



# INSTITUTE OF MACHINE AND INDUSTRIAL DESIGN

INSTITUTE OF MACHINE AND INDUSTRIAL DESIGN  
Faculty of Mechanical Engineering  
Brno University of Technology

# BRNO UNIVERSITY OF TECHNOLOGY



- Founded in **1899**
- The oldest Czech university in Brno, the second oldest and largest university in the Czech Republic
- **8** faculties (FA, FEEC, FCH, FIT, FBM, FCE, FME, FFA), 3 university institutes (IFE, CESA, CEITEC)
- **7** research centres (AdMaS, CMV, CVVOZE, NETME Centre, SIX, CEITEC, IT4Innovations)
- **18 000** students in bachelor, master and doctoral degree programmes
- **3 000** employees (of which **1 000** are academic staff)



# FACULTY OF MECHANICAL ENGINEERING

BRNO FACULTY  
UNIVERSITY OF MECHANICAL  
OF TECHNOLOGY ENGINEERING

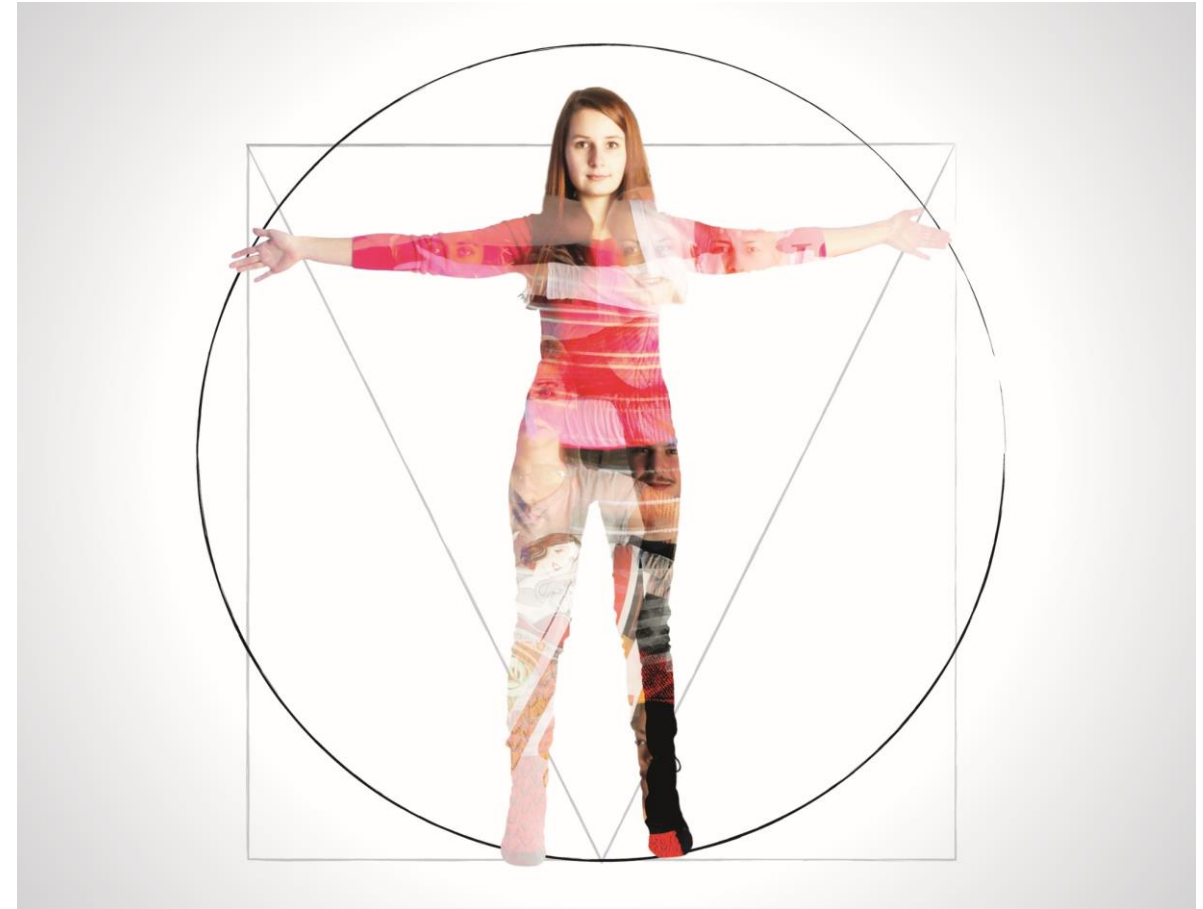
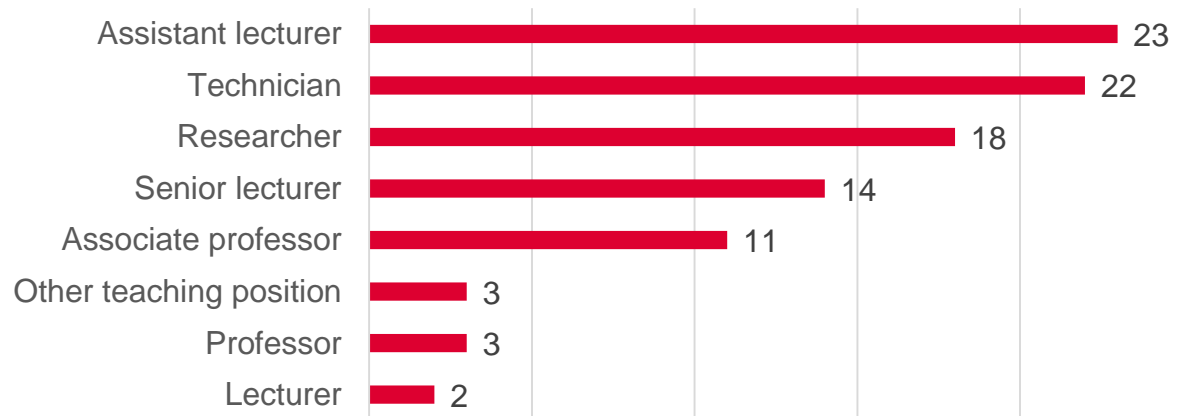
- Founded in **1900**
- The second largest faculty of Brno University of Technology
- **13** institutes, **2** specialized centres
- **1** regional research and development centre – NETME Centre (New Technologies for Mechanical Engineering)
- **4 000** students in bachelor, master and doctoral degree programmes
- **577** employees (of which **275** are academic staff)



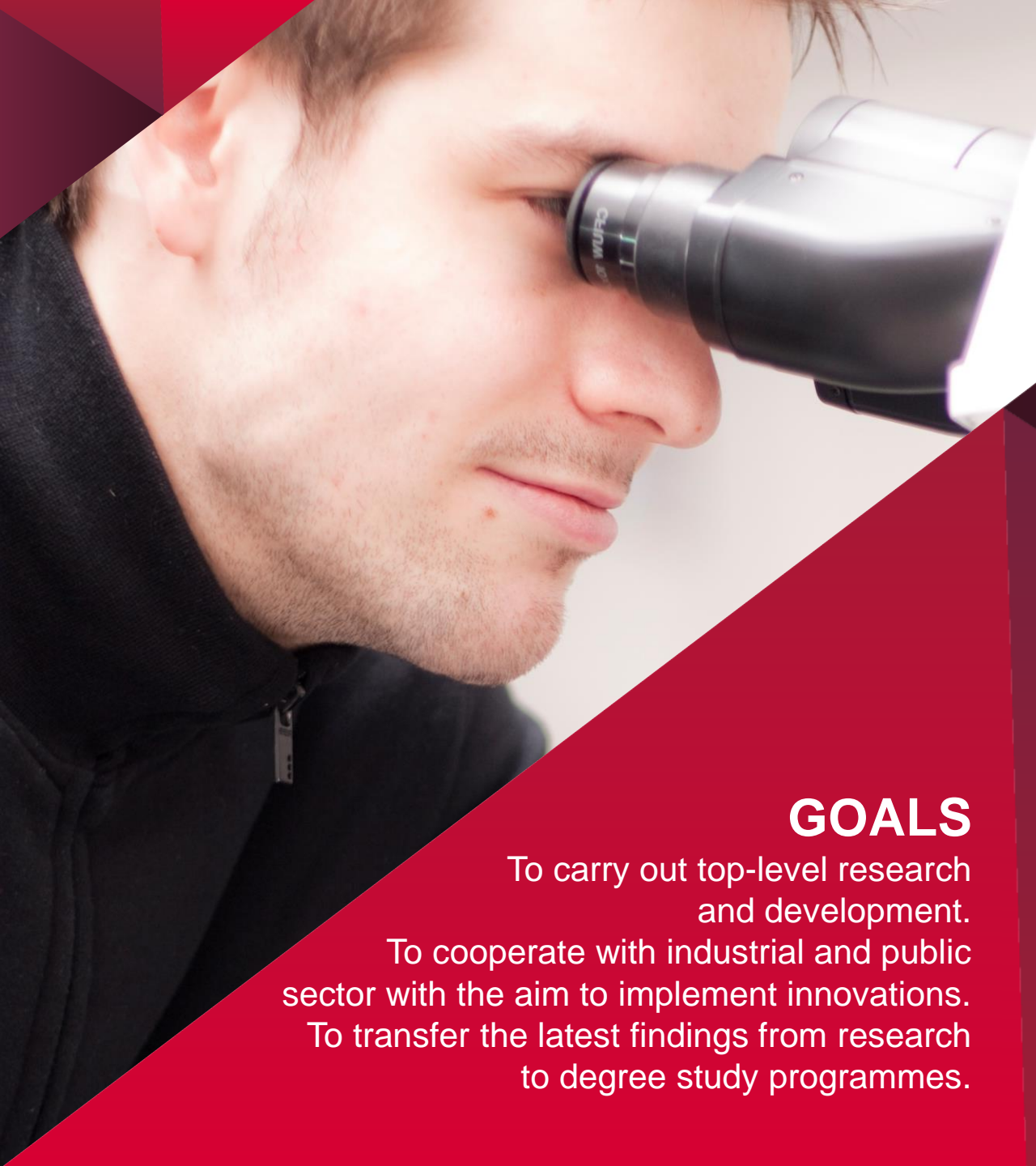
# INSTITUTE OF MACHINE AND INDUSTRIAL DESIGN

- Founded in **1901**
- Infrastructure covering **3 570 m<sup>2</sup>**
- **86** employees (**62 FTE**)
- **29** doctoral students (**27** full-time)
- Tuition - **1 500** students per year

## STRUCTURE OF EMPLOYEES







## **VISION**

To be considered an internationally recognized research institution providing top-level master and doctoral study in the field of machine and industrial design.

## **GOALS**

To carry out top-level research and development.

To cooperate with industrial and public sector with the aim to implement innovations.

To transfer the latest findings from research to degree study programmes.

## **MISSION**

To acquire and apply the latest research-based knowledge and findings in the field of machine and industrial design, to share them via all degree programmes in order to develop the professional capacity of university.

# ORGANIZATIONAL STRUCTURE

Institute  
secretaries



**Viera VAVRUŠOVÁ**  
Economy



**Klára JAVORČEKOVÁ**  
Education and Public  
Relations



**Ivana MUŽÍKOVÁ**  
Operations and Human  
Resources



**Prof. Martin HARTL**  
Director



**Dr. Daniel KOUTNÝ**  
Deputy Director

Heads  
of departments



**Prof. Ivan KŘUPKA**  
Tribology



**Dr. Milan KLAPKA**  
Condition Monitoring



**Dr. Daniel KOUTNÝ**  
Reverse Engineering and Additive  
Technologies



**Dr. Ladislav KŘENEK**  
Industrial design

Tuition  
coordinators



**Dr. Petr SVOBODA**  
1st and 2nd year of bachelor degree  
programme Fundamentals of  
Mechanical Engineering



**Dr. Martin VRBKA**  
3rd year of bachelor degree  
programme Fundamentals of  
Mechanical Engineering



**Dr. Radovan GALAS**  
4th and 5th year of master degree  
programme Mechanical Engineering  
Design



**Dr. Dana Rubínová**  
Bachelor and master degree  
programme Industrial Design

# RESEARCH GROUPS

## TRIBOLOGY

Prof. Ivan KŘUPKA



**Biotribology**  
Dr. Martin Vrbka



**Rail transportation**  
Dr. Milan Omasta



**Advanced lubrication**  
Dr. Petr Šperka

## CONDITION MONITORING

Dr. Ivan MAZŮREK



**Nondestructive testing**  
Dr. Pavel Mazal



**Vibroacoustics**  
Dr. Ivan Mazůrek

## REVERSE ENGINEERING AND ADDITIVE TECHNOLOGIES

Dr. Daniel KOUTNÝ



**3D digitization  
and quality control**  
Dr. Tomáš Koutecký



**Metal 3D printing**  
Dr. Daniel Koutný



**Robotic manufacturing  
and generative design**  
Dr. David Škaroupka

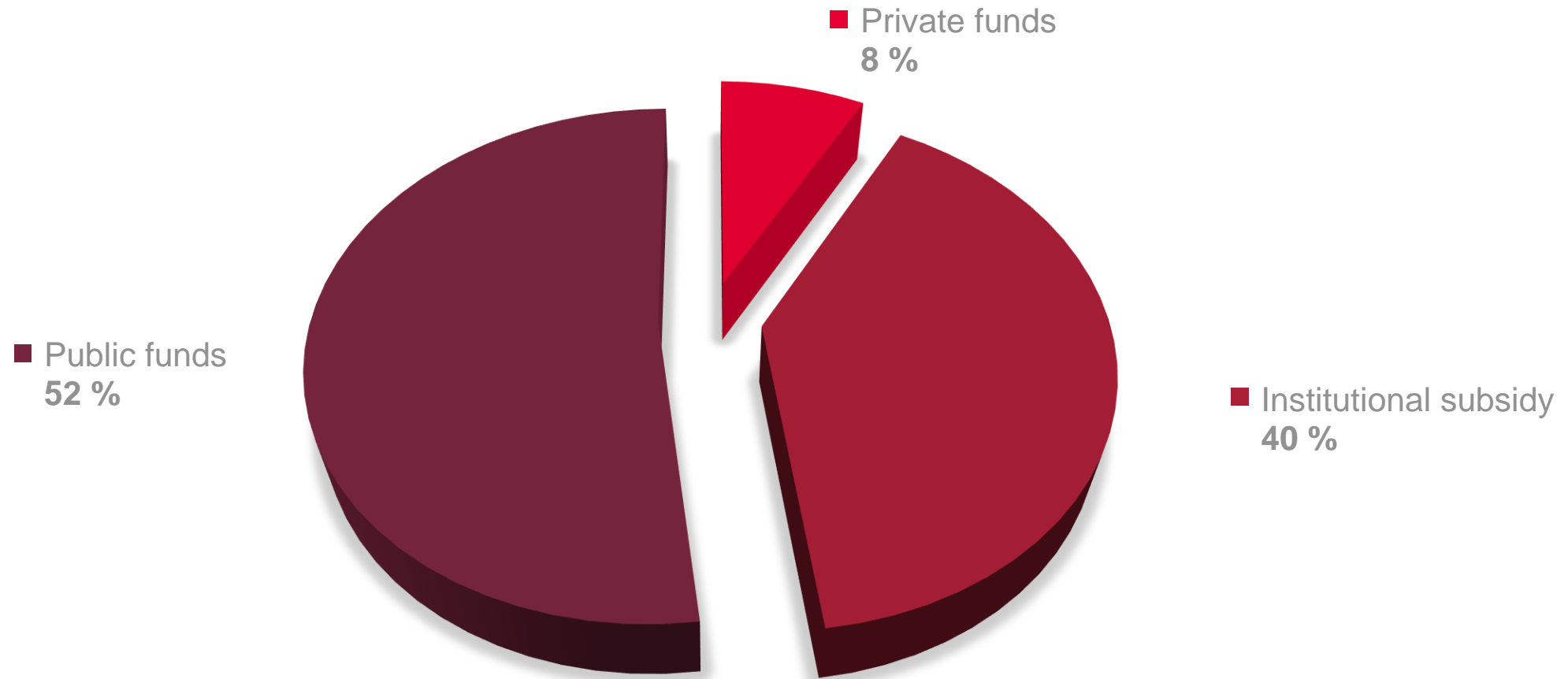
## INDUSTRIAL DESIGN

Dr. Ladislav KŘENEK



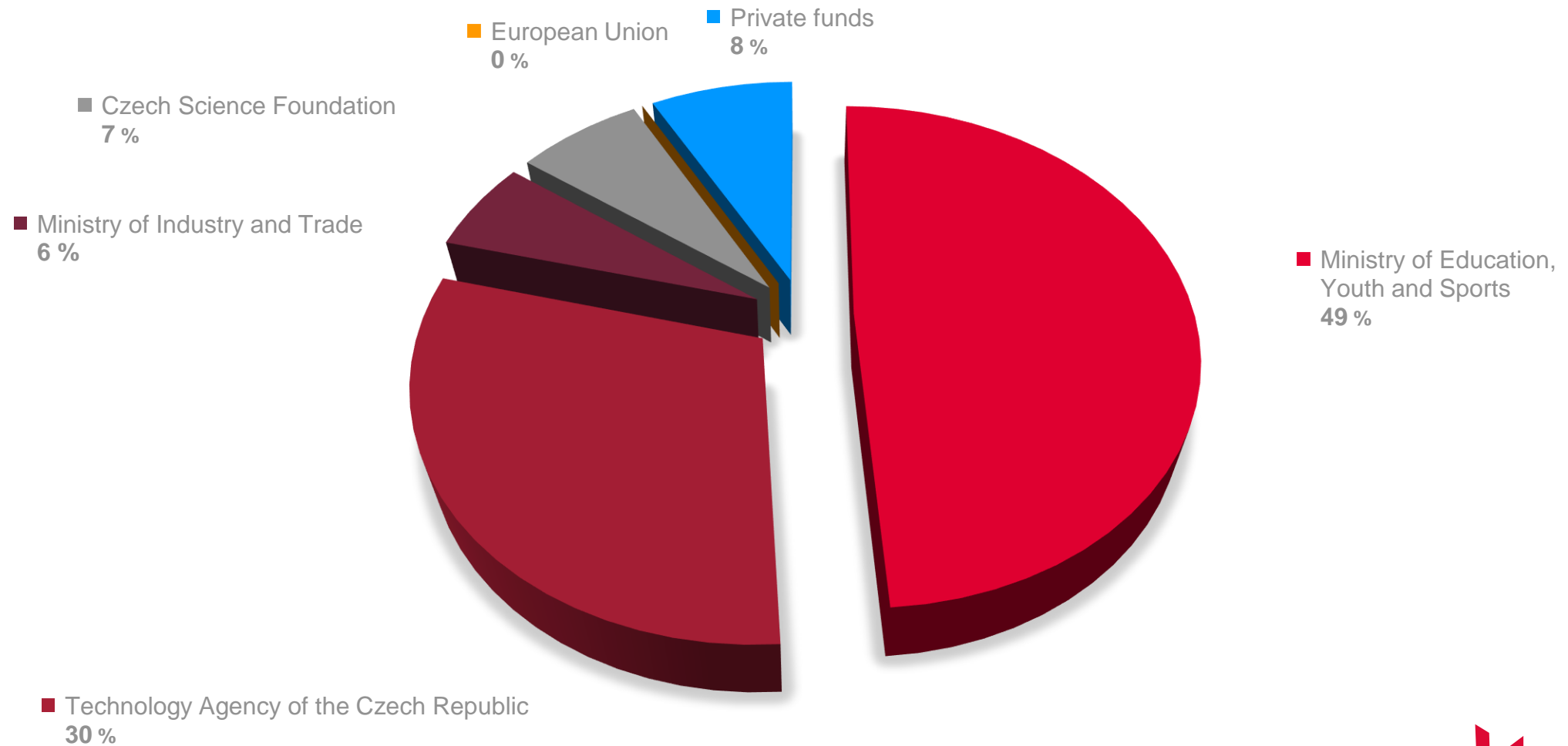
**Product design**  
Dr. Ladislav Křenek

## FUNDING BY TYPE





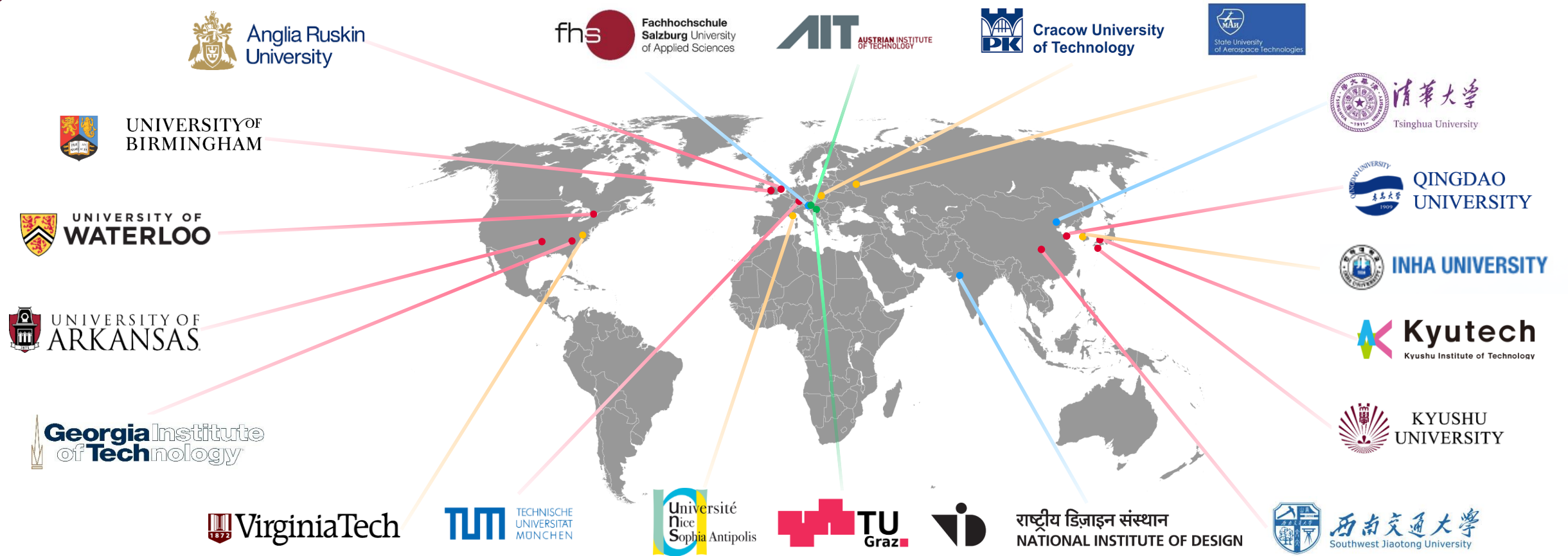
# FUNDING BY PROVIDER



# PARTNERS OF CONTRACTUAL RESEARCH



# INTERNATIONAL PARTNERS



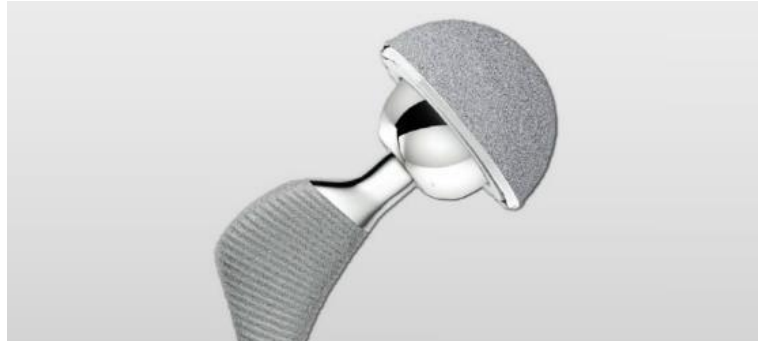
● Tribology ● Condition Monitoring ● Reverse Engineering and Additive Technologies ● Industrial Design

# KEY COMPETENCES

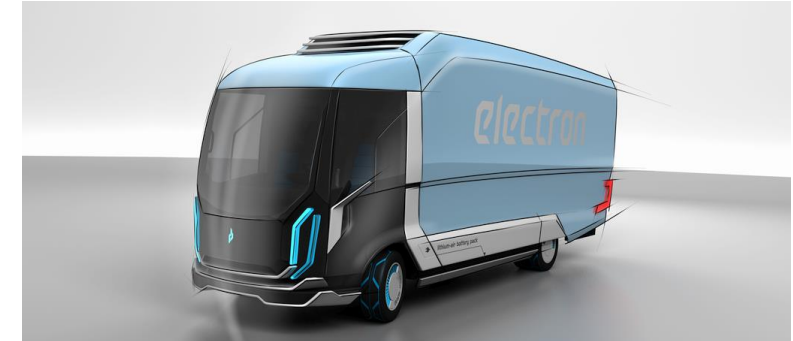
TRIBOLOGY



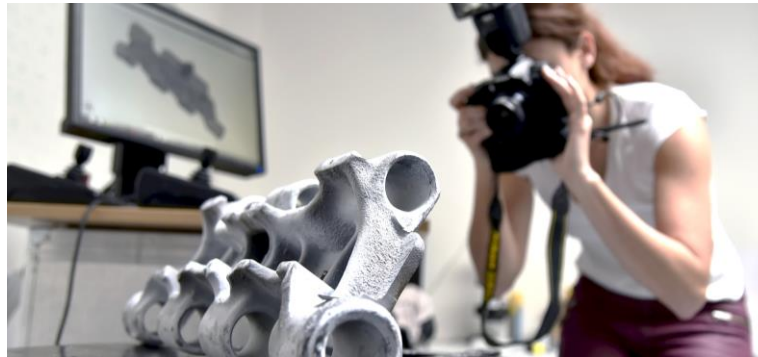
BIOTRIBOLOGY



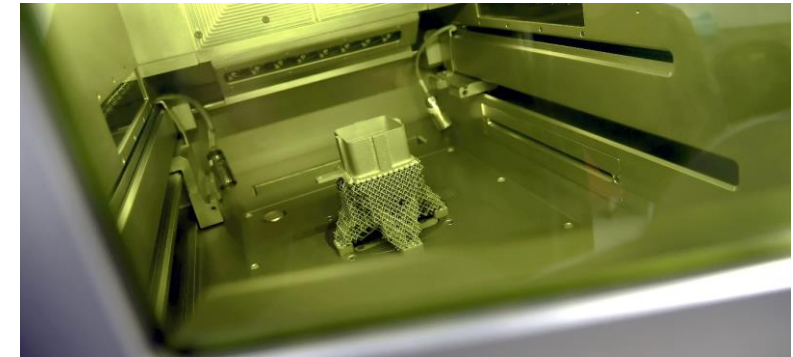
INDUSTRIAL DESIGN



CONDITION MONITORING AND VIBROACOUSTICS



3D DIGITIZATION AND REVERSE ENGINEERING



METAL 3D PRINTING

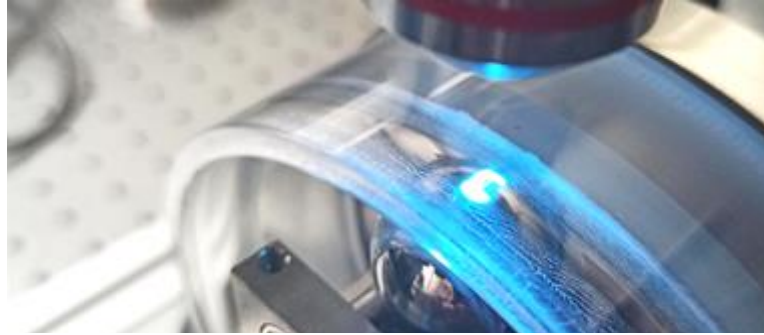


# TRIBOLOGY

ADVANCED EXPERIMENTS



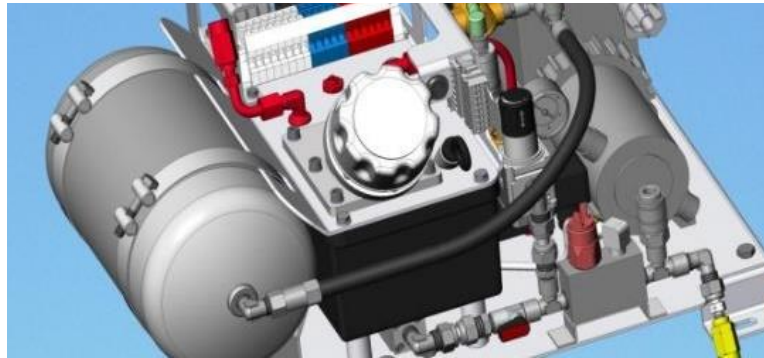
LUBRICATION



SOFT TISSUES



RAIL TRANSPORT



LUBRICATION SYSTEMS

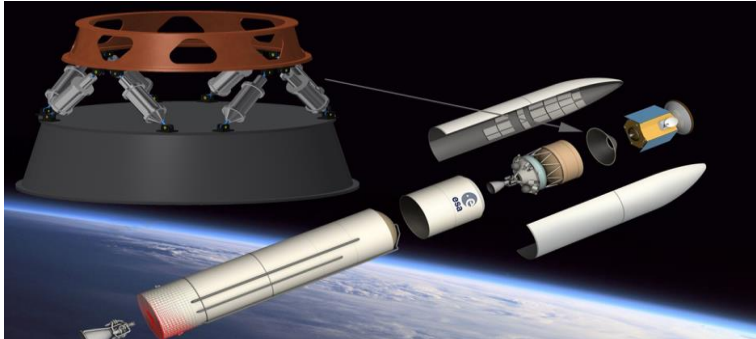


JOINT REPLACEMENTS

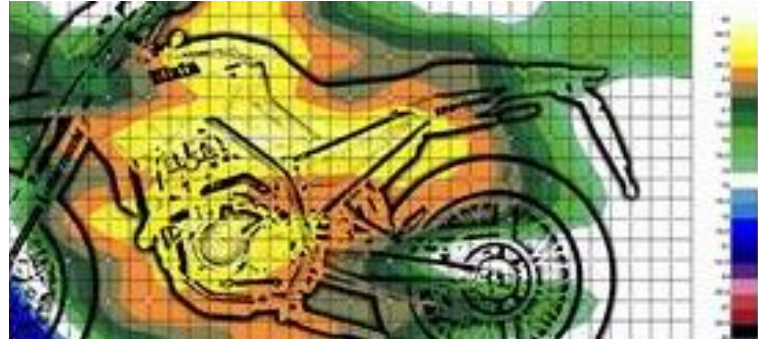


# CONDITION MONITORING

SMART DAMPERS



NOISE SOURCE LOCALIZATION



DEVELOPMENT OF DIAGNOSTIC DEVICES



DIAGNOSTICS OF BEARINGS



DEVELOPMENT OF ADVANCED  
MAGNETIC CIRCUITS



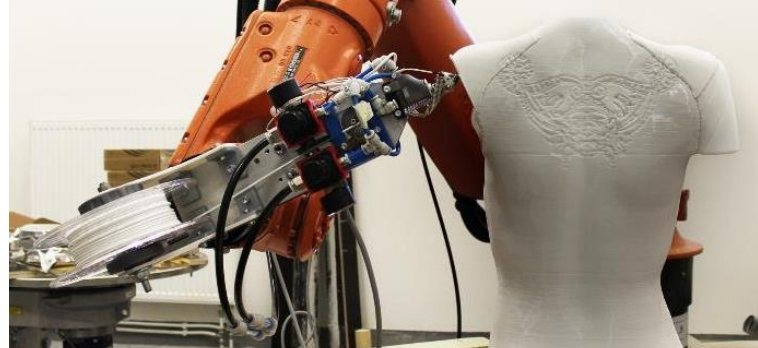
EXPERT-BASED ANALYSES

# REVERSE ENGINEERING AND ADDITIVE TECHNOLOGIES

PHOTOGRAMMETRY AND IMAGE PROCESSING



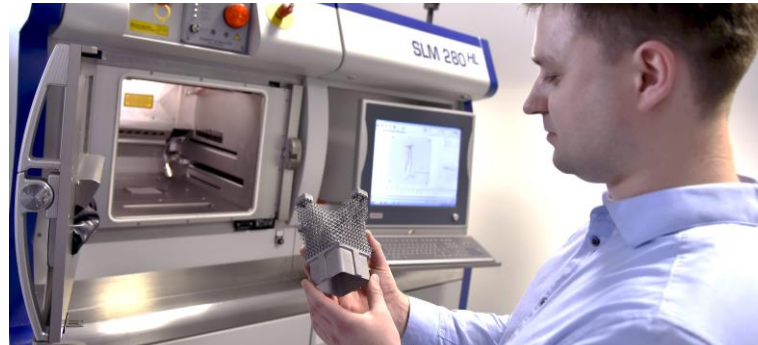
ADDITIVE ROBOTIC MANUFACTURING



ADDITIVE MANUFACTURING OPTIMIZATION



DIGITIZATION AND QUALITY CONTROL



ADDITIVE MANUFACTURING OF METAL PARTS



MECHANICAL ENGINEERING DESIGN



# INDUSTRIAL DESIGN

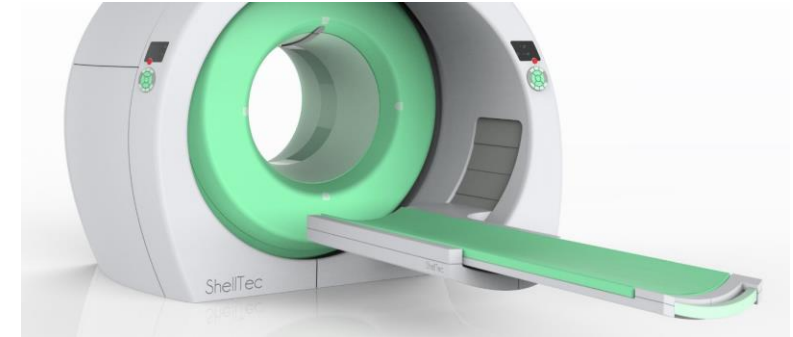
CONCEPTUAL DESIGN



PRODUCTS AND APPLIANCES



MEDICAL DEVICES



TOOLS AND INSTRUMENTS



VEHICLES



PRODUCTION MACHINES

# DEGREE PROGRAMMES

## BACHELOR DEGREE

### FUNDAMENTALS OF MECHANICAL ENGINEERING

- **1 185** students
- **6** compulsory courses, **104** h of lectures, **156** h of tutorials
- **3** optional courses, **52** h of lectures, **65** h of tutorials

### INDUSTRIAL DESIGN

- **71** students
- **52** compulsory courses, **715** h of lectures, **1 740** h of tutorials

## MASTER DEGREE

### MECHANICAL ENGINEERING DESIGN

- **42** students
- **20** compulsory courses, **190** h of lectures, **1 152** h of tutorials

### INDUSTRIAL DESIGN

- **27** students
- **21** compulsory courses, **218** h of lectures, **1 201** h of tutorials

## DOCTORAL DEGREE

### MACHINES AND EQUIPMENT - DESIGN AND PROCESS ENGINEERING

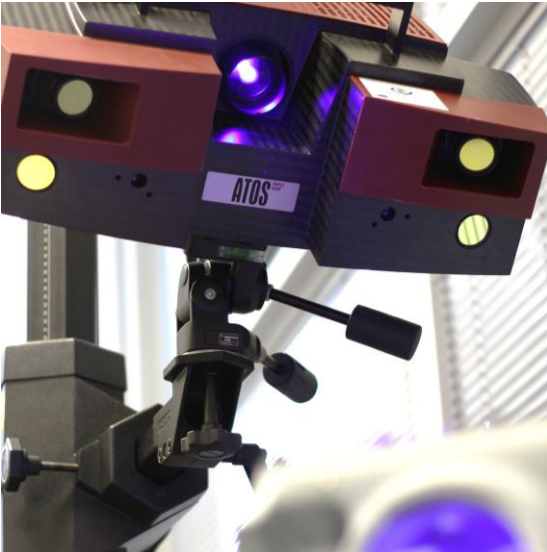
- **29** students
- **8** optional courses, **160** h of lectures

# MECHANICAL ENGINEERING DESIGN

- Project-based learning
- Fundamental design and engineering skills
- Emphasis on creativity and critical thinking

- Emphasis on soft skills and project management
- Small and student-centered teaching
- Top-class facilities and laboratories

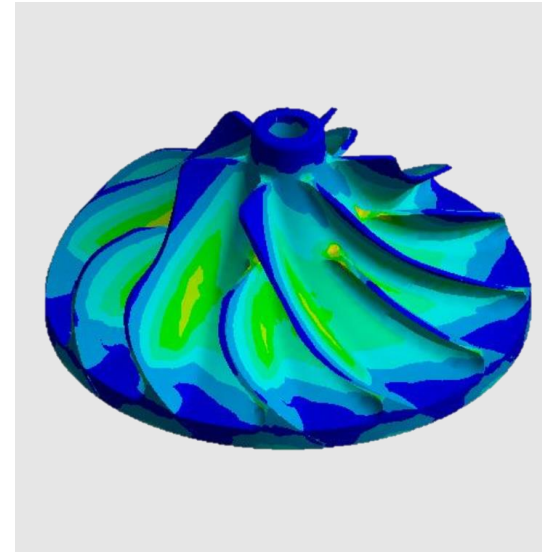
## 3D DIGITAL TECHNOLOGIES



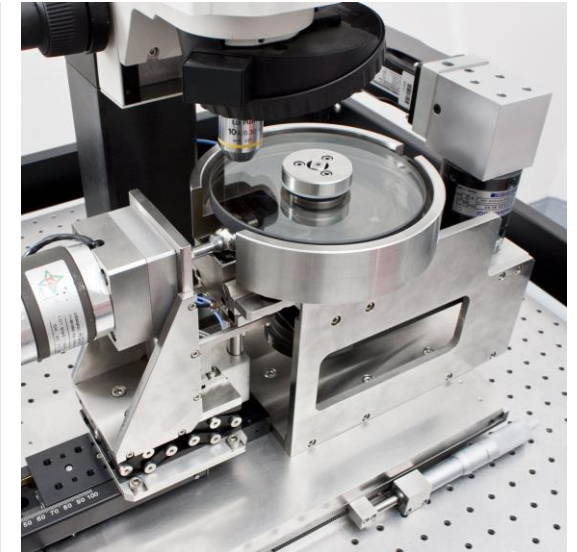
## CONDITION MONITORING



## ENGINEERING ANALYSES AND SIMULATIONS



## TRIBOLOGY





# INDUSTRIAL DESIGN

- Design of industrial products
- Traditional design methods
- Progressive technologies

- Emphasis on creativity, aesthetics and ergonomics
- Combination of artistic and technical approach
- Workshops with industrial partners

## PRODUCT DESIGN



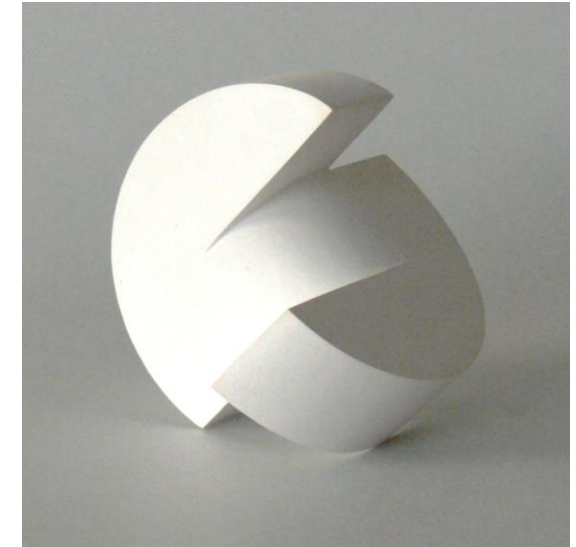
## 3D MODELLING, VISUALIZATION, ANIMATION



## ERGONOMICS



## ARTISTIC TECHNIQUES AND MODEL MAKING



# PROJECT-BASED LEARNING

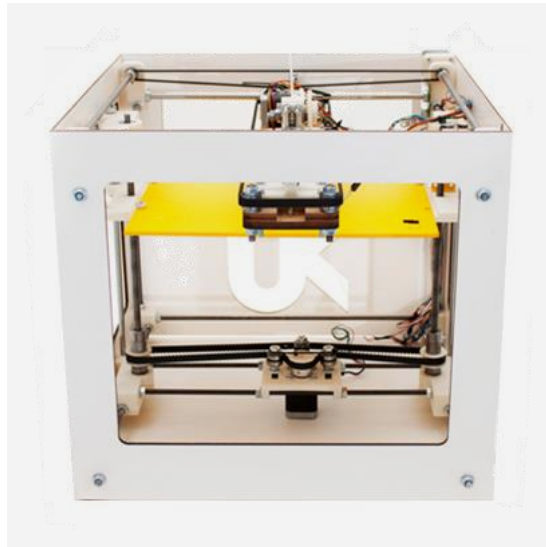
- Wide range of engineering projects
- Application of theoretical knowledge on real problems
- Professional supervision

- Checkpoints during the semester
- Assessment by the examination board
- Real outcomes

## 1st SEMESTER Analytical Project



## 2nd SEMESTER Mechanical Design Project



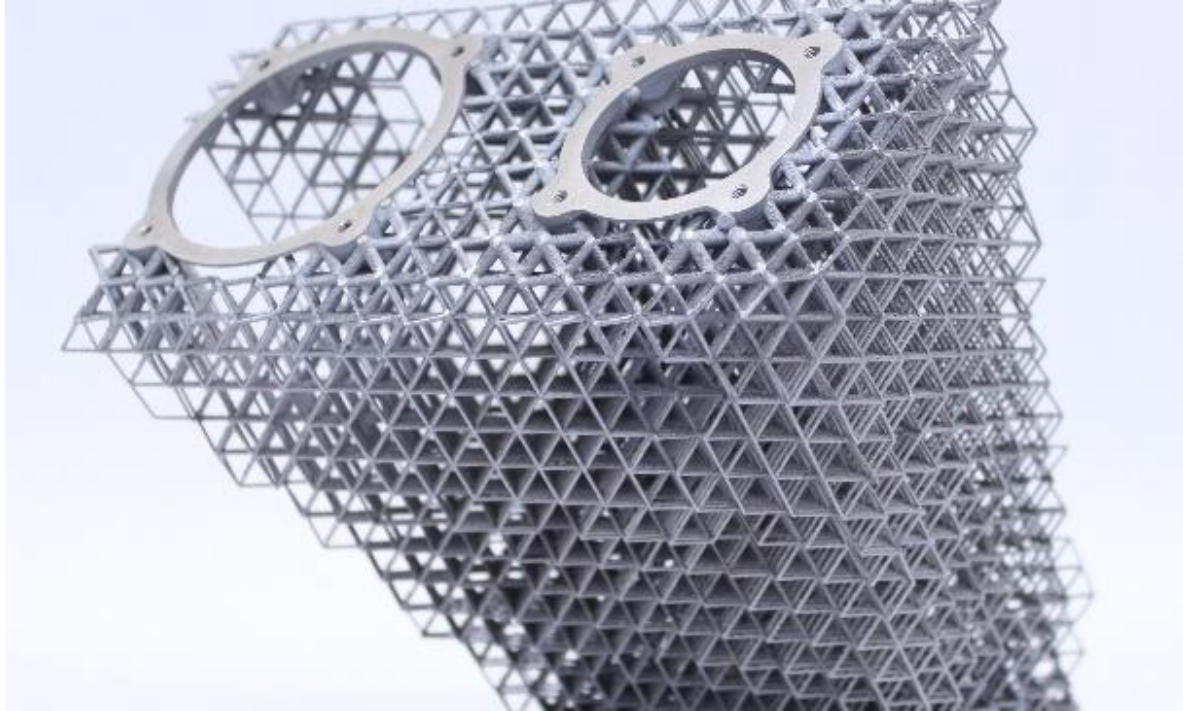
## 3rd SEMESTER Research and Development Project



## 4th SEMESTER Master Thesis Project

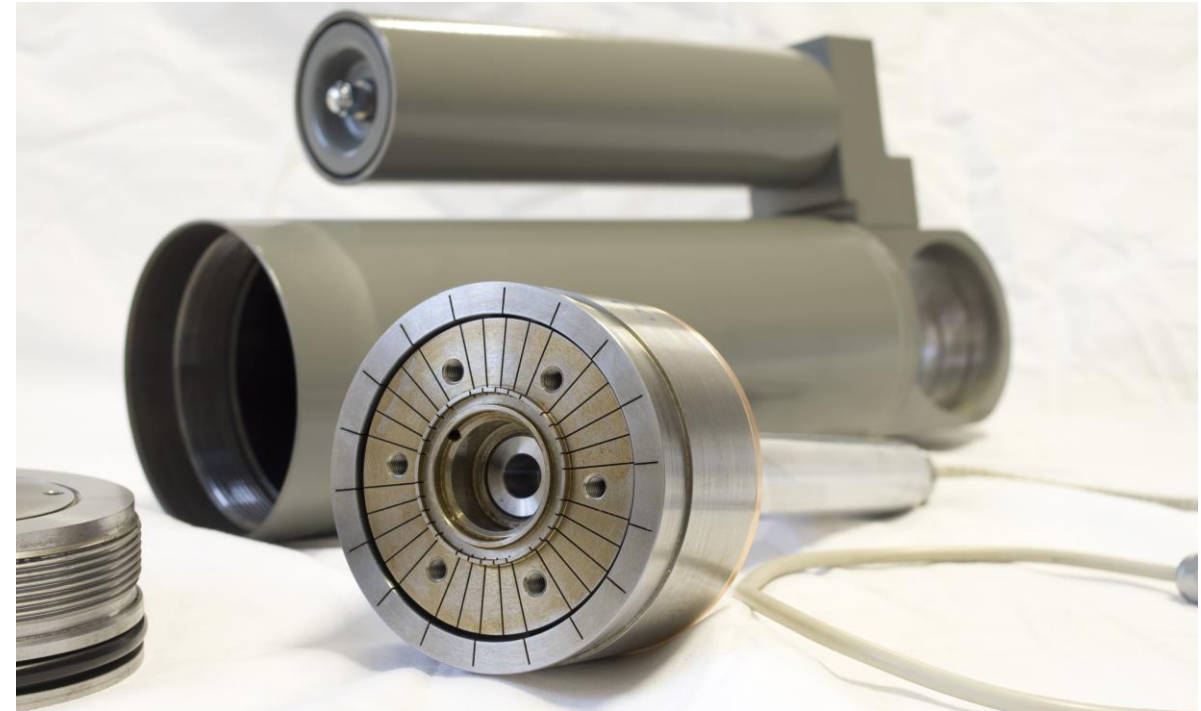


# COOPERATION WITH INDUSTRY



LKE--

Development and 3D print of optimized satellite console for cosmic industry



**ST-OS**  
Strojírna Oslavany

Development of magnetorheological damping system for railway vehicles

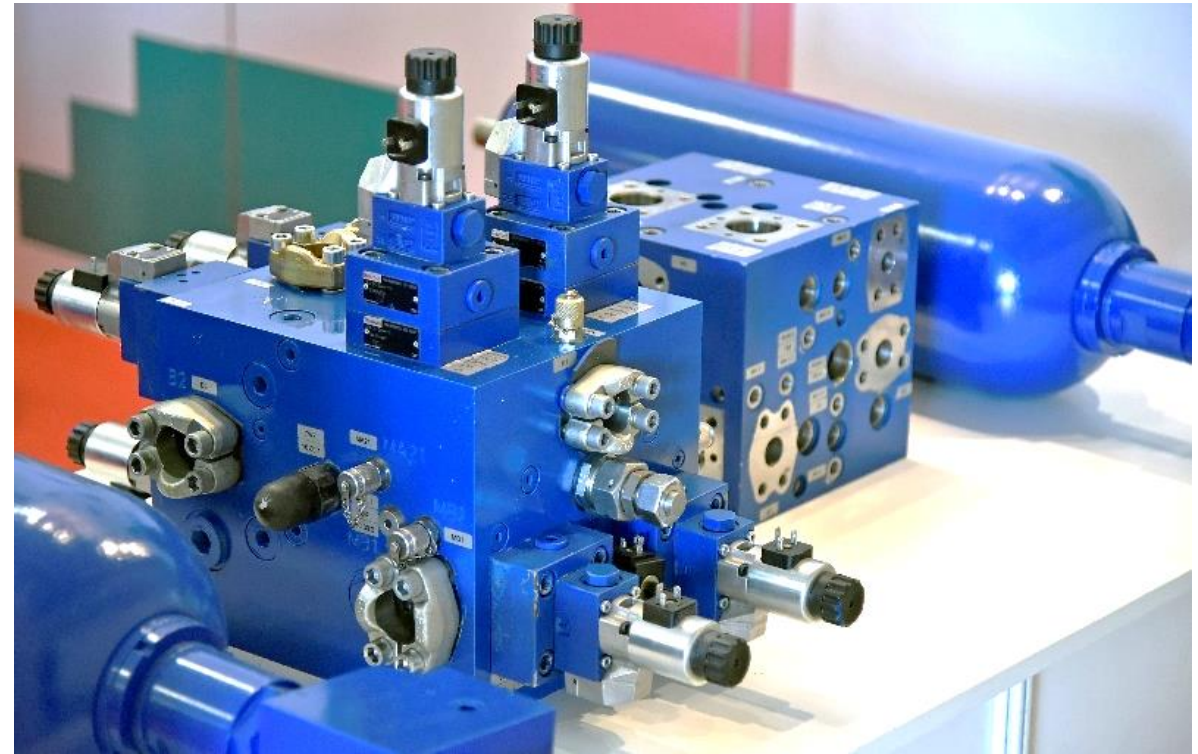


# COOPERATION WITH INDUSTRY



**DAIDO METAL**

Development of experimental device  
for testing of journal bearings



**Rexroth**  
Bosch Group

Hydrostatic recuperative module for fuel saving  
of road roller

# PNEUMOBIL RACING TEAM BRNO

- Student team
- Development of racing cars powered by compressed air
- Participation within project oriented courses or free time activity
- Learning more about mechanisms, electronics, pneumatic systems
- Cooperation with industrial partners
- Participation in international competitions

## INTERNATIONAL AVENTICS PNEUMOBILE COMPETITION

- 60 teams from 8 countries
- Awards:
  - 1st in Acceleration race
  - 1st in Top speed
  - 4th in Long distance race



[www.pneumobilteam.cz](http://www.pneumobilteam.cz)





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[www.ustavkonstruovani.cz](http://www.ustavkonstruovani.cz)