT CR: OP PIK. EN.01.1.02/0.0/0.0/16_084/0010282
  Development of textile products from non-combustible and recyclable materials
- EU/MIT CR:
- EU/OP EIC: EN.01.1.02/0.0/0.0/17_107/0012527 Integration of microcomputers into lighting systems
- EU/OP EIC: EN.01.1.02/0.0/0.0/15_019/0004853 Dynamic multi-axis electrohydraulic heat recovery units
- EU/OP EIC: EN.01.1.02/0.0/0.0/15_019/0004815 Test stand for pre-certification tests of internal combustion engines

## 4.5 Student Grant Competition

Within the support of specific research carried out through the Student Grant Competition, 20 projects with a total volume of CZK 6.39 million were solved, which represents 11.3% of the total volume of financial resources from the Czech budget. For an overview of projects, see Annex 4.5.

## 4.6 Contract Research and Development

Contractual research and development within supplementary activities form an important segment of the Faculty's activities. In 2018, the contractual research earnings of the Faculty of Mechanical Engineering amounted to approximately CZK 9.74 million. Contract research and development carried out by academic staff of the Faculty of Mechanical Engineering under CxI amounted to approximately CZK 7.37 million. See spreadsheet annexes 4.6

## 4.7 Supplementary Activity

- The earnings of supplementary activities of the Faculty of Mechanical amounted to 2.87 mil. CZK, see spreadsheet annexes 4.6
- The faculty of Mechanical Engineering provides expert activities in the field of engineering, mechanical engineering and technical fields (various). In 2018, 4 expert reviews were prepared.
- The Faculty provides Authorized Measurements of Pollutant Emissions pursuant to Section 15 a) of the Air Protection Act. In 2018, three contracts were executed.

## 4.8 The Institute for Nanomaterials, Advanced Technology and Innovation

The Faculty of Mechanical Engineering develops laboratories for two research programs within the existing infrastructure. Sustainability of the project terminated in 2018, see the text annex 4.7

## 4.9 Results of Research and Development Activities

Within the five-year evaluation period it can be stated that the most numerous group of outputs at the Faculty is the category of articles published in a professional periodical. The second most numerous category is articles in the proceedings. The results of applied research follow. In this area the functional sample, prototype, patent and utility model are the most frequently represented among the output categories. It is possible to record the trend of decreasing absolute number of R&D outputs (from 184 to 176), see table annex 4.9.5.

In 2018, the number of articles published in professional journals increased. On the contrary, the number of articles in the proceedings and patents decreased. The Faculty of Mechanical Engineering has registered the following selected results in the year 2017 (year of data collection 2018) in IS R&D, see table annex 4.9.6:

- 0 result – result type B (technical book)
- 64 results – result type J (article in a periodical)
- 78 results – type of result D (article in the proceedings)
- 13 results – result type P (patent)
- 7 results – result type F / U (utility model)
- 1 result – GA result type (prototype)
- 16 results – result type GB (functional sample)
- 0 result – result type ZA (pilot plant)
- 5 results – type of result ZB (proven technology)

For the year 2018 (year of data collection 2019) it is planned to insert the following number of outputs into the IS RVVI, see table annex 4.9.7:

- 1 result – type of result B (technical book)
- 73 results – result type J (article in a periodical)
- 65 results – type of result D (article in the proceedings)
- 6 results – result type P (patent)
- 5 results – result type F / U (utility model)
- 9 results – GA result type (prototype)
- 14 results – result type GB (functional sample)
- 1 result – result type ZA (pilot plant)
- 2 results – result type ZB (proven technology)

In 2018, a total of 50 journal entries were published at the Faculty that are part of the WoS or Scopus databases, and 53 articles in the conference proceedings, which are included in the listed databases. If we compare these data with the previous period, it can be stated that in 2017, a total of 51 outputs were published in magazines that are included in WoS databases, or Scopus, and 73 articles in the conference proceedings which are included in the listed databases. The data source was the publication.tul.cz system.

In 2018, significant R&D results were selected at the Faculty for evaluation within the Methodology 17+. A summary of these results is given in Table 4.9.8.

From the performed analysis, it is evident that approximately 88% of all outputs in 2018 were included in the field 2. Engineering and Technology according to the currently used classification of fields (Frascati manual). Another field in which the Faculty applies outputs is field 1. Natural Sciences (approx. 9%), see table annexes 4.9.9 and 4.9.10.

In field 2. Engineering and Technology, in 2018, the most numerous sub-area was 2.3 Mechanical Engineering (41%) and Sub-area 2.5 Materials Engineering (38%). Other sub-sectors are significantly less represented (2.7 Environmental Engineering – 4%, 2.10 Nanotechnology – 10% etc.).
Table 4.9.11 shows the breakdown of sub-sectors JA to JY in 2017.
Table 4.9.12 shows the breakdown of sub-fields 2.3 Mechanical Engineering in 2018.

In the framework of specific research, 37 articles in professional periodicals and 32 articles in proceedings have been written recently. In the framework of this support were also created three functional samples. A total of 73 outputs generated with SGS support are reported in 2018. It can be stated that in 2018 the outputs decreased compared to the previous year. Summary data for the period 2017–2018 are presented in the table annex 4.9.13.

With the support of institutional support (IP) funds, 22 articles in professional periodicals and 19 articles in proceedings were created in 2018. In the framework of this support, four patents were also created. A total of 50 outputs generated with IP support are reported in 2018. Summary data for the period 2017–2018 are presented in the table annex 4.9.14.

## 4. 10 Technology, Knowledge and Service Transfer (TKST)

The forms of TKST reflect the character of universities, i.e. the character of faculties, the quality of research, development and teaching, the level of infrastructure and the background of the services provided by the university to the academic community. The commonly presented notion of commercialization for TKST implies that TKST must result in 'commercialization or monetization´.

TKST forms at the Faculty of Mechanical Engineering are included in already mentioned and financially awarded forms in other chapters:

- Collaborative research and development.
- Contract research and development.
- Collaborative or contract research within OP EIC projects.
- Expert activity – provision of authorized and expert services.
- Provision of professional services – Complementary Activity.
- Education for the industrial, economic and public spheres.
- Commercialization of R&D results and outputs:
- Sale of licenses:
  Project TA01020313. Material selection and testing procedure for enthalpy exchangers, procedure of heat exchanger surface of the plate heat exchanger. The annual payment for 2018 was 100 ths. CZK.
- Implementation of “proof of concept” projects, scientific activities leading to commercial application:
  In 2018, two partial FME TUL projects were solved within the TUL project PROSYKO. The project is supported by the TACR/GAMA program, Sub-program 1 is aimed at supporting the verification of the practical applicability of R&D results that arise in research organizations and have a high potential for application in new or improved products. The volume of funds for FME TUL was 975 ths. CZK.
  The project is managed under CxI(NATI), see Annex 4.9.

INTERNATIONAL
COOPERATION

# 5 INTERNATIONAL COOPERATION

In the area of international co-operation, activities focused on student and academic staff mobility, strengthening internationalization in teaching, developing existing co-operation with partner foreign institutions and preparing contracts for bilateral co-operation with other research institutions prevailed. International cooperation in all areas of the Faculty was based on 87 contractual relations.

## 5.1 5.1 Internationalization in Education

As part of the internationalization of the environment at FS in 2018, NMSP continued in English in the fields of Machine and Equipment Design, Engineering Technology and Materials, Manufacturing Systems and Processes for 13 students from India – self-payers 2016/2017, of which 10 students successfully completed their studies in 2018.

At the same time 4 students from India – self-payers 2015/2016 also successfully completed their studies in English language in 2018 in the fields of Machine and Equipment Design, Engineering Technology and Materials.

At the same time, teaching of NMSP in the English language of Machine and Equipment Design and Production Systems and Processes for 9 students from India - self-payers 2017/2018 – continued.

Newly, 17 students from India and Turkey - self-paying students 2018/2019 – were admitted to studies of the NMSP in English in the fields of Machine and Equipment Design, Manufacturing Systems and Processes.

In 2018, four government scholarship holders (2x Egypt, Ghana, Taiwan) successfully completed their follow-up Master's study program in English N2301 Mechanical Engineering, study branch Machine and Equipment Design, focusing on energy equipment.

Five government scholarship holders (2x Philippines, Ghana, Myanmar, Syria) continued the follow-up master program N2301 Mechanical Engineering, study branch Machine and Equipment Design, focusing on power engineering in English, and two government scholarship holders (Kosovo, Lebanon) of the DSP P2302 Machines and Equipment, study branch Machines and Equipment Design, specialization Equipment for Thermal Engineering in English.

Six new government scholarship holders (Ethiopia, 2x Ghana, Jordan, Cambodia, Peru) have been enrolled for the follow-up master program N2301 Mechanical Engineering in English, Machine and Equipment Design, Energy Engineering in English, and one government scholarship holder (Ghana) of study program P2302 Machines and Equipment Design, study branch Design of Machines and Equipment, specialization of equipment for thermal technology.

With the support of the Faculty scholarship, 2 students from Vietnam continued their studies in PhD programs in Applied Mechanics and Design of machines and equipment, in the English language.

In 2018, three new students – self-payers (Egypt, Libya, Israel) were admitted to PhD programs in English – Mechanical Engineering (Applied Mechanics) and Machine and Equipment Construction. At the same time, 3 foreign DSP students – self-payers (Germany, Poland, Egypt) continued their studies in English at the Faculty.

In 2018, one student – self-payer (Germany) successfully completed his DSP studies, one student – self-payer (India) failed his DSP, one student – self-payer (Poland) interrupted his DSP studies.

In 2018 ten foreign students – self-payers (Brazil, India, Poland) came to a short-term internship and successfully completed the internship in 2018.

## 5.2 International Cooperation in Education

In the area of international cooperation in education, efforts have been directed to establishing new International contacts and activities, it was continued in the process of implementation of initiated activities and development of existing cooperation in the form of study mobilities for students and Faculty members stays at foreign institutions and reciprocally hosting foreign students and experts at the Faculty of Mechanical Engineering within exchange programs and projects.

**Students' Educational Activities Carried out within the Framework of Projects**

- Institutional development project IRP FME TUL (12423) – "TUL as an important partner within the international education area" was solved at FME TUL – continuation and deepening of existing cooperation with partner universities outside of the EU (TUL will prefer cooperation with Canada, the USA, Vietnam, Russia and Azerbaijan) .
- As part of the IRP FME TUL 12423 project, one Czech student stayed at the Canadian partner university Conestoga College of Technology and Advance Learning in 2018.
- 5 short stays of PhD students were carried oud for the purpose of professional development and to strengthen existing contacts with foreign partner institutions (the USA, Germany, Greece), with financial support from the Institutional Development Plan of the Mobility Fund TUL of 2018.
- One long-term (min. 28 days) stay of a PhD student was carried out for the purpose of professional growth and strengthening existing contacts with foreign partner institutions (USA) with financial support of the TUL 2017 Institutional Development Plan (postponed trip).
- Two one-semester stays of students of FME were carried out at the partner university National Taipei University of Technology, Taiwan, within the framework of inter-university cooperation and with financial support of TUL Mobility Program.
- In 2018, short-term several-day activities of students with financial support from other sources were carried out – 16 short-term trips of DSP students with financial support from the Cooperation Program Czech Republic – Free State of Saxony (BauQu), 2 short-term stays of DSP students with the financial support from the Cooperation programme Czech Republic – Free State of Saxony (Progress.digital), 3 short-term stays of DSP students with financial support from SGS, 28 short-term excursions of students with financial support from the Czech Republic-Free State Saxony Cooperation Program (GreK) and 2 short-term excursions of DSP students with financial support from Horizont2020 (EQUINOX).
- In 2018, 1 student from the partner university of National Taipei University of Technology, Taiwan, successfully completed a one-semester stay at the Faculty of Mechanical Engineering as part of inter-university cooperation.
- In 2018 several short-term stays of foreign students were carried out with financial support from other sources – 6 short-term arrivals of students with financial support from the Cooperation Program Czech Republic – Free State of Saxony (GreK).

**Educational Activities of Students and Academics Carried out within the Framework of Mobility Programs**

See below in chapter 5.4.

## 5.3 International Cooperation in the Field of Scientific and Research Mobility

In the framework of international cooperation in the field of scientific research mobility, efforts have been directed at developing the existing scientific-research activities with foreign partner institutions, establishing new International contacts and developing joint activities in the field of science and research internationally.

- One long-term stay of a member of the academic staff of the Faculty lasting min. 28 days for professional growth and to strengthen existing contacts with foreign partner institutions with the financial support of the TUL 2018 Mobility Fund.
- There were 10 several-day stays abroad of the Faculty academic staff, three of which lasted at least 5 days, for the purpose of professional growth and to strengthen the existing contacts with foreign partner institutions with the financial support of the TUL 2018 Mobility Fund.
- Four short-term stays of foreign academic staff from partner universities in Germany, Vietnam, France and Spain were carried out, of which 3 lasted at least 5 days, with the financial support of the TUL 2018 Mobility Fund.
- The institutional development project IRP FS TUL (12423) "TUL as an important partner within the international education area" was solved – continuation and deepening of existing cooperation with partner universities outside the EU.
- As part of the IRP FS TUL 12423 project, one stay of an academic worker at the Canadian partner university took place in 2018.
- One long-term stay of an academic employee of the FME was carried out at a foreign partner institution in Germany for at least 28 days with financial support from other sources (Cooperation Program Czech Republic – Free State of Saxony, BauQu).

There were 21 short-term stays of several days of academic staff of FS in Germany with financial support from other sources (Cooperation Program Czech Republic – Free State of Saxony, BauQu Project), 12 short-term stays of several days of academic staff of FS in Germany with financial support from other sources (Cooperation Program Czech Republic – Free State of Saxony, Project GreK), 7 short stays of several days of academic staff at foreign partner institutions in Italy and Germany with financial support from other sources (Horizont2020, EQUINOX project), 3 short stays of several days of academic staff of FS in Germany and Estonia with financial support from other sources (OP RDE 16003), 9 short stays lasting several days of FS academics in Germany with financial support from other sources (Program of cooperation Czech Republic – Free state of Saxony, project PokYear.digital), 11 short stays of several days of FME academics in Germany, France and Greece with financial support from other sources (HyHi, 16015), 1 short stay of FS academic staff in Spain with financial support from other sources (TACR 17036) and 2 short stays of FS academic staff in Germany with financial support from other sources (SGC).

- One long-term research stay of a foreign worker from Vietnam was started at the Faculty as part of the HyHi project (16015).
- There were 2 short stays of foreign academic staff from Germany to FME within the project HyHi (16015).
- There was one long-term stay of an academic employee of the FFS at a foreign institution in the USA lasting at least 28 days in the category of other trips.
- There were 3 short-term stays of foreign academics from Thailand and Poland at the Faculty in the category of other arrivals.

## 5.4 International Mobility

The mobility of students, academics and other employees of the FS was realized mainly within the ERASMUS +, ERASMUS + KA107 – Credit Mobility, CEEPUS, Institutional Development Program programs. A significant share of mobility was also realized within other sources.

The mobility of international students and academics at the Faculty of Mechanical Engineering TUL took place primarily within the ERASMUS +, ERASMUS + KA107 – Credit Mobility and CEEPUS programs. Foreign academic staff also took advantage of the offer of stays within the IRP Mobility Fund and foreign students used the offer of internships within the IAESTE program. Mobility of foreign students and academics was also realized within other sources.

The Faculty motivates students of all study programs to carry out a study stay abroad The priority is given to increasing the number of doctoral students going on mobility. Since 2010, foreign study stays or internships have been included in the study plans of doctoral study programs. In 2018, the total foreign mobility of academics and other Faculty staff as well as foreign mobility of Faculty students increased. By contrast, the overall mobility of foreign students and academics decreased slightly.

**Stays of Foreign Students and Foreign Academics at FME TUL**
In 2018, the total number of visits of foreign students and foreign academics in the framework of mobility programs and other resources at the Faculty slightly decreased in comparison with 2017, while in the individual categories of mobility, the largest decline was recorded in the stays of foreign students coming primarily with financial support from other sources and the stays of foreign academics coming under the Erasmus+ program. Student arrivals under the Erasmus+ program remained at the 2017 level, while the IAESTE and CEEPUS programs decreased slightly. Arrivals of foreign academics under the Erasmus+ program decreased significantly compared to 2017, arrivals under the CEEPUS program decreased slightly. Arrivals of foreign academics within the TUL Mobility Fund remained at the 2017 level. Arrivals of foreign students and academics financed from other sources dropped significantly compared to 2017. By contrast, the number of foreign students in the categories of government scholarship holders and self-payers increased. Other activities of foreign academic students increased compared to 2017.

**Foreign and Border Mobility of Students, Academics and Other Faculty Staff**
The overall mobility abroad of academics and other Faculty staff increased in 2018 in terms of programs and other resources compared to 2017, and in addition to the Erasmus+ trips, TUL development projects and other resources were also used. International mobility of Faculty students within mobility programs and other resources also increased slightly in 2018. In individual categories of mobility, there was an increase in student mobility numbers within development projects; student stays within the Erasmus+ program were at the level of 2017 as well as foreign mobility of students of the Faculty with financial support from other sources. Foreign mobility of Faculty staff increased under the Erasmus + program,

while it decreased under the CEEPUS program. Departures of Faculty staff in the framework of development projects increased compared to 2017. Departures of academics with financial support from other sources also increased. Other international activities of students and academics increased compared to 2017.

- There were 14 student study and work stays lasting one semester under the Erasmus+ program, with most of the stays being mobilities of students in the Bachelor's and follow-up study programs.
- 2 Erasmus + KA107 DSP student study stayes were held in the length of three months at partner universities in Vietnam and Thailand.
- 9 Erasmus+ mobilities of academic staff were realiyed, with 5-day short-term teaching stays prevailing.
- There were 2 mobilities in the category of other staff under the Erasmus + program of less than 5 days.
- Two mobilities of academic staff within the Erasmus + KA107 program (Credit Mobility) of 5 days to partner universities in Vietnam and Azerbaijan were carried out.
- There were 127 stays of foreign students at the Faculty of Mechanical Engineering from the European area within the Erasmus+, CEEPUS and IAESTE programs, and in addition 1 from Russia, 1 from Brazil, 1 from Ecuador and 1 from Japan under IAESTE.
- 5 stays of foreign students from partner universities in Thailand, Canada and Vietnam at the Faculty of Mechanical Engineering within the Erasmus + KA107 program (credit mobility) were carried out, of which 1 stay of a PhD student for three months, the remaining 4 were one-semester stays of bachelor and follow-up students
- A total of 3 teaching stays of foreign academics at the Faculty of Mechanical Engineering were carried out under the Erasmus+ and CEEPUS programs, with 1 Erasmus + arrival of less than 5 days and 2 teaching visits under CEEPUS of at least 14 days.
- A total of 6 stays of foreign academics from partner universities in Thailand, Canada, Vietnam and Azerbaijan were held at the Faculty of Mechanical Engineering within the Erasmus+ KA107 program (Credit Mobility), 1 teaching stay and 5 stays in the training category, all mobilites of 5 days.
- There were 5 short-term stays of PhD students within the TUL 2018 Mobility Fund, of which 4 were less than 5 days long.
- One postponed stay of a PhD student lasting at least 28 days within the TUL Mobility Fund 2017 was carried out.
- There were 11 mobilities of academics within the TUL 2018 Mobility Fund, of which 1 long-term stay of at least 28 days and 7 trips of less than 5 days.
- There were 4 short-term stays of foreign academics within the TUL 2018 Mobility Fund, of which
- 1 less than 5 days.
- One student stay abroad for the duration of one semester started within the IRP FME TUL 12423 – "TUL as an important partner within the international education area" – continuation and deepening of existing cooperation with partner universities outside the EU at a partner university in Canada.
- One academic stay at a partner institution within the IRP FS TUL 12423 "TUL as an important partner within the international education area – continuation and deepening of existing cooperation with partner universities outside the EU" was held at a partner university in Canada.
- One long-term stay of an academic employee of the FS was held at a foreign partner institution in Germany forat least 28 days with financial support from other sources (Cooperation Program Czech Republic – Free State of Saxony, BauQu).
- 21 short-term several-day stays of academic staff with financial support from other sources (BauQu), 12 short-term several-day stays of academic staff with financial support from other sources (GreK), 7 short-term several-day stays of academic staff with financial support from other sources (HORIZONT 2020), EQUINOX), 3 short-term several-day stays of academic staff with financial support from other sources (OP RDE 16003), 9 short-term several-day stays of academic staff with financial support from other sources (PokYear.digital) 11 short-term several-day stays of academic staff with support from other sources (HyHi, 16015), 1 short-term stay of an academic employee with financial support from other sources (TACR 17036) and 2 short-term stays of an academic employee with financial support from other sources (SGC).
- One long-term research stay of a foreign worker at the FME was started within the HyHi project (16015).
- There were 2 short-term stays of foreign academic staff at the FME within the HyHi project (16015).
- One long-term stay of an academic employee of the FME at a foreign institution lasting at least 28 days in the category of other trips.

- 3 short-term scientific stays of foreign academic staff at the Faculty in the category of other arrivals were carried out.
- The Faculty of Mechanical Engineering provided instruction of selected courses for Erasmus+ students who came to FT.

**ERASMUS+**

- A total of 68 inter-institutional agreements with partner universities were valid, of which 8 were new inter-institutional agreements concluded in 2018.
- Within the Erasmus+ KA107 Credit Mobility, Call 2017, the Faculty of Mechanical Engineering, received 3 projects in total to develop cooperation with existing foreign partners in Canada, Thailand and Vietnam.
- Under the Erasmus + KA107 Credit Mobility, Call 2018, the Faculty of Mechanical Engineering submitted 2 projects to deepen existing cooperation with partner institutions in Israel and Azerbaijan. The Faculty was successful in the case of the project with Israel. To a limited extent, cooperation with Azerbaijan was supported by other TUL (non-Erasmus+) resources.

**Under CEEPUS program**

In 2018, the Faculty of Mechanical Engineering was an active participant in 4 CEEPUS III networks.

- CIII-RS-0304 Technical Characteristics Research of Modern Products in Machine Industry (Machine Design, Fluid Technics and Calculations) with Purpose of Improvement Their Market Characteristics and Better Placement on the Market.
- CIII-BG-0722 Computer Aided Design for Automated Systems for Assembling.
- CIII-RO-0013 Teaching and Research in Environment – Oriented Technologies in Manufacturing .
- In 2018, the Faculty newly joined the CIII-RS-1012-04-1819 network – Building Knowledge and Experience Exchange in CFDg.

# PARTNERSHIP AND COOPERATION

# 6 PARTNERSHIP AND COOPERATION

Partnership and cooperation with scientific-research institutions and industry partners is one of the pillars of the Faculty's stability.

## 6.1 Membership in Czech and Foreign Associations and Organizations

**FS TUL Membership in Institutions and Organizations of Educational and Professional Character**

- Association of Deans of Technical Faculties
- Czech Society for Mechanics

**Membership of Departments**

- Automotive Industry Association
- Association of the Glass and Ceramics Industry
- Confederation of Industry and Transport
- Company for Machine Tools (at FME CTU in Prague)

**Platforms and Clusters**

- Czech Technology Platform of Engineering, o. s.
- Josef Božek National Competence Centre
- National Competence Centre of Engineering
- CENEN-net – a free academic community
- ININet platform
- NESEFF (Network for Energy Supply and Energy Efficiency)
- COST: Proposal Title: Critical Raw Materials Solutions Under Extreme Conditions
  Proposal Acronym: CRM-EXTREME
- EIP: European Innovation Partnership (EIP) – Sustainable substitution in extreme conditions

## 6.2 Cooperation with Universities and Research Organizations

Forms of cooperation with universities and research organizations include a wide range of activities.

**Meetings, Hosting, Missions**

- **Visit to ESAIP**
  Between 18 to 20 June, the Vice-dean for international relations prof. Fraňa and Ing. Válková visited ESAIP, FS's Erasmus+ Partner Institution. The program included an introduction to the structure of ESAIP, the structure of study programs and discussions with Mr. Cordovilla, Head of the International Office, on further student exchanges.
- **Visit from MPI Dusseldorf**
  At the beginning of June, F. Stein and M. Palma tool a trip with colleagues from the KMT within the project Hy-Hi.
- **Cooperation with King Mongkut's University of Technology North Bangkok (KMUTNB)**
  In order to build a network of joint research activities between FS TUL and King Mongkut's University of Technology North Bangkok (KMUTNB) (Thailand), Asst. Prof. Dr. Rapeephun Dangtungee and PhD student Chakaphan Ngaowthong visited our university as part of Erasmus+ Credit Mobility (KA107). Dr. Dangtungee took part in a weekly training in laboratory preparation of masterbatches and subsequent processing of PLA-based biocomposites and cellulose nanocrystals. The effect of preparation and modification of nanocrystals in order to increase dispersion and distribution in nonpolar matrix was subsequently evaluated with respect to thermo-mechanical properties and morphology of the resulting system. PhD student Ngaowthong worked in the framework of his three-month internship in the laboratories of KSP to complete his dissertation thesis dealing with the influence of the degree of recycling on the final properties of biocomposites reinforced with sisal fibers.
  Mr Rapeephun Dangtungee stayed at TUL as part of Erasmus+ Credit Mobility from 16 to 20 August. PhD student Chakaphan Ngaowthong was here on a study stay under Erasmus+ Credit Mobility between July 1 and September 30.
- **Representatives of Nha Trang University at the Faculty of Mechanical Engineering**
  From 3 to 7 September, we welcomed colleagues Hung Tran Doan and Tuong Nguyen Van from partner universities Nha Trang University from Vietnam. Their visit took place within the ERASMUS+

Credit Mobility project, which was awarded to the Faculty of Mechanical Engineering within the 2017 call. Nha Trang University is one of the long-term partners of the Faculty of Mechanical Engineering. Two students from Nha Trang joined the Faculty for one-semester study in WS 2018/2019 . Reciprocally, a short-term PhD student stay at Nha Trang University was held between March and May 2018.

- **Colleagues from Conestoga College again at the Faculty of Mechanical Engineering**
  From September 24 till 28, we welcomed colleagues Calina Stoicoiu and Florina David from Conestoga College, a partner in Canada. This year's visit takes place within the ERASMUS+ Credit Mobility project, which the Faculty of Mechanical Engineering received last year. The Faculty of Mechanical Engineering and Conestoga College have been working together for more than 10 years, and during this time students and academics exchanges from both universities took place. This academic year, two students from Conestoga College study one semester at our Faculty. The cooperation with this institution will continue in the coming years and our students will be able to carry out a one-semester study stay at the Canadian University with the support of the Faculty of Mechanical Engineering TUL.
- **Visit to Dnipro University of Technology**
  From 30 September to 3 October, the Vice-Dean for International Relations prof. Fraňa and Ing. Válková paid their first visit Dnipro University of Technology in Ukraine. During the visit, there was a meeting with the Rector, Vice-Rectors for International Relations, Development, Science, and the Deans of the Institute of Electric Power Engineering, Institute of Economics. Further, a tour of Dept. of Electric Drive, Dept. of Electricity Supply Systems and Dept. of Renewable Energy Sources was organized. The aim of the meeting was to establish cooperation between FS TUL and Dnipro University of Technolgy across universities, consultations on the submission of possible scientific projects and mobility programs (Erasmus+ Credit Mobility) including study visits, internships for students and research, teaching stays for academics. Another item on the agenda was the creation of double degree programs.
- **Cooperation and Azerbaijan Technical University (AZ) in Baku**
  In October 2018 a joint meeting of the management of the Faculty of Mechanical Engineering TUL and TU in Baku took place at the University of Azerbaijan. The subject of the meeting was cooperation in the area of automotive and E-mobility with regard to energy sources. The Embassy of the Czech Republic in Baku was also consulted. Further negotiations were held with companies in Azerbaijan (state enterprise Socar etc.). In November 2018, the Dean of TU AZ, Faculty of Mechanical Engineering, graduated from prof. Mammadov, Vice-Rector for International Cooperation prof. Namazov and prof. Subarov from TU AZ stay at TUL. It was a concrete exchange of students between FS TU AZ and FS TUL. Porf. Mammadov gave a lecture on energy sources and energy savings in industry.
- **Delegation from Malaysia to FS TUL**
  On November 30, the Faculty welcomed a delegation of academics and PhD students from Universiti Teknologi MARA from Malaysia. The visit from the University of Technology Mara was based on previous cooperation. TUL officials had visited the university several times in the past, the MoU had been signed and a conference in Thailand had been co-organized. This university is a prestigious technical university and its representatives were touring Europe to look for potential partners for deeper cooperation. During the meeting, the universities introduced each other, then an excursion to the laboratories of mechanics and power units followed.

**Informal Cooperation of Faculty Workplaces**

The departments cooperate with related workplaces in the Czech Republic and Slovakia at both scientific research and pedagogical levels. Members of the departments regularly meet in committees for the habilitation procedure, defense of doctoral theses, publish joint publications etc.

**Meeting of Departments**

- Meeting of representatives of institutes and departments of mechanics of elasticity and strength from the Czech and Slovak Republics, Štiřín u Prahy 22-24 May 2018. Participation of KMP.
- Meeting of Departments of Mechanics and Elasticity and Strength of UWB, TUL, CTU in Tachov, 10-12 September 2018. Participation of KMP.
- Meeting of institutes and departments of Production Technology and Robotics in Zaječí, 10-12 September 2018. KSA, KSR participation.

**Cooperation Supported by Operational Program Entrepreneurship and innovation for competitiveness**

The Faculty participated together with universities and research organizations to address two projects of collaborative nature (MIT), 1 Project of collaborative characterat (GACR) and 1 project with international R & D cooperation (H2020).

**Cooperation supported by the OP Enterprise and Innovation for Competitiveness**
The Faculty participated in the solution of 4 projects supported from the OP EIC. See Text Annex 7.4.2.

**COOPERATION supported by the OP Cross-Border Cooperation**
Together with the German universities, the Faculty participates in the solution of 3 projects supported from the OP Cooperation Program Czech Republic – Free State of Saxony 2014–2020.

**Accredited Cooperation in Education**
Accreditation granted to the Faculty of Mechanical Engineering TU in Liberec for the implementation of the PhD study program in cooperation with other institutions:

- DSP Mechanical Engineering to finish studies: together with the Institute of Thermomechanics of the Academy of Sciences of the Czech Republic for the study branch Applied Mechanics and together with the Institute of Macromolecular Chemistry of the Academy of Sciences of the Czech Republic for the study branch Materials Engineering. Standard length of studies 4 years, Czech and English version.
- Newly granted accreditation in 2018, started for AY 2018/2019: together with the Institute of Thermomechanics and the Institute of Physics of the Academy of Sciences of the Czech Republic for the study program Applied Mechanics. Standard length of studies 4 years, Czech and English version.

## 6.3 Conferences, symposia, fairs

**EAN 2018 – The 56 th International Conference on Experimental Stress Analysis**
June 5–7, co-organized by the Department of Applied Mechanics .
Number of participants: 110, including 5 from abroad.

**SESIA 2018**
11–13 September, the traditional meeting of the deans of the Czech and Slovak faculties of mechanical engineering took place. This time under the auspices of FME VŠB–TU Ostrava. One of the points of discussion at the joint meeting was the number of students and the demand of companies for graduates.

**XV. International Conference of Glassmaking Machines and a seminar Metals in Glass Technologies**
13th September at TUL, co-organized by the Department of Glass Producing Machines and Robotics.
Number of participants: 57 experts, including 2 from abroad (Germany).

**XIII. Experimental Fluid mechanics 2018**
Organized on 13–16 November by the Department of Power Engineering Equipment in Prague. It was the 13th annual conference and it was focused on experimental research in fluid mechanics and thermodynamics.
Number of participants: 156, of which 87 from abroad**.**

**MSV in Brno**
1–5 October, the results of cooperation with the Faculty of Textile Engioneering and CxI were presented there by our Faculty.

## 6.4 Cooperation with Industry

Forms of cooperation with industry include scientific-research and pedagogical activities.

**Industrial Board of the Faculty of Mechanical Engineering TU in Liberec**
The Industrial Board is an advisory working group established by the Dean of the Faculty of Mechanical Engineering TU in Liberec. It includes 17 representatives of industrial companies and enterprises. In 2018, two meetings took place.

**Scientific and Research Collaborative Cooperation with the Application Sphere**
The Faculty participated in the implementation of 2 projects supported by TA CR and 6 projects supported by the Ministry of Industry and Trade of the Czech Republic as a researcher. As a researcher, it implemented 2 projects supported by the Ministry of the Interior. See text section 4.4.

**Scientific and Research Contractual and Complementary Activities**
Scientific and research complementary activities represent an important segment of the Faculty's activities. See text sections 4.6 and 4.7 for details .

**Expert Activity**
The Faculty holds an expert certificate for the fields of Mechanical Engineering, Technical fields (various), Energy, Glass. In 2018, 4 reviews were prepared.
The Faculty holds an Authorization for Measurement of Pollutant Emissions pursuant to Section 15 a) of the Air Protection Act. In 2018, three authorized measurements were carried out. See table annex 6.4.2.

**Education of Industrial Workers**
Education of workers from the industrial sphere is an important segment of the Faculty of Mechanical Engineering's activity. A total of 31 professional seminars and courses were organized. The courses were attended by 244 participants. The volume of funds obtained through this activity amounted to approximately CZK 1.3 million.

**Cooperation in Education Supported by OP Cross-border Cooperation Projects**
Within the GreK project, which aims to build and strengthen cross-border cooperative teaching of modern plastics processing methods between the Zittau / Görlitz University and the Technical University of Liberec, regional plastics companies and research institutions are involved.

**Professional Work Experience of Students in Companies**
All students of Bachelor and Master's, or follow-up Master's study programs of the Faculty have completed the compulsory subject Professional Work Experience in Enterprises in the length of 2–6 weeks according to their study branches (Bc studies - compulsory elective course Professional Practice, Mg studies – compulsory course Professional Practice in Enterprises in the length of 2–4 weeks according to the study branche).

**Involvement of Experts from Companies and Institutions in Teaching**
Standard forms of cooperation are lectures by experts, supervision of theses and experts participating in the students' work experience. See table annex 6.4.3.
In the context of professionally focused seminars and lectures, other experts from the application sphere and academia presented, see below section 6.5 Special events and lectures.

**Students Excursion to Industrial Enterprises and Institutes**
In 2018 individual and several-day excursions of students to industrial companies and companies were realized by individual departments: ZPS – SLÉVÁRNA, a.s. Zlín, Continental Barum OtYearovice, FATRA a.s. Napajedla, ALUCAST s.r.o. Tupesy, INVOS s.r.o. Svárov, KOVÁRNA VIVA a.s. Zlín, Škoda Auto a.s. Mladá Boleslav – nástrojárna, lisovna, Modelárna Liaz spol. s r.o. Liberec, Komerční slévárna šedé a tvárné litiny Turnov a.s., KSM Castings CZ a.s. Hrádek nad Nisou, Matador Automotive ČR s.r.o. Liberec, Preciosa Ornela a.s. v Desné a v Zásadě, Uhelná elektrárna Mělník, ZVVZ Milevsko, malé vodays elektrárny Vydra a Čeňkova Pila včetně expozice "Šumavská energie", Aerodynamická laboratoř v Novém Kníně (Workplace Ústavu termomechaniky AVČR), Městská elektrárna Písek, vodays dílo Štěchovice (přehradays a přečerpávací vodays elektrárna), Jaderná elektrárna Temelín, Home Credit Arena (technologické zázemí), TERMIZO a.s., TOPTEC Turnov, větrné elektrárny v Jindřichovicích pod Smrkem, Atrea, s.r.o. (pasivní domy), vodays dílo Josefův Důl, CEDIMA Meziměstí s.r.o., HAUK s.r.o, Wikov Hronov nad Metují, Tonak a.s., Nový Jičín a Strakonice, Škoda Auto a.s. Mladá Boleslav, VÚTS a.s., Ortopedická klinika FN Motol, Stránský a Petržík, Bílá Třemešná, logistické centrum Alza.cz Praha, Denso Manufacturing Liberec, s.r.o., Modelárna Liaz spol. s r.o., BMW Group in Berlin.

**Excursion of Academic Staff to Industrial Enterprises and Institutes**
During the year, academic staff excursions to industrial enterprises took place and professional seminars were attended in the following companies: Johnson controls a.s., Rieter a.s., Večerník s.r.o., Nanovia s.r.o, VUTS a.s., BTTO s.r.o., Hagal s.r.o., manufacturing facilities of Hermle AG (Germany).

## 6.5 Professional Events and Lectures

- **Advanced Engineering Ltd.**
  On March 27, the Department of Manufacturing Systems and Automation organized a seminar for students and academics, 10 participants.
- **Automation in Machine Construction**
  On April 23 and May 14, the Department of Textile Machine Design organized it. The program of the seminars was to introduce the portfolio of B&R products and services with respect to the needs of mechanical designers. It included a description of selected applications and definition of limits and usability for various applications. The second part of the seminar dealt with the use of SERVOsoft software for the design and dimensioning of drives. This included a practical demonstration of the drive design in this software with the aim of optimal tuning.
- **HR Point - Meeting of HR officers**
  May 15, traditionally at TUL together with Czechinvest. The theme of this year's HR meeting was "Modern technologies in HR". It was also spoken about the Jobs.cz, Práce.cz, Profesia or Tablets and Mobile Applications portals around the corner and other possibilities by which the Internet and smartphones change the movement in the labor market.
- **Mechanism of heat transfer and storage – Theoretical principles and applications**
  On May 17, presented by Ing. Heiko Fechner of the Institute of Building Climatology, TU Dresden.
- **Magneto-sensitive rubber in a vibration isolation context**
  On June 3–7, prof. Nere Gil-Negrete, University of Navarra, San Sebastian, Spain lectured at the Department of Applied Mechanics.
- **Electromagnetics systems, Introduction to Conestoga College**
  On September 26, a professional lecture by prof. Florin David and a lecture by Calin Stoicoiu on study opportunities at Conestoga College took place.
- **Lectures and seminar on behavior of polymers and elastomers.**
  On November 6-8, Prof. Jean-Benoit Le Cam, Head of the Laboratory at the University of Rennes, France, gave a lecture at the Department of Applied Mechanics.
- **Seminar with Dormer&Pramet**
  On 29 November, organized by the Department of Manufacturing Systems and Automation, 70 participants.

## 6.6 Awards

**National Awards of FME TUL students:**

**Prize of the Governor of the Liberec Region**
Ing. Jan Hušek
Branch: Engineering Technology and Materials
Thesis topic: Production and verification of a prototype of a two-component part for sealing the A-pillar joint

**Preciosa Foundation Award**
Ing. Jakub Taich
Branch: Machine and Equipment Design
Theme DP: Design of compact DLP 3D printer

**Prototype of the new vibro-insulated seating of the golf cart seat**
Radla Jírová, a student of the Faculty of Mechanical Engineering, proposed a simple construction solution, which is currently under patent. Z won the poster section at the prestigious international conference EAN 2018 held in Harrachov.

## 6.7 Our Sponsors

**Support of ČEZ as**
Annual financial support and offer of other professional events, i.e. summer schools for students, excursions of employees and students to nuclear power plants, organization of lectures at TUL – 200 thousand CZK.

**Support of ŠKODA AUTO a.s.**
Car rental for Faculty use. Financial support to StudentFormula – 200 000 CZK.

**StudentFormula support**
AGC Automotive Czech as; Benteler CR sro; CNC Machining Liberec sro; Demos trade, as; Entry Engineering Ltd.; Faurecia Emissions Control Technologies GDK spol. s r.o .; Henniges Automotive; KAMAX sro; KOH-I-NOOR Ponas Ltd.; Jablotron Alarms Inc .; M JINDRA, sro; Magna Exteriors (Bohemia) Ltd.; Modelarna Liaz spol. s r.o .; Rieter CZ sro; RP Technology Ltd.; SV metal spol. s r.o .; ŠKODA AUTO as; T - Mobile Czech Republic Inc.; VYVA PLAST, Ltd.; WURTH, spol. s ro ; Jablonec nad Nisou (TRW Automotive Czech sro). Financial support, material support - material, services and other forms.
Liberec Region – 200 000 CZK.

**Promotion of companies on FME TUL website**
A form of thanks to companies for their support and company advertising.

# FACULTY DEVELOPMENT

# 7 FACULTY DEVELOPMENT

The Faculty's own development took place in all areas of its activities with the financial support of grants and projects.

## 7.1 Quality and Culture of Academic Life

**Internal impulses for Faculty development**

- Individual Language courses organized by CDV TUL and individual language courses.
- Education of academic staff in so-called academic skills and competences.
- Education of academics in professional courses and seminars.
- Training of academics in professional courses within the TUL of OP RDE RoliZ and Techology Transfer projects.
- Completion of courses in higher education pedagogy.
- See table and text appendices 7.1.

**Meeting of Alumni**

In 2018, the meeting of the first alumni classes was held as part of the 65th anniversary celebration of the Faculty of Mechanical Engineering.

## 7.2 Infrastructure

In March 2018, the reconstruction of building C was completed. Department of Power Engineering Equipment, which had been residing in the temporary premises in building F during the reconstruction, gradually moved back to the reconstructed premises.

The investment development of the laboratories and classrooms of the Faculty of Mechanical Engineering in the amount of CZK 126 million came from the following resources:

- FRIM – departments about CZK 11.24 million, especially for co-financing, see below.
- IRP TUL – approx. on of Devices for the determination of contact angle and surface energy .
- OP RDE – retrofitting of laboratories in the amount of CZK 39.73 mil.
- OP RDE – retrofitting of laboratories in the amount of CZK 2.04 mil.
- OP RDE – in the framework of the university project HyHi retrofitting of laboratories in the amount of CZK 2.14 million.
- OP RDE – as part of the university project Furniture for furnishings in the amount of CZK 10.57 million.
- OP RDE – within the framework of the university project Vi4.0 retrofitting in the amount of CZK 58.63 million.
- R&D project MV VI20172020052 - mold prototype and a test mold for CZK 2.19 million.

## 7.3 Development projects

**TUL Institutional Development Plan for 2018**

Within the framework of IP TUL, the Faculty was the researcher of 8 partial projects, see the table annex 7.3.

- Promotion and presentation of FME TUL.
- Organizing SVOČ at the TUL.
- Study aid – Ejector for ejector cooling equipment.
- Innovation of automation laboratories and development of production system model with implementation of Industry 4.0 principles.
- Device for determining contact angle and surface energy.
- Support for self-paying students at FME TUL – Study texts in English.
- TUL as an important partner within the international space.
- Support of personal and professional growth of PhD students.

## 7.4 Projects Funded by the EU Structural Funds in 2014–2020

In 2018, two Faculty projects funded by the EU Structural Funds under the Research, Development, Education Program continued and two university projects of a scientific and application nature coordinated by the Faculty of Mechanical Engineering were launched. See table at ext 7.4.

In 2018, three Faculty projects financed from EU Structural Funds under the Cross-border Cooperation Program Czech Republic - Free State of Saxony continued. See text and table appendix 7.4.

In 2018, two projects financed from EU Structural Funds under the Entrepreneurship for Innovation and Competitiveness Program were launched and two projects continue.

# EXTERNAL AND INTERNAL EVALUATION OF THE FACULTY

# 8 External and Internal Evaluation of the Faculty

## 8.1 External Evaluation of the Faculty

**Accreditation Procedure**

- In March 2018, the National Accreditation Authority (NAU) approved 6 new DSPs: Applied Mechanics (CZ, AN), Machines and Equipment Design (CZ, AN), Technologies and Materials (CZ, AN).
- During the year 2018, two new study programs were prepared and submitted for discussion and approval by the NAU: BSP Engineering, NMSP Polymers and Composites Technology. Accreditation files were filed in Czech and English versions, i.e. a total of 4 accreditation files.
- At the same time, two other new NMSPs were prepared for submission to the NAU in January 2019: NMSP Materials and Technologies, NMSP Machines and Equipment Design. Accreditation files were prepared in Czech and English versions.
- In parallel with the preparation of accreditation files, the Standards of Quality of Activities of the Faculty of Mechanical Engineering TU in Liberec, the so-called self-assessment report, was elaborated.

**Quality Standards of Activities of the Faculty of Mechanical Engineering TU in Liberec**

- In parallel with the preparation of accreditation files, the quality standards of the Faculty of Mechanical Engineering were elaborated.

**FEANI**

- FME TUL is accredited by FEANI and is registered in the “FEANI Index”.

**Interest in Graduates and Quality of Graduates**

- The demand for graduates of the Faculty of Mechanical Engineering is high and the demand for graduates exceeds the supply. The Faculty monitors the number of graduates in the Labor Office records, which monitors the number of graduates as of April 30 and September 30 of the relevant year.

**Meeting of Deans of Mechanical Faculties of Czech and Slovak Universities – SESIA 2018**

- On September 11–13, the traditional meeting of the deans of the Czech and Slovak faculties of Mecanical Engineering took place. This time under the auspices of FME VŠB–TU Ostrava. One of the points of discussion at the joint meeting was the number of students and the demand of companies for graduates.

## 8.2 Internal Evaluation of the Faculty

- In 2018, the Faculty was evaluated as part of the elaboration of the Report on Internal Quality Assessment of Educational, Creative and Related Activities of TUL. The report was approved by the SB of FME TUL in June 2018.
- There is a regular annual evaluation of the results of activities of individual departments.
  Annual reports on the activities of departments – stored in the electronic archive of FME TUL.
- Regular monthly dean boards with the participation of Vice-Deans, Heads of Departments, Secretary, Study Department and Department of Development and Projects.
- 3 sessions of the Scientific Board of the Faculty of Mechanical Engineering TU in Liberec.
- 4 sessions of the Academic Senate of the Faculty of Mechanical Engineering TU in Liberec.
- 2 meetings of the FS TUL Industrial Board.
- 1 meeting ot Dean's Working Group “Concept and Quality of Activities”.
- Three-level evaluation of teaching and study by students: IS STAG, questionnaire surveys at the end of the third semester, questionnaire surveys of Bc and Mgr graduates.

## 8.3 Management of the Faculty and Control Activities

- In accordance with Act No. 320/2001 Coll., Act on Financial Control, Implementing Decree No. 416/2004 Coll. and the Rector's directive on the internal control system, all types of control control were carried out at the Faculty, i.e. preliminary, continuous and subsequent.
- The evidence of those are the minutes of meetings of the Faculty management and leaders, minutes of individual inspections and Reports of the Department's Audit Activities for 2018. The secretary of the Faculty trained departmental budget administrators.

- Continuous and follow-up inspections of selected projects, student grant competition projects were carried out at the departments, and processes were checked, i.e. the budget of FME TUL and the inventory of property were checked.

## 8.4 A Look Back at the History of the Faculty

***Sad Announcements***

At the age of 91, professor Václav Hercík, a long-time member of the Department of Applied Mechanics of the Faculty of Mechanical Engineering, TUL, died in July. He worked at the university from 1953 to 1978, and after an involuntary leave he worked here again from 1991 to 1997.

At the age of 79 years, we were abandoned by a long-time teacher and a member of the Department of Textile Machine Design, FS TUL Assoc. prof. Ing. Jiří Mrázek, CSc. He worked at the High School of Mechanical and Textile Engineering in Liberec and later at the Technical University of Liberec for more than 43 years.

At the age of 79 years, Professor Miroslav Olehla died in October. His name is inextricably linked with the Department of Applied Cybernetics. He was one of the first graduates of the high schools in Liberec, where he dedicated the entire productive life teaching and research work.

*We honour their memory!*

## 65th Anniversary of VŠS – VŠST – TUL

***Dean's speech at the ceremonial meeting of the Scientific Council on the 65th anniversary of the foundation of the Faculty***

Dear Alumni, dear colleagues,

sixty-five years since the foundation of the University of Mechanical Engineering, today's Technical University of Liberec, and of the Faculty of mechanical Engineering provides an opportunity to look back on the work done and thank all those who have participated in the development of the Faculty – by educating students, performing science and research activities and especially by professional employment.

Over the course of 65 years, three generations of students and their professors, associate professors and assistant professors passed through at the dormitories, lecture halls and classrooms of this Faculty. This is a good reason to think about how, whether and what has changed in the mission of the Faculty and in the demands for the education of new Bachelors and engineers – mechanical engineers.

Teaching began on October 1, 1953, and 259 students enrolled in the frst yea. They had passed the first entrance selection procedure at the Faculty of Mechanical Engineering of the Czech Technical University in Prague. During its existence, more than eleven thousand students have graduated from the Faculty of Mechanical Engineering VŠS-VŠST-TUL.

The University of Mechanical Engineering was established in order to strengthen the automotive industry in Liberec region by providing specialists - engineers, especially for the production of LIAZ trucks and Škoda cars. Over the years, another the focus has been added, on glass (Crystalex) and textile (Textilana) and plastics processing (Plastimat). We carried out this mission until the first half of the 1990s.

Over the three generations, the engineer's tools and aids have changed significantly. Drawing boards and calculators have been replaced by computers and computational programs – design drawings, motion kinematics, material behaviour, flow, thermal and physical fields, processes and systems are examined by designers and technologists before the actual production process. This enables unprecedented possibilities of predicting and optimizing products and processes of various types.

The focus of the Faculty is gradually developing. The dominance of metals is balanced by an interest in new materials – plastics and composites. Emphasis is placed more and more on environmental protection – not only in technology operations, but also in product recycling.

Today, the Faculty of Mechanical Engineering operates in new buildings and laboratories where modern machines, equipment and technologies – Rapid prototyping, nanofiber production equipment, robots, injection molding machines, measuring and testing equipment, microscopes, etc. operate.

The machinery industry in the Czech Republic has been the backbone industry since the times of Austria-Hungary. I am convinced that the Faculty of Mechanical Engineering of the Technical University of Liberec has made a significant contribution to keeping this privilege since 1953 and contributes to it in all areas of activity, in particular by educating professionals – graduates who spread the reputation of our Faculty.

However, the university and its name are mainly created and formed by people – students, graduates, professors and other employees. I want to thank all of you for what you have been and are doing for the Faculty of Mechanical Engineering.

***Awards given by the Dean of the Faculty of Mechanical Engineering TUL***

**Crystal plaque for participation in the development of the faculty**
ReCtor TUL Miroslav Brzezina
Emeritus Rector TUL Zdeněk Kůs
Emeritus Rector TUL Vojtěch Konopa
Emeritus Rector TUL David Lukáš
Emeritus Rector VŠVT-TUL Bohuslav Stříž
Emeritus Dean FS TUL Petr Louda
Emeritus Dean FS TUL Miroslav Malý
Emeritus Dean FS TUL Ludvík Prášil
TUL Bursar Vladimír Stach
Governor of the Liberec region Martin Půta

**Crystal plaque for long/term cooperation wit hthe Faculty**
prof. Ing. Iva Nová, CSc.
prof. Ing. Jaroslav Beran, CSc.
Assoc. prof. Ing. Lubomír Moc, CSc.
Ing. Petr Novotný, CSc.
Dipl.-Ing. Michael Oeljeklaus, ŠKODA AUTO a.s.
Assoc. prof. Ing. Jaroslav Katolický, Ph.D., Dean of the Faculty of Mechanical Engineering of Brno University of Technology
Assoc. prof. Ing. Ivo Hlavatý, Ph.D., Dean of the Faculty of Mechanical Engineering VŠB-TU Ostrava
Assoc. prof. Ing. Milan Edl, Ph.D., Dean of the Faculty of Mechanical Engineering, UWB in Pilsen
Assoc. prof. Ing. Roman Čermák, Ph.D., Dean of the Faculty of Technology, Tomáš Baťa Univ in Zlín
prof. Ing. Lubomír Šooš, Ph.D., Dean of the Faculty of Mechanical Engineering STU in Bratislava

**65th Anniversary of the Faculty**
A book on the history of the faculty - handed over to graduates who graduated 60 years ago:
Josef Bajzík
Ladislav Bartoš
Pavel Jelínek
Miroslav Jirásek
Karel Matoušek
Michael Meixner-Slunéčko
Josef Mevald
Alois Mikulášek
Marianna Pevná
Bohumír Plíva
Stanislav Smékal
Jiří Svoboda
Jan Šálek
Josef Šandera
Josef Zedaysk

# CONCLUSION

# 9 Conclusion

The Annual Report on the Activities of the Faculty of Mechanical Engineering TU in Liberec for 2018 provides information on the Faculty, its pedagogical and educational activities, scientific-research and creative activities, national and international cooperation, partnership and internationalization, and the third role.

In 2018,The Faculty of Mechanical Engineering has aimed at development not only in pedagogical activity, scientific, research, development and innovation activities, but also in the area of third role. The annual report shows that the Faculty's activities in 201 8 were very thorough nd extensive, and covered a wide range of activities that are mentioned in the previous chapters and in the following annexes to the annual report. Faculties who belong to the university faculties must provide these activities inherently. From the Annual Report it is evident that the Faculty has succeeded in meeting the goals with the support and activities of all members of the academic community and other workers in 2018 as well.

In some areas and activities, the Faculty has achieved high quality and very good results, e.g. in the area of professional growth of the academic staff, age structure, in the field of science-research projects, publications, in the area of quality assessment of education at all levels of study programs, in the field of accreditation degree programs, in the areas of legislation and adjustment processes within the Faculty, in the field of new promotions of the Faculty, in the area of raising interest and the number of applicants in a foreign language, in the area of student involvement in internal processes and, last but not least, there has been a significant renewal of infrastructure and laboratory and instrumentation equipment. On the other hand, there is still a lack of interest of the young generation in the study of technical fields, which is further supported by the demographic curve. A major persistent problem of public universities is the funding of educational activities by the state, which would ensure both decent education and the evaluation of academic staff. This handicap then very often leads either to the departure of young academics to industry or research centres, or to the orientation of some workers only towards projects at the expense of their activities and skills growth. Application of Methodology 17+ may be a threat or opportunity for the Faculty in the coming years. The internal problem of the university or Faculty is a high overhead burden. The last, but not unimportant, problem of today is the administrative burden and the overwhelming administration of the Faculty and academic staff.

Nowadays, there are a lot of changes and new things at the state level that do not always have to benefit the development of universities and the university environment. These changes often lead to situations that have a rather negative impact on the faculties' activities. That's why I want to give my very sincere thanks once again to all members of the academic community who through their work, their activities and their efforts take care of the development of the Faculty and the university, for which they deserve great appreciation.

*prof. Dr. Ing. Petr Lenfeld*
*Dean*
*Faculty of Mechanical Engineering TU Liberec*

The Annual Report was approved by the Academic Senate of the Faculty of Mechanical Engineering TUL on 19 June 2019.

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## 2.3 Personnel Structure of the Facutly

**Tab. 2.3.1 Average recalculated numbers and qualification structure of employees as of Dec 31**

| Year | Academic Staff | | | | | Scienticic workers | Other staff | Total |
|---|---|---|---|---|---|---|---|---|
| | Professors | Associated Professors | Senior Lecturers | Lecturers | Tutors | | | |
| 2000 | 8,6 | 29,7 | 47,4 | | | – | 39,6 | 125,4 |
| 2001 | 8,7 | 33,7 | 47,3 | | | 6,6 | 37,7 | 134,0 |
| 2002 | 8,5 | 34,4 | 50,9 | | | 5,4 | 31,4 | 130,6 |
| 2003 | 10,1 | 31,4 | 52,0 | | | 7,7 | 26,3 | 127,5 |
| 2004 | 11,6 | 29,2 | 22,5 | 31,1 | | 3,1 | 26,2 | 123,7 |
| 2005 | 12,1 | 28,4 | 31,3 | 17,4 | | 13,2 | 29 | 131,4 |
| 2006 | 11,7 | 28,0 | 34,3 | 19,6 | | 5,8 | 25,5 | 124,9 |
| 2007 | 10,1 | 27,5 | 48,9 | 5,3 | | 1,1 | 29,7 | 122,5 |
| 2008 | 9,7 | 26,7 | 51,5 | 6,9 | | 1,6 | 32,4 | 128,8 |
| 2009 | 12,6 | 24,9 | 50,3 | 7,7 | | 5 | 34,6 | 135,1 |
| 2010 | 14,9 | 28,4 | 46,7 | 7,7 | 9,9 | 3 | 41,0 | 151,6 |
| 2011 | 16,5 | 26,4 | 51,7 | 6,2 | 8,8 | 0 | 34,2 | 143,8 |
| 2012 | 14,6 | 21,94 | 47,0 | 6,5 | 7,9 | 0 | 34,8 | 132,7 |
| 2013 | 13,5 | 23,5 | 43,3 | 6,8 | 6,5 | 0 | 44,2 | 136,8 |
| 2014 | 12,65 | 22,35 | 43,15 | 5,1 | 2,75 | 2,5 | 37,3 | 125,8 |
| 2015 | 11,45 | 21,3 | 41,05 | 6,3 | 3 | 0,7 | 29,6 | 113,4 |
| 2016 | 12,65 | 20,3 | 39,2 | 4,7 | 3,6 | 1,5 | 25,7 | 107,65 |
| 2017 | 12,9 | 21,4 | 38,05 | 6,8 | 1,2 | 1,6 | 25,25 | 107,05 |
| 2018 | 11,9 | 20,3 | 36,7 | 8,9 | 0 | 3,9 | 34,2 | 115,9 |

**Tab. 2.3.2 Number of staff (physical) and qualification structure of faculty staff**

| Year | Academic Staff | | | | | Scienticic workers | Other staff | Total |
|---|---|---|---|---|---|---|---|---|
| | Professors | Associate professors | Senior Lecturers | Lecturers | Tutors | | | |
| 2008 | 19 | 33 | 65 | 12 | 0 | 9 | 46 | 184 |
| 2009 | 24 | 32 | 60 | 10 | 0 | 10 | 52 | 188 |
| 2010 | 24 | 33 | 60 | 13 | 0 | 5 | 54 | 189 |
| 2011 | 23 | 31 | 55 | 10 | 14 | 0 | 47 | 180 |
| 2012 | 22 | 27 | 54 | 8 | 11 | 0 | 43 | 165 |
| 2013 | 22 | 27 | 50 | 8 | 8 | 0 | 54 | 169 |
| 2014 | 21 | 28 | 52 | 7 | 4 | 3 | 50 | 165 |
| 2015 | 20 | 27 | 52 | 9 | 3 | 1 | 39 | 151 |
| 2016 | 20 | 26 | 50 | 7 | 4 | 2 | 34 | 143 |
| 2017 | 20 | 26 | 51 | 9 | 2 | 2 | 33 | 143 |
| 2018 | 18 | 27 | 51 | 8 | 0 | 11 | 33 | 148 |

**Tab. 2.3.3 Age Structure of Faculty Academic Staff as of 31 December 2018**

| Age | Academic staff | | | | | | | | | | Scienticic workers | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Professors | | Associate professors | | Senior Lecturers | | Lecturers | | Tutors | | | |
| | total | women | total | women | total | women | total | women | total | women | total | women |
| do 29 | | | | | | | | | | | 5 | |
| 30-39 | | | 3 | 1 | 22 | 3 | 5 | 1 | | | 2 | |
| 40-49 | 2 | | 8 | 1 | 25 | 4 | 1 | | | | 2 | |
| 50-59 | 3 | | 5 | 3 | 2 | 1 | | | | | 1 | 4 |
| 60-69 | 8 | 1 | 4 | | 1 | | 2 | 1 | | | 1 | 1 |
| nad 70 | 5 | 1 | 7 | | 1 | | | | | | | |
| Total | 18 | 2 | 27 | 5 | 51 | 8 | 8 | 2 | | | 11 | 5 |

**Tab. 2.3.4 Structure of Academic Staff (employment agreements) of the Faculty according to the Extent of Workload as of 31 December 2018**

| Rozsah úvazku v % | Total | Professors | Associate professors | CSc., Dr., Ph.D. | Other |
|---|---|---|---|---|---|
| do 0,3 | 16 | 4 | 4 | 6 | 2 |
| do 0,5 | 15 | 2 | 3 | 5 | 5 |
| do 0,7 | 8 | 1 | 2 | 3 | 2 |
| nad 0,7 | 76 | 11 | 18 | 37 | 10 |
| Total | 115 | 18 | 27 | 51 | 19 |

## 3.1 Accredited Study Programs and Branches

Pursuant to Article II of Act No. 137/2016 Coll., the accredited study programs which are carried out by higher education institutions under the existing legal regulations on the last day before the date of entry into force of this Act, become degree programs accredited under the Act No. 111/1998 Coll. as amended as of the effective date of this Act and are accredited for a specified period, but at least until 31 December 2024; for this period, the current division of these study programs into branches of study remains unchanged.

**Tab. 3.1.1 Overview of Accredited Study Programs and Branches Guaranteed by the FME**

| STUD PROG | Study programme | KKOV | Study branch Field of education | Accreditation till | Standard length of studies Study form | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | B | M,N | P | F, A |
| B2301 | Mechanical Engineering | 2301R000 | | 1.3.2019 | 3 | | | P, K |
| N2301 | Mechanical Engineering | 3909T010 | Innovation Engineering | 1.11.2020 | | 2 | | P, K |
| | | 2302T002 | Machines and Equipment Design | 31.7.2020 | | 2 | | P, K |
| | | 2301T048 | Engineering Technology and Materials | 31.7.2020 | | 2 | | P, K |
| | | 2301T049 | Manufacturing Systems and Processes | 31.8.2024 | | 2 | | P, K |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Polymers and Composites Technology | – | Mechanical Engineering, Technology and Materials | 28.12.2028 | | 2 | | P, K |
| M2301 | Mechanical Engineering | 3901T003 | Applied Mechanics | 31.3.2020 | | 5 | | P, K |
| P2301 | Mechanical Engineering | 3901V003 | Applied Mechanics | 1.3.2018 | | | 4 | P, K |
| | | 2301V031 | Manufacturing Systems and Processes | 10.2.2018 | | | 4 | P, K |
| | | 3911V011 | Material Engineering | 10.2.2018 | | | 4 | P, K |
| P2302 | Machinse and Equipment | 2302V010 | Machines and Equipment Design | 31.12.2017 | | | 4 | P, K |
| P2303 | Engineering Technology | 2303V002 | Engineering Tachnology | 10.2.2018 | | | 4 | P, K |
| P0715D270001 | Machines and Equipment Design | – | Mechanical Engineering, Technology and Materials | 19.5.2023 | | | 4 | P, K |
| P0788D270002 | Technologie s and Materials | – | Mechanical Engineering, Technology and Materials | 19.2.2023 | | | 4 | P, K |
| P0715D270004 | Applied Mechanics | – | Mechanical Engineering, Technology and Materials | 6.6.2028 | | | 4 | P, K |

STUDPROG – study programs codes
KKOV – study branch code
B – Bachelor's study program
N – Master's study program following up a Bachelor's study program
M – Master's study program
P – PhD. Study program
F – form of study: P – full-time, K – part-time (combined) form of studies
A – Study programs (study branches) carried out in English

## 3.2 Studies Offered in English

Pursuant to Article II of Act No. 137/2016 Coll., the accredited study programs which are carried out by higher education institutions under the existing legal regulations on the last day before the date of entry into force of this Act, become degree programs accredited under the Act No. 111/1998 Coll. as amended as of the effective date of this Act and are accredited for a specified period, but at least until 31 December 2024; for this period, the current division of these study programs into branches of study remains unchanged.

**Tab. 3.2.1 Overview of Accredited Study Programs and Branches in English**

| STUD PROG | Study programme | KKOV | Study branch Field of Education | Accreditation till | Standard length of studies Study form | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | B | M,N | P | F, A |
| B2301 | Mechanical Engineering | | | 1.03.2019 | 3 | | | P, A |
| N2301 | Mechanical Engineering | 3909T010 | Innovation Engineering | 1.11.2020 | | 2 | | P, K, A |
| | | 2301T048 | Engineering Technology and Materials | 31.7.2020 | | 2 | | P, K, A |
| | | 2302T010 | Machines and Equipment Design | 31.7.2020 | | 2 | | P, K, A |
| | | 2301T049 | Manufacturing Systems and Processes | 31.8.2024 | | 2 | | P, K, A |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Polymers and Composites Technology | – | Mechanical Engineering, Technology and Materials | 28.12.2028 | | 2 | | P, A |
| M2301 | Mechanical Engineering | 3901T003 | Applied Mechanics | 31.3.2020 | | 5 | | P, K, A |
| P2301 | Mechanical Engineering | 3901V003 | Applied Mechanics | 1.3.2018 | | | 4 | P, K, A |
| | | 2301V031 | Manufacturing Systems and Processes | 10.2.2018 | | | 4 | P, K, A |
| | | 3911V011 | Material Engineering | 10.02.2018 | | | 4 | P, K, A |
| P2302 | Machines and Equipment | 2302V010 | Machines and Equipment Design | 31.12.2017 | | | 4 | P, K, A |
| P2303 | Engineering Technology | 2303V002 | Engineering Technology | 10.02.2018 | | | 4 | P, K, A |
| P0715D270002 | Machines and Equipment Design | – | Mechanical Engineering, Technology and Materials | 19.5.2023 | | | 4 | P, K, A |
| P0788D270001 | Technologies and Materials | – | Mechanical Engineering, Technology and Materials | 19.5.2023 | | | 4 | P, K, A |
| P0715D270003 | Applied Mechanics | – | Mechanical Engineering, Technology and Materials | 6.6.2028 | | | 4 | P, K, A |

STUDPROG – study programs codes
KKOV – study branch code
B – Bachelor's study program
N – Master's study program following up a Bachelor's study program
M – Master's study program
P – PhD. Study program
F – form of study: P – full-time, K – part-time (combined) form of studies
A – Study programs (study branches) carried out in English

## 3.3 Interest in Studies and Requirements for the Admission Procedure

**Tab. 3.3.1 Applicants for studies for the academic year 2018/2019**

| Code | Study programme | Number of Applicants | | | | |
|---|---|---|---|---|---|---|
| | | Applied to studies | Accepted to Studies | Accepted after PŘ | Accepted in total | Enrolled |
| B2301 | Mechanical Engineering (K) | 84 | 82 | 0 | 82 | 76 |
| B2301 | Mechanical Engineering (P) | 379 | 289 | 0 | 289 | 234 |
| N2301 | Mechanical Engineering (K) | 33 | 27 | 1 | 28 | 27 |
| N2301 | Mechanical Engineering (P) | 128 | 46 | 4 | 50 | 46 |
| M2301 | Mechanical Engineering (P) | 0 | 0 | 0 | 0 | 0 |
| P0715D270001 | Machines and Equipment Design (K) | 2 | 2 | 0 | 2 | 2 |
| | Machines and Equipment Design (P) | 3 | 2 | 0 | 2 | 1 |
| P0715D270002 | Machines and Equipment Design (K) | 2 | 2 | 0 | 2 | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Machines and Equipment Design (P) | 2 | 1 | 0 | 1 | 0 |
| P0715D270004 | Applied Mechanics (K) | 0 | 0 | 0 | 0 | 0 |
| | Applied Mechanics (P) | 3 | 3 | 0 | 3 | 3 |
| P0715D270003 | Applied Mechanics (K) | 0 | 0 | 0 | 0 | 0 |
| | Applied Mechanics (P) | 1 | 1 | 0 | 1 | 0 |
| P0788D270002 | Technologies and Materials (K) | 4 | 4 | 0 | 4 | 4 |
| | Technologies and Materials (P) | 5 | 4 | 0 | 4 | 3 |
| P0788D0270001 | Technologies and Materials (P) | 1 | 0 | 0 | 0 | 0 |
| | Technologies and Materials (K) | 0 | 0 | 0 | 0 | 0 |
| P2301* | Mechanical Engineering | 2 | 2 | 0 | 2 | 0 |
| P2302* | Machines and Equipment | 1 | 0 | 0 | 0 | 0 |
| P2303* | Engineering Technology | 1 | 0 | 0 | 0 | 0 |
| **Faculty in total** | | **651** | **465** | **5** | **470** | **398** |

Note.: P – full-time form of studies, K – parat-time/combined form of studies, PŘ – review of the decision.

* The admission procedure for these programs was closed in June 2018 due to the opening of the admission procedure for newly accredited PhD study programs.

## 3.4 Number of Students and Alumni

**Tab. 3.4.1 Number of Students Enrolled to studies as of 31 October 2018**

| KKOV | Study programme | Czech Republic | | | Foreigners | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | P | K | Total | P | K | Total | P | K | Total |
| B2301 | Mechanical Engineering | 364 | 98 | 462 | 74 | 1 | 75 | 438 | 99 | 537 |
| N2301 | Mechanical Engineering | 67 | 67 | 134 | 56 | 4 | 60 | 123 | 71 | 194 |
| M2301 | Mechanical Engineering | 6 | 0 | 6 | 0 | 0 | 0 | 6 | 0 | 6 |
| P0715 D270001 | Machines and Equipment Design | 1 | 2 | 3 | 0 | 0 | 0 | 1 | 2 | 3 |
| P0715 D270002 | Machines and Equipment Design | 0 | 0 | 0 | 1 | 2 | 3 | 1 | 2 | 3 |
| P0715 D270004 | Applied Mechanics | 3 | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 3 |
| P0715 D270003 | Applied Mechanics | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| P0788 D270002 | Technologies and Materials | 3 | 4 | 7 | 0 | 0 | 0 | 3 | 4 | 7 |
| P0788 D0270001 | Technologies and Materials | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| P2301 | Mechanical Engineering | 9 | 11 | 20 | 5 | 6 | 11 | 14 | 17 | 31 |
| P2302 | Machines and Equipment | 11 | 10 | 21 | 3 | 2 | 5 | 14 | 12 | 26 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| P2303 | Engineering Technology | 5 | 5 | 10 | 3 | 0 | 3 | 8 | 5 | 13 |
| **Faculty in total** | | **469** | **197** | **666** | **142** | **15** | **157** | **611** | **212** | **823** |

**Tab. 3.4.2 Number of International Students Enrolled as of 31 October 2018**

| Type | Form | Studies in Czech | | Studies in English | | | Total |
|---|---|---|---|---|---|---|---|
| | | Government scholarship holders | Others | Government scholarship holders | Self-funding students | Short-term | |
| Bachelor's | K | 0 | 1 | 0 | 0 | 0 | 1 |
| | P | 1 | 42 | 0 | 0 | 31 | 74 |
| Follow-up | K | 0 | 4 | 0 | 0 | 0 | 4 |
| | P | 0 | 1 | 11 | 29 | 15 | 56 |
| Master's | K | 0 | 0 | 0 | 0 | 0 | 0 |
| | P | 0 | 0 | 0 | 0 | 0 | 0 |
| PhD | K | 0 | 5 | 0 | 5 | 0 | 10 |
| | P | 0 | 6 | 3 | 3 | 0 | 12 |
| **Total** | | **1** | **59** | **14** | **37** | **46** | **157** |

**Tab. 3.4.3 Number of students as of 31 October 2018 Number of Alumni in 2018 (from 1.1.2018 to 31.12.2018)**

| Study program | Number of students | | Number of Alumni | |
|---|---|---|---|---|
| | Full-time | Part-time | Full-time | Part-time |
| BSP | 438 | 99 | 36 | 9 |
| NMSP (MSP) – Studies in Czech | 74 | 71 | 48 | 12 |
| NMSP (MSP) – Studies in English | 55 | 0 | 18 | 0 |
| DSP – Studies in Czech | 38 | 37 | 7 | 4 |
| DSP – Studies in English | 6 | 5 | 0 | 1 |
| **Total** | **611** | **212** | **109** | **26** |

**Tab. 3.4.4 Overview of Students and their Length of Studies**

| **Study program** | Form | Date of graduation | Number of Alumni | Average length of studies |
|---|---|---|---|---|
| MSP | P | February 2018 | 0 | – |
| | P | June2018 | 1 | 4,00 |
| | K | February 2018 | 0 | – |
| | K | June2018 | 0 | – |
| **Total MSP** | | February + June 2018 | **1** | **4,00** |
| NMSP | P | February 2018 | 4 | 3,75 |
| | P | June2018 | 61 | 2,11 |
| | K | February 2018 | 1 | 5,00 |

| | | | | |
|---|---|---|---|---|
| | K | June2018 | 11 | 2,73 |
| **Total NMSP** | | February + June | **77** | **2,32** |
| **Total MSP + NMSP** | | February + June | **78** | – |
| BSP | P | February 2018 | 6 | 5,17 |
| | P | August 2018 | 30 | 3,87 |
| | K | February 2018 | 5 | 7,60 |
| | K | August 2018 | 4 | 7,50 |
| **Total BSP** | | February + August | **45** | **4,78** |
| DSP | P | | 7 | 7,71 |
| | K | | 5 | 8,40 |
| **Total DSP** | | | **12** | **8,0** |
| **Total alumni** (BSP, MSP, NMSP, DSP) | | | **135** | **3,48** |

**Tab. 3.4.5 Number of Alumni in Study Programmes and Specializations between 2008–2018**

| Program<br>Branch<br>Specialization | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **B2341 Engineering** | **38** | **53** | **103** | **114** | **129** | **130** | **77** | – | – | – | – |
| **B2301 Mechanical Engineering** | | | | | | **6** | **30** | **50** | **87** | **62** | 45 |
| **M2301 a N2301 Mechanical Engineering** | **110** | **103** | **96** | **68** | **64** | **65** | **72** | **129** | **82** | **72** | **78** |
| **Branch Applied Mechanics M2301** | **4** | **6** | **4** | **1** | **6** | **9** | **3** | **1** | **1** | **1** | **1** |
| **Specialization** Engineering Mechanics | 1 | 4 | 6 | 2 | – | 4 | 8 | 2 | 1 | – | 1 |
| **Specialization** Mechanics of Fluids and Thermodynamics | 2 | – | – | 2 | 1 | 2 | 1 | 1 | – | 1 | – |
| **Branch Innovation Engineering** | **4** | **13** | **9** | **10** | **10** | **13** | **13** | **6** | **7** | **5** | **3** |
| **Specialization** Product Innovation | 4 | 13 | 9 | 10 | 10 | 13 | 13 | 6 | 7 | 5 | 3 |
| **Branch Machines and Equipment Design** | | | | | | | | **25** | **26** | **31** | **34** |
| **Specialization** Textile and single-purpose machines | | | | | | | | 5 | 2 | 1 | 4 |
| **Specialization** Glas Machinery and Robotics | | | | | | | | 3 | 1 | 1 | – |
| **Specialization** Production machines | | | | | | | | 3 | 4 | 11 | 13 |
| **Specialization** | | | | | | | | 12 | 13 | 11 | 9 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Transport Machines | | | | | | | | | | | |
| **Specialization** Energetic Devices | | | | | | | | 2 | 6 | 7 | 8 |
| **Specialization** Instrumentation | | | | | | | | – | – | – | – |
| **Branch Engineering technologies and systems** | | | | | | | | **36** | **29** | **22** | **28** |
| Specialization Polymer Production | | | | | | | | 10 | 10 | 9 | 9 |
| Specialization Foundry, welding and metal forming | | | | | | | | 11 | 13 | 6 | 12 |
| Specialization Material Engineering | | | | | | | | 6 | 4 | 4 | 2 |
| Specialization Machining and assembly | | | | | | | | 9 | 2 | 3 | 5 |
| **Branch Production Systems and Processes** | | | | | | | | **8** | **13** | **13** | **12** |
| Specialization Production Systems | | | | | | | | 6 | 13 | 13 | 11 |
| Specialization Automated control systems | | | | | | | | 2 | – | – | 1 |
| **TOTAL P2301+P2302+P2303** | **16** | **9** | **17** | **12** | **14** | **5** | **23** | **8** | **15** | **13** | **12** |
| **P2301 Mechanical Engineering** | **6** | **3** | **8** | **9** | **5** | **1** | **10** | **4** | **6** | **3** | **5** |
| **Branch Applied Mechanics** | **1** | **–** | **5** | **4** | **2** | **–** | **3** | **2** | **3** | **1** | – |
| Specialization Engineering Mechanics | – | – | 5 | 3 | 1 | – | 2 | – | 3 | – | – |
| Specialization Mechanics of Fluids and Thermodynamics | 1 | – | – | 1 | 1 | – | 1 | 2 | – | 1 | – |
| **Branch Material Engineering** | **3** | **2** | **2** | **4** | **3** | **–** | **5** | **1** | **3** | **1** | **1** |
| **Branch Production Systems and Processes** | **2** | **1** | **1** | **1** | **0** | **1** | **2** | **1** | **–** | **1** | **4** |
| Specialization Applied Cybernetics | – | – | 1 | – | – | 1 | 1 | 1 | – | – | 2 |
| Specialization Automation of technical preparation of production | – | – | – | – | – | – | 1 | – | – | 1 | 2 |
| Specialization Automation of machines and production processes | – | – | – | – | – | – | – | – | – | – | – |
| Specialization Manufacturing systems with industrial robots | – | 1 | 1 | – | – | – | – | – | – | – | – |
| **P2302 Machines and Equipment** | **5** | **2** | **3** | **1** | **3** | **3** | **10** | **1** | **4** | **4** | **5** |
| **Branch Machines and Equipment Design** | **5** | **2** | **3** | **1** | **3** | **3** | **10** | **1** | **4** | **4** | **5** |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Specialization Machine parts and mechanisms | 1 | – | 1 | – | 2 | 1 | 1 | – | 1 | 1 | 2 |
| Specialisation Wheeled and transport/handling machines | – | 1 | 1 | 1 | – | 1 | 4 | – | 1 | – | 1 |
| Specialisation Machining and Assembly Machinery | – | – | – | – | – | – | 1 | – | – | – | 1 |
| Specialisation Piston Combustion Engines | 2 | 1 | 1 | – | 1 | – | 1 | – | – | 3 | – |
| Specialisation Glass-Production and Ceramic Machinery | 2 | – | – | – | – | – | – | – | – | – | – |
| Specialization Technical Machine Diagnostics | – | – | – | – | – | – | – | – | – | – | – |
| Specialization Textile and clothing machines | – | – | – | – | – | – | 3 | – | 1 | – | 1 |
| Specialization Heat Technology | – | – | – | – | – | 1 | – | 1 | 1 | – | – |
| **P2303 Engineering Technology** | **5** | **4** | **6** | **2** | **6** | **1** | **3** | **3** | **5** | **6** | **2** |
| **Branch Engineering Technology** | **5** | **4** | **6** | **2** | **6** | **1** | **3** | **3** | **5** | **6** | **2** |
| Specialization Material Engineering | – | – | – | – | – | – | – | – | – | – | – |
| Specialization Machining and assembly | – | 1 | 1 | – | – | – | 1 | 1 | – | 2 | – |
| Specialization Foundry | 2 | 1 | 1 | 2 | 3 | – | 1 | – | – | 1 | – |
| Specialization Welding | 1 | – | 2 | – | – | – | – | – | – | 1 | – |
| Specialization Metals Forming | 1 | 2 | 2 | – | 3 | – | – | – | – | 2 | 1 |
| Specialization Polymer manufacturing | 1 | – | – | – | – | 1 | 1 | 2 | 5 | – | 1 |
| **Total for each year** | **164** | **165** | **216** | **194** | **207** | **206** | **202** | **187** | **184** | **147** | **135** |

**Tab. 3.4.6 Number of Students of PhD study programmes in 2018 (as of 31 October 2018)**

| Department | Full-time | Part-time | Total | Defended 2018 |
|---|---|---|---|---|
| DAM | 1 | 1 | 2 | 0 |
| DET | 7 | 4 | 11 | 2 |
| DMS | 7 | 8 | 15 | 1 |
| DPE | 12 | 7 | 19 | 0 |
| DMM | 5 | 8 | 13 | 2 |
| DMA | 2 | 1 | 3 | 0 |
| DVE | 7 | 2 | 9 | 2 |
| DGR | 1 | 0 | 1 | 0 |
| DTD | 1 | 2 | 3 | 1 |
| DMA | 1 | 9 | 10 | 4 |

| | | | | |
|---|---|---|---|---|
| **Total** | **44** | **42** | **86** | **12** |

## 3.6 Scholarships

**Tab. 3.6.1 Scholarships Paid to Students in 2018**

| Scholarship type | Number of Students |
|---|---|
| Merit based | 141 |
| For outstanding research, development or other creative results contributing to deepen knowledge | 221 |
| In a difficult social situation | 3 |
| Accommodation scholarship | 382 |
| To support studies abroad | 13 |
| To support studies in the Czech Republic | 33 |
| For PhD students (DSP) | 28 |
| **Total** | **821** |

**Tab. 3.6.2 Amount of Scholarships Paid in 2018**

| Financial source of scholarships | Scholarship Type | Amount (in ths. CZK) |
|---|---|---|
| State budget | To DSP students | 2 347 |
| State budget – government scholarships | To international students | 2 164 |
| Scholarship fund of FS TUL | | 4 035 |
| | Of which: | |
| | Merit-based scholarships | 2 516 |
| | extraordinary scholarships | 977 |
| | To support studies abroad | 119 |
| | To support studies in the CR | 423 |
| Other (SGC, IP, grants, donations) | | 2 407 |
| **Total** | | **10 953** |

## 3.9 Quality of Teaching

**Tab. 3.9.1 Publication Activity of FME TUL in 2018**

| Year | Number of published titles | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2018 | Book in CZ | Book in EN | Study material | Web application | Study material ČJ | Study material AN | Teaching aid | Virtual models | Functional model/Exp. equipment |
| Total | 1 | 1 | * | * | 0 | 7 | * | * | * |

* Documented in detail in the annual reports of the departments.

## 3.10 Lifelong Learning

**Tab. 3.10.1 Lifelong Learning Courses in 2018 – Education for Business**

| Technical Sciences | | |
|---|---|---|
| Course length | Number of courses | Number of attendants |
| to 15 hours | 10 | 80 |
| 16–100 hours | 21 | 164 |
| 101 and more hours | – | – |

## 4.1 Scientific-Research Activity

**Tab. 4.1.1 Subsidies to FS TUL for Scientific-Research Activity in 2018**

| Source | Share (%) | Subsidy (in ths. CZK) | | |
|---|---|---|---|---|
| | | NIV | INV | Total |
| Institutional Support | 53,77 | 29 763 | 700 | 30 463 |
| Grant support (GACR, TACR, MoI CR) | 34,95 | 17 600 | 2 200 | 19 800 |
| Specific research support (SGC) | 11,28 | 6 390 | 0 | 6 390 |
| **Total sources form CR** | | 53 753 | 2 900 | 56 653 |
| Transferred to other TUL units | | 1 605 | | |
| OP RDE – Excellent research and development (Hyhi) * | | 9 679 | 2 133 | 11 812 |
| OP RDE – Pre-application research and development (3D STAR)* | | 4 174 | 2 035 | 6 209 |
| OP RDE – DSP (DspFSTUL,ViFSTULTUL)* | | 791 | 37 342 | 38 133 |
| OP EIC – Application | | 6 899 | 0 | 6 899 |
| HORIZONT ** | | 2 666 | 0 | 2 666 |
| **Total sources from the EU** | | 24 209 | 41 510 | 65 719 |
| ** Transferred to other TUL units | | 466 | | |
| **Total sources CR and EU** | | 77 962 | 44 410 | 122 372 |

Only grants whose Beneficiary is FME TUL are listed.
Other NIV sources for R&D received by the faculty within the framework of co-research on projects of other components and projects under CxI are not included.
INV subsidies from OP RDE Furniture under TUL (CZK 10.6 million) and from OP RDE Vi4.0 under TUL (CZK 58.6 million) are not included.
* The amount includes only the subsidy, i.e. 95% of the costs, 5% is co-financed from FS TUL sources.

**Tab. 4.1.2 Development of subsidies for scientific and research activities**

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| FME | 76,2 | 64,9 | 73,7 | 57,1 | 59,7 | 63,5 | 44,5 | 47,2 | 61,1 | 56,7 |
| Of which INV | 4,9 | 3,9 | 5,8 | 2,9 | 4,7 | 2,8 | 0 | 0 | 7,1 | 2,9 |
| Of which non-public | 2 | 1,8 | 2,1 | 0,9 | | 0,5 | 0,6 | 0,5 | | |
| FME* | | | | | | | | 8,5 | 8 | 2,5 |

* In the years 2010-2013, the CNATI project was solved with the participation of the academic staff of the TUL –

information on the financial contribution of the FME on this are not available. In the following years, the share is under other components without a share in the NPI CxI project.

### 4.1.3 Grant support to FS TUL for S&R in 2018

| Provider | Program | Subsidy (in ths. CZK) | | |
|---|---|---|---|---|
| | | NIV | INV | Total |
| GA CR | GA-Standard projects | 932 | 0 | 932 |
| TA CR | EPSILON (2015-2025) | 2 043 | 0 | 2 043 |
| MIT CR | TRIO | 6 108 | 0 | 6 108 |
| MoI ČR | Program BV | 8 532 | 2 200 | 10 732 |
| MEYS | Specific research | 6 390 | 0 | 6 390 |
| **Total** | | 24 005 | 2 200 | 26 205 |

### 4.1.4 Support in 2018 – FS TUL share on solving CxI projects

| **Provider** | **Program** | Subsidy (in ths. CZK) |
|---|---|---|
| **Targeted support** | | |
| TA CR | GAMA (2014–2019) | 975 |
| TA CR | EPSILON (2015–2025) | 746 |
| MoI CR | Security research (2015–2020) | 813 |
| MEYS | NPU | the amount is not available |
| | | 2 534 * |
| EU-MPO | OP PIK | 249 * |

* The amount is not exhaustive, the faculty has no data available.

Tab. 4.1.5 **Targeted support for scientific research projects of FME TUL (grants and specific)**

| Source (in ths. CZK) | Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
| Support | 63 783 | 49 431 | 39 349 | 35 884 | 34 590 | 15 700 | 17 933 | 31 781 | 26 190 |
| of which non-public sources | 900 | 749 | 900 | * | 499 | 615 | 494 | | |
| of which investment | 286 | 2 116 | 2 962 | 4 664 | 2 760 | 0 | 0 | 7 100 | 2 222 |

* In previous years, a contract research project of the DGR, VZ and the Center was solved and counted.

## 4.4 Scientific-Research Projects

**Tab. 4.4.1 Scientific and research projects solved in 2018 – supported from the Czech budget**

| Provider | Program | FS TUL as | | Of which in 2018 | |
|---|---|---|---|---|---|
| | | Beneficiary | Co-beneficiary | End of solution | Start of solution |
| GA CR | GA-Standard projects | – | 1 | 1 | – |
| TA CR | EPSILON (2015-2025) | – | 2 | – | 1 |
| MIT CR | TRIO | – | 6 | 1 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| MI CR | Program BV | 2 | – | – | – |
| **Total** | | 2 | 11 | 1 | 2 |

**Tab. 4.4.2 Scientific and research projects solved in 2018 – supported from EU funds**

| Provider | Program | FS TUL as | | Of which in 2018 | |
|---|---|---|---|---|---|
| | | Coordinator for TUL | Co-beneficiary | End of solution | Start of solution |
| EU / MEYS | OP RDE – Capacity Building for RDE – DspFMETUL, ViFMETUL | 2* | – | – | – |
| EU / MEYS | OP RDE – Excellent research | 1 | – | – | 1 |
| EU / MEYS | OP RDE – Pre-application research | 1 | – | – | 1 |
| EU / MIT | OP EIC | – | 4 | – | 2 |
| H2020 | H2020-SC-2015-one-stage | – | 1 | 1 | – |
| **Total** | | 4 | 5 | 1 | 4 |

* Beneficiary a coordinator – FME TUL.

## 4.5 Student Grant Competition

**Tab. 4.5.1 List of student grant competition projects in 2018**

| Int. č. | Name of Projects<br>Researcher | Solution period | Subsidy (in ths. CZK) |
|---|---|---|---|
| 21120 | Research on advanced composites materials, polymeric materials, development and simulation of mechanical and mechatronic systems | 2016–2018 | 319 |
| | Ing. David Cirkl, Ph.D. | | |
| 21121 | Advanced Analysis Utilization the for the Research of the Special Material Types Application Possibilities in the Industrial Production | 2016–2018 | 289 |
| | Ing. David Koreček | | |
| 21122 | Research of physical, thermal and technological parameters for the application of production technologies | 2016–2018 | 718 |
| | Ing. Jiří Sobotka, Ph.D. | | |
| 21123 | Study and evaluation of the material's structure and properties | 2016–2018 | 400 |
| | Ing. Adam Hotař, Ph.D. | | |
| 21124 | Experimental and numerical investigation in applied fluid mechanics and energy devices | 2016–2018 | 425 |
| | Ing. Jan Kracík | | |
| 21125 | Innovation of products and equipment i engineering practice | 2016–2018 | 334 |
| | Ing. Rudolf Martonka, Ph.D. | | |
| 21126 | Improving the quality of machining and assembly processes | 2016–2018 | 195 |
| | Ing. Miloslav Ledvina | | |
| 21127 | Modern methods of development and testing of vehicles and their parts | 2016–2018 | 371 |
| | Ing. Pavel Brabec, Ph.D. | | |

| | | | |
|---|---|---|---|
| 21128 | Research and development in the field of glass-producing machines, industrial and service robotics | 2016–2018 | 150 |
| | Ing. Vlastimil Hotař, Ph.D. | | |
| 21129 | Research of the structures and the procesess of textile and single-purpose machines | 2016–2018 | 270 |
| | Ing. Jiří Komárek, Ph.D. | | |
| 21130 | Research and development in the field of 3D technology, manufacturing systems and automation | 2016–2018 | 419 |
| | Ing. Radomír Mendřický, Ph.D. | | |
| 21131 | Research and development of devices for production of nanofibrous materials using AC-elektrospinning process | 2016–2018 | 350 |
| | Ing. Ondřej Baťka | | |
| 21132 | Innovation of technical systems structures with the use of composite materials | 2016–2018 | 279 |
| | Ing. Petr Lepšík, Ph.D. | | |
| 21135 | Experimental and numerical research of real fluid | 2016–2018 | 270 |
| | Ing. Jan Novosád | | |
| 21180 | Research of renewable and biodegradable "green" composites based on cellulose nanocrystals | 2017–2018 | 254 |
| | Ing. Martin Borůvka | | |
| 21223 | Automation of the production line of multi-layer nanofibrous tubular structures | 2018 | 190 |
| | Ing. Andrii Shynkarenko | | |
| 21224 | Stereolithography-based 3D printing of ceramic and composite materials | 2018 | 160 |
| | Ing. Iaroslav Kovalenko | | |
| 21225 | Research of application of cavity inserts produced by additive manufacturing used for polymer injection mould design | 2018–2020 | 228 |
| | Ing. Martina Češková | | |
| 21226 | Experimental, numerical and mathematical study on ejector refrigeration | 2018 | 252 |
| | Ing. Vu Van Nguyen | | |
| 21227 | An interaction of fluid with solid structure | 2018–2019 | 237 |
| | Ing. Tomáš Kořínek | | |
| 21016 | Management SGC – DO/FME | 2018 | 158 |
| **FS total** | | | **6 390** |

## 4.6 Scientific-research Contractual and Complementary Activity

**Tab. 4.6.1 Overview of Revenue of Contractual and Complementary Activity in 2018**

| Department | Contractual Research under FME (ths. CZK) | Complementary Activity under FME (ths. CZK) | Contractual Research under CNATI (ths. CZK) | Complementary Activity under CNATI (ths. CZK) |
|---|---|---|---|---|
| DAM | 248 | 41 | 0 | |
| DET | 1 818 | 1 017 | 165 | 0 |

| | | | | |
|---|---|---|---|---|
| DMS | 1 323 | 584 | 0 | 0 |
| DPE | 872 | 83 | 0 | 0 |
| DMM | 4 221 | 414 | 1 098 | 5 |
| DMA | 78 | 5 | 0 | 0 |
| DVE | 314 | 594 | 3 151 | 0 |
| DGR | 0 | 102 | 159 | 153 |
| DTD | 646 | 0 | 5 945 | 0 |
| DMA | 158 | 78 | 0 | 0 |
| Total | 9 677 | 2 735 | 7 367 | 153 |
| D(FME) | | 651 | | |

**Tab. 4.6.2 Development of the Volume of Funds from Contract Research and Complementary Activities**

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| Revenue (ths. CZK) | 9 499 | 9 600 | 8 171 | 8 131 | 9 373 | 12 115 | 11 692 | 13 351 | 16 759 | 13 262 |
| Profit ratio in revenues (%) | 16,5 | 22,2 | 22,1 | 22 | 29 | 21,5 | 20,2 | 21,8 | 22,6 | 20,6 |

## 4.9 Results of Scientific Research and Development Activities of FME TUL

**Tab. 4.9.5 Number of Faculty Outputs in 2014–2018**

| Type of output | Number of outputs in | | | | | Total |
|---|---|---|---|---|---|---|
| | 2014 | 2015 | 2016 | 2017 | 2018 | |
| J – Article in a professional periodical | 58 | 68 | 65 | 60 | 73 | 328 |
| D – Article in porceedings | 170 | 127 | 100 | 81 | 65 | 540 |
| FP – industrial pattern | 2 | 0 | 0 | 0 | 0 | 2 |
| FU – utility model | 17 | 19 | 7 | 7 | 5 | 55 |
| GA – prototype | 7 | 0 | 4 | 1 | 9 | 21 |
| GB – Functional sample | 16 | 9 | 6 | 16 | 14 | 61 |
| B – professional book | 2 | 6 | 2 | 0 | 1 | 11 |
| P – patent | 5 | 14 | 16 | 13 | 6 | 54 |
| S – software | 3 | 3 | 1 | 0 | 0 | 7 |
| ZA – pilot plant | 1 | 1 | 0 | 0 | 1 | 3 |
| ZB – Proven technology | 5 | 4 | 0 | 1 | 2 | 16 |
| M – organizing a conference | 0 | 4 | 2 | 3 | 3 | 12 |
| W – organizing a workshop | 6 | 8 | 1 | 0 | 0 | 15 |
| Total | 292 | 263 | 204 | 184 | 179 | |

Note.: Dates from 2014–2016 taken from www.rvvi.cz, dates for 2017 and 2018 taken from publikace.tul.cz (data in the databases as of 17 March 2019).

**Tab. 4.9.6 Number of Selected Outputs by Departments in 2017 and 2018 (number of results)**

| | Year 2017 / Year 2018 | | | | | | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | BN | C | D | DN | FU | GA | GB | J | JI | JN | JR | P | Number | Share (%) |
| DAM | | 1 | 2 | 3 | 3 | | | | | 2 | 3 | | | 14 | 5,8 |
| | | | | 6 | 3 | | | | | 7 | 1 | 1 | | 18 | 8,3 |
| DET | | 1 | | 8 | | 1 | | | 1 | 2 | 17 | 1 | 7 | 38 | 15,8 |
| | | 1 | | 12 | | 1 | | | | 1 | 9 | 1 | | 25 | 11,5 |
| DMS | | | | 9 | 9 | | | | | 2 | 2 | 1 | 1 | 24 | 10,0 |
| | | | | 6 | 8 | 1 | | | | 7 | 9 | 6 | 1 | 38 | 17,5 |
| DPE | | 3 | | 14 | 7 | | | | | 1 | 1 | 1 | | 27 | 11,3 |
| | | 1 | | 15 | 3 | | 2 | | 1 | | 1 | 4 | | 27 | 12,4 |
| DMA | | 1 | | 6 | 11 | | | 5 | | | 3 | | | 26 | 10,9 |
| | 1 | | | 4 | 2 | | | | 1 | | 7 | 1 | | 16 | 7,4 |
| DMM | | | 1 | 18 | 1 | 4 | 1 | 2 | | | 5 | | | 32 | 13,4 |
| | | | 1 | 8 | 1 | 2 | 4 | 2 | | 2 | 1 | | 1 | 22 | 10,1 |
| DMA | | | | | | | | | | 2 | 5 | | | 7 | 2,9 |
| | | | | | | | | | | 3 | 3 | | | 6 | 2,8 |
| DVE | | | | 15 | 7 | | | 2 | 2 | 2 | | 1 | | 29 | 12,1 |
| | | | | 13 | 11 | 1 | | | 1 | 1 | 1 | | 1 | 29 | 13,4 |
| DGR | | 1 | 1 | 1 | 1 | 1 | | 2 | | 1 | | 5 | | 13 | 5,4 |
| | | | 1 | 1 | 5 | | | 5 | | 2 | | 4 | | 18 | 8,3 |
| DTD | | | | 5 | 1 | 1 | | 5 | | 4 | | | 5 | 19 | 7,9 |
| | | | | 3 | 1 | | | 7 | | | | | 3 | 14 | 6,5 |
| Total | 1 | 9 | 1 | 105 | 29 | 7 | 4 | 6 | 12 | 13 | 45 | 7 | 19 | 258 | |
| | 0 | 7 | 4 | 83 | 41 | 7 | 1 | 16 | 3 | 16 | 36 | 9 | 13 | 236 | |

Note: Data taken from publikace.tul.cz (data in the database as of 17 March 2019).

**Tab. 4.9.7 Number of Selected Outputs of Faculty Departments in 2017 and 2018 (share of results)**

| | Year 2017 / Year 2018 | | | | | | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | Number | Share (%) |
| DAM | | 0,25 | 2 | 3 | 3 | | | | | 1,5 | 2,5 | | | 12,25 | 5,9 |
| | | | | 6 | 3 | | | | | 5,15 | 1 | | | 15,15 | 8,0 |
| DET | | 0,33 | | 7,67 | | 0,75 | | | | 1,75 | 15,63 | 1 | 6,08 | 33,21 | 15,9 |
| | | 0,25 | | 11,09 | | 1 | | | | 0,75 | 9 | 1 | | 23,09 | 12,2 |
| DMS | | | | 7,9 | 8,16 | | | | | 0,76 | 1,28 | 0,75 | 1 | 19,85 | 9,5 |
| | | | | 4,15 | 6,25 | 1 | | | 0,25 | 5,07 | 6,03 | 4 | 0,65 | 27,40 | 14,5 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DPE | | 3 | | 12,9 | 5,59 | | | | | 0,75 | 1 | 1 | | 24,24 | 11,6 |
| | | 1 | | 13,32 | 2,33 | | 2 | | 1 | | 0,66 | 4 | | 24,31 | 12,8 |
| DMA | | 1 | | 5,2 | 11 | | | 5 | | | 2,8 | | | 25,00 | 12,0 |
| | 0,5 | | | 4 | 2 | | | | 1 | | 5,64 | 1 | | 14,14 | 7,5 |
| DMM | | | 1 | 17,67 | 1 | 2,51 | 0,75 | 1,65 | 1 | | 5 | | | 30,58 | 14,7 |
| | | | 1 | 8 | 1 | 1,51 | 2,64 | 1,86 | | | 1 | | 0,62 | 17,63 | 9,3 |
| DMA | | | | | | | | | | 1,08 | 3 | | | 4,08 | 2,0 |
| | | | | | | | | | | 2,67 | 4,5 | | | 7,17 | 3,8 |
| DVE | | | | 14,24 | 7 | | | 2 | 2 | 1,29 | | 1 | | 27,53 | 13,2 |
| | | | | 13 | 10,88 | 1 | | | 1 | 1 | 1 | | 0,75 | 27,88 | 14,7 |
| DGR | | 1 | 1 | 1 | 1 | 1 | | 0,8 | | 1 | | 5 | | 11,80 | 5,7 |
| | | | 1 | 1 | 4,75 | | | 5 | | 2 | | 4 | | 17,75 | 9,4 |
| DTD | | | | 5 | 0,97 | 1 | | 4,98 | | 3,64 | | | 3,64 | 19,23 | 9,2 |
| | | | | 3 | 1 | | | 7 | | | | | 2,66 | 14,66 | 7,7 |
| Total | 0,5 | 5,58 | 4 | 74,58 | 37,72 | 5,26 | 0,75 | 14,43 | 3 | 11,77 | 31,21 | 8,75 | 10,72 | 208,27 | |
| | 0 | 2,25 | 2 | 63,56 | 31,21 | 4,51 | 4,64 | 13,86 | 3,25 | 16,64 | 28,83 | 14 | 4,68 | 189,43 | |

Note: Data taken from publikace.tul.cz (data in the database as of 17 March 2019).).

**Tab. 4.9. Results included in the Faculty Round of Selection of Significant Results according to Methodology 17+ in 2018**

| Name of Result | Author | Result type | Branch | Co-authorship |
|---|---|---|---|---|
| Electrode For Continuous Production of Composite Nanofiber Material Using AC Electrospinning Method | Valtera Jan, Beran Jaroslav, Souček Jiří | GB functional sample | 2.10.1 | FME/FTT/ CNATI |
| Method for production of polymeric nanofibers by spinning of solution or melt of polymer in | Beran Jaroslav, Bílek Martin, Valtera Jan | P – patent | 2.10.1 | FME/FTT/ CNATI |
| Roller for scraping hair on the surface of felt semi-finished products and a device for scraping hair on the surface of felt semi-finished products equipped with this roller | Beran Jaroslav, Kopal Jaroslav, Kazda František | P – patent | 2.3.1 | FME |
| A method of producing polymeric nanofibres by electrical spinning of a polymer solution or melt, a spinning electrode for this method, and a device for the production of polymeric nanofibres fitted with at least one of these spinning electrodes | Beran Jaroslav, Bílek Martin, Valtera Jan, Skřivánek Josef | P – patent | 2.10.1 | FME/FTT/ CNATI |
| Functional sample of frosting module for flat glass areal patterning for application on industrial robot | Hotař Vlastimil | GB functional sample | 2.3.1 | FME/CNATI |

| | | | | |
|---|---|---|---|---|
| A Method of Producing a Ballistically Resistant Composite for Personal Protective Armour | Louda Petr | P – patent | 2.5.5 | FME/FTT |
| Verified technology of repairing creep-resistant components from material GX12CrMoVNb9-1 | Moravec Jaromír, Nováková Iva | ZB proven technology | 2.5.1 | FME |
| Verified technology of repairing creep-resistant components from material GX23CrMoV12-1 | Moravec Jaromír, Nováková Iva | ZB proven technology | 2.5.1 | FME |
| Verified technology of repairing creep-resistant components from material G17CrMoV5-10 | Moravec Jaromír, Nováková Iva | ZB proven technology | 2.5.1 | FME |
| Polymeric composite with hollow glass microspheres and carbon fibres | Habr Jiří, Běhálek Luboš, Lenfeld Petr, Bobek Jiří | P – patent | 2.5.5 | FME |
| Dual Printing Head for FLM Technology | Keller Petr | GB functional sample | 2.3.2 | FME |
| A mobile flood board | Ševčík Ladislav, Mašín Ivan | FU utility model | 2.3.2 | FME/CNATI |
| A flood barrier | Ševčík Ladislav, Mašín Ivan | FU – utility model | 2.3.2 | FME/CNATI |
| A heated laminating roller for a laminating device and a laminating device fitted with this laminating roller | Ševčík Ladislav | FU – utility model | 2.3.2 | FME/CNATI |
| A device for storing fibrous reinforcement on fibreglass composite structures | Ševčík Ladislav | FU – utility model | 2.3.2 | FME/CNATI |
| Laminating roller with radiant heating | Ševčík Ladislav | GA – prototype | 2.3.2 | FME/CNATI |
| Hybrid composite material with synthetic polymer matrix, hemp fibers and glass hollow bubbles. | Habr Jiří, Seidl Martin, Běhálek Luboš | P – patent | 1.4.4 | FME |

**Tab. 4.9.9 Frequency of Results produced by FME in 2017 in Branches according to Methodology 2017+ (according to the Branch Classification in Frascati manual)**

| Branch Classification | Number of Outputs | Recalculated shares (%) |
|---|---|---|
| 1 Natural Sciences | 19 | 6,7 |
| 2 Engineering and Technology | 259 | 90,9 |
| 3 Medical and health sciences | 4 | 1,4 |
| 5 Social Sciences | 3 | 1,1 |
| **Total** | 285 | 100,0 |

Note: Data taken from the database publikace.tul.cz as of 18 March 2019.

**Tab. 4.9.10 Frequency of Results produced by FS in 2018 in Branches according to Methodology 17+ (according to the Branch Classification in Frascati manual)**

| Branch Classification | Number of Outputs | Recalculated shares (%) |
|---|---|---|
| 1 Natural Sciences | 23 | 8,7 |
| 2 Engineering and Technology | 232 | 87,9 |
| 3 Medical and health sciences | 8 | 3 |
| 5 Společenské vědy | 1 | 0,4 |
| **Total** | 264 | 100,0 |

Note: Data taken from the database publikace.tul.cz as of 18 March 2019.

**Tab. 4.9.11 Frequency of Results produced by FS in 2018 in Branch Engineering and Technology (according to the Branch Classification in Frascati manual)**

| Branch Classification | Number of Outputs | Recalculated shares (%) |
|---|---|---|
| 2.2 Electrical Engineering, Electronic Engineering, Information Engineering | 12 | 4,6 |
| 2.3 Mechanical Engineering | 105 | 40,5 |
| 2.5 Material Engineering | 89 | 34,4 |
| 2.6 Medical Engineering | 1 | 0,4 |
| 2.7 Environmental Engineering | 27 | 10,4 |
| 2.9 Industrial Biotechnology | 4 | 1,5 |
| 2.10 Nano-technology | 18 | 6,9 |
| 2.11 Other Engineering and technologies | 3 | 1,2 |
| Total | 259 | 100,0 |

Note: Data taken from the database publikace.tul.cz as of 17 March 2019.

**Tab. 4.9.12 Frequency of Results produced by FS in 2018 in Branch Engineering and Technology (according to the Branch Classification in Frascati manual)**

| Branch Classification | Number of Outputs | Recalculated shares (%) |
|---|---|---|
| 2.1 Civil Engineering | 2 | 0,9 |
| 2.2 Electrical Engineering, Electronic Engineering, Information Engineering | 11 | 4,7 |
| 2.3 Mechanical Engineering | 95 | 40,9 |
| 2.4 Chemical Engineering | 1 | 0,4 |
| 2.5 Material Engineering | 89 | 38,4 |
| 2.6 Medical Engineering | 0 | 0 |
| 2.7 Environmental Engineering | 9 | 3,9 |
| 2.9 Industrial Biotechnology | 2 | 0,9 |
| 2.10 Nano-technology | 23 | 9,9 |
| 2.11 Other Engineering and technologies | 0 | 0 |
| Total | **232** | **100** |

Note: Data taken from the database publikace.tul.cz as of 17 March 2019.

**Tab. 4.9.13 Number of Outputs of the SGC projects between 2017 and 2018**

| Output type | Number of Outputs | | Recalculated share of FME outputs | |
|---|---|---|---|---|
| | 2017 | 2018 | 2017 | 2018 |
| J – Article in a professional periodical | 33 | 27 | 28,7 | 23,65 |
| D - Article in proceedings | 67 | 43 | 57 | 41,38 |
| FP – industrial pattern | 0 | 0 | 0 | 0 |
| FU – utility model | 0 | 0 | 0 | 0 |
| GA – prototype | 0 | 0 | 0 | 0 |
| GB – functional sample | 7 | 1 | 6,06 | 1 |
| B – professional book | 0 | 0 | 0 | 0 |
| P – patent | 0 | 1 | 0 | 1 |
| S – software | 0 | 0 | 0 | 0 |
| ZA – pilot plant | 0 | 0 | 0 | 0 |
| ZB – Proven technology | 0 | 0 | 0 | 0 |
| C – Chapter in a monograph | 0 | 0 | 0 | 0 |
| O – other outputs | 0 | 0 | 0 | 0 |
| **Total** | 107 | 72 | 91,76 | 67,03 |

Note: Data taken from the database publikace.tul.cz as of 17 March 2019.

**Tab. 4.9.14 Number of Outputs financed from Institutional Support between 2017 and 2018**

| Output type | Number of Outputs | | Recalculated share of FS outputs | |
|---|---|---|---|---|
| | 2017 | 2018 | 2017 | 2018 |
| J – Article in a professional periodical | 14 | 27 | 8,7 | 18,86 |
| D – Article in proceedings | 41 | 20 | 35 | 15,57 |
| FP – industrial pattern | 0 | 0 | 0 | 0 |
| FU – utility model | 0 | 0 | 0 | 0 |
| GA – prototype | 0 | 0 | 0 | 0 |
| GB – functional sample | 0 | 0 | 0 | 0 |
| B – professional book | 0 | 1 | 0 | 0,5 |
| P – patent | 6 | 5 | 4,25 | 4,08 |
| S – software | 0 | 0 | 0 | 0 |
| ZA – pilot plant | 0 | 0 | 0 | 0 |
| ZB – Proven technology | 0 | 0 | 0 | 0 |
| C – Chapter in a monograph | 0 | 0 | 0 | 0 |
| O – other outputs | 1 | 3 | 0,6 | 2,19 |
| **Total** | 62 | 56 | 48,55 | 41,2 |

Note: Data taken from the database publikace.tul.cz as of 17 March 2019.

## 5.2 International Cooperation in Education

**Tab. 5.2.1 Overview of cooperation based on inter-university agreements 2018**

| **Type of Agreement / Country** | **Partner institutioin** |
|---|---|
| **Inter-university cooperation** | |
| Azerbaijan | Azerbaijan Technical University |
| Bulgaria | Technical University of Sofia |
| France | Université de Franche-Comté, ISIFC |
| India | Apollo Engineering College |
| Indonesia | Diponegoro University |
| Canada | Conestoga College Institute of Technology and Advance Learning, Ontario |
| Canada | University of Waterloo, Ontario |
| Kazakhstan | Kazakh – British Technical University |
| Norway | Ostfold University College |
| Russia | National Research University „Moscow Power Engineering Ins.“ |
| Slovakia | Trenčianska univerzita Alexandra Dubčeka |
| Germany | Hof University of Applied Sciences |
| Germany | BTU Cottbus - Senftenberg |
| Thailand | King Mongkuts´s University of Technology North Bangkok |
| Vietnam | Nha Trang University, Faculty of Mechanical Engineering |
| **Agreements with institutes/institutions** | |
| Poland | Institute for Engineering of Polymer Materials and Dyes, Torun |
| Germany | Bundesanstalt für Materialfforschung und prüfung (BAM) |
| USA | ATCC – Material Transfer Agreement |
| India | Europe Study Centre |
| **Erasmus – inter-institutional agreements** | |
| Viz kapitola 5.4 | 68 institution |
| **Total** | **87 institution** |

## 5.3 International S&R Mobility and Development Projects

**Tab. 5.3.1. CEEPUS – mobility funds – incoming academic staff and students**

| Year | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| Contribution(CZK) | 127 576 | 213 764 | 100 600 | 71 100 | 63 600 |

**Tab. 5.3.2 International Projects**

| Provider | Program | Solution period | Foreign partner | Type of collaboration |
|---|---|---|---|---|
| EU | H2020 | 2016–2018 | National Technical University of Athens | S&R |
| EU | OP | 2015–2019 | Hochschule Zittau/Görlitz<br>Technische Universität Dresden | Development |

| | | | | |
|---|---|---|---|---|
| EU | OP | 2016–2019 | Technische Universität Dresden | Development |
| EU | OP | 2017–2019 | Technische Universität Dresden | Development |

For details see text annex 5.3.

## 5.4 International Mobilities

**Tab. 5.4.1 International mobility under programs in 2018**

| Program | ERASMUS+ | | | Erasmus+ KA107 | CEEPUS | IAESTE | DAAD |
|---|---|---|---|---|---|---|---|
| | C | U | Z | | | | |
| Number of outgoing students | 14* | 4 | 10 | 2** | 0 | 0 | 1*** |
| Number of incoming students | 123**** | 83 | 40 | 5***** | 2****** | 6******* | 0 |
| Number of outgoing academic/other staff | 11******** | 11 | 0 | 2 | 0 | 0 | 0 |
| Number of incoming academic/other staff | 1********* | 1 | 0 | 6********** | 2********** | 0 | 0 |
| Total | **149** | **99** | **50** | **15** | **4** | **6** | **1** |

C – total, U – completed, Z – started.
* of which 2 Ph.D., all mobilities in the length of at least 28 days in 2018.
** Ph.D. students, mobilities in the length of 3 months 2018.
*** mobilities in the length of 26 days, language course
**** of which 2 Ph.D. students and 12 incoming stays shorter than 28 days, all mobilities in the length of at least 14 days in 2018.
***** of which 1 Ph.D. student with a mobility in the length of 3 months, other 4 incoming mobilities in the length of 1 semester.
****** of wchich 1 incoming stay shorter than 28 days (22 days in 2018) and 1 Ph.D. student.
******* all mobilities in the length of at least 28 days in 2018.
******** of which 2 mobilities of other staff and 6 mobilities shorter than 5 days.
********* 1 mobility shorter than 5 days.
********** all mobilities in the length of 5 days.
********** mobilities in the length of at least14 days.

Note.: Student stays started in the previous year and stays shorter than 4 weeks (28 days) and stays of academics/ other staff of less than 5 days are also included.

**Tab. 5.4.2 Other International Activities outside Programs in 2018**

| Activity | Conference Active participation | Conference Passive participation | Negotiation on cooperation | Other |
|---|---|---|---|---|
| Outgoing students | 7 | 3 | 2 | 32* |
| Incoming students | 0 | 2 | 2 | 7** |
| Outgoing academic/other staff | 30 | 8 | 25*** | 30**** |
| Incoming academic/other staff | 77 | 15 | 4 | 4***** |
| **Total** | **114** | **28** | **33** | **73** |

* Fairs, Excursions, trainings, symposium, professional course.
** Excursion
*** of which 1 other staff member
**** of which 1x mobility in the length of at least 28 days (training), fair (of which 4x other staff) lectures, excursions (of which 1 other staff member), training, Nano Day in EP.
***** 3x scientific stay in the length of at least 5 days, professional consultation.

**Tab. 5.4.3 Mobility in the framework of development projects, other sources, government scholarships and self-funding students in 2018**

| Program | Government scholarships | Development projects | Other sources | Self-funding students |
|---|---|---|---|---|
| Number of outgoing students | 0 | 7* | 53** | 0 |
| Number of incoming students | 18*** | 0 | 7**** | 63***** |
| Number of outgoing academic/other staff | 0 | 12****** | 67******* | 0 |
| Number of incoming academic/other staff | 0 | 4******** | 3********* | 0 |
| **Total** | **18** | **23** | **130** | **63** |

***** 5 students supported from IRP TUL Mobility Fund 2018 – of which 4 mobilities shorter than 5 days, 1 student supported from IRP FS 12423 and a postponed mobility realized from z IRP TUL Mobility Fund 2017 – both in the length of at least 28 days.

** 2x one-semester study stay within the TUL Mobility Program (interuniv. cooperation), 16x short-term stay within the project Czech Republic - Free State of Saxony (BauQu), 28x short-term stay within the project Czech Republic – Free State of Saxony (GreK), 2x short-term stay within the project Cooperation Program Czech Republic - Free State of Saxony (PokYear.digital), 3x short-term stay within SGC and 2x short-term stay within HyHi (16015).

*** Studioyng in English, including studies started in previous, of which 4 successfully completed their studies in 2018 (Habashy, Salem, Aidoo, Tsao), Ajami, Duran, Linn, Moro, Salonga, Huluka, Ayisi, Sai, Hdaib, Phan, Rubio – NMSP studies, Cubreli, Kouta and Bediako – DSP studies.

**** 1x incoming student for one semester (studies, interuniversity cooperation Taiwan, started in 2017,

***** of which 53 students – NMSP and Ph.D. studies (inc. students graduating in 2018), 10 students – traineeships in the length of at least 2 months.

****** 11x TUL Mobility Fund 2018 (1 stay longer than 28 days, 7 mobilities shorter than 5 days), 1x mobility within IRP FS 12423.

******* 1 stay/traineeship in the length of at least 28 days (Česko-Sasko, BauQu), 21x short-term stay (BauQu), 7x short-term stay (EQUINOX, H2020), 12x short-term stay (Česko-Sasko, GreK), 9x short-term stay (Česko-Sasko, PokYear.digital), 3x short-term stay (OP VVV 16003), 1x short-term stay (TAČR 17036), 11x short-term stay (HyHi, 16015), 2x short-term stay (SGS).

******** Arrivals within IRP Mobility Fund 2018, of which 1 arrival shorter than 5 days.

********* 1x long-term stay (SandR worker) and 2x short-term stay within the HyHi project (16015).

**Tab. 5.4.4 Mobility under programs, IRP, other sources, government scholarships and self-funding students according to countries in 2018**

| Country | Number of outgoing students | Number Of incoming students | Number of outgoing staff | Number of incoming staff |
|---|---|---|---|---|
| Republic of Azerbaijan | | | 1 (Erasmus KA107, in the length of=5 days) | 1 (Erasmus KA107, in the length of=5 days) |
| Belgium | | | 1 (FOM, in the length of=5days) | |
| Brazíl | | 1 (IAESTE) + 6 (self-funding,stay) | | |
| Bulgaria | | | 2 (Erasmus, shorter than 5 days, 1x other staff) | |
| Egypt | | 2 (gov. scholarship) + 2 (self-funding) | | |
| Equador | | 1 (IAESTE) | | |

| | | | | |
|---|---|---|---|---|
| Estonia | | | 1 (other sources, short stay) | |
| Etiopia | | 1 (gov. scholarship) | | |
| Philippines | | 2 (gov. scholarship) | | |
| Finnland | 2 (Erasmus) | 5 (Erasmus) | | |
| France | 1 (Erasmus) | 29 (Erasmus, 4x shorter than28 days) | 2 (Erasmus, shorter than5 days, 1x other staff) + 1 (other sources, short stay) | 1 (FOM, in the length of 5 days) |
| Ghana | | 5 (gov. scholarship) | | |
| India | | 43 (self-funding, of which1x stay) | | |
| Italy | | | 2 (other sources, short stay) | |
| Izrael | | 1 (self-funding) | 1 (FOM, shorter than5 days) | |
| Japan | | 1 (IAESTE) | | |
| Jordan | | 1 (gov. scholarship) | | |
| Cambodia | | 1 (gov. scholarship) | | |
| Canada | 1 (IRP 12423) | 2 (Erasmus KA107) | 1 (FOM, in the length of more than 28 days) + 1 (IRP 12423, in the length of more than 5 days) | 2 (Erasmus KA107, in the length of=5 days) |
| Kosovo | | 1 (gov. scholarship) | | |
| Lebanon | | 1 (gov. scholarship) | | |
| Libya | | 1 (self-funding) | | |
| Lithuania | | 8 (Erasmus) | | |
| Hungary | 1 (other sources, short stay) | 3 (Erasmus, 1x shorter than28 days) | | |
| Myanmar | | 1 (gov. scholarship) | | |
| Germany | 3 (Erasmus) + 1 (DAAD, 26 days) + 3 (FOM, short stay) + 50 (other sources, short stay) | 2 (Erasmus) + 2 (self-funding) + 6 (other sources, short stay) | 1 (Erasmus, in the length of=5 days) + 3 (FOM, shorter than5days) + 1 (other sources, long stay) + 59 (other sources, short stay) | 1 (Erasmus, shorter than 5 days) + 1 (FOM, shorter than5 days) + 2 (other sources, short stay) |
| The Netherlands | | | 2 (FOM, 1x in the length of=5 days, 1x shorter than5 days) | |
| Peru | | 1 (gov. scholarship) | | |
| Poland | | 4 (Erasmus) + 1 (CEEPUS, shorter than 28 days) + 4 (self-funding, x stay) | 2 (Erasmus, in the length of=5days) + 1 (other sources, short stay) | 2 (CEEPUS) |
| Portugal | 7 (Erasmus) | 18 (Erasmus, 6x shorter than 28 days) | 2 (Erasmus, shorter than 5 | |

| | | | | |
|---|---|---|---|---|
| | | | days) | |
| Austria | | 1 (IAESTE) | | |
| Russia | | 1 (IAESTE) | | |
| Greece | 1 (FOM, short stay) | 1 (Erasmus) | 1 (other sources, short stay) | |
| Slovakia | | 5 (Erasmus) + 1 (CEEPUS) | 1 (Erasmus, in the length of=5 days) | |
| Slovenia | | 1 (IAESTE) | | |
| Serbia | | | 1 (FOM, shorter than5 days) | |
| Syria | | 1 (gov. scholarship) | | |
| Spain | | 15 (Erasmus, 1x shorter than 28 days) | 1 (Erasmus, in the length of 5 days) + 1 (other sources, short stay) | 1 (FOM, in the length of=5 days) |
| Sweden | 1 (Erasmus) | | | |
| Taiwan | 2 (other sources, one-semester studies) | 1 (gov. scholarship) + 1 (intern. Cooperation, other sources, shorter than 28 days) | | |
| Thailand | 1 (Erasmus KA107) | 1 (Erasmus KA107) | | 1 (Erasmus KA107, in the length of=5 days) |
| Turkey | | 33 (Erasmus) + 2 (self-funding) | 1 (FOM, shorter than5 days) | |
| USA | 2 (FOM, 1x in the length of min. 28 days, 1x short stay, longer than 5 days) | | | |
| Vietnam | 1 (Erasmus KA107) | 2 (Erasmus KA107) + 2 (self-funding) | 1 (Erasmus KA107, in the length of=5 days) + 1 (FOM, in the length of více než 5 days) | 2 (Erasmus KA107, in the length of=5 days) + 1 (FOM, longer than 5 days) + 1 (other sources, SandR worker) |

Note.: Including Student mobilities started in previous year and stays shorter than 4 weeks (28 days) as well as mobilities of academic/other stadd shorter than and including 5 days.

### Tab. 5.4.5 Development of international mobility and other activities

| Activity | Number of outgoing and incoming mobilities | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | | |
| | Total | Total | Total | Total | Total | Total | P | OA | C |
| Outgoing students | 56 | 68 | 111 | 94 | 106 | 98 | 77* | 44 | 121 |
| Incoming students | 52 | 78 | 98 | 134 | 204 | 238 | 224** | 11 | 235 |
| Outgoing academic/other staff | 108 | 137 | 117 | 135 | 107 | 137 | 92*** | 93 | 185 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Incoming academic/other staff | 31 | 50 | 51 | 52 | 58 | 139 | 16**** | 100 | 116 |
| **Total** | **247** | **333** | **377** | **415** | **475** | **612** | **409** | **248** | **657** |

C – Total; OA – other activities (Tab. 5.4.2).

P – withing programs: * of which 7 outgoing – IRP, 53 outgoing – other sources,
(Tab.5.4.1., 5.4.3) ** of which 18 x gov. scholarship, 63 incoming – samoplátci, 7 příjezdů – other sources,
*** of which 12x IRP, 67x other sources,
**** of which 4x IRP, 3x other sources.

## 6.4 Expert Activity

**Tab. 6.4.1 Expert Activity**

| Year | Number of reviews | Service (ths. CZK) |
|---|---|---|
| 2012 | 0 | 0 |
| 2013 | 2 | undifferentiated |
| 2014 | 4 | 26,40 |
| 2015 | 3 | 259,98 |
| 2016 | 4 | 42,68 |
| 2017 | 0 | 0 |
| 2018 | 4 | 69,70 |

**Tab. 6.4.2 Authorized emission measurement**

| Year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Service (ths. CZK) | 110,00 | 64,41 | 23,00 | 16,00 | 24,00 | 15,56 |

**Tab. 6.4.3 Numbers of experts from the application sphere involved in teaching and practice in accredited study programs of FME TUL in 2018**

| Department | Persons in labour-law relationship with the university or its unit | | | Persons without labour-law relationship with the university or its unit | | |
|---|---|---|---|---|---|---|
| | Participating in instruction | Supervision of final thesis | Involved in practice | Podílející se na výuce | Supervision of final thesis | Involved in practice |
| DAM | 6 | 0 | 0 | 1 | 1 | 0 |
| DET | 1 | 1 | 0 | 0 | 0 | 0 |
| DMS | 1 | 1 | 0 | 0 | 0 | 0 |
| DPE | 1 | 0 | 0 | 0 | 0 | 0 |
| DMM | | 0 | 0 | 0 | 0 | 0 |
| DMA | 0 | 0 | 0 | 0 | 0 | 0 |
| DVE | 1 | | | | | |
| DGR | 0 | 0 | 0 | 1 | 0 | 0 |
| DTD | 0 | 0 | 0 | 0 | 0 | 0 |
| DMA | 1 | 0 | 0 | 0 | 4 | 0 |
| Total | 12 | 2 | | 1 | 5 | |

Note.: Within instruction, experts from the world of work are guests to the lectures – detail in annual reports of the departments.

## 7.1 Quality and culture of academic life

**Tab. 7.1.1 Courses of further education of Faculty of Mechanical Engineering employees in 2018 ***

| Course characteristics | Number of courese | Number of participants |
|---|---|---|
| Oriented towards pedagogical skills | see project OP SRE TUL – RoLiz | |
| Courses oriented towards general skills | 4 | 5 |
| Courses oriented to languages * | | 14S + 21A |
| Professional courses | 28 | 60 |

** Courses organized by CDV TUL, language schools, courses organized by departments.
S – PhD student, A – academic staff
* See the text appendix 7.1 for specifications

## 7.3 Development and Investment Projecst financed by MEYS CR

**Tab. 7.3.1 Institucional development plan of TUL for year 2018 – partial projects run by FME TUL**

| Int. No. | Project title FS TUL<br>Researcher / Workplace | Allocated funds (ths. CZK) | | |
|---|---|---|---|---|
| | | NIV | INV | Total |
| 12389 | Promotion and Presentation of FME TUL<br>prof. Dr. Ing. Petr Lenfeld / DFME | 280 | 0 | 280 |
| 12398 | Organizing SVOČ at TUL<br>Assoc. prof. Ing. Dora Kroisová, Ph.D. / DFME | 300 | 0 | 300 |
| 12399 | Study Aid – Ejector for ejector cooling equipment<br>Assoc. prof. Ing. Václav Dvořák, Ph.D. / KEZ | 150 | 0 | 150 |
| 12400 | Innovation of automation laboratories and development of production system model with implementation of principles Industry 4.0<br>Ing. Radek Votrubec, Ph.D. / KSA | 122 | 0 | 122 |
| 12401 | Device for determining contact angle and surface energyAssoc. prof. Ing. Dora Kroisová, Ph.D. / KMT | 8 | 98 | 106 |
| 12423 | TUL as an important partner in the international educational spaceprof. Ing. Karel Fraňa, Ph.D. / DFME | 140 | 0 | 140 |
| 12438 | Support of personnel and professional development of PhD students<br>Assoc. prof. Ing. Martin Bílek / DFS | 75 | 0 | 75 |
| **Total FS TUL** | | 1 075 | 98 | 1 173 |

## 7.4 Projects Ffinanced from EU Structual Funds 2014–2020

### 7.4.1 OP Research, Development and Education

**Tab. 7.4.1.1 Involvment in OP RDE projects – FME TUL Beneficiary**

| Project title<br>Registration number | Subsidy 2018 (in ths. CZK) | Implementation |
|---|---|---|
| Development of PhD study programs of FME TUL<br>CZ.02.2.69/0.0/0.0/16_018/0002718 | 268 | 2017–2022 |

| | | |
|---|---|---|
| Development of Research Infrastructure for PhD Study Programs at FME TUL CZ.02.1.01/0.0/0.0/16_017/0002650 | 38 259 | 2017–2022 |

**Tab. 7.4.1.2 Involvment of FME TUL in university OP RDE projects – TUL Beneficiary**

| Project title<br>Registration number | Subsidy 2018 (in ths. CZK) | Implementation |
|---|---|---|
| Development of TUL human resources for increasing the relevance, quality and access to education in the conditions of Industry 4.0 – Vi4.0 – CZ.02.2.69/0.0/0.0/16_015/0002329 | 58 630 | 2017–2022 |
| Support of Study environment development at TUL CZ.02.2.67/0.0/0.0/17_044/0008541 | 10 570 | 2017–2019 |

**Tab. 7.4.1.3 Involvment of FME TUL in university OP RDE projects – TUL projects coordinator**

| Project title<br>Registration number | Subsidy 2018 (in ths. CZK) | Implementation |
|---|---|---|
| Hybrid materials for hierarchical structures – HyHi CZ.02.1.01/0.0/0.0/16_019/0000843 | 11 812 | 2018-2022 |
| 3D printing in construction and architecture – 3D STAR CZ.02.1.01/0.0/0.0/16_025/0007424 | 4 467 | 2018–2022 |

### 7.4.2 OP Enterprise and Innovation

**Tab. 7.4.2.1 Involvment in projecst OP Enterprise and Innovation FS TUL project partner**

| Project title<br>Registration number | Subsidy 2018 (in ths. CZK) | Implementation |
|---|---|---|
| Development of textile products from non-combustible and recyclable materials<br>CZ.01.1.02/0.0/0.0/16_084/0010282 | 3 960 | 2018-2020 |
| Integration of microcomputers into lighting systemsCZ.01.1.02/0.0/0.0/17_107/0012526 | 245 | 2018–2020 |
| Dynamic multi-axis electrohydraulic heat recovery units<br>CZ.01.1.02/0.0/0.0/15_019/0004853 | 1 934 | 2016–2018* |
| Test stand for pre-certification tests of internal combustion engines<br>CZ.01.1.02/0.0/0.0/15_019/0004815 | 760 | 2016–2019** |

* Převedeno z CxI. **Vedeno pod FS a CxI.

### 7.4.3 OP Cross-Border Cooperation

**Tab. 7.4.3.1 Involvment in Cooperation Program Czech Republic – Free State of Saxony projects FME TUL project partner**

| Project title<br>Registration number | Subsidy 2018 (in ths. CZK) | Implementation |
|---|---|---|
| Cross-border cooperative teaching of plastics processing technologies Zittau-Liberec – GreK<br>100252772 | 2 000 | 2015–2019 |
| Building partnerships in building technology research to educate scientific followers in the border region – BauQu<br>100252950 | 960 | 2016–2019 |

| | | |
|---|---|---|
| Practically oriented development of competencies in production technology in regions through cooperation.digital – POKYEAR.digital 100281976 | 2 099 | 2017–2019 |

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# ANNEXES

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7.4.1 OP Research, Development and Education

7.4.2 OP Entrepreneurship and innovation for competitiveness

7.4.3 OP Crossborder Cooperation

## 2.4 Procedures for Granting Associate Professorship and Full Professorship

**Procedures for Granting Full Professorship**

| | |
|---|---|
| Name and surname: | **Assoc. prof. Ing. Tomáš Vít, Ph.D.** |
| Workplace: | Faculty of Mechanical Engineering TUL, Department of Power Engineering Equipment |
| Branch: | Applied Mechanics |
| Topic of professor lecture: | Perspective of thermoacoustic devices |
| Date of initiation of the procedure: | 20 September 2017 |
| Defended in front of SB FS TUL: | 4 April 2018 |
| Defended in front of SB TUL: | 11 June2018 |
| Datum jmenování: | 5 December 2018 |

| | |
|---|---|
| Name and surname: | **Assoc. prof. Ing. Václav Dvořák, Ph.D.** |
| Workplace: | Faculty of Mechanical Engineering TUL, Department of Power Engineering Equipment |
| Branch: | Applied Mechanics |
| Date of initiation of the procedure: | 28 November 2018 |

**Procedures for Granting Associate Professorship (Habilition Procedures)**

| | |
|---|---|
| Name and surname: | **Ing. Petr Lepšík, Ph.D.** |
| Workplace: | Faculty of Mechanical Engineering TUL, Department of the Design of Machine Elements and Mechanism |
| Branch: | Design of machinery and equipment |
| Title of habilitation thesis: | Systematic creativity tools to increase machine and equipment efficiency |
| Topic of habilitation thesis: | Innovation of technical systems by means of functional analysis |
| Initiation of the procedure: | 6 June 2017 |
| Defended in front of SB FS TUL: | 23 May 2018 |
| Datum jmenování: | 1 July 2018 |

| | |
|---|---|
| Name and surname: | **Ing. Petra Dančová, Ph.D.** |
| Workplace: | Faculty of Mechanical Engineering TUL, Department of Power Engineering Equipment |
| Branch: | Applied Mechanics |
| Initiation of the procedure: | 3 December 2018 |

### 3.4 List of PhD Studies alumni in 2018

| | |
|---|---|
| Name and surname: | **Ing. Lucie Heligar Svobodová** |
| Study Branch: | 2301V031 Manufacturing Systems and Processes |
| Specialization : | Automation of technical preparation of engineering production |
| Supervising Workplace: | Department of Manufacturing Systems and Automation |
| Supervisor: | Assoc. prof. Dr. Ing. František Manlig (prof. Ing. Přemysl Pokorný, CSc.) |
| Dissertation topic: | Knowledge and its role in production systems |
| Date of defense: | 15 February 2018 |

| | |
|---|---|
| Name and surname: | **Ing. Michal Kašpárek** |
| Study Branch: | 2301V031 Manufacturing Systems and Processes |
| Specialization : | Applied cybernetics |
| Supervising Workplace: | Department of Manufacturing Systems and Automation |
| Supervisor: | prof. Ing. Miroslav Olehla, CSc. |
| Dissertation topic: | Control of sound transmission and reflection in acoustic tube by semi-active method with impedance shunt |
| Date of defense: | 16 March 2018 |

| | |
|---|---|
| Name and surname: | **Ing. Miroslav Vavroušek** |
| Study Branch: | 2301V031 Manufacturing Systems and Processes |

| | |
|---|---|
| Specialization : | Applied cybernetics |
| Supervising Workplace: | Department of Manufacturing Systems and Automation |
| Supervisor: | prof. Ing. Miroslav Olehla, CSc. |
| Dissertation topic: | Design of rotary pneumatic motor control |
| Date of defense: | 16 March 2018 |

| | |
|---|---|
| Name and surname: | **Mgr. Pavel Černý** |
| Study Branch: | 3911V011 Materials Engineering |
| Supervising Workplace: | Department of Material Science |
| Supervisor: | prof. RNDr. Petr Špatenka, CSc. |
| Dissertation topic: | Plasmachemical treatment for surface functionalization |
| Date of defense: | 18 April 2018 |

| | |
|---|---|
| Name and surname: | **M. A. Martin Sturm** |
| Study Branch: | 2302V010 Machines and Equipment Design |
| Supervising Workplace: | Department of the Design of Machine Elements and Mechanism |
| Supervisor: | prof. Ing. Lubomír Pešík, CSc. |
| Dissertation topic: | Design Optimization of Linear Vibratory Conveyors |
| Date of defense: | 11 April 2018 |

| | |
|---|---|
| Name and surname: | **Ing. Miroslav Pažout** |
| Study Branch: | 2302V010 Machines and Equipment Design |
| Specialization: | Wheeled transport and handling machines |
| Supervising Workplace: | Department of Vehicles and Engines |
| Supervisor: | prof. Dr. Ing. Pavel Němeček |
| Dissertation topic: | Foot impactor behavior in protection tests |
| Date of defense: | 20 February 2018 |

| | |
|---|---|
| Name and surname: | **Ing. Aleš Dittrich** |
| Study Branch: | 2302V010 Machines and Equipment Design |
| Specialization: | Reciprocating internal combustion engines |
| Supervising Workplace: | Department of Vehicles and Engines |
| Supervisor: | Assoc. prof. Ing. Josef Laurin, CSc. |
| Dissertation topic: | Initiation of spark ignition mixture |
| Date of defense: | 29 May 2018 |

| | |
|---|---|
| Name and surname: | **Ing. Jiří Komárek** |
| Study Branch: | 2302V010 Machines and Equipment Design |
| Specialization : | Textile machines |
| Supervising Workplace: | Department of Textile Machine Design |
| Supervisor: | prof. Ing. Jaroslav Beran, CSc. |
| Dissertation topic: | Sewing machine needle bar mechanism |
| Date of defense: | 25. June2018 |

| | |
|---|---|
| Name and surname: | **Ing. Jan Vácha** |
| Study Branch: | 2303V002 Engineering technology |
| Specialization : | Plastics processing |
| Supervising Workplace: | Department of Engineering Technology |
| Supervisor: | prof. Dr. Ing. Petr Lenfeld |
| Dissertation topic: | Research of application possibilities of carbon nanotubes in thermoplastic polymer matrices |
| Date of defense: | 5. března 2018 |

| | |
|---|---|
| Name and surname: | **Ing. Lukáš Zuzánek** |
| Study Branch: | 2303V002 Engineering technology |
| Specialization : | Forming of Metals |
| Supervising Workplace: | Department of Engineering Technology |
| Supervisor: | Assoc. prof. Ing. Pavel Solfronk, Ph.D. |
| Dissertation topic: | Degradation of properties of high-strength materials due to hydrogen embrittlement |

| | |
|---|---|
| Date of defense: | 29 November 2018 |

| | |
|---|---|
| Name and surname: | **Ing. Pavel Srb** |
| Study Branch: | 2302V010 Machines and Equipment Design |
| Specialization : | Machine Elements and Mechanisms |
| Supervising Workplace: | Department of the Design of Machine Elements and Mechanism |
| Supervisor: | Assoc. prof. Ing. Vítezslav Fliegel, CSc. |
| Dissertation topic: | Research of low-density composite foams with natural fibers for the design of automotive seat cushions |
| Date of defense: | 05 November 2018 |

| | |
|---|---|
| Name and surname: | **Ing. Pavel Novák** |
| Study Branch: | 2301V031 Manufacturing Systems and Processes |
| Specialization : | Automation of technical preparation of engineering production |
| Supervising Workplace: | Department of Manufacturing Systems and Automation |
| Supervisor: | prof. Ing. Jan Skalla, CSc. |
| Dissertation topic: | Adaptive regulation of voltage converters |
| Date of defense: | 13 November 2018 |

## 4.3 National Competence Centres

**Josef Božek Automotive Competence Centre for Ground Transport Units**
The solution will start in January 2019.

| | |
|---|---|
| Provider: | TA CR |
| Program: | NCC National Competence Cesntres (2018–2022) |
| Project identification code: | TN01000026 |
| Beneficiary: | CTU Prague |
| Other project participants: | 23 business entities<br>Technical University in Liberec, FME<br>University Pardubice<br>UWB in Plzeň<br>VŠB-TU Ostrava<br>Brno University of Technology |
| Solution time: | 2019-2020 |
| Guarantor for TUL: | Ing. Robert Voženílek, Ph.D., Department of Vehicles and Engines |

**Competence Centre ENGINEERING**
The solution will start in January 2019.

| | |
|---|---|
| Provider: | TA ČR |
| Program: | NCC National Competence Cesntres (2018–2022) |
| Project identification code: | TN01000015 |
| Beneficiary: | VÚTS, a.s. |
| Other project participants: | 19 business entities<br>TU in Liberec, FS<br>CTU Prague<br>UWB in Plzeň<br>VŠB-TU Ostrava<br>Brno University of Technology<br>Institute of Physical Materials AV ČR, v.v.i. |
| Solution period: | 2019–2020 |
| Guarantor for TUL: | prof. Ing. Jaroslav Beran, CSC., Department of Textile Machine Design |

## 4.4 Science-Research Projects

### TA CR – EPSILON

**Product development for the automotive industry from the AlSi5Mg alloy**

| | |
|---|---|
| Provider: | TA CR |
| Program: | EPSILON |

Project identification code: TH02020799
Beneficiary: TOP ALULIT s.r.o.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Researcher Co-beneficiary: Assoc. prof. Ing. Jiří Machuta / Assoc. prof. Ing. Jaromír Moravec, Ph.D.
Department of Engineering Technology
Solution period: 2016–2019
Internal number TUL: 17025
Subsidy in 2018 total: total / INV / NIV – 2 926 837 / 0 / 2 926 837 CZK
Of which FME/DET: total / INV / NIV – 1 043 400 / 0 / 1 043 400 CZK
Of which other co-beneficiaries: total / INV / NIV – 1 883 437 / 0 / 1 883 437 CZK

**Development of a new range of fire pumps for extreme conditions**
Provider: TAČR
Program: EPSILON
Project identification code: TH03010378
Beneficiary: Pavliš a Hartman spol. s r.o.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Researcher Co-beneficiary: Assoc. prof. Ing. Václav Dvořák, Ph.D.,
Department of Power Engineering Equipment
Solution period: 2018–2020
Internal number TUL: 17036
Subsidy in 2018 total: total / INV / NIV – 1 000 000 / 0 / 1 000 000 CZK

**MIT CR – TRIO**

**Numerical simulation of welding and life prediction of welded structures in the area of land transport, steel structures and power engineering**
Provider: MIT CR
Program: TRIO – 1. Call
Project identification code: FV10709
Beneficiary: MECAS ESI s.r.o.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Researcher Beneficiary: Assoc. prof. Ing. Jaromír Moravec,
Department of Engineering Technology
Internal number TUL: 17772
Solution period: 2016–2018
Subsidy in 2018 total total / INV / NIV – 2 666 000 / 0 / 2 666 000 CZK
Of which FME/DET: total / INV / NIV – 1 220 000 / 0 / 1 220 000 CZK
Of which other co-beneficiaries: total / INV / NIV – 1 446 000 / 0 / 1 446 000 CZK

**Highly efficient jet weaving machine for production of leno fabrics**
Provider: MIT CR
Program: TRIO – 1. Call
Project identification code: FV10215
Beneficiary: VÚTS a.s.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Researcher Beneficiary: Assoc. prof. Ing. Iva Petríková, Ph.D.,
Department of Applied Mechanics
Internal number TUL: 17762
Solution period: 2016–2019
Subsidy FME 2018: total / INV / NIV – 690 949 / 0 / 690 949 CZK

**Development of progressive kicking technology in hat production**
Provider: MIT CR
Program: TRIO – 1. Call
Project identification code: FV10467
Beneficiary: TONAK a.s.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Researcher Beneficiary: prof. Ing. Jaroslav Beran, CSc.,
Department of Textile Machine Design

Internal number TUL: 17776
Solution period: 2016–2019
Subsidy FME 2018: total / INV / NIV – 1 388 714 / 0 / 1 388 714 CZK

**Modular range of machine tool tool holders**
Provider: MIT CR
Program: TRIO – 2. Call
Project identification code: FV20241
Beneficiary: VÚTS a.s.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Researcher Beneficiary: Assoc. prof. Ing. David Cirkl, Ph.D.
Department of Applied Mechanics
Internal number TUL: 17782
Solution period: 2017–2019
Subsidy FME 2018: total / INV / NIV – 782 989 / 0 / 782 989 CZK

**Special transformation mechanisms in electronic cam drives**
Provider: MIT CR
Program: TRIO – 2. Call
Project identification code: FV20547
Beneficiary: VÚTS a.s.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Researcher Beneficiary: prof. Ing. Petr Louda, CSc., Department of Material Science
Internal number TUL: 17778
Solution period: 2017–2020
Subsidy FME 2018: total / INV / NIV – 980 773 / 0 / 980 773 CZK

**Research and development of new generation automatic machine for production of self-supporting coils**
Provider: MIT CR
Program: TRIO – 3. Call
Project identification code: FV30091
Beneficiary: JiKoN – nástrojárna, s.r.o.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Researcher Beneficiary: Assoc. prof. Ing. Martin Bílek, Ph.D.
Department of Textile Machine Design
Internal number TUL: 17776
Solution period: 2018–2020
Subsidy FME 2018: total / INV / NIV – 1 044 000 / 0 / 1 044 000 CZK

**MI CR**

**Application of geopolymer composites as a fire barrier (AGK)**
Provider: MI CR
Program: Security Research of the Czech Republic 2015-2020 (BV III/1-VS)
Project identification code: VI 20172019055
Beneficiary: TUL, CxI(NATI)
Researcher Beneficiary: prof. Ing. Petr Louda, CSc.
Solution period projektu: 2017–2020
Internal number TUL: 16299
Subsidy FME 2018: total / INV / NIV – 3 767 413 / 0 / 3 767 413 CZK

**Applied research in the field of next generation personal protective equipment For IRS needs**
Provider: MI CR
Program: Security Research Program
Project identification code: VI20172020052
Beneficiary: TUL, Faculty of Mechanical Engineering
Co-beneficiary: Clean air s.r.o.
Researcher Beneficiary: Ing. Martin Seidl, Ph.D., Department of Engineering Technology

| | |
|---|---|
| Internal number TUL: | 16298 |
| Solution period: | 2017–2020 |
| Subsidy total in 2018: | total / INV / NIV – 7 750 000 / 2 200 000 / 5 550 000 CZK |
| Subsidy TUL in 2018: | total / INV / NIV – 6 964 451 / 2 200 000 / 4 764 451 CZK |
| Of which: | |
| Subsidy NATI: | total / INV / NIV – 1 605 374 / 0 / 1 605 374 CZK |
| Subsidy FME: | total / INV / NIV – 3 159 077 / 2 200 000 / 3 159 077 CZK |
| Of which: | |
| Subsidy KSP(DET) 2018: | total / INV / NIV – 1 972 683 / 2 200 000 / 1 972 683 CZK |
| Subsidy KSA(DMSA) 2018: | total / INV / NIV – 700 878 / 0 / 700 878 CZK |
| Subsidy KEZ(DPEE) 2018: | total / INV / NIV – 375 844 / 0 / 375 844 CZK |
| Subsidy KTS(DTMD) 2018: | total / INV / NIV – 109 672 / 0 / 109 672 CZK |

**GA CR – GA**

**Optimization of pulsating current generation in fluid mechanics**

| | |
|---|---|
| Provider: | GA CR |
| Project: | GA – standard projects |
| Project identification code: | GA16-16596S |
| Beneficiary: | Institute of Thermomechanics AS CR, v.v.i. |
| Another Participant: | Technical University in Liberec |
| Researcher for TUL: | Assoc. prof. Ing. Tomáš Vít, Ph.D., Department of Power Engineering Equipment |
| Internal number TUL: | 17277 |
| Solution period: | 2016–2018 |
| Subsidy FME 2018: | total / INV / NIV – 931 944 / 0 / 931 944 CZK |

**EU – HORIZONT 2020**

**EQUINOX – A novel process for manufacturing complex shaped Fe-Al intermetallic parts resistant to extreme environments**

| | |
|---|---|
| Provider: | EU – European Regional Development Fund |
| Program: | H2020 – H2020-SC-2015-one-stage |
| Project identification code: | 689 510 |
| Lead partner: | National Technical University of Athens, School of Chemical Engineering |
| Participant: | TUL, Faculty of Mechanical Engineering |
| Researcher: | Ing. Pavel Hanus, Ph.D., Department of Material Science |
| Internal number TUL: | DZG93/2210 |
| Period: | 2016–2019 |
| Total Subsidy: | total / INV / NIV – 4 061 810 / 0 / 4 061 810 CZK (advance payment for 18 months) |
| Subsidy in 2018: | total / INV / NIV – 2 920 855 / 0 / 2 920 885 CZK |
| Total in 2018/FME TUL | total / INV / NIV – 3 132 067 / 0 / 3 132 067 CZK (including the deposit balance) |
| Subsidy 2018/KSP(DET): | total / INV / NIV – 834 000 / 0 / 834 000 CZK |
| Subsidy 2018/KMT(DMS): | total / INV / NIV – 1 832 000 / 0 / 1 832 000 CZK |
| Subsidy 2018/CxI(NATI): | total / INV / NIV – 466 000 / 0 / 466 000 CZK |
| Subsidy other co-beneficiaries: | total / INV / NIV – xxx / 0 / xxx CZK (we don't have information) |

## R&D projects solved under CxI and other TUL units

FS academic staff are researchers, co-researchers or participate in project research.

**NP – MEYS ČR** see 4.7

**OP RaD – Commercialization of results** see 7.4.3

**TA CR – EPSILON**

**Development of technical means for rapid assortment change on the machine for preparation of production of industrial sorting screens**

| | |
|---|---|
| Provider: | TA CR |
| Program: | EPSILON |
| Project identification code: | TH02010964 |
| Beneficiary: | SIKR s.r.o. |
| Co-beneficiary: | TUL, CxI(NATI) |
| Researcher responsible: | Assoc. prof. Dr. Ing. Ivan Mašín a Assoc. prof. Ing. Michal Petrů, Ph.D. |
| Projects's solution period: | 2017–2019 |
| Internal number TUL: | 11018 |
| Subsidy CNATI 2018: | 1 186 220 |
| Non-public sources 2018: | 100 000 CZK |
| KST(DMM) share in 2018: | 286 544 CZK |

**It works by developing a bi-system liquid filter for recycling process water using modern modeling methods**

| | |
|---|---|
| Provider: | TA CR |
| Program: | EPSILON |
| Project identification code: | TH02020949 |
| Beneficiary: | ALFICO, s.r.o. |
| Co-beneficiary: | TUL, CxI(NATI) |
| Researcher responsible: | Assoc. prof. Ing. Michal Petrů, Ph.D. |
| Projects's solution period: | 2017–2019 |
| Internal number TUL: | 117019 |
| Subsidy CNATI 2018: | 1 156 632 CZK |
| Non-public sources 2018: | 100 000 CZK |
| KST(DMM) share in 2018: | 107 055 CZK |

**Development of burner for gas infrared heater on the principle of kinetic combustion**

| | |
|---|---|
| Provider: | TA CR |
| Program: | EPSILON |
| Project identification code: | TH03020122 |
| Beneficiary: | LERSEN, s.r.o. |
| Co-beneficiary: | TUL, CNATI |
| Researcher responsible: | Ing. Tomáš Martinec, Ph.D. |
| Projects's solution period: | 2018–2020 |
| Internal number TUL: | 17028 |
| Subsidy CNATI 2018: | 1 371 760 CZK |
| Non-public sources 2018: | 100 000 CZK |
| KST(DMM) share in 2018: | 262 352 CZK |

**Development of autonomous IoT equipment for evaluating operational data of suspension agricultural technology**

| | |
|---|---|
| Provider: | TA CR |
| Program: | EPSILON |
| Project identification code: | TH03010277 |
| Beneficiary: | BEDNAR FMT, s.r.o. |
| Co-beneficiary: | TUL, CNATI |
| Researcher responsible: | Assoc. prof. Ing. Michal Petrů, Ph.D. |
| Projects's solution period: | 2018–2020 |
| Internal number TUL: | 17029 |
| Subsidy CNATI 2018: | 1 885 000 CZK |
| KST(DMM) share in 2018: | 89 953 CZK |

**Operational diagnostics of profile and tram track gauge under**

| | |
|---|---|
| Provider: | TA CR |
| Program: | EPSILON |
| Project identification code: | TH03010459 |
| Beneficiary: | DPMLJ, a.s. |
| Co-beneficiary: | TUL, CNATI |

Researcher responsible: Ing. Michal Starý, Ph.D.
Projects's solution period: 2018–2020
Internal number TUL: 14022
FME share in 2018: 20 %

**Robot for reeducation of bipedal locomotion**
Provider: TA CR
Program: EPSILON
Project identification code: TH03010299
Beneficiary: Embitron s.r.o.
Co-beneficiary: TUL, CNATI
Researcher responsible: prof. Ing. Aleš Richter, CSc.
Projects's solution period: 2018–2021
Internal number TUL: 17033
FME share in 2018: 20 %

**MI CR – Security research in the Czech Republic**

**Development of flood protection systems to increase population and infrastructure protection**
Provider: MI CR
Program: Security research program ČR 2015-2020 (BV III/1-VS)
Project identification code: VI20152018046
Beneficiary: JaP – Jacina, s.r.o.
Co-beneficiary: TUL, CNATI
Researcher Co-beneficiary: Ing. Michal Petrů, Ph.D.
Projects's solution period: 2015–2018
Internal number TUL: 17302
Subsidy CNATI 2018: 1 967 000 CZK
KST(DMM) share in 2018: 518 909 CZK

**Use of modern modeling methods in the development and testing of fire closures**
Provider: MI CR
Program: Security research program CR 2015-2020 (BV III/1-VS)
Project identification code: VI20152018046
Beneficiary: JaP – Jacina, s.r.o.
Co-beneficiary: TUL, CNATI
Researcher Co-beneficiary: Ing. Tomáš Martinec, Ph.D.
Projects's solution period: 2015–2018
Internal number TUL: 17301
Subsidy CNATI 2018: 2 064 000 CZK
KTS(DMM) share in 2018: 295 951 CZK

**OP RDE**

**Modular platform for autonomous bogies of specialized electric vehicles for freight and equipment transport**
Provider: MEYS – EU
Call: Pre-application research
Project identification code: CZ.02.1.01/0.0/0.0/16_025/0007293
Beneficiary: TUL, CxI(NATI)
Researcher responsible: Assoc. prof. Ing. Michal Petrů, Ph.D.
Projects's solution period: 2018–2022
Internal number TUL: 16023
KST(DMM) share in 2018: 181 359 CZK

**OP EIC**

**Construction of actively controlled pram using modern technologies**
Provider: MIT CR
Call:

Project identification code: CZ.01.1.02/0.0/0.0/15_013/0004773
Beneficiary: TUL, CxI (NATI)
Odpovědný Researcher: Assoc. prof. Ing. Michal Petrů, Ph.D.
Projects's solution period: 2016–2018
Internal number TUL: 11053
DMM share in 2018: 67 536 CZK

## 4.7 Institute for Nanomaterials, Advanced Technologies and Innovation

**Development of the Institute for Nanomaterials, Advanced Technologies and Innovation (CxI++)**

The main objective of the project is to support the use of the newly built research infrastructure of the University workplace CxI (NATI). The project deals with seven research topics, which are solved by academics of the Faculty of Mechanical Engineering.

Provider Subsidy: MEYS
Program of support: NPU
Beneficiary: Technical University v Liberci, (CNATI)
Registration Number**:** LO1201
Subsidy total for project: 175 711 ths. CZK
Implementation period: 2014–2018
Internal number TUL: 16001

## 4.9 Commercialization of R&D Results and Outputs

**PROSYKO – Proactive system of commercialization at TU in Liberec**

Provider: TA CR
Program: GAMA, Sub-program 1
Project type: „Proof of concept stage"
Project identification code: TG01010117
Beneficiary: TUL, CxI(NATI)
Researcher responsible: Ing. Stanislav Petrík, Ph.D.
Project's Solution period: 2014–2018
Internal number TUL: 17862

- Partial projecs FME: Ecological combing technology for surface treatment of felt structures
  Researcher: Ing. Šimon Kovář, Ph.D., Department of Textile Machine Design
  Internal number: 14163
  Solution period: 2017–2019
  Subsidy FME 2018: 715 520 / 0 / 715 520 CZK
- Partial projecs FME: Orthopedic mattress with variable stiffness
  Researcher: Ing. Radek Votrubec, Ph.D., Department of Manufacturing Systems and Automation
  Internal number: 14162
  Solution period: 2017–2018
  Subsidy FME 2018: 259 148 / 0 / 259 148 CZK

## 5.2 International Cooperation in Education

**CEEPUS**

CEEPUS is a Central European exchange program focused on regional university cooperation within university networks. In 2018, the Faculty of Mechanical Engineering was an active participant in 4 CEEPUS III networks:

- CIII-RS-0304 Technical Characteristics Researching of Modern Products in Machine Industry (Machine Design, Fluid Technics and Calculations) with the Purpose of Improvement Their Market Characteristics and Better Placement on the Market.
- CIII-BG-0722 Computer Aided Design of Automated Systems for Assembling.

- CIII-RO-0013 Teaching and Research of Environment – Oriented Technologies in Manufacturing.
- Nově se fakulta v roce 2018 zapojila do sítě CIII-RS-1012-04-1819 Building Knowledge and Experience Exchange in CFDg.

Researcher: TUL, Faculty of Mechanical Engineering
Internal number TUL: 10060
Subsidy FME 2018: 63 600 CZK

**ERASMUS+ KA107 – Credit mobility**

**Call 2017**
The Faculty of Mechanical Engineering was successful within the Call 2017 and received a total of 3 projects, namely a project with partner universities in Canada, Thailand and Vietnam. In 2018 study stays of students of the Faculty of Mechanical Engineering were realized at partner universities in Vietnam and Thailand. Study stays of foreign students from Thailand, Canada and Vietnam at the Faculty of Mechanical Engineering were carried out reciprocally. Simultaneously, in 2018, one member of the academic staff of the Faculty of Mechanical Engineering went to a partner university in Vietnam for a training mobility, reciprocally 2 foreign academics from Vietnam came for training, 1 foreign academic from Thailand and, 1 foreign academic from Canada came for training mobility and 1 foreign academic from Canada came for a teaching mobility to the Faculty of Mechanical Engineering.

**Call 2018**
Under the 2018 call, the Faculty of Mechanical Engineering submitted 2 projects, one project for cooperation with Israel, the other for cooperation with Azerbaijan, both were supported. In 2018 a foreign academic from Azerbaijan arrived at the Faculty of Mechanical Engineering for training. Reciprocally, one academic of the Faculty of Mechanical Engineering also took part in the training mobilitz abroad.

Provider: DZS
Program: Erasmus+ KA107 – Credit mobility
Researcher: TUL/FME
Project Objective: Developing and supporting cooperation with partner universities in countries outside the EU.

**TUL as an important partner in the international educational space – continuation and deepening of existing cooperation with partner universities outside the EU (TUL will prefer cooperation with Canada, the USA, Vietnam, Russia and Azerbaijan)**
Provider: MEYS
Program: Institutional Development Plan TUL (IP TUL)
Researcher: TUL, Faculty of Mechanical Engineering
Internal number TUL: 12423
Subsidy FME 2018: 140 000 CZK / used 127 000 CZK

Project Objective:
The objective of the project was to carry out motivational study stays of selected students of FME at partner universities outside Europe. The long-term goal is to maintain and further develop contacts and activities with these universities.

## 5.3 International Projects

**EQUINOX – A novel process for manufacturing complex shaped Fe-Al intermetallic parts resistant to extreme environments**
Provider: EU – European Regional Development Fund
Program: H2020 – H2020-SC-2015-one-stage
Project identification code: 689 510
Lead partner: National Technical University of Athens, School of Chemical Engineering
Participant: TUL, Faculty of Mechanical Engineering
Researcher: Ing. Pavel Hanus, Ph.D., Department of Material Science
Internal number TUL: DZG93/2210
Period: 2016–2019
Details: See above 4.4 R&D projects

**Developmnet projects – see below 7.4.4 OP Cross-border cooperation**

## 5.4 International mobility

The new European Union Education Program 2014-2020 Erasmus+ promotes cooperation and mobility in all fields of education, training and sport and youth.

Inter-institutional agreements valid in 2018 under ERASMUS+:

- Universiteit Gent (Belgium)
- Technical University of Sofia (BG)
- Technical University of Sofia – Plovdiv (BG)
- Technical University of Gabrovo (BG)
- Trakia University – Stara Zagora (BG)
- Aalto University of Technology TKK (FI)
- Université de Bourgogne – Dijon(FR)
- University of Angers (FR)
- INSA Rennes (FR)
- Université de Franche-Comté Besançon (FR)
- Université de Technologie de Belfort-Montbéliard (FR)
- Ecole Nationale Mines d´Ales (FR)
- Universite de Savoie (FR)
- Groupe ESAIP (FR)
- Université de Haute Alsace (FR)
- BTU Cottbus-Senftenberg (DE)
- Technische Universität Dresden (DE)
- The University of Applied Sciences Emden/Leer (DE)
- Hochschule Hof (DE)
- WestsächsischeHochschule Zwickau (DE)
- Technische Universität Darmstadt (DE)
- Chemnitz University of Technology (DE)
- RWTH Aachen University (DE)
- Hochschule Zittau/Görlitz (DE)
- Hochschule Albstadt-Sigmaringen (DE)
- Budapest University of Technology and Economics (HU)
- Aleksandras Stulginskis University (LT)
- Vilnius College of Technologies and Design (LT)
- Koszalin University of Technology (PL)
- Technical University of Lodz (PL)
- Wroclaw University of Technology (PL)
- University of Bielsko-Biala (PL)
- Poznan University of Technolgy (PL)
- UTP University of Science and Technology in Bydgoszcz (PL)
- Universidade de Coimbra (PT)
- Universidade do Porto (PT)
- Universidade do Minho (PT)
- Universidade da Beira Interior (PT)
- University POLiTECHNICA of Bucharest (RO)
- University of Zilina (SK)
- Technical University of Košice (SK)
- TU Zvolen (SK)
- Universita Alexandra Dubčeka Trenčín (SK)
- Universidad Politécnica de Valencia (ES)
- Universidade de Oviedo Gijón (ES)
- Universidad del Pais Vasco, Bilbao (ES)
- Erciyes University (TR)
- Osmaniye Korkut Ata University (TR)
- Karadeniz Technical University (TR)
- Cukurova Universitesi (TR)
- Trakia University – Stara Zagora (BG)

- Trakya Universitesi (TR)
- Istanbul University (TR)
- USAK University (TR)
- Dogus University (TR)
- Bursa Teknik Üniversitesi (TR)
- Hacettepe University (TR)
- Karabuk University (TR)
- Cumhuriyet University (TR)
- Firat University (TR) – Erasmus+

New inter-institutional agreements concluded in 2018 for cooperation in the area of exchanges of students, academics and in the field of science and research:

- University of Southern Denmark (DK) – Erasmus+
- Karelia University of Applied Sciences (FI) – Erasmus+
- The University of Dunaújváros (HU) – Erasmus+
- Kielce University of Technology (PL) – Erasmus+
- Technological Educational Institute of Crete (GR) – Erasmus+
- University of the West of Scotland (UK) – Erasmus+
- Marmara University (TR) – Erasmus+
- University of Malta (MT) – Erasmus+

Valid for bilateral agreements cooperation in areas of mutual exchanges of students, academics and research and development in 2018 as part of transatlantic cooperation:

- University of Waterloo (CAN)
- Conestoga College Institute of Technology and Advance Learning, Ontario (CAN)
- Nha Trang University (Vietnam)
- Diponegoro University (Indonesia)
- Kazakh – British Technical University (Kazachstan)
- King Mongkuts´s University of Technology North Bangkok (Thajsko)
- Apollo Engineering College (India)
- Azerbaijan Technical University (Azerbaijan)

Other valid inter-institutional agreements Faculty of Mechanical Engineering are listed in Tab. 5.4.2.

## 7.1 Quality and Culture of Academic Life

- **Two-year university education courses, completed with the ING-PAED IGIP degrees and an international certificate of completion of the Branchy technical education course.**
  The Center of Continuous Education organizes and offers to TUL as standard. In 2017, the following academics of FS TUL completed the second year (examinations in January 2018):
  Ing. Šimon Kovář, Ph.D.
  Ing. Rudolf Martonka, Ph.D.
  Ing. Ladislav Perk
  Ing. Marie Stará, Ph.D.
  Ing. Miroslav Vavroušek
  Ing. Radek Votrubec, Ph.D.
  Ing. Petr Žabka, Ph.D.

- **Language courses**
  English prevails, German, French and Russion are also studied.
  Organized by the departmenrs, CDV TUL, within TUL OP RDE, language schools.

- **Professional courses**
  ATOS Professional + TRITOP Professional; Rozdílové školení SW GOM V2018; Calypso základ, v oblasti 3D – měřicí techniky, Multisenzorovný souřadnicový měřicí stroj ZEISS O-Inspect 322; 3D skenovací systém MetrsSCAN 350 a SW VXelements; AnyFactory – Simulace, výrobní ukazatele a Industrie 4.0; 3D construction printing course; Workshop Comsol Multiphysics; Igitur-Instron + upgrade SW; Elso-ConforMat+SW; Dantec – optické bezkontaktní zařízení HW, SW; Kistler – zařízení pro modální analýzu; práce s vědeckými informacemi; Školení ABB Robotics University-

úroven 2IRC5 ; Školení TREK; Fyzikální modelování v prostředí Matlab; SUPro – setkání uživatelů Creo; Dopřádání na rotorových dopřádacích strojích; Hygiena a hluk; Měření zbytkových napětí materiálu; ANSYS 19 Update; LaVision: DaVis PIV seminář; simulační SW Magma 5, Magma Core + Mould.

- **Courses organized within the university project OP RDE – RoLiZ, Technology Transferí**
  Aplikace statistických metod v ekonomii, Aspekty interkulturních kompetencí A, B, Didaktika, E-learning na TUL – základays kurz a kurz pro pokročilé, Etika, Jak se učit cizí jazyky, Komunikace, asertivita, sebereflexe, Komunikační dovednosti pro akademické pracovníky, Moderní technologie na Katedře netkaných textilií, Morální rozhodování – svoboda a odpovědnost, Pedagogická psychologie, Práce s kulturní diverzitou studentů, Praktické využití laboratoří Katedry materiálového inženýrství, Principy sociální psychologie v praxi, Psychologie osobnosti, Realizační fáze projektu, Rétorika, Rozvoj tvořivosti, Simulace procesů zpracování kovů a plastů, Sociální psychologie, Student se specifickými potřebami na TUL, Technické výpočty v Matlabu, Technika mluveného projevu, Úvod do didaktiky, Úvod do sociologie, Vysokoškolský zákon a jeho aplikace, Využití experimentálních laboratoří Katedry oděvnictví, Základy práva.

  FS academics / participants in at least one of the courses:
  Pavel Brdlík, Jágrová, Jitka, Jiří Machuta, Rudolf Martonka, David Pospíšil, Radka Dvořáková, Dana Semotjuková, Marcela Válková, Zuzana Horčičková, Petr Lepšík, Josef Skřivánek, Pavel Brabec, František Koblasa, Marie Stará, Miroslav Vavroušek, Petr Lenfeld, Pavlína Kočnarová, Magda Vestfálová, Maryna Garan, Jan Hujer, Michal Sivčák, Tomáš Zvolský, Petr Žabka, Iva Petríková, Iva Nová, Iva Nováková, Anna Benešová, Adam Hotař, Jan Kracík, Štěpánka Dvořáčková, Dora Kroisová, LKuboš Běhálek, Šimon Kovář, Tomáš Vít, Petra Dančová, Petr Zelený, David Cirkl, Ladislav Ševčík, Andrii Shynkarenko, Aleš Dittrich, Radek Votrubec.

## 7.4 Projects financed from EU Structural Funds

### 7.4.1 OP Research, Development and Education

**DspFSTUL – Development of research-oriented study programs** (Call PO2_02_16_018)
The project deals with the development of new PhD study programs of FME TUL which meet the requirements for PhD study of technical direction in accordance with the requirements of the knowledge economy and in accordance with international standards. The study programs cover the scientific and research areas of machine design and construction, production technology of processes and materials and mechanics.

| | |
|---|---|
| Beneficiary: | Technical University of Liberec, Faculty of Mechanical Engineering |
| Provider: | MEYS – EU |
| Program: | OP RDE |
| Priority axis: | PO1 – Strengthening capacities for quality research |
| Investment priority: | 1 – Improving the quality and efficiency and access to tertiary and even education, especially for disadvantaged groups, in order to increase participation and level of achieved education |
| Registration number: | CZ.02.2.69/0.0/0.0/16_018/0002718 |
| Researcher responsible: | Assoc. prof. Ing. Martin Bílek, Ph.D., DO/FME |
| Solution period: | 2017–2022 |
| Internal number TUL: | 16005 |
| Solution period: | 2017–2022 |
| Subsidy total: | 3 064 815 CZK / 2 911 575 CZK Subsidy MEYS / 153 240 CZK co-financed by FME TUL |
| Used by FME 2018: | total / INV / NIV – 268 045 / 0 / 268 045 CZK<br>It is the MEYS subsidy without co-financing from FME TUL. |

**ViFS TUL – Research infrastructures for educational purposes – building or upgrading**
(Call PO2_02_16_017)
The project deals with the development of instrumentation and laboratory equipment for the implementation of three new PhD study programs FME TUL.

| | |
|---|---|
| Beneficiary: | Technical University of Liberec, Faculty of Mechanical Engineering |
| Provider: | MEYS – EU |
| Program: | OP RDE |

| | |
|---|---|
| Priority axis: | PO1 – Strengthening capacities for quality research |
| Investment axis: | 1 – Strengthening research and innovation infrastructure and capacities to develop excellence in research and innovation and support centers of excellence, particularly those of European interest |
| Registration number: | CZ.02.1.01/0.0/0.0/16_017/0002650 |
| Researcher responsible: | Assoc. prof. Ing. Martin Bílek, Ph.D., DO/FME |
| Solution period: | 2017–2022 |
| Internal number TUL: | 16006 |
| Subsidy total: | 51 966 649 CZK / 49 368 317 CZK Subsidy MEYS / 2 598 332 CZK co-financed by FME TUL |
| Used by FME 2018: | total / INV / NIV – 38 259 057 / 37 342 125 / 522 992 CZK<br>It is the MEYS subsidy without co-financing from FS TUL |

**3D STAR – 3D printing in construction and architecture**

| | |
|---|---|
| Beneficiary: | Technical University of Liberec |
| Co-beneficiary: | CTU Prague, Klokner Institute |
| Provider Subsidy: | MEYS CR – EU |
| Program: | OP RDE Pre-application research |
| Registration number: | CZ.02.1.01/0.0/0.0/16_025/0007424 |
| Researcher responsible at TUL: | Ing. Petr Zelený, Ph.D. |
| Solution period projektu: | 2018–2022 |
| Internal number TUL: | 16018 |
| Subsidy total TUL: | 72 698 912 CZK |
| Subsidy FME TUL 2018: | 5 % |
| Subsidy KSA(DMA) 2018: | total / INV / NIV – 4 466 984 / 1 418 952 / 3 048 032 CZK |

**HyHi – Hybrid materials for hierarchical structures**

| | |
|---|---|
| Provider: | MEYS CR – EU |
| Program: | OP RDE Excellent research |
| Priority axis: | 1 – Strengthening capacities for quality research |
| Investment priority: | 1 – Strengthening research and innovation infrastructure and capacities to develop excellence in research and innovation and support centers of excellence, particularly those of European interest |
| Registration number: | CZ.02.1.01/0.0/0.0/16_019/0000843 |
| Beneficiary: | TUL |
| Researcher responsible at TUL: | prof. Dr. Ing. Petr Lenfeld |
| Internal number TUL: | 16015 / 16016 / 16017 |
| Project solution period: | 2018–2022 |
| Subsidy total: | total / INV / NIV – 228 497 881 / 31 406 269 / 197 091 611 CZK<br>(amounts to 95 % of overall costs, 5 % is co-financed by TUL) |
| Subsidy FME 2018: | total / INV / NIV – 24 973 637 / 13 300 000 / 11 673 637 CZK<br>(It is the MEYS subsidy without co-financing from FS TUL) |
| Used by FME 2018: | total / INV / NIV – 11 812 308 / 2 133 308 / 9 679 000 CZK |

### 7.4.2 OP Entrepreneurship and innovation for competitiveness

**Development of textile products from non-combustible and recyclable materials**

| | |
|---|---|
| Provider: | MIT CR – EU |
| Program: | OP Entrepreneurship and innovation for competitiveness |
| Call: | Aplikace III |
| Projekt: | CZ.01.1.02/0.0/0.0/16_084/0010282 |
| Beneficiary: | Aligard s.r.o. |
| Co-researcher: | TUL, Faculty of Mechanical Engineering, Department of Material Science |
| Researcher responsible: | prof. Ing. Petr Louda, CSc. |
| Internal number: | 17065 |
| Solution period: | 2018–2019 |
| Subsidy FME 2018: | 3 959 505 CZK |

**Integration of microcomputers into lighting systems**

| | |
|---|---|
| Provider: | MIT CR – EU |
| Project: | CZ.01.1.02/0.0/0.0/17_107/0011226 |

Program: OP Entrepreneurship and innovation for competitiveness
Call: Aplikace III
Beneficiary: SANS SOUCI, s.r.o.
Co-researcher: TUL, Faculty of Mechanical Engineering, Department of Material Science
Researcher responsible: prof. Ing. Petr Louda, CSc.
Internal number: 17049
Solution period: 2018–2020
Subsidy FME 2018: 245 324 CZK

**Dynamic multi-axis electrohydraulic heat recovery units**
Provider: MIT CR – EU
Program: OP Entrepreneurship and innovation for competitiveness
Call: Aplikace I
Project: CZ.01.1.02/0.0/0.0/15_019/0004853
Beneficiary: OCHI inženýring s.r.o.
Co-beneficiary: STAutomation, s.r.o.
Researcher Co-beneficiary: TUL, Faculty of Mechanical Engineering, Department of Material Science
Researcher responsible: prof. Ing. Petr Louda, CSc.
Internal number: 17053
Solution period: 2016–2018
Subsidy FME 2018: total 1 933 974 CZK, inc. non-public sources / Subsidy 655 000 CZK

**Test stand for pre-certification tests of internal combustion engines**
Provider: MIT CR – EU
Program: OP Entrepreneurship and innovation for competitiveness
Call: Aplikace
Project: CZ.01.1.02/0.0/0.0/15_019/0004815
Beneficiary: TES Vsetín s.r.o.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Co-researcher, Co-beneficiary: TUL, CxI(NATI)
Researcher: Ing. Pavel Brabec, Ph.D., Department of Vehicles and Engines
Internal number: 17059 FME, 17058 CxI (NATI)
Subsidy FME 2018: used / INV / NIV – 760 277 / 0 / 760 277 CZK (guess item)
Donation – Beneficiary: 174 971 CZK

**OP EIC solved under CNATI**

**Test stand for pre-certification tests of internal combustion engines**
Provider: MIT CR
Program: OP Entrepreneurship and innovation for competitiveness
Call: Aplikace
Projekt: CZ.01.1.02/0.0/0.0/15_019/0004815
Beneficiary: TES Vsetín s.r.o.
Co-beneficiary: TUL, Faculty of Mechanical Engineering
Researcher responsible, Co-beneficiary:TUL, CNATI
Researcher: Ing. Pavel Brabec, Ph.D., Department of Vehicles and Engines Internal
Number: 17059 FME, 17058 CNATI

**Industrial research and experimental development of a small urban electric car and tools for its production**
Provider: MIT CR – EU
Program: OP Entrepreneurship and innovation for competitiveness
Call: Aplikace
Project identification code: OP EIC CZ.01.1.02/0.0/0.0/16_084/0009908
Beneficiary: COMBATRA, spol. s r.o.
Other project participants: TUL, CxI(NATI)
Solution period: 2017–2020
Guarantor at TUL: Ing. Robert Voženílek, Ph.D., DVE
Internal number TUL: 17063
Subsidy 2018: total / INV /NIV 0 CZK / 0 CZK / 0 CZK
(the MH has not yet been approved)

### 7.4.3 OP Crossborder Cooperation

**GreK**
**Cross-border cooperative teaching of plastics processing technology Zittau-Liberec**

| | |
|---|---|
| Program: | Cooperation program Czech Republic – Free State of Saxony 2014–2020 |
| Priority axis: | 3 – Investments in education, training and vocational training |
| Specific objective: | 3.2 Improving youth employment |
| Project Registration Number: | 100252772 |
| Provider Subsidy: | EU – European Regional Development Fund |
| Lead partner: | Hochschule Zittau/Görlitz (HSZG) |
| Project partner: | Technische Universität Dresden (TUD) |
| Project partner: | TUL, Faculty of Mechanical Engineering |
| Responsible Researcher at TUL: | Ing Luboš Běhálek, Ph.D., Department of Engineering Technology |
| Solution period: | 2015–2019 |
| Internal number TUL: | 15401 |
| Subsidy total: | 272 727 EUR |
| Subsidy FME TUL 2018: | 2 954 140 CZK |
| Subsidy DET 2018: | 2 954 140 CZK |
| Used DET 2018: | 2 011 718 CZK |

**BauQu**
**Building partnerships in the field of building technology research to educate scientific followers in the border region**

| | |
|---|---|
| Program: | Cooperation program Czech Republic – Free State of Saxony 2014–2020 |
| Provider Subsidy: | EU – European Regional Development Fund |
| Lead partner: | Technische Universität Dresden (TUD) |
| Project partner: | TUL, Faculty of Mechanical Engineering |
| Researcher responsible at TUL: | Assoc. prof. Ing. Karel Fraňa, Ph.D., Department of Power Engineering Equipment |
| Solution period: | 2016–2019 |
| Internal number TUL: | 15402 |
| Subsidy FME 2018: | 40 893 EUR |
| Used FME 2018: | 960 105 CZK |

**POKYEAR.digital**
**Practically oriented development of competencies in production technology in regions through cooperation.digital**

| | |
|---|---|
| Program: | Cooperation program Czech Republic – Free State of Saxony 2014–2020 |
| Provider Subsidy: | EU – European Regional Development Fund |
| Lead partner: | Technische Universität Dresden (TUD) |
| Project partner: | TUL, Faculty of Mechanical Engineering |
| Researcher responsible at TUL: | Ing. František Koblasa, Ph.D. Department of Manufacturing Systems and Automation |
| Registration Number: | 100281976 |
| Solution period: | 2017–2019 |
| Internal number TUL: | 15402 |
| Subsidy total: | 256 085,90 EUR |
| Subsidy FME 2018: | total / INV / NIV – 1 925 602 / 0 / 1 925 602 CZK |
| Used FME 2018: | total / INV / NIV – 2 098 689 / 0 / 2 098 689 CZK |

# ANNUAL REPORT 2018

## Faculty of Mechanical Engineering

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