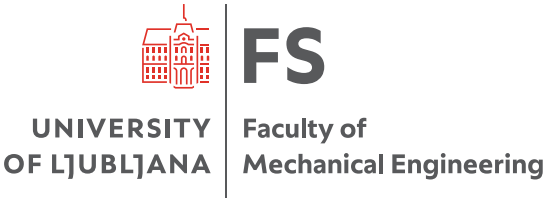
UNIVERSITY OF L]UBL]ANA

FS Faculty of Mechanical Engineering

Annual Report 2025



University of Ljubljana

Faculty of Mechanical Engineering

Aškerčeva cesta 6

1000 Ljubljana

Slovenia

Telephone: +386 1 4771 200

Fax: +386 1 2518 567

E-mail: dekanat@fs.uni-lj.si

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Dean
Prof. dr. Jernej Klemenc

Vice Dean for Education, 1st Cycle
Assoc. Prof. Dr. Matevž Zupančič

Vice Dean for Education, 2nd and 3rd Cycles
Assoc. Prof. Dr. Miha Brojan

Secretary General
Dr. Tone Češnovar

Vice Dean for Research and International Relations
Prof. dr. Franci Pušavec

SUPPORTING SERVICES

Faculty secretariat	Andreja Koban Domitrovič
Student office	Nika Vardjan Naglič
Accounts and financial department	mag. Barbara Bergant Kaučič
Human resource department	Anja Novak
Department of international cooperation, scientific and research work	mag. Tanja Mavrič Rušt
Department of Economic Affairs and Communications	Katja Pustovrh
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Technical and maintenance department	Aleš Hočevar
IT department	Grega Tomažin
Publishing department	mag. Pika Škraba
Quality Assurance Office	Alenka Rogelj Ritonja

ASST. PROF. DR. DOMINIK KOZJEK – RECIPIENT OF THE ERC STARTING GRANT

On 4 September 2025, the European Research Council awarded Asst. Prof. Dr. Dominik Kozjek, an ERC Starting Grant—one of Europe's most prestigious funding schemes, designed to support outstanding early-career researchers in establishing or consolidating their independent research teams. The five-year project, valued at €1.5 million, will be hosted at the Faculty of Mechanical Engineering, University of Ljubljana. It marks a significant milestone for the Faculty and for the Slovenian scientific community at large, while further affirming Dr. Kozjek's long-standing research excellence.

The awarded project, entitled MeltingWell, addresses one of the central challenges in metal additive manufacturing: uncontrolled process variations in selective laser melting, which lead to defects and inconsistent material properties in printed components. By integrating advanced artificial intelligence methodologies, the project aims to develop predictive and corrective strategies to mitigate such deviations, enabling more stable and industrially reliable metal 3D printing. The anticipated outcomes will facilitate broader adoption of the technology across high-demand sectors, including aerospace, energy, automotive engineering, and biomedicine. Research activities will be carried out at the Laboratory for Mechatronics, Manufacturing Systems and Automation LAMPA at the Faculty of Mechanical Engineering, in collaboration with national and international research partners.

Dr. Kozjek completed his undergraduate, master's, and doctoral studies at the Faculty of Mechanical Engineering, University of Ljubljana. Prior to his academic career, he gained practical experience in industry as a CNC operator, laboratory technician, and production specialist. Early exposure to real-world manufacturing environments shaped his pragmatic and analytical mindset—an approach he continues to integrate into high-level scientific inquiry. From 2021 to 2023, he was a postdoctoral researcher at Northwestern University in Chicago, where he contributed to the development of advanced approaches for improving selective laser melting. It was during this period that the foundational concept for the MeltingWell project was conceived.

Dr. Kozjek is distinguished by a pronounced interdisciplinary profile that combines technical excellence with a strong engagement in the arts and sport. Before pursuing mechanical engineering, he graduated from the Ljubljana Conservatory of Music and Ballet, performing in chamber ensembles and orchestras. He remains an active pianist and choral singer. His athletic achievements are equally notable: he was a member of the national team in Olympic weightlifting

Photo: Mateja Jordovič Potočnik

and a national junior champion. Music and sport continue to provide him with balance, focus, and creative space—qualities he frequently channels into his scientific work.

Following his postdoctoral tenure in the United States, Dr. Kozjek made a deliberate decision to return to Slovenia. Despite attractive opportunities abroad, he felt a strong sense of responsibility toward the academic environment that had supported his education. He believes his greatest contribution lies at home—through collaboration with Slovenian industry and research institutions, and particularly through mentoring students and introducing them to cutting-edge technological developments.

Commenting on the achievement, the Dean of the Faculty of Mechanical Engineering, Prof. dr. Jernej Klemenc, emphasized that the ERC Starting Grant represents a clear confirmation of the Faculty's research excellence and serves as an inspiring example for young researchers. Dr. Kozjek's success underscores the Faculty's commitment to fostering an environment where breakthrough ideas and internationally recognized achievements can emerge.

INTRODUCTION

UNIVERSITY OF LJUBLJANA

Founded in 1919, the University of Ljubljana is the oldest higher education institution in Slovenia and represents the foundation of the country's academic, scientific, and cultural development. Over more than a century, it has evolved into a comprehensive and internationally recognised university that integrates education, research, and artistic activity across a wide range of disciplines, including the humanities, social sciences, natural sciences, engineering, medicine, and the arts.

The University of Ljubljana is the central and largest educational and research institution in Slovenia. It is renowned for its quality social and natural sciences and technical study programmes. The University of Ljubljana has been listed in the 501-600 group by the prestigious Academic Ranking of World Universities (ARWU); listed in the 801-1000 group in the Times Higher Education (THE) ranking, and placed 535th in the Quacquarelli Symonds ranking.

Today, the University of Ljubljana is composed of 23 faculties and three art academies, bringing together tens of thousands of students and a large community of academic and professional staff. With around 38,000 students, it is a major intellectual hub that significantly contributes to the development of knowledge and highly skilled professionals in Slovenia.

A defining feature of the University is its strong emphasis on research excellence and interdisciplinary collaboration. It accounts for a substantial share of Slovenia's scientific output and actively participates in international research projects and networks. Through close cooperation with industry and other institutions, the University promotes innovation, knowledge transfer, and the practical application of research results.

Internationalisation is one of its key strategic priorities. The University of Ljubljana maintains partnerships with numerous universities and research institutions worldwide, enabling student and staff mobility as well as joint academic initiatives. It offers diverse study opportunities and actively supports international students through exchange programmes, summer schools, and other forms of academic cooperation.

Beyond education and research, the University also plays an important cultural and social role. Its academies and faculties contribute significantly to Slovenia's artistic and cultural landscape, while its academic community fosters critical thinking, creativity, and social responsibility. Located in the capital city, the University is closely connected with the urban environment and plays a vital role in shaping its intellectual and cultural life.

With a strong tradition and a clear vision for the future, the University of Ljubljana continues to develop as a modern and forward-looking institution, committed to academic excellence, innovation, and addressing the key challenges of contemporary society.

FACULTY OF MECHANICAL ENGINEERING, UNIVERSITY OF LJUBLJANA

The Faculty of Mechanical Engineering is a member of the University of Ljubljana, and an important educational and research institution with high international standards in the field of mechanical engineering in Slovenia and the wider region of the Central and Southeast Europe. Through the history and with development the faculty overcame the classic understanding of mechanical engineering, since today it offers programmes from numerous specialised engineering fields.

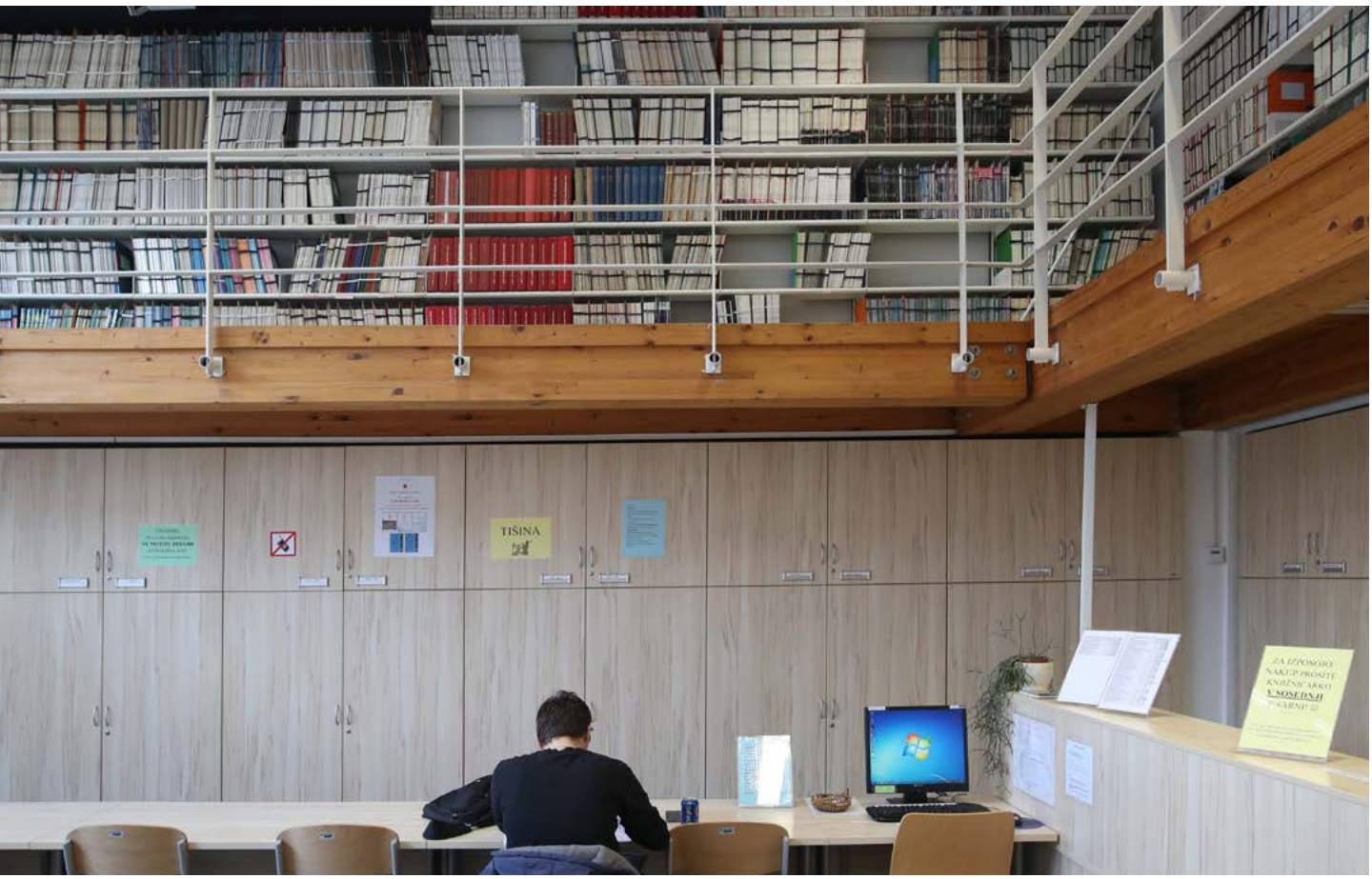


Photo: UL FME Archive

Foundation

Throughout history, technical occupations were well established among the Slovenes, although until the establishment of the University in Ljubljana in 1919, students had to attain their knowledge abroad, mostly in the Austrian universities. After the end of the World War 1, which also meant the end of the Austro-Hungarian rule, the wish to establish our own university, which would include a faculty of technical sciences also came to life. Even before the formal establishment of the University of Ljubljana there were organised lectures for the students of mechanical, electrical and civil engineering. The Faculty of Technical Sciences in Ljubljana was established through the effort by Dr. Milan Vidmar, and it remained in such form until 1957, when the departments of electrical and mechanical engineering were united. In October 1960, under the resolution of the University Board, the Faculty of Mechanical Engineering became an independent member of the University of Ljubljana with study programmes on all three levels. In the beginning it had four chairs – organisational units – where the faculty and assistants performed teaching and scientific work. The faculty was at first housed in the so called old building on Aškerčeva cesta 6; in 1971 it moved into a new building at the same location. Today, the Faculty of Mechanical Engineering of the University of Ljubljana is still located in both buildings.

Today

The Faculty of Mechanical Engineering of the University of Ljubljana is today the largest institution for education and research of mechanical engineering in Slovenia. In-house design and research work, and quality transfer of knowledge to the students and research partners enables a competitive integration into the international environment.

The Faculty of Mechanical Engineering carries out its **educational activities** for all three study cycles in accordance with the Bologna Declaration guidelines. Two first cycle study programmes, the professional and academic programmes, deliver an insight into a wider field of mechanical engineering; the second cycle master's programme is a continuation of the first cycle; the individually tailored third cycle doctoral programme is based on solving problems at the highest scientific level. The educational process in the first and second cycles is carried out in the form of lectures and practicals, where the lectures provide theoretical knowledge, and the laboratories perfect practical skills. The degree, obtained at the Faculty of Mechanical Engineering, is internationally accredited on the European level (ASIIN, ENUA, EUR-ACE), and is equal to other degrees in Europe.

Scientific research work at the Faculty of Mechanical Engineering is carried out in the fields of power and process engineering, design, mechanics and maintenance of machines, production engineering, mechatronics, micromechanic systems and automatisation. The researchers are involved in national basic and applicative projects, and in numerous international projects, actively working with scientific research centres and the industry. Through cooperation with the industry and other institutions the faculty is contributing toward higher economic growth, and is publishing the results of innovation potentials in international scientific journals. Special attention is also given to the education of young and promising researchers, who decide on the career path in research also because of the tenders from ARIS (Slovenian Research and Innovation Agency).

CHAIRS AND LABORATORIES AT THE FACULTY OF MECHANICAL ENGINEERING

CHAIR OF SYNERGETICS

Laboratory for Synergetics LASIN

1

CHAIR OF MACHINE ELEMENTS AND DEVELOPMENT EVALUATION

Laboratory for Machine Elements LASEM

Laboratory for Structure Evaluation LAVEK

2

CHAIR OF POWER ENGINEERING

Laboratory for Internal Combustion Engines and Electromobility LICeM

Laboratory for Heat and Power LTE

Laboratory for Hydraulic Machines LVTS

Laboratory for Pumps, Compressors and Technical Acoustics LEDSTA

3

CHAIR OF CYBERNETICS, MECHATRONIC AND PRODUCTION ENGINEERING

Laboratory for Mechatronics, Production Systems and Automation LAMPA

4

CHAIR OF MANUFACTURING TECHNOLOGIES AND SYSTEMS

Laboratory for Forming LAP

Laboratory for Alternative Technologies LAT

Laboratory for Handling, Assembly and Pneumatics LASIM

5

CHAIR OF MATERIALS, SCIENCE AND TECHNOLOGY

Laboratory for heat treatment and materials testing LATOP

Laboratory for Welding LAVAR

6

CHAIR OF HEATING AND PROCESS ENGINEERING

Laboratory for Measurements in Process Engineering LMPS

Laboratory for Thermal Technology LTT

7

CHAIR OF MECHANICS

Laboratory for Dynamics of Machines and Structures LADISK

8

CHAIR OF SOLID MECHANICS AND RHEOLOGY OF MATERIALS

Laboratory for Non-Linear Mechanics LANEM

Laboratory for Numerical Modelling and Simulation LNMS

Laboratory for Experimental Mechanics LEM

9

The Faculty of Mechanical Engineering has been broken into units called chairs since the very start of its independent operations. The organisational structure derives from the basic courses, which further spread and evolved into specific areas or subunits called laboratories with the development of research engineering.

In 2025, 32 laboratories and a Unit for Supplementary Division operated within the scope of 16 chairs.

CHAIR OF OPTODYNAMICS AND LASER APPLICATIONS

Laboratory for photonics and laser systems FOLAS

Laboratory for laser techniques LASTEH

10

CHAIR OF TRIBOLOGY AND MAINTENANCE SYSTEMS

Laboratory for tribology and interface nanotechnology TINT

Laboratory for Fluid Power and Controls LFT

11

CHAIR OF FLUID DYNAMICS AND THERMODYNAMICS

Laboratory for Fluid Dynamics and Thermodynamics LFDT

12

CHAIR OF THERMAL AND ENVIRONMENTAL ENGINEERING

Laboratory for Refrigeration and District Energy LAHDE

Laboratory for Sustainable Technologies in Buildings LOTZ

13

CHAIR OF MACHINING TECHNOLOGY MANAGEMENT

Laboratory for Machining LABOD

Laboratory of Quality Assurance LAZAK

14

CHAIR OF ENGINEERING DESIGN AND TRANSPORTATION SYSTEMS

Laboratory for Engineering Design LECAD

Laboratory for Material Handling and Machine Structures LASOK

15

CHAIR OF MODELLING IN ENGINEERING SCIENCES AND MEDICINE

Laboratory for Modelling Machine Elements and Structures LAMEK

16

AVIATION DIVISON

Laboratory for aeronautics AEROL

17

UNIT FOR SUPPLEMENTARY DIVISION

Mathematics Research Team RSMAT

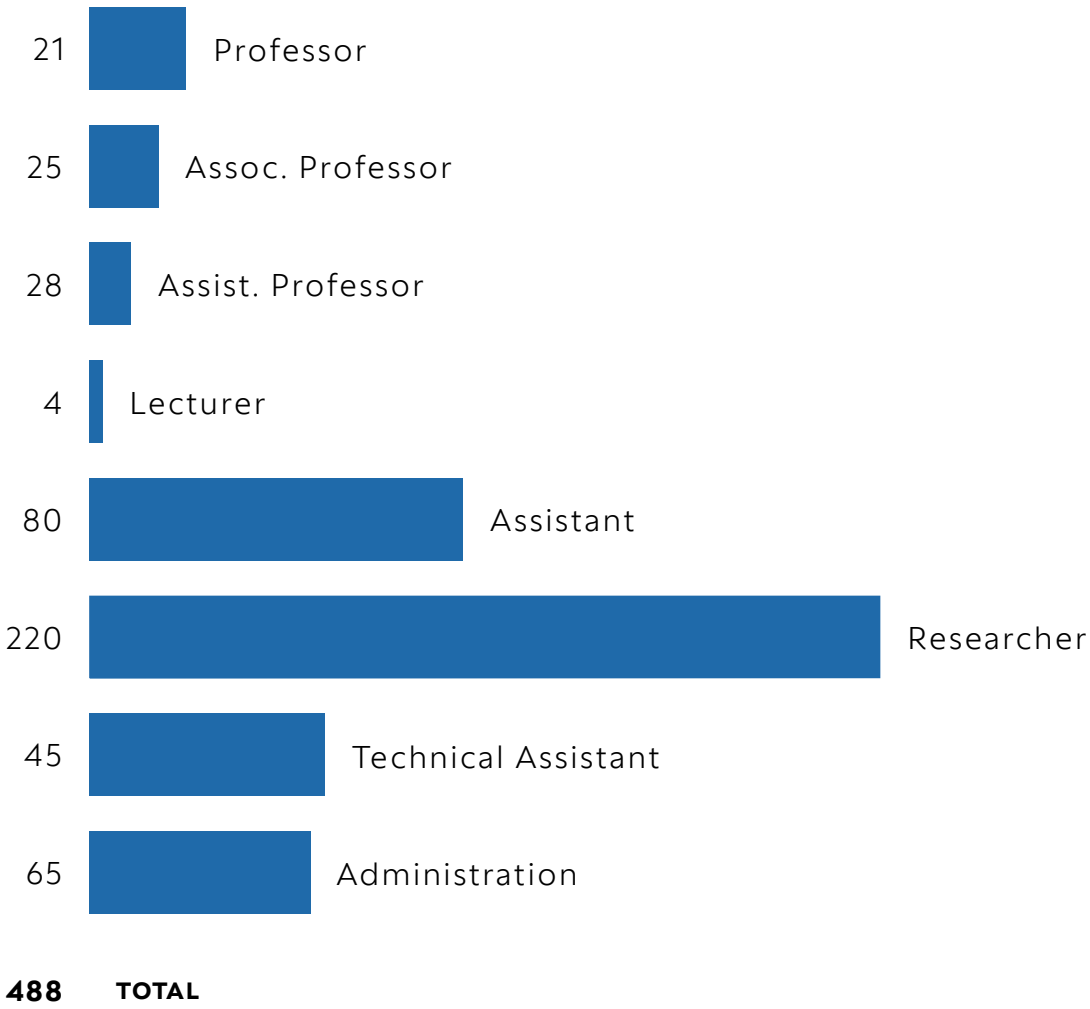
Unit for Supplementary Division EDZ

18

THE FACULTY OF MECHANICAL ENGINEERING IN NUMBERS

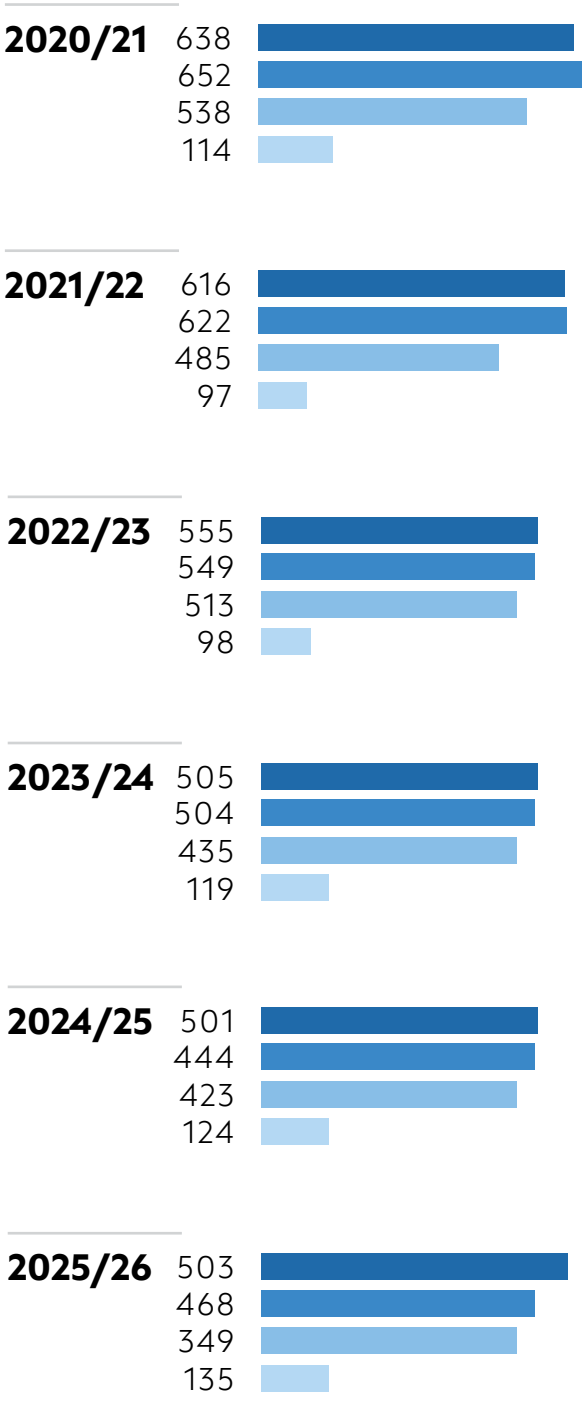
EMPLOYEE STRUCTURE

2025



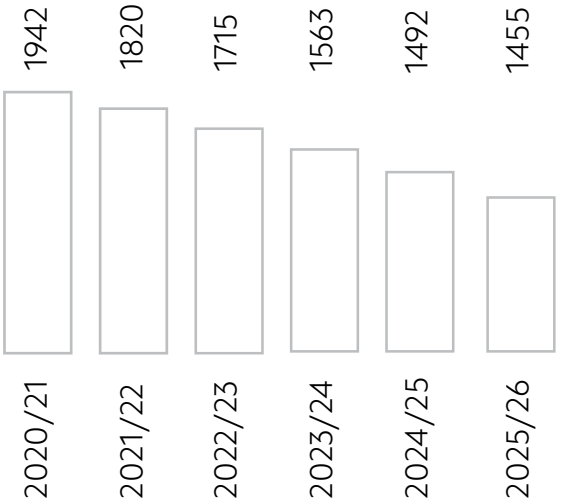
488 **TOTAL**

NUMBER OF ENROLLED STUDENTS

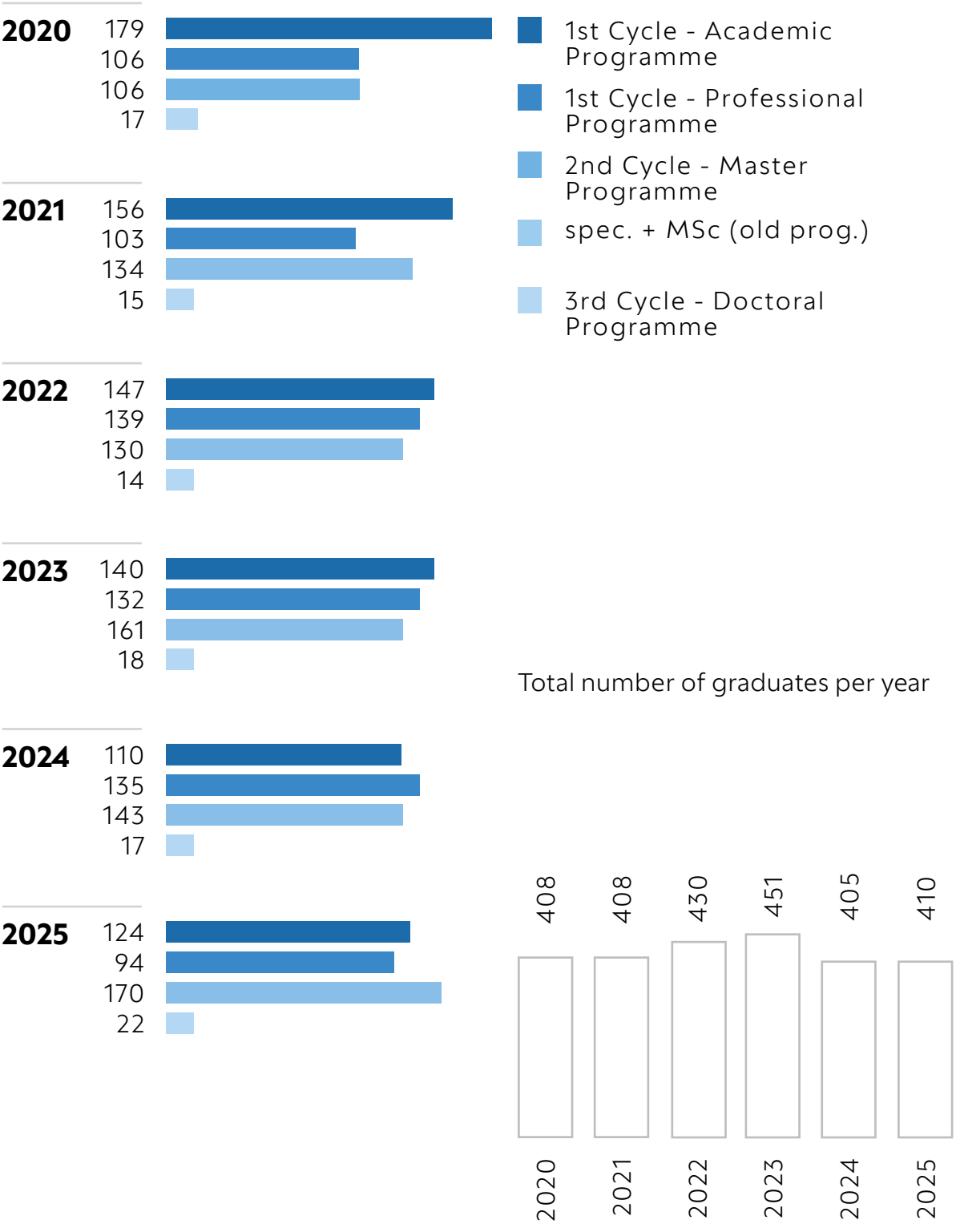


- 1st Cycle - Academic Programme
- 1st Cycle - Professional Programme
- 2nd Cycle - Master Programme
- 3rd Cycle - Doctoral Programme

Total number of enrolled students per year

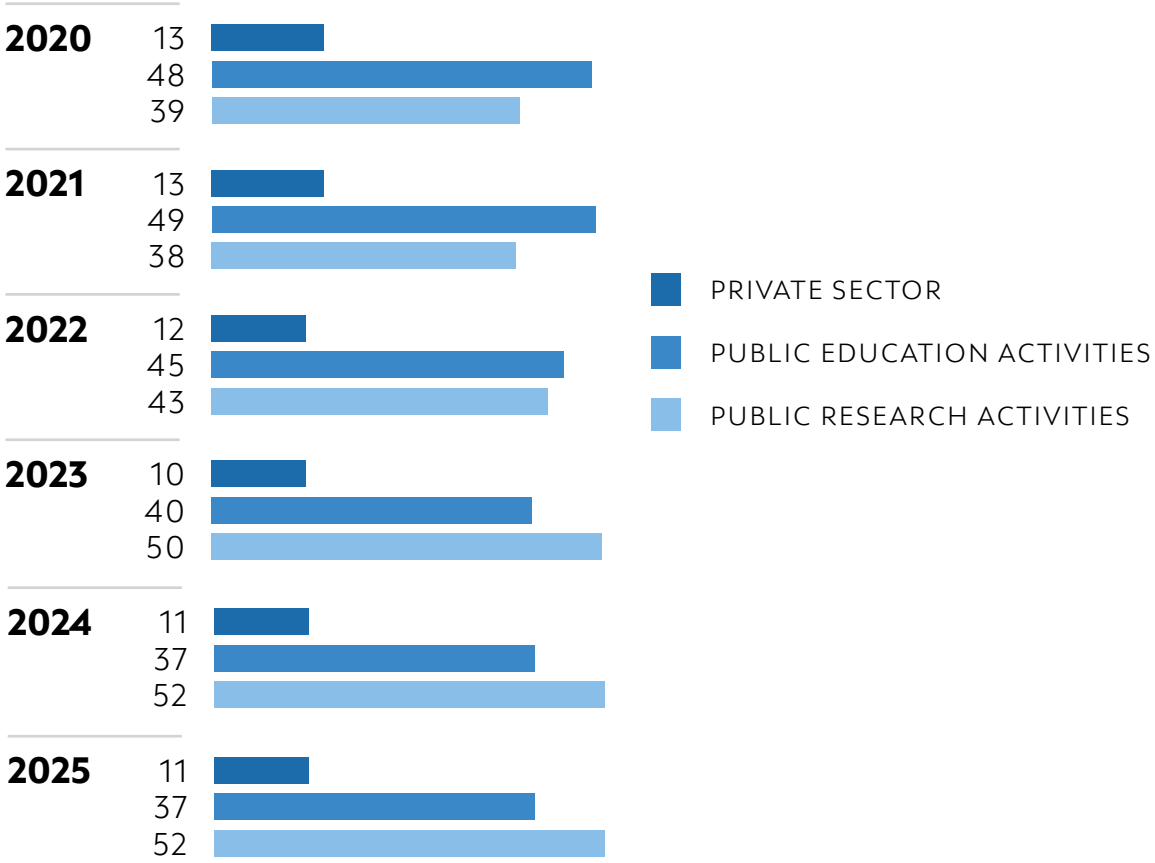


NUMBER OF GRADUATES



Total number of graduates per year

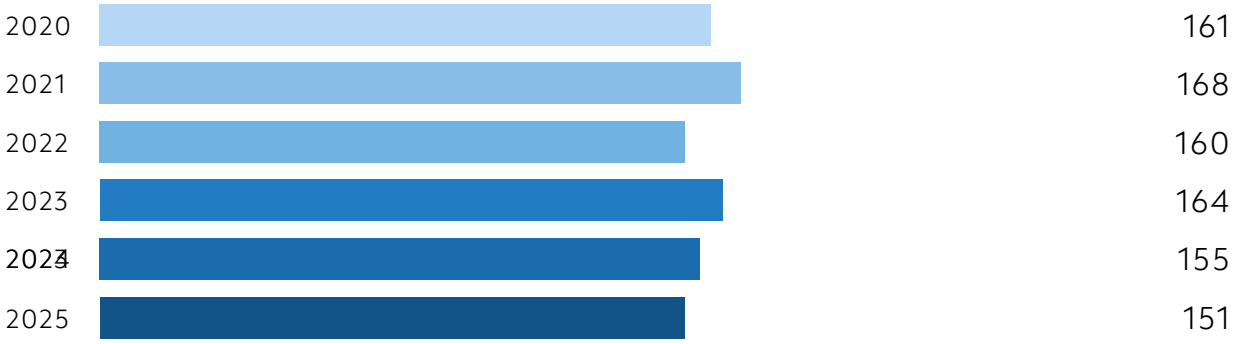
FINANCING STRUCTURE IN %



NUMBER OF INTERNATIONAL RESEARCH PROJECTS

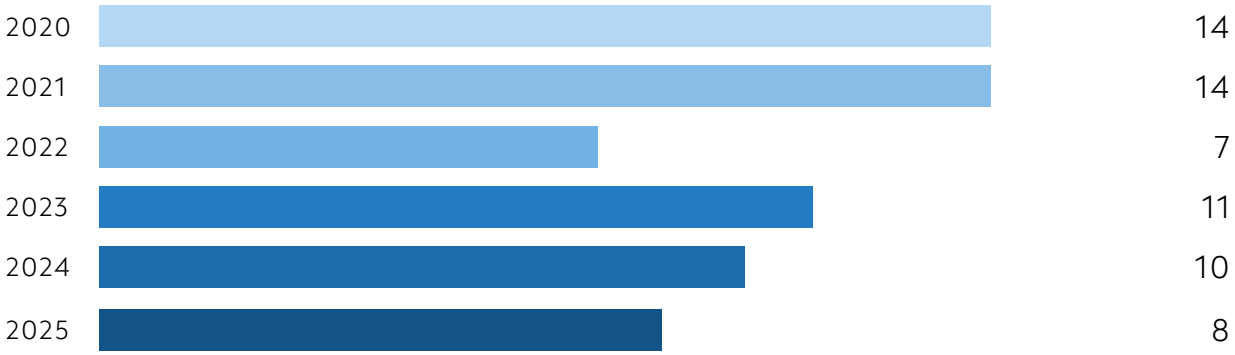
Programme	2021	2022	2023	2024	2025
Obzorje Evropa	1	7	26	44	49
Horizon 2020	12	13	6	5	2
ERDF - European regional development fund	2	0	1	1	3
ERA-NET M-era.Net	0	2	2	3	1
Life+	1	1	1	1	1
Erasmus +	9	13	15	15	15
European Defence Fund (EDF)	0	2	2	3	3
European defence agency (EDA)	1	2	3	3	2
European space agency (ESA)	0	1	4	5	7
Eureka	1	1	0	0	0
EIT – European Institute od Innovation & Technology	3	2	3	2	2
COST	7	6	5	5	4
Other	9	16	13	13	13
ARRS – international projects	3	4	3	11	10
Total	**49**	**70**	**84**	**111**	**112**

NUMBER OF MARKET-ORIENTED PROJECTS WITH THE INDUSTRY



NUMBER OF ORIGINAL SCIENTIFIC ARTICLES

NUMBER OF PATENTS



PUBLISHING AND JOURNALS

PUBLISHING

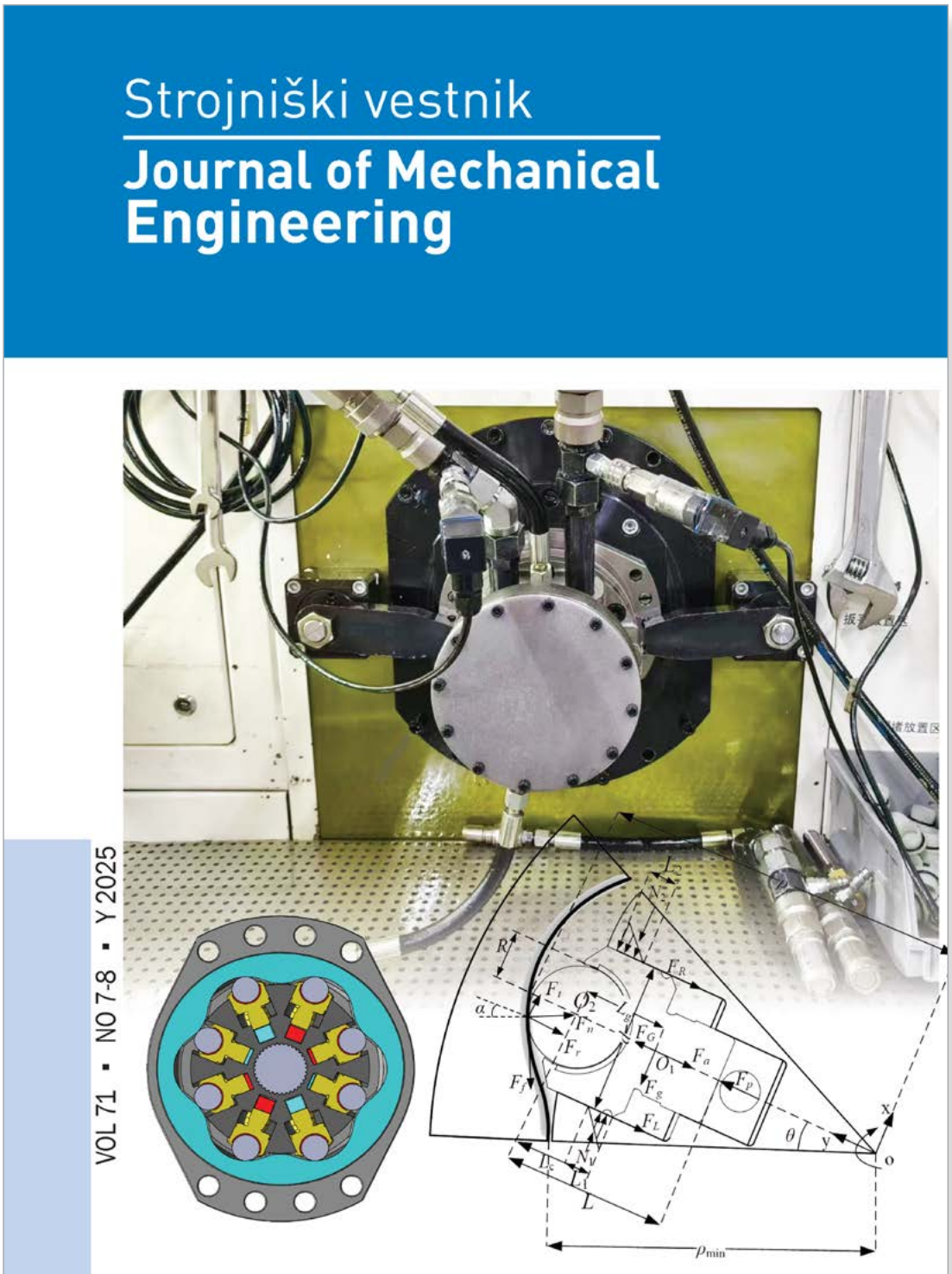
The publishing department of the Faculty of Mechanical Engineering is publishing study materials and other non-periodicals. The department is following the rules, set out by the Senate of the faculty, which define the main framework of its activities. The publishing department publishes 25 publications per year with an international standard book number (ISBN) and CIP, the acronym for the cataloguing in publication. The publishing department began using the ISBN system in 1986; since then it published almost 340 works with the ISBN number. These are course books, proceedings of domestic and international conferences, organised by chairs and laboratories of the faculty, printed editions of doctoral works, and scientific monographs. In the recent years the publications are also available in electronic form on CDs and USB sticks; free course books are available at the faculty website and the Repository of the University of Ljubljana.

With the introduction of digital printing technology the process for printing publications is significantly shorter and also much cheaper. Digital printing technology provides quality and relatively low cost printing also for limited editions. Due to this new technology the policy of the publishing department is to sell the entire edition of a textbook in three years; after this it gets reprinted with any possible revisions and updates. The editions for the first year programmes have up to 400 copies; and up to 150 copies for higher year programmes and the second cycle. The publishing department tries to offer the textbooks at an affordable price for students; around €10 for the first year textbooks, and around €15 for higher years. In order for the textbooks to be available at the student friendly prices, the authors usually charge no fees for the first editions. Only after a reprint, when there is no cost of reviews, proofreading, and design, the authors get some compensation.

JOURNALS

Strojniški vestnik – Journal of Mechanical Engineering

The Strojniški vestnik – Journal of Mechanical Engineering publishes theoretical and practice oriented papers, dealing with problems of modern technology (power and process engineering, structural and machine design, production engineering mechanism and materials, etc.) It considers activities such as: design, construction, operation, environmental protection, etc. in the field of



mechanical engineering and other related branches. The journal is published in Open Access. The international conferences selected papers are welcome for publishing as a special issue of SV-JME with invited co-editor(s). The Journal is indexed in the WoS Thomson and Scopus databases where is positioned in the fourth and second quarter, respectively. The growth of the Journal is evident in the constant increase in the number of citations in WoS.

The SV-JME has been published since 1955; the publishers are the Faculty of Mechanical Engineering of the University of Ljubljana, the Faculty of Mechanical Engineering of the University of Maribor, the Association of Mechanical Engineers of Slovenia, and the Chamber of Commerce and Industry of Slovenia.

The Journal is freely available at https://www.sv-jme.eu/issues/volume-71-2025

Ventil

The scientific and professional journal Ventil publishes articles, dealing with the development and research work at universities, institutes and companies from the field of fluid technics, automatisation and mechatronics. Its aim is to familiarise with the achievements of Slovene companies, their products, and events, which are connected with the development and production in the relevant fields. It creates new connections between the Slovene industry and the research and development sphere, and among the Slovene and world production, developmental and expert community. It also encourages popularity of fluid technics, automatisation, and mechatronics, especially among the young people, while it also cultivates the scientific terminology in these fields.

The publishers are the University of Ljubljana, the Faculty of Mechanical Engineering with co-founders GZS-ZKI (Chamber of Commerce and Industry of Slovenia, Association of the Metal Industry) and SDFT (Slovene Fluid Technics Association). It has 6 issues per volume in single issues at 800 copies each. The technical quality conforms to the international standards, valid in Slovenia. It is also included in the COBBIS, INSPEC, DOAJ and university and library databases (RWTH Aachen – IFAS, TU – Wien, University in Hannover and The British Library). Under its present title Ventil the journal has been published since 1995.

The magazine is freely available at https://revija-ventil.si


REVIJA ZA FLUIDNO TEHNIKO, AVTOMATIZACIJO IN MEHATRONIKO
VENTIL
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Letnik 31 / 2025 / 6 / December
Hidravlične komponente
Mehatronski prototipi za inženirsko izobraževanje
Uvajanje simulacij v zgodnji fazi razvoja
Digitalizacija v gozdarski tehnologiji
EMERSON Process Management
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OPL
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SEAL & TRADE d.o.o.
ppt commerce
OMEGA AIR more than air

STUDY PROGRAMMES

The Faculty of Mechanical Engineering of the University of Ljubljana offers study programmes for all three levels since 1960, which testifies to the strong foundations of its study programmes in Slovenia. Through the years the programmes were adapted to various requirements, changed in accordance with legislation and regulations, and were thoroughly renewed in accordance with the Bologna Declaration.

Today, the Faculty of Mechanical Engineering offers the following study programmes:

1ST CYCLE

Professional Study Programme in Mechanical Engineering – Project Oriented Applied Programme lasts 3 years and is practice oriented; in the 2nd year it is separated into 9 basic study directions. The graduates acquire the degree of Bachelor of Applied Science in Mechanical Engineering (graduate's professional degree).

1st year	2nd year – directions
Common curriculum	**Energy engineering**
	Process engineering
	Design of machines and devices
	Design of industrial systems
	Production technologies
	Production engineering
	Airline transport pilot
	Aircraft design and maintenance
	Mechatronics

Academic Study Programme in Mechanical Engineering – Research and Development Programme lasts 3 years and has no directions. Students acquire theoretical knowledge for continuation of the studies in the 2nd Cycle. Graduates acquire the degree of Bachelor of Science.

2ND CYCLE

Master's Study Programme in Mechanical Engineering – Research and Development Programme lasts 2 years and is divided into 6 basic directions. Graduates acquire the degree of Master of Science.

Basic directions
Engineering design
Mechanics
Energy engineering
Process engineering
Production engineering
Mechatronics and laser technology

TRIBOS – Joint Master's Programme in Tribology of Surfaces and Interfaces lasts 2 years and is carried out by four partner European universities. Graduates acquire the degree of Master of Tribology of Surfaces and Interfaces.

3RD CYCLE

Doctoral Study Programme in Mechanical Engineering lasts 4 years and is divided into three basic fields of study. Graduates acquire the degree of Doctor of Philosophy.

Fields
Energetical, Process and Environmental Engineering Sciences
Constructional and Mechanical Engineering Sciences
Production Engineering Sciences, Cybernetics and Mechatronics

Interdisciplinary Doctoral Programme in Environmental Protection (coordinated at the level of the University of Ljubljana) lasts 4 years and combines the scientific fields of 13 faculties. Graduates acquire the degree of Doctor of Philosophy.

Interdisciplinary Doctoral Study Programme Biosciences lasts 4 years and is carried out by five members of the University of Ljubljana. Graduates acquire the degree of Doctor of Philosophy.

RESEARCH

The Faculty of Mechanical Engineering of the University of Ljubljana is carrying out its social agenda in the scientific research and applicative developmental fields in order to provide high level of excellence, and to transfer new research findings into the industrial environment.

Research and development activities at the Faculty of Mechanical Engineering include:

- Power and process engineering,
- Design,
- Engine mechanics and maintenance,
- Production engineering,
- Mechatronics,
- Micromechanical systems,
- Automatisation.

The research activities are carried out within the laboratories. The faculty is closely linked with institutes, domestic and foreign companies, and with other organisations from the field of medicine, electrical engineering, chemistry, informational technology and civil engineering. It is venturing outside the boundaries of classic research engineering, since it is reaching into new research fields, which bring higher added value to the society.

Research work is the basis for modern and quality teaching

Our researchers strongly believe that research work is the basis for progressive and quality teaching, therefore taking part in national basic and applicative projects and international projects is a regular practice at the faculty.

Development of young and promising researchers

The faculty pays special attention to the education and development of young and promising students, who are deciding on the career in research through the programme of the Slovenian Research Agency.

The Infrastructure centre for modern engineering

Within the Network of infrastructure centres of the University of Ljubljana (MRIC UL) the faculty has the Infrastructure centre for modern engineering, which offers quality operations, infrastructural support, know-how and cooperation between research groups within research institutions, the Slovene industry and the wider international arena. The Centre uses high-end equipment, which requires highly qualified and specialised staff for its operation and maintenance.

Highly trained staff, wide networks of researchers and interdisciplinary approach make the Faculty of Mechanical Engineering the largest scientific research institution in mechanical engineering in Slovenia.

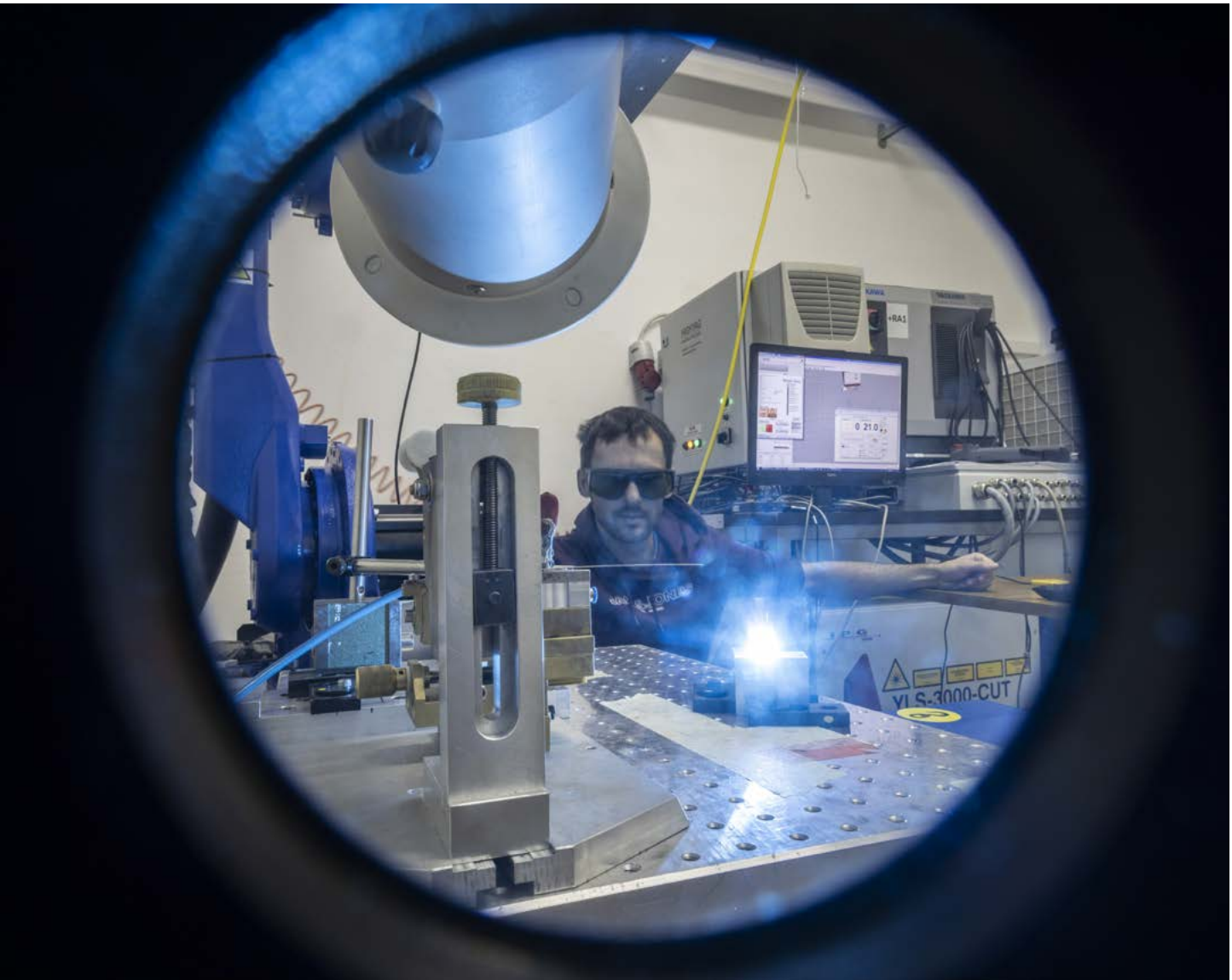
Program groups

Within the Slovene Research Agency there are programme groups, which represent research fields established for a longer time period, and are important for Slovenia. The researchers from the Faculty of Mechanical Engineering are involved in the following 14 programme groups:

1. Modelling in technics and medicine
2. Multiphase systems
3. Energy engineering
4. Development evaluation
5. Heat and mass transfer
6. Tribology
7. Synergetics of complex systems and processes
8. Innovative production systems and processes
9. Fuctionaliesed fluids for advanced enery systems
10. Mechanics in Engineering
11. Sustainable Polymer Materials and Technologies
12. Advanced production technologies for high quality and sistainable production
13. Production systems, laser technologies and materials welding - PLAS
14. Optodynamics
15. Fusion technologies
16. Decentralized solutions fort he digitalization of industry and smart cities and communities

PRESENTATION OF PROGRAMME GROUPS AND ACTIVITIES OF LABORATORIES

Photo: Željko Stevanić, IFP d.o.o.



01 MODELLING IN TECHNICS AND MEDICINE

The Modelling in Engineering Sciences and Medicine programme group is based on an interdisciplinary approach and consists of researchers from the Faculty of Mechanical Engineering and the Faculty of Medicine (both University of Ljubljana).

The group's main research activity is modelling of systems related to traffic which involve modelling of mechanical and anatomical structures for investigating systems response to different kinds of excitation. Integrated into commercial software packages and expandable, these developed material and mechanical models are used for predicting the initiation and growth behaviour of damage to metallic and non-metallic materials at diverse monotonic and dynamic loads.

This enables modelling of various types of mechanical and biomechanical systems (human body, vehicles, traffic devices). The group also investigates and updates data and their relationships in traffic databases and develops geoinformation systems designed to determine exposure to traffic accident risk on specific sections of the road network.

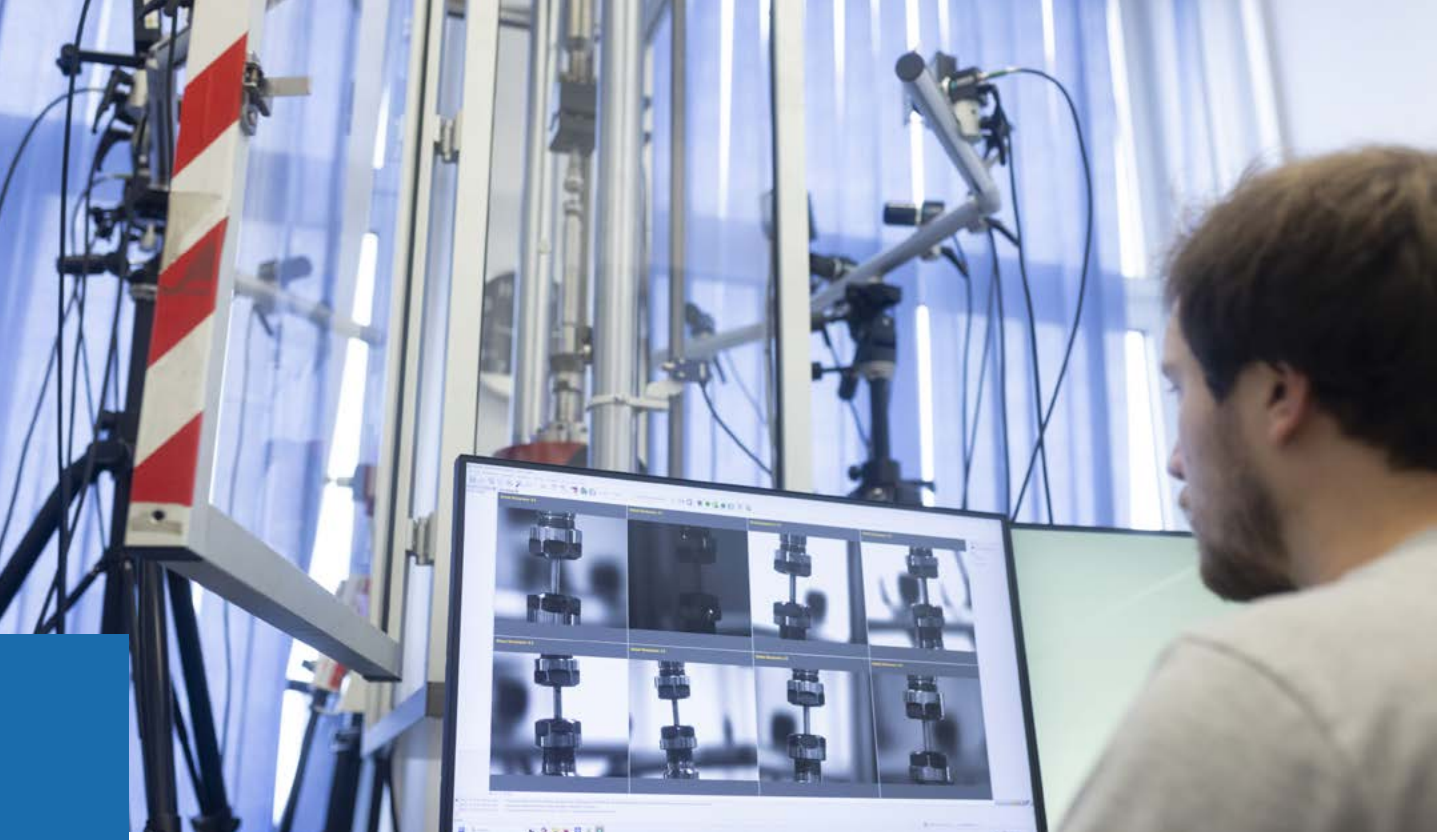


Photo: Željko Stevanić, IFP d.o.o.

Laboratory for Modelling Machine Elements and Structures LAMEK

RESEARCH AREAS

Technical Product Documentation (TPD) • Geometric Product Specifications (GPS) • Geometric dimensioning and tolerancing (GDT) • Mechanics of structures and machines • Structures, machine elements and materials modelling • Composite and SMA structures • Development and design of machines and production systems • Blast and ballistic response of structures • Vehicle engineering and transportation research • Traffic safety and accident analysis • Biomechanics

DEPARTMENT HEAD Assoc. Prof. dr. Robert Kunc

DEPARTMENT MEMBERS Assist. Prof. dr. Simon Krašna, Assist. Prof. dr. Jovan Trajkovski, Assist. Prof. dr. Samo Zupan, Res. Assoc. dr. Andrej Žerovnik, Matej Kranjec, Aleksander Novak, Slobodanka Ivanjić Kostrešević, Jernej Korinšek, Jr. Res. Luka Roblek, Jr. Res. Narendra Singh, Tch. Asst. Urban Žnidaršič, Jr. Res. David Kolšek, Renata Piščanec

ORIGINAL SCIENTIFIC ARTICLES

BRUSKI, Dawid, PACHOCKI, Lukasz, TRAJKOVSKI, Jovan, FANG, Howie, WILDE, Krzysztof. Cervical spine injuries during car collisions with three types of roadside barriers. Advances in engineering software. [Online ed.]. May 2025, vol. 203, [article no.] 103887, str. 1-14, ilustr. ISSN 1873-5339.

SINGH, Narendra, TRAJKOVSKI, Jovan, RODRIGUEZ MATAS, Jose Felix, KUNC, Robert. Effect of age on the biomechanical properties of porcine LCL. Bioengineering. 2025, vol. 12, no. 1, [art.] 5, 13 str., ilustr. ISSN 2306-5354.

SINGH, Narendra, TRAJKOVSKI, Ana, TRAJKOVSKI, Jovan, KUNC, Robert, RODRIGUEZ MATAS, Jose Felix. A pilot study on the age-dependent, biomechanical properties of longitudinal ligaments in the human cervical spine. Bioengineering. 2025, vol. 12, no. 1, [art. no.] 61, 13 str., ilustr. ISSN 2306- 5354.

Photo: Željko Stevanić, IFP d.o.o.

ŽNIDARŠIČ, Urban, ŽEROVNIK, Andrej, TOMAŽEVIČ, Matevž, KUNC, Robert. The Stress–strain state in the pelvis during sit-to-stand transfer. Bioengineering. 2025, vol. 12, issue 12, [article no.] 1328, 17 str., ilustr. ISSN 2306-5354.

TRAJKOVSKI, Jovan, AMBROŽ, Miha, KUNC, Robert. From paper to product : comparing the effectiveness of three working methods on learning outcomes and social interaction in a technical drawing course. Education sciences. 2025, vol. 15, no. 9 , [article no.] 1121, str. 1-24, ilustr. ISSN 2227-7102.

ROBLEK, Luka, KUNC, Robert, ŽEROVNIK, Andrej, KORELC, Jože, BRAMBILLA, Alma, PETRINI, Lorenza. A novel asymmetric function to improve tension- compression asymmetry and torsion response and its implementation to Auricchio- Petrini model for shape memory alloys. European journal of mechanics - A/Solids. 2025, vol. 112, [art. no.] 105650, str. 1-21, ilustr. ISSN 0997-7538.

DJORDJEVIĆ, Srdjan, MASTNAK, Elijan, ŽUMER, Jan, KRAŠNA, Simon, ĆIRIĆ, Maja, DOPSAJ, Milivoj. Total potentiation level: a new metric for quantifying post- activation potentiation dynamics using tensiomyography and statistical parametric mapping. Frontiers in bioengineering and biotechnology. 2025, vol. 13, [article no.] 1533749, str. 1-13, ilustr. ISSN 2296-4185.

KOPYLOV, Semen, AMBROŽ, Miha, PETAN, Žiga, KUNC, Robert, ZHENG, Sifa, HOU, Zhichao. Vehicle pitch dynamics control using in-wheel motors. Proceedings of the Institution of Mechanical Engineers. Part D, Journal of automobile engineering. 2025, vol. 239, iss. 5, str. 1-14, ilustr. ISSN 0954-4070.

PLEŠNIK, Boštjan, DJOKIĆ, Mihajlo, DJORDJEVIĆ, Srdjan, KRAŠNA, Simon, ŽUMER, Jan, TROTOVŠEK, Blaž. Non-invasive and continuous intra-abdominal pressure assessment using MC sensors. Scientific reports. 2025, vol. 15, [article no.] 10775, 9 str., ilustr. ISSN 2045-2322.

PROJECTS

SMM d.o.o. Research work. Robert Kunc. Ongoing since 1.1.2016

World Road Association – PIARC. Motorcycle Protection Systems & Safety aspects of management of traffic for motorcycles. Robert Kunc. 17.3.2025 - 30.10.2025

European Space Agency ESA. SPACECOOL. Study of Opportunities for Elastocaloric Cooling and Heating Technology in Space Applications. Andrej Žerovnik. 1.10.2025 - 1.10.20264

EQUIPMENT

Multicamera Digital Image Correlation System for Spatial Measurement of Displacements and Deformations of Complex-Shaped Samples. Aris paket23.

02 MULTIPHASE SYSTEMS

The program group Multiphase systems (2022-2027) is focused on the following highly interconnected research and development activities, encompassing the whole spectra of technology readiness levels:

1. Computational and experimental investigation of an extended-spectrum of coupled multiphase, multiscale and multiphysics problems with solids, fluids, and gasses. Key accents on multiphase flows, melting and solidification.

2. Investigation of the influence of external fields (rotation, shaking, magnetohydrodynamics, ultrasonics) on multiphase systems.

3. Development of a new generation of highly efficient and self-adaptive meshless methods for problems of classical field theories.

4. Horizontal integrated materials modelling for through process simulations; development of artificial intelligence and physical models of manufacturing and materials processing chains; in particular for casting, rolling, extrusion and heat treatment.

5. Vertical integrated materials modelling for multiscale simulations; relations between process parameters - macrostructure - microstructure - properties.

6. Vital connection of the developments with the high-end Slovenian and global industry concerning digitalization, quality, productivity, safety and environmental impact.

7. Design of novel microfluidic sample delivery systems for femtosecond crystallography used in large international research centres with free-electron lasers and synchrotrons.

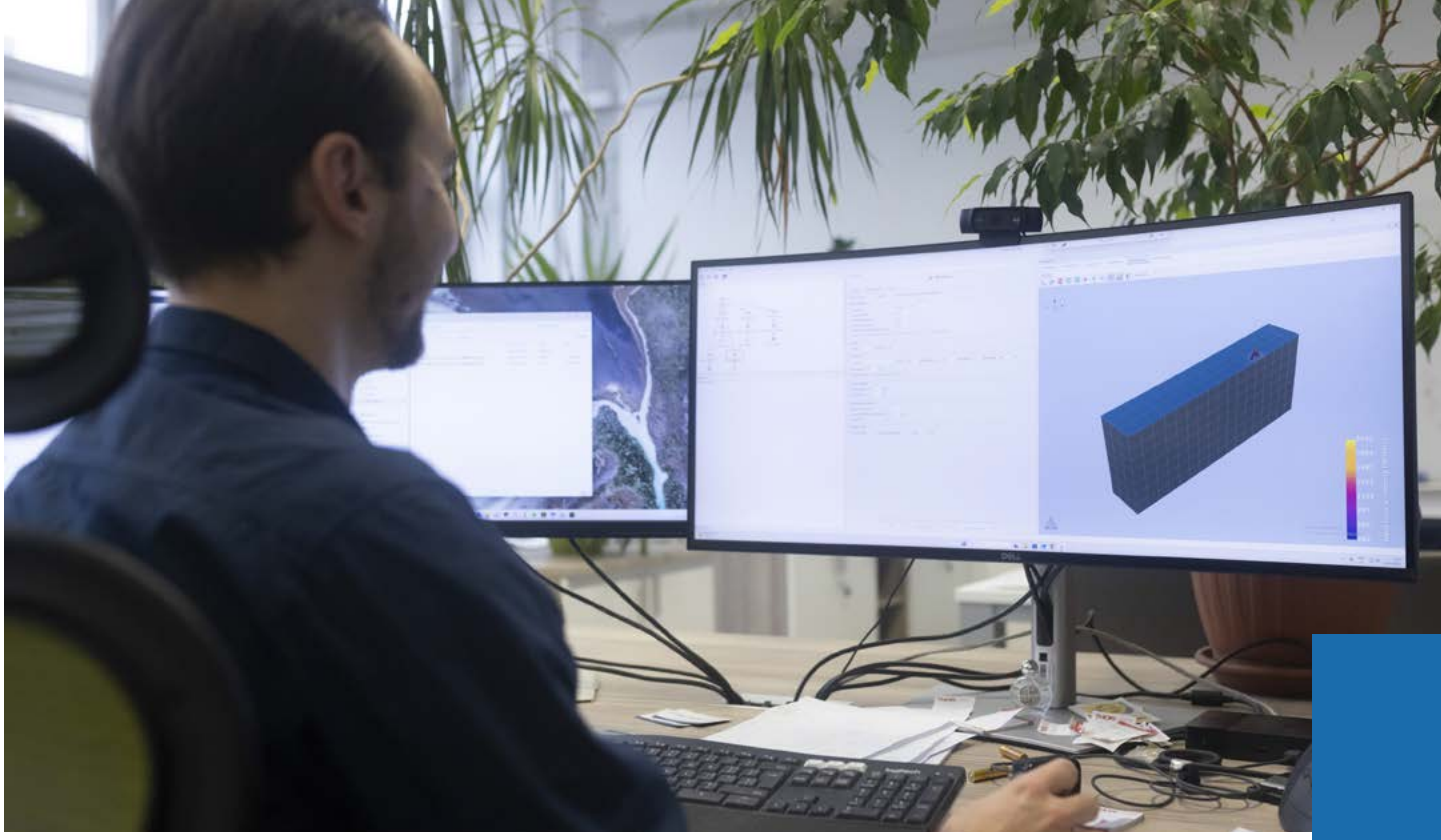


Photo: Željko Stevanić, IFP d.o.o

Laboratory for Fluid Dynamics and Thermodynamics LFDT

RESEARCH AREAS

Two-phase flow • Microfluidics • Solidification • Meshless methods • Multiscale and multiphysics modelling • Modelling of materials and processes • Intelligent systems

DEPARTMENT HEAD Prof. dr. Božidar Šarler

DEPARTMENT MEMBERS Asst. Prof. dr. Boštjan Mavrič, Asst. Prof. dr. Rizwan Zahoor, Tch. Asst. dr. Umut Hanoglu, Res. Assoc. dr. Katarina Mramor, Res. Assoc. dr. Miha Kovačič, Res. Assoc. dr. Robert Vertnik, Res. Assoc. dr. Qingguo Liu, Matic Cotič, dr. Rana Khush Bakhat, Tch. Asst. dr. Gašper Vuga, Tch. Asst. Ajda Kunavar, Tch. Asst. dr. Tadej Dobravec, Jr. Res. dr. Anton Bergant, Jr. Res. dr. Izaz Ali, Tch. Asst. Krištof Kovačič, Tch. Asst. Bor Zupan, Tch. Asst. Jure Dolinar, Tch. Asst. Gašper Vidic, Tch. Asst. Viktor Govže, Zdenka Rupič

ORIGINAL SCIENTIFIC ARTICLES

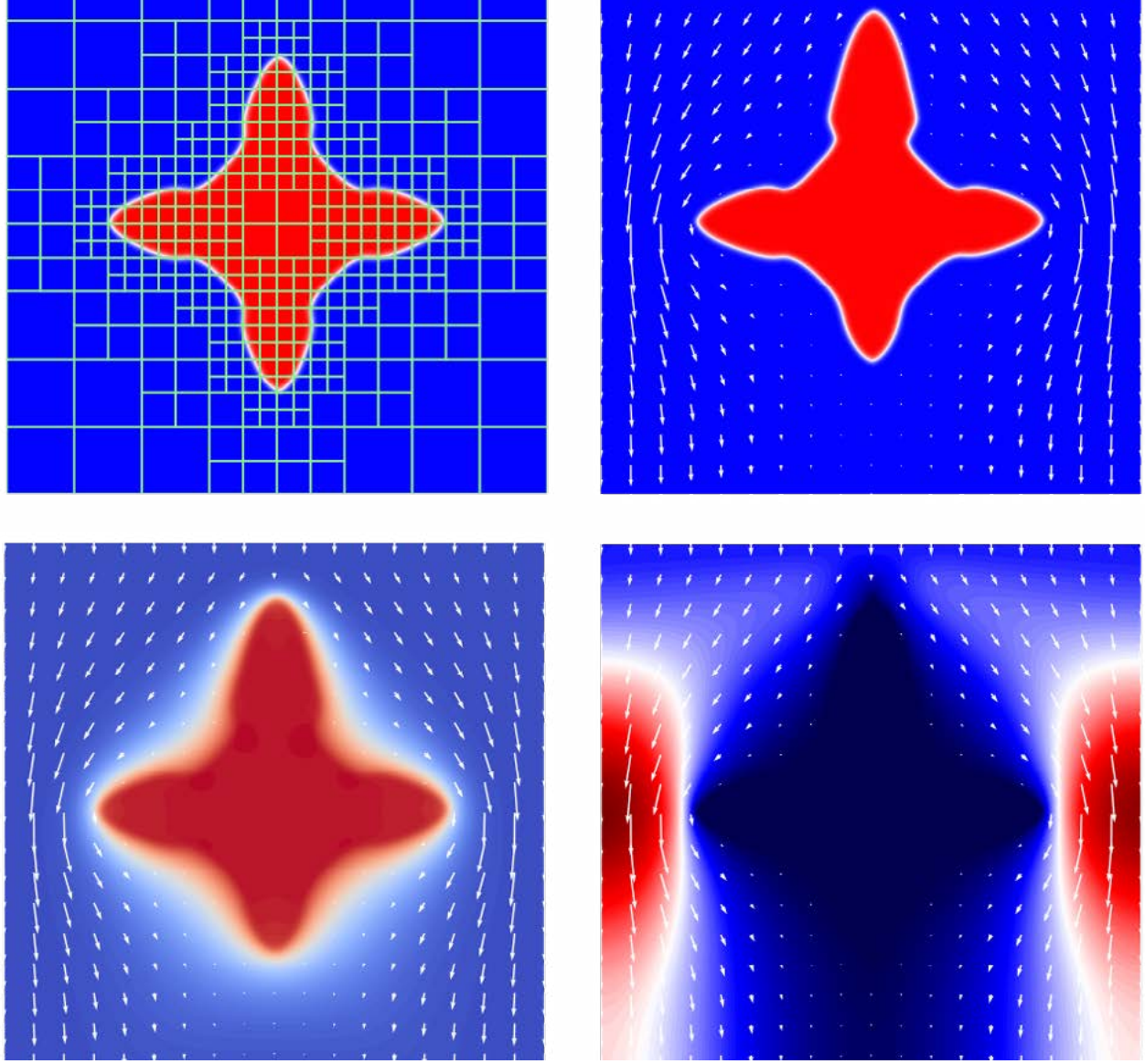
ZUPAN, Bor, PERPAR, Matjaž, GREGORC, Jurij, ŠARLER, Božidar. A simple multiple flow regime modeling approach of induced flow in external loop airlift reactors. Applied thermal engineering. August 2025, vol. 272, [article no.] 126410, str. 1-13, ilustr. ISSN 1873-5606.

BERAS, Mitja, BREZOČNIK, Miran, ŽUPERL, Uroš, KOVAČIČ, Miha. Developing an alternative calculation method for the smart readiness indicator based on genetic programming and linear regression. Buildings. [Online ed.]. 2025, vol. 15, iss. 10, [article no.] 1675, str. 1-36, ilustr. ISSN 2075-5309.

BERAS, Mitja, STĘPIEŃ, Krzysztof, KOVAČIČ, Miha, ŽUPERL, Uroš. Achieving maximum smart readiness indicator scores: a financial analysis with an in-depth feasibility study in non-ideal market conditions. Buildings. [Online ed.]. May 2025, vol. 15, iss. 11, [article no.] 1839, 41 str. ISSN 2075-5309.

CHEN, Ching-Shyang, KARAGEORGHIS, A., LIU, Qingguo. Hybrid meshless method for solving inhomogeneous polyharmonic equations. Computers & mathematics with applications. [Print ed.]. Oct. 2025, vol. 196, str. 218-232, ilustr. ISSN 0898-1221.

XU, Wenzhi, FU, Zhuojia, XI, Qiang, LIU, Qingguo, ŠARLER, Božidar. A novel spatial-temporal collocation solver for long-time transient diffusion with time-varying source terms. Engineering



Phase field without fluid circulation (top-left), phase field with circulation (top-right), temperature field (bottom-left) and absolute velocity value (bottom-right).

analysis with boundary elements. 2025, vol. 171, [art. no.] 106060, str. 1-10, ilustr. ISSN 0955-7997.

DOBRAVEC, Tadej, MAVRIČ, Boštjan, ŠARLER, Božidar. A study on different implementations of Neumann boundary conditions in the meshless RBF-FD method for the phase-field modelling of dendrite growth. Engineering analysis with boundary elements. April 2025, vol. 173, [article no.] 106154, 9 str., ilustr. ISSN 1873-197X.

MRAMOR, Katarina, ZAHOOR, Rizwan, VERTNIK, Robert, ŠARLER, Božidar. Meshless large-eddy solution of turbulent flow. Engineering analysis with boundary elements. 2025, vol. 179, part. a, [article no.] 106431, 13 str., ilustr. ISSN 1873- 197X.

ALI, Izaz, VUGA, Gašper, MAVRIČ, Boštjan, ŠARLER, Božidar. Meshless solution of the crack propagation in brittle elastic material under shear, compressible and tensile loading. Engineering fracture mechanics. 2025, vol. 323, [article no.] 111207, 26 str., ilustr. ISSN 1873-7315.

ZAHOOR, Rizwan, BAJT, Saša, ŠARLER, Božidar. A numerical study of double flow focusing micro-jets. International journal of numerical methods for heat & fluid flow. 2025, vol. 35, iss. 6, str. 1983-2003, ilustr. ISSN 0961-5539.

BERGANT, Anton, PEKOL], Jošt. Approximate, numerical and experimental investigations of a water hammer in Vrhovo bulb-turbine hydroelectric power plant. Journal of energy technology. [Tiskana izd.]. dec. 2025, vol. 18, issue 4, str. [189]-202, graf. prikazi. ISSN 1855-5748.

KOVAČIČ, Miha, ŽUPERL, Uroš, GANTAR, Gašper. Absorbed energy modeling of hypoeutectoid steels using linear regression and genetic programming taking into account continuous casting parameters = Modeliranje absorbirane energije hipoevtektoidnih jekel z uporabo linearne regresije in genetskega programiranja z upoštevanjem parametrov kontinuirnega litja. Materiali in tehnologije. [Tiskana izd.]. nov.-dec. 2025, letn. 59, št. 6, str. 831–838, ilustr. ISSN 1580-2949.

ALI, Izaz, ŠARLER, Božidar, MAVRIČ, Boštjan. Efficient meshless phase-field modeling of crack propagation by using adaptive load increments and variable node densities. Mathematics. 2025, vol. 13, issue 23, [article no.] 3795, 18 str., ilustr. ISSN 2227-7390.

ŠARLER, Božidar, MAVRIČ, Boštjan, DOBRAVEC, Tadej, VERTNIK, Robert. A meshless multiscale and multiphysics slice model for continuous casting of steel. Metals. 2025, vol. 15, no. 9, 16 str., ilustr. ISSN 2075-4701.

ZUPAN, Bor, ZAHOOR, Rizwan, BAJT, Saša, ŠARLER, Božidar. Numerical treatment of electrical properties in two-phase electrohydrodynamic systems. Physics of fluids. Aug. 2025, vol. 37, issue 8, [article no.] 083353, str. 1-19, ilustr. ISSN 1070-6631.

BERGANT, Anton, REK, Zlatko, URBANOWICZ, Kamil. Analytical, numerical 1D and 3D water hammer investigations in a simple pipeline apparatus. Strojniški vestnik. 2025, vol. 71, no. 5/6, str. 149-156, ilustr. ISSN 0039-2480.

MUNĐAR, Goran, KOVAČIČ, Miha, ŽUPERL, Uroš. A machine vision approach to assessing steel properties through spark imaging. Tehnički glasnik. 2025, vol. 19, no. 1, [article no.] 330646, str. 77-81, ilustr. ISSN 1848-5588.

ALI, Izaz, VUGA, Gašper, MAVRIČ, Boštjan, ŠARLER, Božidar. A fourth-order phase-field model of crack initiation and propagation under thermomechanical loading solved with strong-form meshless method. Theoretical and applied fracture mechanics. 2025, vol. 139, part. b , [article no.] 105078, 16 str., ilustr. ISSN 1872- 7638.

PROJECTS

Slovenian Research and Innovation Agency. Development of innovative meshless methods for multiphysics and multiscale simulation of cutting-edge technologies. Božidar Šarler. 1.10.2022 - 30.9.2025

DESY Hamburg - Innovative methods for imaging with the use of x-ray free electron laser and synchrotron sources - III. Božidar Šarler. 13.4.2022 - 12.4.2026

Štore Steel. Enhancements of the steel processing simulation system. Božidar Šarler. 1.5.2024 – 31.12.2025

Danieli Automation. Optimisation of Boundary Heat Flux Setup for Continuous Machines with Soft Reduction. Božidar Šarler. 15.12.2025 - 30.10.2026

Slovenian Research and Innovation Agency. Next generation meshless methods for advanced steel processing simulations. Boštjan Mavrič. 1.1.2025 - 31.12.2027

Slovenian Research and Innovation Agency. Sustainable Environmental Solutions: Spatial Domain as the Future of Noise Monitoring. Jure Murovec. 1.1.2025 – 31.12.2026

DOCTORAL DISSERTATIONS

ALI, Izaz. Meshless numerical solution of phase-field model of crack initiation and propagation in thermo-mechanical processing of steel : doctoral thesis. Mentor: Šarler, Božidar.

VUGA, Gašper. Modelling of Thermomechanics of Continuous Casting of Steel by a Meshless Numerical Method : doctoral thesis. Mentor: Šarler, Božidar.

RANA, Khush Bakhat. Development of meshless numerical method for simulation of compressible two-phase flow : doctoral thesis. Mentor: Šarler, Božidar.

EQUIPMENT

Data base for simulation of microsturctures of aluminum alloys and steel. Aris paket23.

AWARDS AND ACHIEVEMENTS

Asst. Res. Dr. Izaz Ali received the Faculty Award for researchers under the age of 35 for outstanding research achievements.

03 ENERGY ENGINEERING

The Energy Engineering research programme is engaged in a wide range of activities:

1. In the field of internal combustion engines we research advanced designs of engine control and scavenging optimisation. We take part in designing future hybrid, electric and conventional powertrain systems.

2. In the field of fuel cells and batteries we have been developing next-generation electrochemical models containing nanomaterials.

3. To achieve high efficiency, durability, economic and environmental sustainability of the use of alternative fuels for, among other things, the research into stationary energy systems, we optimise the performance of systems for cogeneration of heat and electricity.

4. The research work in the field of turbine machines is concerned with the development of high efficiency and low noise systems. We develop cavitation erosion models. We also study the biological effects of cavitation for medical use and for wastewater treatment.

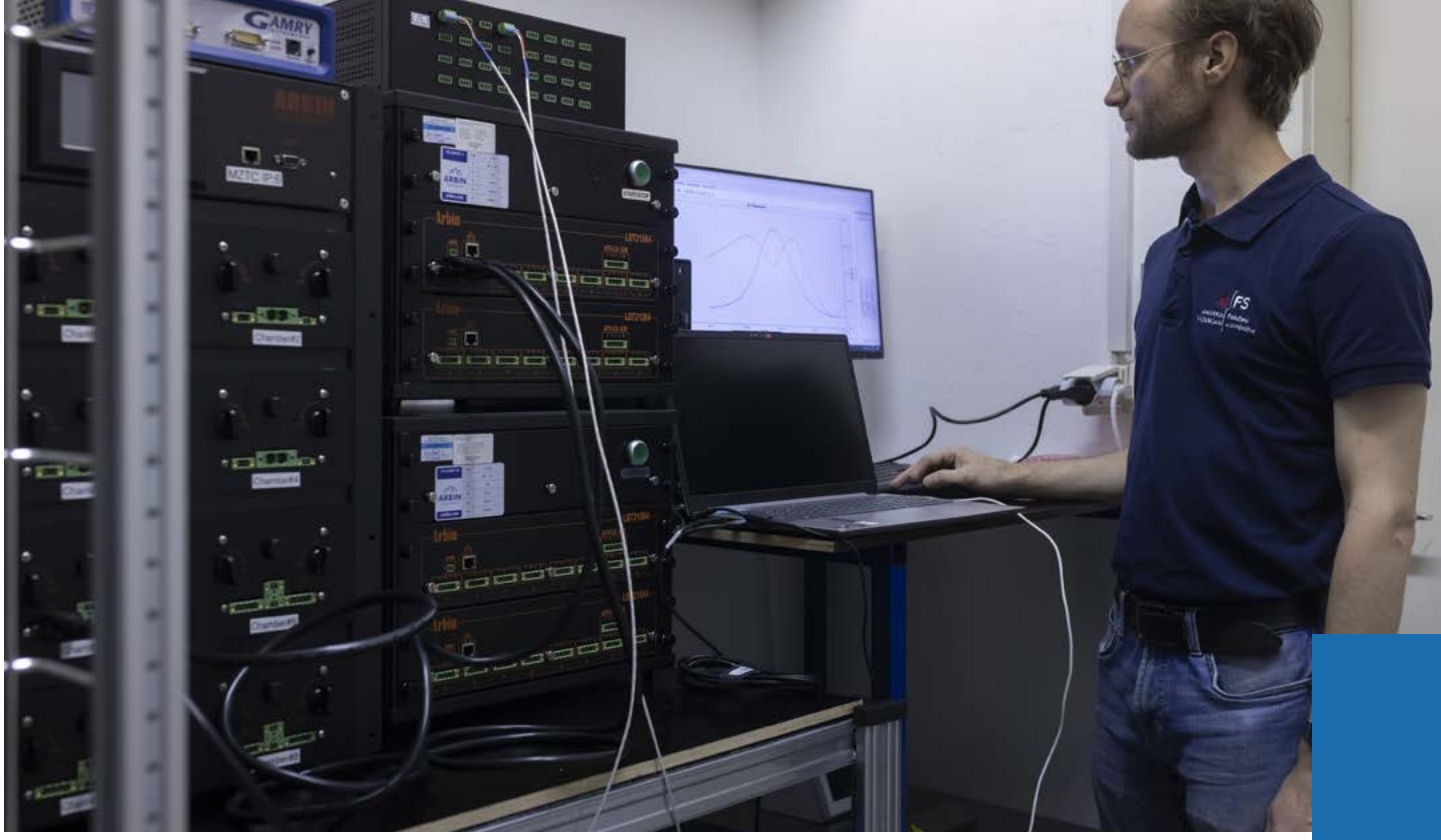


Photo: Željko Stevanić, IFP d.o.o.

Laboratory for Internal Combustion Engines and Electromobility LICeM

RESEARCH AREAS

Internal combustion engines • Alternative fuels • Exhaust emission • Hybrid powertrain systems • Electric vehicles • Fuel cells • Batteries • Numerical modelling of systems and components

DEPARTMENT HEAD Prof. dr. Tomaž Katrašnik

DEPARTMENT MEMBERS Asst. Prof. dr. Ambrož Kregar, Tch. Asst. dr. Samuel Rodman Oprešnik, Jr. Res. dr. Rok Vihar, Asst. Prof. dr. Anton Žnidarčič, dr. Chowdhury Haque Amer Amor, Asst. Prof. dr. Klemen Zelič, Asst. Prof. dr. Urban Žvar Baškovič, Jr. Res. dr. Blaž Tratnik, Dev. Igor Mele, Asst. Prof. dr. Andraž Kravos, Ivo Pačnik, Dev. Davor Rašić, Tch. Asst. Žiga Rosec, Tit Voglar, Tch. Asst. dr. Mitja Drab, Jr. Res. dr. Matej Prijatelj, Jr. Res. dr. Jan Šuntajs, Tch. Asst. dr. Samo Penič, Jr. Res. Jasmina Tabaković, Jr. Res. dr. Sayandeep Dutta, Jr. Res. dr. Seyedeh Shima Nezamipour Masouleh, Ariel Marie Stolz, Jr. Res. Nishan Koirala, Tch. Asst. Valentina Šimić Škraba, Jan Gimpelj, Jr. Res. dr. Marko Keber, Jure Korenjak, Jon Hauptman, dr. Jože Moškon, Nina Reščič, Lana Regent, Iva Klofutar, Jacinta Podbršček, Tanja Perec Escuredo

ORIGINAL SCIENTIFIC ARTICLES

PIŠEK, Jon, KATRAŠNIK, Tomaž, ZELIČ, Klemen. PyBEP : an open-source tool for electrode potential determination from battery ocv measurements. Batteries. 2025, vol. 11, iss. 8, [art. no.] 295, str. 1-15, ilustr. ISSN 2313-0105.

PRIJATEL], Matej, KREGAR, Ambrož, KRAVOS, Andraž, KATRAŠNIK, Tomaž. Modeling core-shell Pt–co catalyst degradation in fuel cells using a continuum approach. ChemElectroChem. 2025, vol. 12, isuue. 19, 9 str., ilustr. ISSN 2196- 0216.

KRAVOS, Andraž, VRLIĆ, Martin, HAMETNER, Christoph, JAKUBEK, Stefan, KATRAŠNIK, Tomaž. Real-time capable nonlinear distributed parameter observer considering two-phase flow in PEM fuel cells. International journal of hydrogen energy. [Online ed.]. 2025, vol. 134, str. 181-197, ilustr. ISSN 1879-3487.

Photo: Željko Stevanić, IFP d.o.o

KATRAŠNIK, Tomaž, KRAVOS, Andraž. Advanced state-of-X diagnostics of proton exchange membrane fuel cells enabled by the multi-scale modeling framework. International journal of hydrogen energy. 2025, vol. 141, str. 1359-1371, ilustr. ISSN 0360-3199.

BRENDEL, Philipp, MELE, Igor, ROSSKOPF, Andreas, KATRAŠNIK, Tomaž, LORENTZ, Vincent. Parametrized physics-informed deep operator networks for design of experiments applied to lithium-ion-battery cells. Journal of energy storage. Aug. 2025, vol. 128, [art. no.] 117055, str. 1-14, ilustr. ISSN 2352-152X.

ZELIČ, Klemen, ESMAEILPOUR, Meysam, JANA, Saibal, MELE, Igor, WENZEL, Wolfgang, KATRAŠNIK, Tomaž. Physicochemically-informed continuum level model of a solid electrolyte interphase growth in Li-ion batteries. Journal of power sources. Jan. 2025, vol. 627, [art.] 235814, str. 1-11, ilustr. ISSN 0378-7753.

ŽNIDARČIČ, Anton, KATRAŠNIK, Tomaž, SEL]AK, Tine. Innovative surrogate combustion model for efficient design of small-scale waste mono-incineration systems. Processes. [Online ed.]. 2025, vol. 13, iss. 10, [article no.] 3170, str. 1-33, ilustr. ISSN 2227-9717.

PROJECTS

Horizon Europe. INDY. Energy Independent and Efficient Deployable Military Camps. Tomaž Katrašnik. 1.12.2022 – 31.1.2025

Horizon Europe. PULSELION. Pulsed Laser igitaliza tEchnology for soLid State battery igitalizatio supported by igitalization. Tomaž Katrašnik. 1.9.2022 - 31.8.2026

Horizon Europe. ADVAGEN. Development of ADVAnced next GENeration Solid- State batteries for Electromobility Applications. Tomaž Katrašnik. 1.8.2022 - 31.7.2026

Austrian Research Promotion Agency (FFG). MoSiLiB. Modeling and development of silicon- tin sulfide composite anodes for generation 3b lithium-ion batteries. Tomaž Katrašnik. 1.6.2022 - 31.5.2025

Horizon Europe. NEXTCELL. Towards the next generation of high performance li-ion battery cells. Tomaž Katrašnik. 1.1.2023 – 31.12.2026

Horizon Europe, MSCA Doctoral Networks. BLESSED. Bridging Models at Different Scales To Design New Generation Fuel Cells for Electrified Mobility. Tomaž Katrašnik. 1.2.2023 – 31.1.2027

Horizon Europe. FASTEST. Fast-track hybrid testing platform for the development of battery systems. Tomaž Katrašnik. 1.6.2023 – 31.5.2026

Horizon Europe. HiHELIOS. demonstrating a High-energy and High-power hybrid battery storage soLutIonS platform for multiple grid services. Tomaž Katrašnik. 1.12.2024 - 31.5.2028

Horizon Europe. InnoBMS. Situationally aware innovative battery management system for next generation vehicles. Tomaž Katrašnik. 1.1.2024 - 30.6.2027

Horizon Europe. NEXTBMS. NEXT-generation physics and data-based Battery Management Systems for optimised battery utilization. Tomaž Katrašnik. 1.6.2023 – 30.11.2026

Horizon Europe. MEAsureD. Advanced MEAs ensuring high efficiency HDV. Tomaž Katrašnik. 1.6.2023 – 31.5.2026

Horizon Europe. NAHV. North Adriatic Hygrogen Valley. Tomaž Katrašnik. 1.9.2023 – 31.8.2029

Horizon Europe. RealHyFC. Reliable durable high power hydrogen fueled PEM Fuel Cell stack. Tomaž Katrašnik. 1.6.2023 – 31.5.2026

European Defence Fund. SENTINEL. Sustainable Energy Capabilities for Enhanced Military Camps and Operations. Tomaž Katrašnik. 1.11.2025 - 31.10.2029

Horizon Europe. RESiLiTE. Robust, Economical, Silicon-rich, Lightweight and Thermally Efficient battery packs. Anton Žnidarčič. 1.7.2025 - 30.6.2028

European Regional Development Fund, Ministry of Higher Education, Science and Innovation. CHRONOSTORE. Chemical Energy Storage Solutions Across Temporal Scales for Climate-Resilient Renewable Energy Systems. Tomaž Katrašnik. 1.7.2025 - 30.6.2028

Horizon Europe. HiVEP. High-Voltage Fast-Charging Efficient Electric Vehicle Powertrains. Tomaž Katrašnik. 1.2.2025 - 31.7.2028

TECES – EDF. CALIPSO. Innovative Propulsion Solutions for land and naval defence application. Urban Žvar Baškovič. 1.1.2025 - 30.11.2026

Horizon Europe. TWIN-LOOP. TwinOps and vehicle specific Digital Twin for Software Defined EVs. Tomaž Katrašnik. 1.1.2025 - 31.12.2027

European Space Agency ESA. Advanced simulation models to boost performance of Regenerative Fuel Cell Systems. Andraž Kravos. 1.1.2025 - 30.9.2025

Horizon Europe. INDY. Energy Independent and Efficient Deployable Military Camps. Tomaž Katrašnik. 1.12.2022 - 31.1.2025

Horizon Europe. SENERGY NETS. Increase the Synergy among different ENERGY NETworkS. Tomaž Katrašnik. 1.9.2022 - 31.8.2026

LIFE. LIFE21-CET-PDA-3DIVERSE Decentralization, Diversity and Dynamic load regulation – novel approaches to tangible energy transition with diversification of production sources. Tine Seljak. Tomaž Katrašnik. 1.10.2022 - 30.9.2025

PEER-REVIEWED HIGHER EDUCATION TEXTBOOKS

TRENC, Ferdinand, KATRAŠNIK, Tomaž. Letalski motorji. 1. popravljena izd. Ljubljana: Fakulteta za strojništvo, 2025. VI, 266 str., ilustr. ISBN 978-961-7187-15- 1.

EQUIPMENT

System for analysing electrochemical cells and development of advanced State-of-X observers. Aris paket23.

AWARDS AND ACHIEVEMENTS

Prof. dr. Tomaž Katrašnik received an award for excellence in teaching.

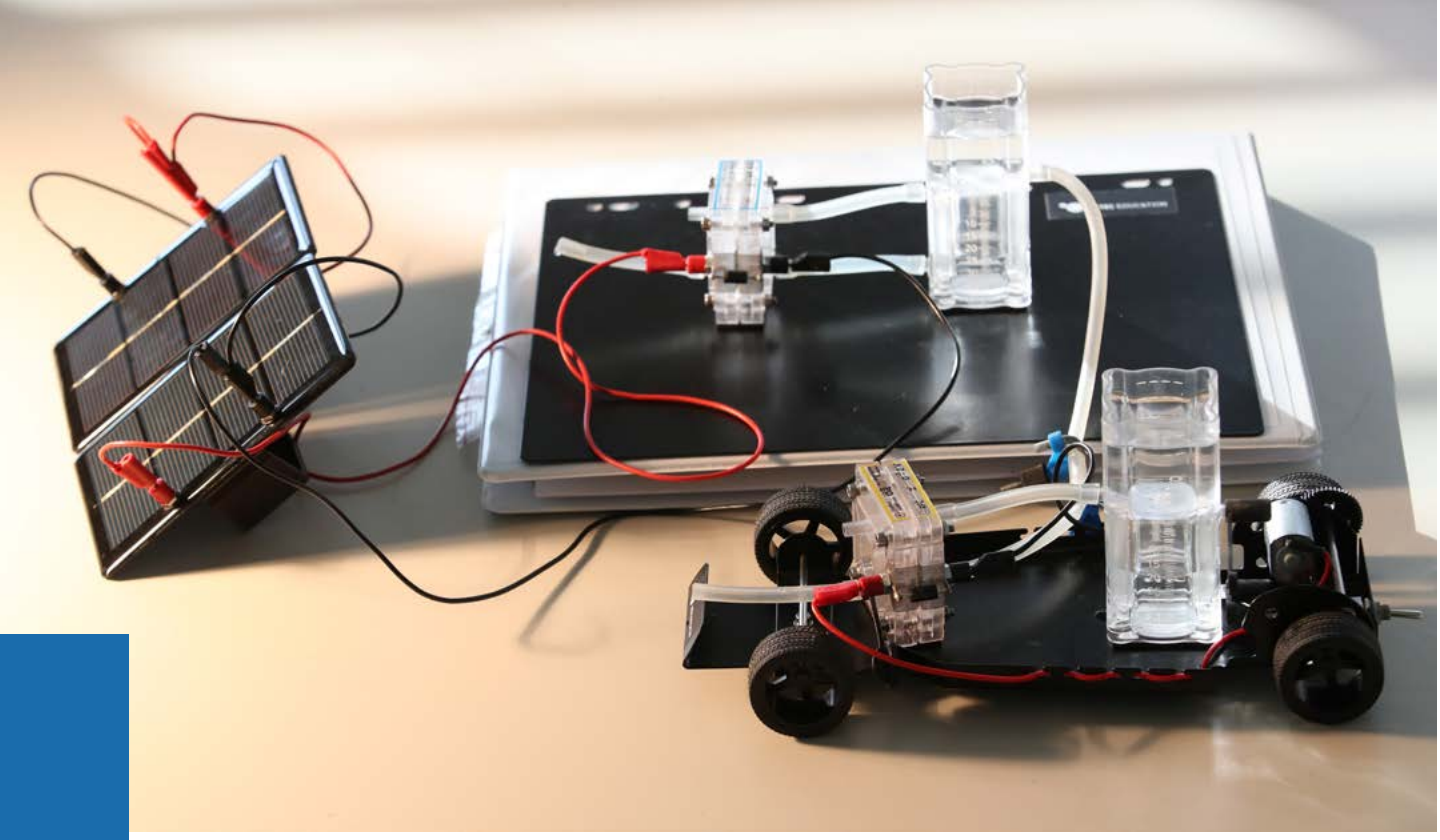


Photo: Željko Stevanić, IFP d.o.o

Laboratory for Heat and Power LTE

RESEARCH AREAS

Energy systems • Heat generators • Combustion • Hydrogen technologies • Smart Grids • Life Cycle Assessment • Environmental impacts of energy conversion

DEPARTMENT HEAD Prof. dr. Mihael Sekavčnik

DEPARTMENT MEMBERS Assoc. Prof. dr. Andrej Senegačnik, Tch. Asst. dr. Boštjan Drobnič, Assoc. Prof. dr. Mitja Mori, Jr. Res. dr. Igor Kuštrin, Tch. Asst. dr. Andrej Lotrič, Tch. Asst. dr. Rok Stropnik, Jr. Res. Jure Gramc, Jr. Res. Emilija Todorovski, Jr. Res. Filip Todorovski, Tch. Asst. Mihael Boštjan Končar, Jr. Res. Domen Hojkar, Gholamreza Masoudi Rad, Yousaf Hasnain Muhammad, Asst. Prof. dr. Tine Seljak, Jr. Res. Vid Zuljan, Jr. Res. Jan Podvratnik, Jr. Res. Dominik Gregorčič, Maj Rudolf Vahtar, Tanja Perec Escuredo

ORIGINAL SCIENTIFIC ARTICLES

TODOROVSKI, Filip, TODOROVSKI, Emilija, SEKAVČNIK, Mihael, MORI, Mitja, LOTRIČ, Andrej. Electrochemical assessment of contact pressure effects on durability of high-temperature proton exchange membrane fuel cells under dynamic operation. Electrochimica Acta. [Print ed.]. Nov. 2025, vol. 540, [article no.] 147254, str. 1-18, ilustr. ISSN 0013-4686.

KONČAR, Mihael Boštjan, HOJKAR, Domen, DROBNIČ, Boštjan, SEKAVČNIK, Mihael, MORI, Mitja (umetnik). Model-based comparison of nuclear and renewable energy based strategies for Slovenia. Energija. [Online ed.]. 2025, vol. 74, no. 1, str. 24-28, ilustr. ISSN 1849-0751.

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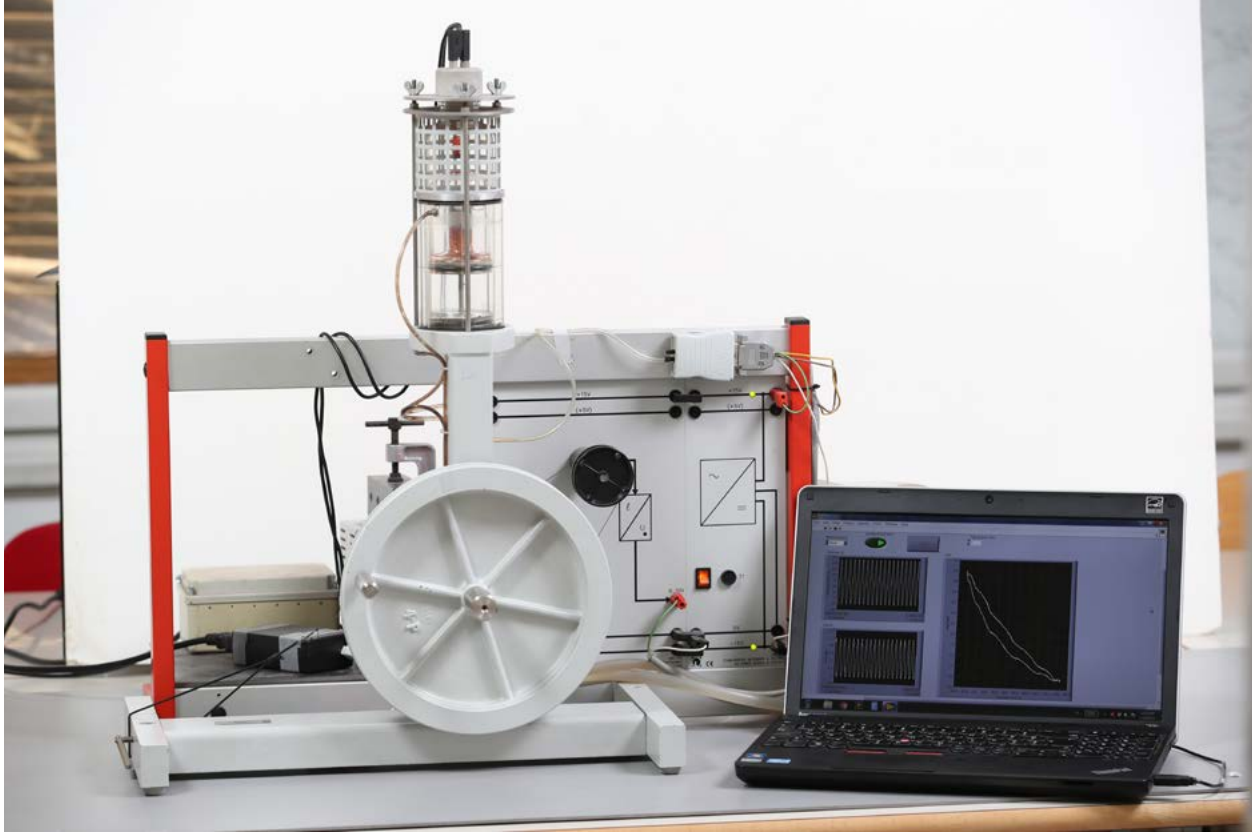

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PROJECTS

Slovenian Research and Innovation Agency. PROMETHEIA - Processes for metal- to-char encapsulation. Mihael Sekavčnik. 1.12.2021 - 30.11.2025

Horizon Europe. SENERGY NETS. Increase the Synergy among different ENERGY NETworkS. Mitja Mori, Tine Seljak. 1.9.2022 - 30.08.2026

Termoelektrarna Šoštanj. Strokovna podpora za preverjanje učinkov dolgoročne vzdrževalne pogodbe za blok 6. Mihael Sekavčnik. 1.4.2022 - 31.3.2025

Termoelektrarna Brestanica. Izvedba termičnih prevzemnih preizkusov plinske turbine PB7 v

Termoelektrarni Brestanica. Mihael Sekavčnik. 6.5.2024 - 5.5.2025

Termoelektrarna Šoštanj. Strokovna podpora pri obratovanju in za preverjanje učinkov dolgoročne vzdrževalne pogodbe ua blok 6. Igor Kuštrin. 5.5.2025 - 4.5.2028

Horizon Europe. HYScale. Economic green hydrogen production at scale via a novel, critical raw material free, highly efficient and low-capex advanced alkaline membrane water electrolysis technology. Mitja Mori. 1.6.2023 - 31.5.2027

Horizon Europe. HYGHER. HYdroGen High pressure supply chain for innovative and cost Efficient distribution. Mitja Mori. 1.1.2024 - 31.12.2026

Horizon Europe. SINGLE. Electrified Single Stage Ammonia Cracking to Compressed Hydrogen. Mitja Mori. 1.5.2023 - 30.4.2026

Horizon Europe. SURE2COAT. Sustainable surface treatments of complex shape components for transsectorial industrial innovation. Mitja Mori. 1.1.2023 – 31.12.2025

Horizon Europe. PilotSOEL. Advanced Processes Enabling Low cost and High Performing Large Scale Solid Oxide Electrolyser Production. Rok Stropnik. 1.6.2023 - 31.5.2026

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Mitja Mori. 1.1.2024 – 30.6.2026

Slovenian Research and Innovation Agency. HyBReED. Development of resilient chemical energy storage with hydrogen and batteries. Mihael Sekavčnik. 1.1.2024 – 30.6.2026

Slovenian Research and Innovation Agency. Improving the applicability of Municipal Solid Waste gasification on an industrial scale by controlling the thermochemical conversion processes. Tine Seljak. 1.3.2025 – 28.2.2029

Horizon Europe. GUESS-Why. GUidelinEs for Safe and Sustainable-by-design systems based on reneWable Hydrogen. Mitja Mori. 1.1.2025 - 31.12.2027

Horizon Europe, MSCA, Doctoral Networks. UPCYCLE. UPscaling deep conversion routes for hard-to-reCYCLE biogenic waste. Tine Seljak. 1.2.2025 - 31.1.2029

Laboratory for Hydraulic Machines LVTS

RESEARCH AREAS

Fluid mechanics • Turbine machines • Computer aided visualisation

DEPARTMENT HEAD Prof. dr. Marko Hočevar

DEPARTMENT MEMBERS Prof. dr. Matevž Dular, Res. Assoc. dr. Benjamin Bizjan, Asst. Prof. dr. Martin Petkovšek, Asst. Prof. dr. Lovrenc Novak, Res. Assoc. dr. Mojca Zupanc, Jr. Res. dr. Jurij Gostiša, Res. Assoc. dr. Jure Zevnik, mag. Tone Godeša, Sr. Dev. Aleš Malneršič, Matej Sečnik, Jr. Res. dr. Žiga Pandur, Tch. Asst. dr. Primož Drešar, Tch. Asst. Jernej Ortar, Tch. Asst. Žan Boček, Žiga Gruden, Asst. Prof. dr. Juan Manuel Rossello, Tch. Asst. Žak Sovec, Jr. Res. Andraž Zupanc, Ercil Toyran, Tch. Asst. Jakob Mali, Tch. Asst. Karin Žibert, Tadej Brodarič, Tanja Perec Escuredo

ORIGINAL SCIENTIFIC ARTICLES

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PROJECTS

Horizon Europe. H-HOPE. Hidden Hydro Oscillating Power for Europe. Marko Hočevar. 1.11.2022 - 31.10.2026

Horizon Europe. PureWater. Combining Cavitation and Plasma to Tackle Drinking Water Pollution. 22.12.2025 - 30.6.2027

Erasmus+. EVERYONE. Exchange of renewable energy harvesting experience in Europe for improving competence of young engineers. Marko Hočevar. 1.9.2023- 28.2.2026

Ministry of Agriculture, Forestry and Food – EIP. MOTIKA. Pospešeno okopavanje zelenjave. Marko Hočevar. 19.5.2022 - 18.5.2025

Slovenian Research and Innovation Agency. Causma. Removal of selected antimicrobials by plasma-cavitation hybrid technology from water matrices of varying complexity. Martin Petkovšek. 1.10.2022 -30.9.2025

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Marko Hočevar. 1.1.2024 – 30.6.2026

Slovenian Research and Innovation Agency. Bubbles interacting with four states of matter. Matevž Dular. 1.9.2024 - 31.8.2027

Slovenian Research and Innovation Agency. Curious. Curious Case of Imploding Cavitation Bubbles: Fast Jets and Where to Find Them? Jure Zevnik. 1. 10. 2023 – 30. 9. 2025

Erasmus+. Acting4Water. Tackling water scarcity by using advanced technologies in business-academia-society cooperation. Martin Petkovšek, Mojca Zupanc. 1.10.2023 – 31.3.2026

Slovenian Research and Innovation Agency. Studies of micro-channel cavitation phenomenon for activation of chemical oxidants – CAV-MICRO. Mojca Zupanc. 1.3.2025 – 29.2.2028

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Slovenian Research and Innovation Agency. Upscaling from individual cavitation bubble to cavitation cloud for increased bacterial inactivation. Žiga Pandur. 1.1.2025 – 31.12.2026

Horizon Europe, MSCA Doctoral Networks. CaviPRO. Modelling, Control and Applications of Hydrodynamic Cavitation Phenomena. Matevž Dular. 1.2.2024 - 31.1.2028

Slovenian Research and Innovation Agency. DigiSad. Development and introduction of digital tools to support fruit production. Marko Hočevar. 1.10.2022 - 30.9.2025

Slovenian Research and Innovation Agency. FFS. Measures to reduce the use of chemical plant protection products in viticulture. Marko Hočevar. 1.10.2022 - 30.9.2025

PATENTS

OMAN, Simon, NAGODE, Marko, KLEMENC, Jernej, MAJDIČ, Franc, HOČEVAR, Marko, GOSAR, Aleš, ŠKRLEC, Andrej, OLAH, Laslo. Submersible pump assembly and method for use of same : European patent specification EP 4 093 970 B1, 2025- 06-11. Munich: European Patent Office, 2025.

OMAN, Simon, NAGODE, Marko, KLEMENC, Jernej, MAJDIČ, Franc, HOČEVAR, Marko, GOSAR, Aleš, ŠKRLEC, Andrej, OLAH, Laslo. Submersible pump assembly and method for use of same : European patent specification EP 4 093 971 B1, 2025- 06-11. Munich: European Patent Office, 2025.

Photo: UL FME Archive

Laboratory for Pumps, Compressors and Technical Acoustics LEDSTA

RESEARCH AREAS

Noise measurement and analysis • Environmental noise • Noise reduction • Identification and parametrisation of sound source • Prediction and modelling of noise propagation • Use of noise as a source of information • Psychoacoustics • Pumps • Ventilators • Compressors • Cavitation

DEPARTMENT HEAD Assoc. Prof. dr. Jurij Prezelj
DEPARTMENT MEMBERS Tch. Asst. dr. Luka Čurović, Asst. Prof. dr. Jure Murovec, Assist. Tch. Asst. dr. Anže Železnik, Assist. Jr. Res. Nejc Cerkovnik, Andrej Hvastja

ORIGINAL SCIENTIFIC ARTICLES

ŽELEZNIK, Anže, ČUROVIĆ, Luka, MUROVEC, Jure, CERKOVNIK, Nejc, PREZEL], Jurij. Estimating viscous losses in recycled granular microparticles : a time-domain wave decomposition impedance tube with boundary condition approximation. Applied acoustics. Jan. 2025, vol. 228, [art. no.] 110372, str. 1-11, ilustr. ISSN 0003-682X.

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PROJECTS

Slovenian Research and Innovation Agency. Acoustic monitoring of urban noise and biodiversity for green future using IoT-Sound-Radar and AI for event classification. Jurij Prezelj. 1.10.2023 – 30.9.2026

Slovenian Research and Innovation Agency, Ministry of Environment, Spatial Planning and Energy. Managing low-frequency noise in promoting the use of renewable energy sources. Jurij Prezelj. 1.10.2024 – 31.7.2027

Slovenian Research and Innovation Agency. Sustainable Environmental Solutions:

Spatial Domain as the Future of Noise Monitoring. Jure Murovec, 1.1.2025 – 31.12.2026 Asst. Prof. dr. Jure Murovec received the Faculty Award for researchers under the age of 35 for outstanding research achievements.

DOCTORAL DISSERTATION

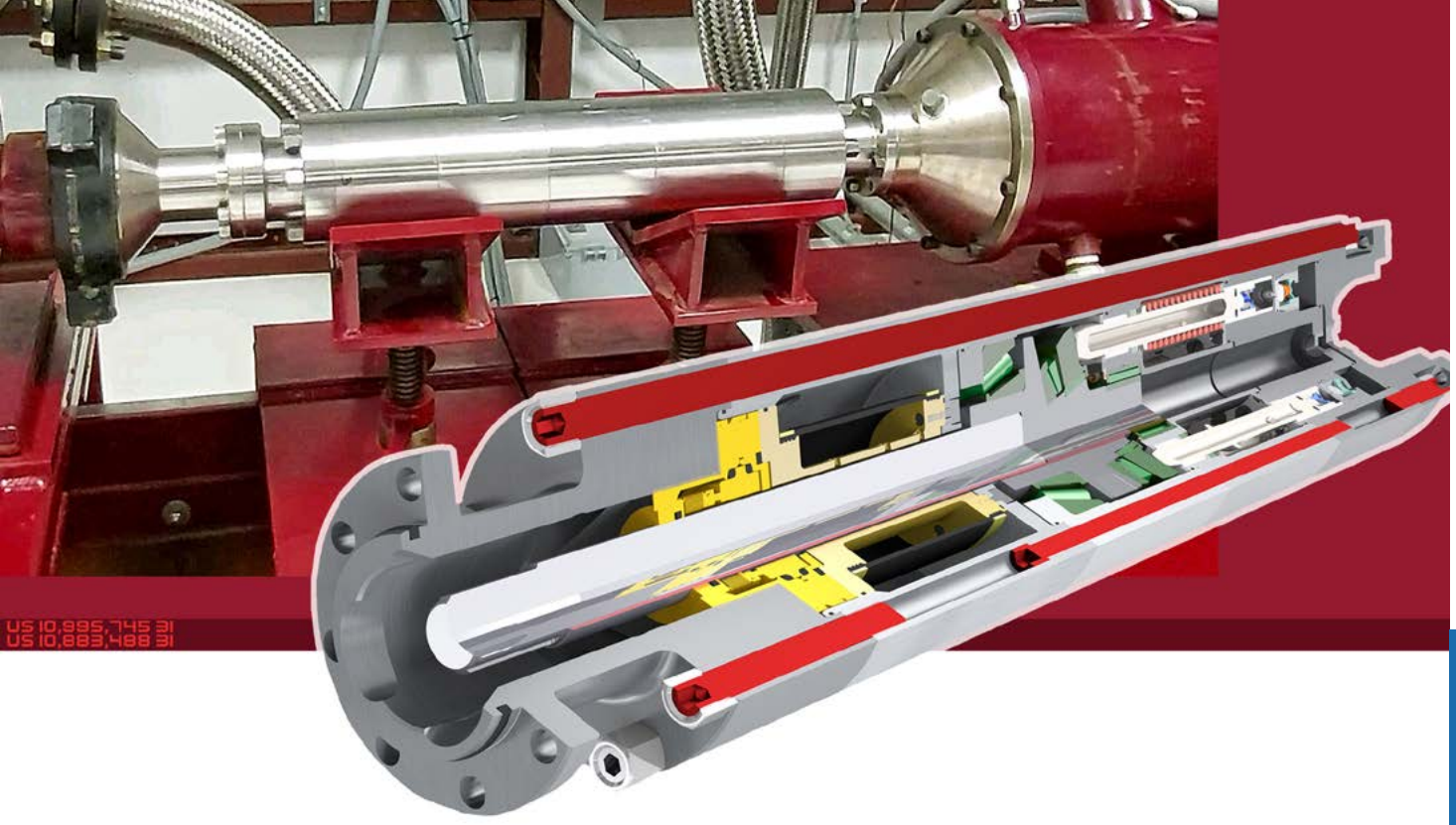
ŽELEZNIK, Anže. Acoustic characterization of granular materials for the development of metamaterials with improved sound insulation and absorption : doctoral thesis. Mentor: Prezelj, Jurij.

04 DEVELOPMENT EVALUATION

In the Development evaluation programme group, we are improving upon the rebmix algorithm for finite mixture parameter estimation and the Dirlik method for fatigue life prediction in the frequency-domain.

We will model the stress-strain states of rubber and rubber composites and their fatigue life. We will improve the energy based method for the durability prediction of thermomechanically loaded components. We will research the lithium-ion batteries. We will improve the models of durability showing a significant break-point in the durability curve. We will research the modelling of the fatigue life of casted parts with inhomogeneities and of parts with a hybrid metal-nonmetal load-carrying structure.

Prediction of the behaviour of structures that are loaded with mechanical loads causing high strain rates in the material will be improved. For wood products, the influence of the probability distribution of occurrence and location of inhomogeneities on the material properties of wood will be determined. The damage initiation and damage propagation periods during fatigue of wood and wood-based composites and hybrids will be investigated.



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Laboratory for Machine Elements LASEM

RESEARCH AREAS

Machine element • Operational strength • Development evaluations

DEPARTMENT HEAD Prof. dr. Marko Nagode
DEPARTMENT MEMBERS Assist. Prof. dr. Simon Oman, Tch. Asst. dr. Ivan Okorn, Tch. Asst. dr. Branislav Panić, Tch. Asst. dr. Andrej Škrlec, Jr. Res. Sanel Avdić, Milan Obradović, Renata Piščanec

ORIGINAL SCIENTIFIC ARTICLES

BENEDIČIČ, Matjaž, NAGODE, Marko, KLEMENC, Jernej, ŠERUGA, Domen. Interspace minimisation for optimal description of temperature-dependent nonlinear material behaviour. Applied sciences. 2025, vol. 15, iss. 22, [art. no.] 12121, str. 1- 12, ilustr. ISSN 2076-3417.

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NAGODE, Marko, OMAN, Simon, KLEMENC, Jernej, PANIĆ, Branislav. Finite mixture models : a key tool for reliability analyses. Mathematics. 2025, vol. 13, issue 10 , [article no.] 1605, 24 str., ilustr. ISSN 2227-7390.

KOCJAN, Tadej, NAGODE, Marko, KLEMENC, Jernej, OMAN, Simon. Coupling of fatigue crack growth and crack nucleation fatigue approach for non-crystallising rubber under fully relaxing uniaxial loading with multiaxial stress–strain state of 3D dumbbell test specimen. Polymer testing. 2025, vol. 145, [article no.] 108752, 13 str., ilustr. ISSN 1873-2348.

OMAN, Simon, KLEMENC, Jernej, GOSAR, Aleš, NAGODE, Marko. Critical factors affecting the strength of climbing ropes : a study of wear, fatigue loading and temperature. Results in engineering. 2025, vol. 27, [article no.] 106471, str. 1-16, ilustr. ISSN 2590-1230.

KATUNIN, Andrzej, DRAGAN, Krzysztof, NAGODE, Marko, LIS, Krzysztof, JOSZKO, Kamil, CHOLEWA, Adam, KLEMENC, Jernej, OMAN, Simon, ŻAK, Paweł, SYNASZKO, Piotr. Towards quantification of hidden corrosion using D-Sight non- destructive testing technique. U.Porto journal of engineering. 2025, vol. 11, no. 1, 16 str., ilustr. ISSN 2183-6493.

PROJECTS

European Space Agency ESA. SV-CompReUse. Predicting residual service life of sandwich composites for reusable space vehicles. Marko Nagode. 1.6.2024 – 31.8.2025

Emri d.o.o. Tiantie - razvoj in optimizacija osnovnega vibro-izolacijskega elementa. Simon Oman. 4.9.2025 - 3.9.2026

Emri d.o.o. Tiantie - razvoj vibro-izolacije za železniške proge. Marko Nagode. 4.9.2025 - 3.9.2026

PATENTS

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OMAN, Simon, NAGODE, Marko, KLEMENC, Jernej, MAJDIČ, Franc, HOČEVAR, Marko, GOSAR, Aleš, ŠKRLEC, Andrej, OLAH, Laslo. Submersible pump assembly and method for use of same : European patent specification EP 4 093 970 B1, 2025- 06-11. Munich: European Patent Office, 2025.

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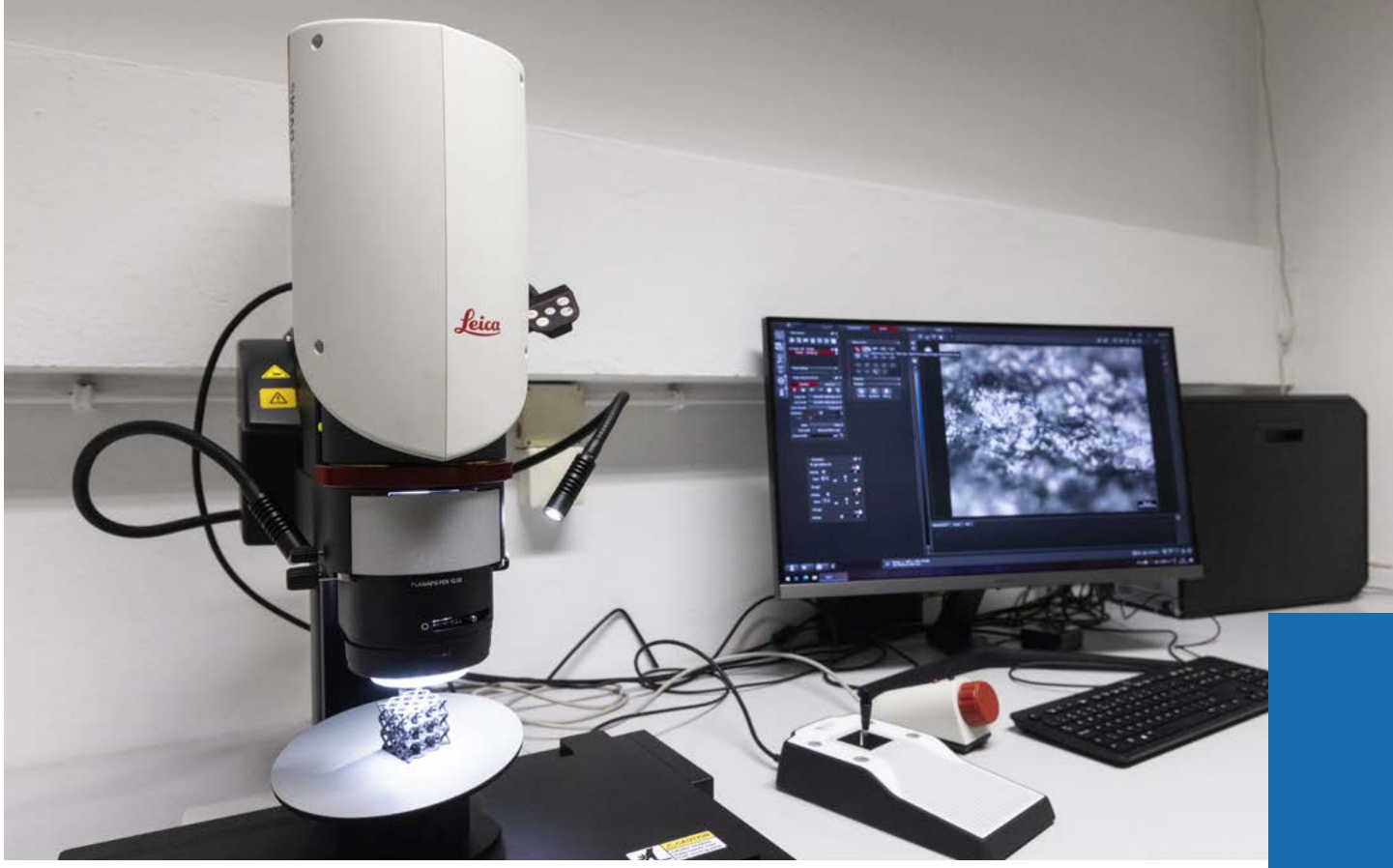

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Laboratory for Structure Evaluation LAVEK

RESEARCH AREAS

Development • Evaluation • Reliability • Maintainability • Supportability • Availability • Dependability • Durability • Prediction

DEPARTMENT HEAD Prof. dr. Jernej Klemenc

DEPARTMENT MEMBERS Assoc. Prof. dr. Domen Šeruga, Tch. Asst. dr. Dejan Tomažinčič, Tch. Asst. dr. Peter Zobec, Tch. Asst. dr. Aleš Gosar, Tch Asst. dr. Jure Kajbič, dr. Nikonov Anatolij, Jr. Res. Aslan Berk, Renata Piščanec

ORIGINAL SCIENTIFIC ARTICLES

PAWLICZEK, Roland, GŁOWACKA, Karolina, KLEMENC, Jernej, NAGODE, Marko, ŁAGODA, Tadeusz. New possibilities for testing rubber composites : design of the fatigue bending test. Advances in Sciences and Technology. 2025, vol. 19, no. 4, str. 42-49, ilustr. ISSN 2299-8624.

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NEČEMER, Branko, FAKIN, Jure, GLODEŽ, Srečko, ŠRAML, Matjaž, KLEMENC, Jernej, FAJDIGA, Gorazd. Bending quasi-static and fatigue behaviour of Norway spruce wood using experimental approach and FEM analysis. Case studies in construction materials. 2025, vol. 22, iss. jul., [art. no.] e04734, str. 1-16, ilustr. ISSN 2214-5095.

ŠERUGA, Domen, NAGODE, Marko, KLEMENC, Jernej, DOUBRAVA, Karel, BARTOŠÁK, Michal. Evolution control of cyclic softening of Inconel 718 under isothermal low-cycle fatigue loading by improved calculation of accumulated plastic strain. International journal of pressure vessels and piping. [Print ed.]. Dec. 2025, vol. 218, pt. a, [art. no.] 105583, str. 1-11, ilustr. ISSN 0308-0161.

TOMAŽINČIČ, Dejan, PANIĆ, Branislav, NAGODE, Marko, KLEMENC, Jernej. The fatigue life estimation of the porous AlSi9Cu3 alloy based on the classification of pore geometry using multivariate

probability distribution density. Journal of materials research and technology. [Spletna izd.]. 2025, vol. 36, str. 10039-10054, ilustr. ISSN 2214-0697.

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TOMAŽINČIČ, Dejan, KAJBIČ, Jure, KLEMENC, Jernej. Fabrication and response testing of a hybrid cellular structure with the ability to transform cells formed into diamond-shaped silhouettes. Materials & design. 2025, vol. 259, [art. no.] 114822, str. 1-17, ilustr. ISSN 0264-1275.

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PROJECTS

Slovenian Research and Innovation Agency. Development of a cellular composite with the ability to transform cells by a selected activation mechanism. Z2-50081. Dejan Tomažinčič. 1.10.2023 - 30.9.2025

European Space Agency ESA. SV-CompReUse. Predicting residual service life of sandwich composites for reusable space vehicles. Jernej Klemenc. 1.6.2024 – 31.8.2025

Slovenian Research and Innovation Agency. Experimental and numerical analysis of static and fatigue double-side bending of rubber matrix composites. Jernej Klemenc. 1.1.2024 – 31.12.2026

Emri d.o.o. Tiantie - razvoj in optimizacija osnovnega vibro-izolacijskega elementa. Jernej Klemenc. 4.9.2025 - 3.9.2026

Emri d.o.o. Tiantie - razvoj vibro-izolacije za železniške proge. Jernej Klemenc. 4.9.2025 - 3.9.2026

PATENTS

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OMAN, Simon, NAGODE, Marko, KLEMENC, Jernej, MAJDIČ, Franc, HOČEVAR, Marko, GOSAR, Aleš, ŠKRLEC, Andrej, OLAH, Laslo. Submersible pump assembly and method for use of same : European patent specification EP 4 093 970 B1, 2025-06-11. Munich: European Patent Office, 2025.

OMAN, Simon, NAGODE, Marko, KLEMENC, Jernej, MAJDIČ, Franc, HOČEVAR, Marko, GOSAR, Aleš, ŠKRLEC, Andrej, OLAH, Laslo. Submersible pump assembly and method for use of same : European patent specification EP 4 093 971 B1, 2025-06-11. Munich: European Patent Office, 2025.

DOCTORAL DISSERTATIONS

KAJBIČ, Jure. Napovedovanje dobe trajanja z dodajnimi tehnologijami izdelanih biorazgradljivih termoplastičnih kompozitov : doktorsko delo. Mentor: Klemenc, Jernej. Co-mentor: Fajdiga, Gorazd.

05 HEAT AND MASS TRANSFER

We conduct research and development of systems for the supply and use of energy for heating, cooling, air-conditioning and process engineering with emphasis on renewable energy sources and efficient use of energy.

We are engaged in advanced mechanisms of heat transfer and heat transport, a part of which includes boiling research in microstructures. We are involved in exergoeconomic optimisation of the entire energy supply chain. We research and develop alternative magnetocaloric and electrocaloric cooling technologies for real applications in the domain of conventional refrigerators with inclusion of thermal diodes and switches.

We conduct research of thermal response of cities with natural building elements and integration into buildings' envelope. We study the impact of cooling loads of buildings on electricity consumption and thermal comfort in buildings with inclusion of thermal storage. Research results are verified with measurements conducted in laboratories and on real systems for which innovative measuring methods and meters are being developed.

Photo: UL FME Archive

Laboratory for Measurements in Process Engineering LMPS

RESEARCH AREAS

Metrology • Primary and secondary measurement standards and procedures • Measurements in process and energy engineering • Experimental methods • Evaluation of uncertainty of measurements

DEPARTMENT HEAD Assoc. Prof. dr. Jože Kutin

DEPARTMENT MEMBERS Asst. Prof. dr. Gregor Bobovnik, Asst. Prof. dr. Andrej Svete, Tch. Asst. dr. Primož Žibret, Peter Sambol, Urh Planko, Assist. Primož Žibret, Tch. Asst. Benjamin Novak, Katja Tajč, Tilen Gašperin, Zdenka Rupič

ORIGINAL SCIENTIFIC ARTICLES

KUTIN, Jože, BOBOVNIK, Gregor, GUGOLE, Federica, VEEN, Adriaan M.H. van der. Evaluation of uncertainty associated with totalisation of time-sampled data in gas quantity and energy measurements. Measurement. Sensors. May 2025, vol. 38, suppl., [art. no.] 101572, str. 1-4, ilustr. ISSN 2665-9174.

SVETE, Andrej, ŽVAR BAŠKOVIČ, Urban, GOLOB, Jure, MAVRAR, Žiga, KATRAŠNIK, Tomaž, KUTIN, Jože. A method for determining the high-frequency in-cylinder pressure of an internal combustion engine using a pressure sensor dynamically calibrated with a shock tube. Mechanical systems and signal processing. 2025, vol. 241, [art. no.] 113534, str. 1-24, ilustr. ISSN 0888-3270.

SVETE, Andrej, NOVAK, Benjamin, PLANKO, Urh, KUTIN, Jože. Experimental investigation of the developed focusing elements for generating extreme pressures in a diaphragmless shock tube. Scientific reports. 2025, vol. 15, [article no.] 23929, 15 str., ilustr. ISSN 2045-2322.

PROJECTS

European Partnership on Metrology. Met4H2. Metrology for the hydrogen supply chain. Gregor Bobovnik. 1.10.2022 – 30.9.2025

European Partnership on Metrology. SmartGasNet. Metrology for smart metering in gas networks. Gregor Bobovnik. 1.8.2025 - 31.7.2028

European Partnership on Metrology. CryoMet. Metrology for reliable liquefied energy gases measurement. Jože Kutin. 1.8.2025 - 31.7.2028

Dewesoft d.o.o. Razvoj večkanalnega tlačnega merilnega skenerja in pripadajočega kalibracijskega Sistema. Jože Kutin. 1.12.2024 - 30.9.2025

EQUIPMENT

Ultra-low temperature bath. Aris paket23.

AWARDS AND ACHIEVEMENTS

Laboratory LMPS, UL-FS was appointed as a designated institute (DI) responsible for national measurement standards in the field of flow rate and speed of gases. 2025

Laboratory for Thermal Technology LTT

RESEARCH AREAS

Heat and mass transfer • Thermal engineering • Applied thermodynamics • Process engineering • Biotechnology • Environmental protection technologies

DEPARTMENT HEAD Prof. dr. Iztok Golobič

DEPARTMENT MEMBERS Assoc. Prof. dr. Matevž Zupančič, Asst. Prof. dr. Matic Može, Tch. Asst. dr. Ivan Sedmak, Tch. Asst. dr. Jure Berce, Tch. Asst. dr. Mattia Bucci, Tch. Asst. dr. Armin Hadžić, Tch. Asst. Samo Jereb, Tch. Asst. Klara Arhar, Zdenka Rupič

ORIGINAL SCIENTIFIC ARTICLES

ARHAR, Klara, MOŽE, Matic, ZUPANČIČ, Matevž, GOLOBIČ, Iztok. Evaluation of hydrogen bubble growth on a platinum microelectrode under varying electrical potential. Applied sciences. 2025, vol. 15, iss. 8, [art. no.] 4107, str. 1-24, ilustr. ISSN 2076-3417.

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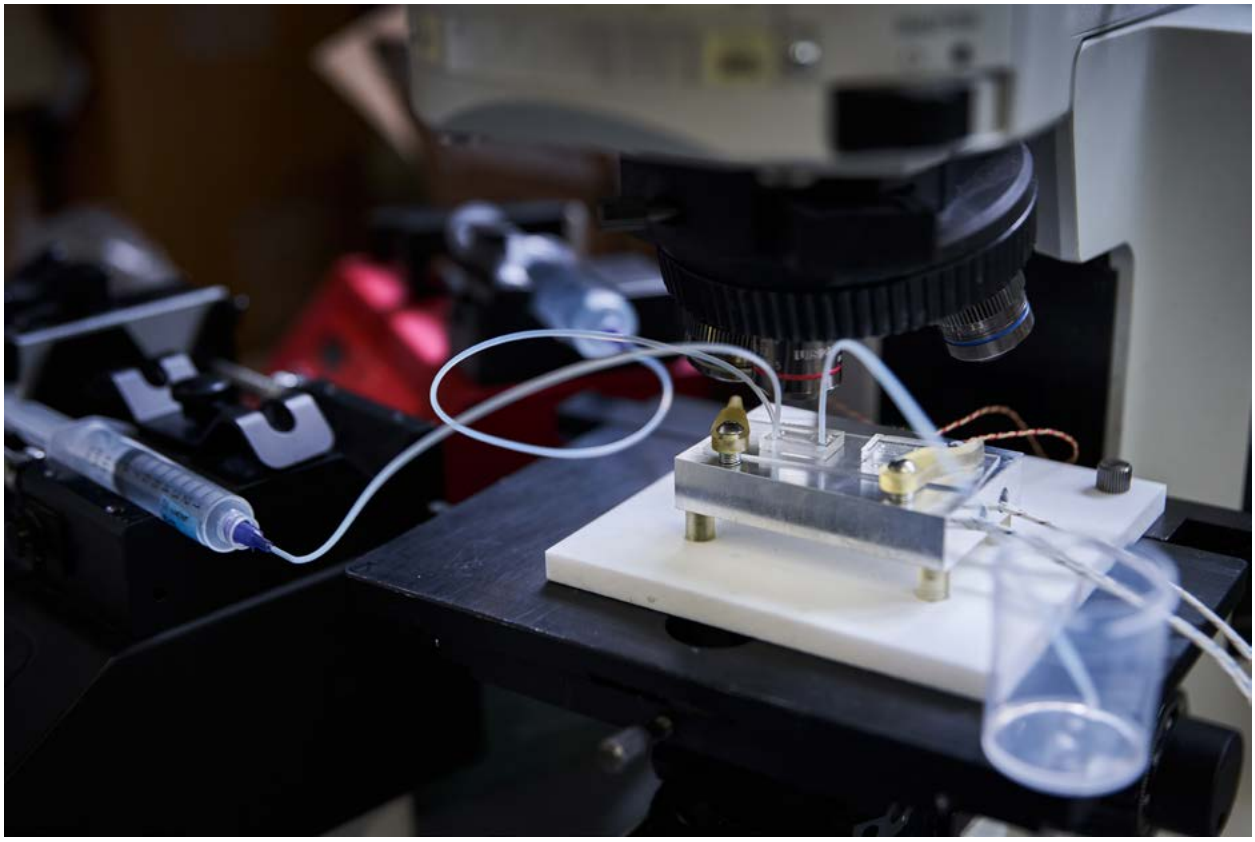
SHANG, Yuheng, MOŽE, Matic, CASTAGNE, Sylvie, SEVENO, David, GOLOBIČ, Iztok, VETRANO, Maria Rosaria. Effect of surface temperature on splashing of droplets impacting on a cold superhydrophobic surface. Applied thermal engineering. 2025, vol. 272, [article no.] 126351, 8 str., ilustr. ISSN 1873-5606

VODOPIVEC, Matevž, FONTANAROSA, Donato, GEBREKIROS BERHE, Mulugeta, BUCCI, Mattia, MOŽE, Matic, ZUPANČIČ, Matevž, CASTAGNE, Sylvie, GOLOBIČ, Iztok, VETRANO, Maria Rosaria. Experimental investigation of single bubble dynamics on a novel high aspect ratio conical micro-cavity in saturated pool boiling: Impact of surface tension. Applied thermal engineering. Nov. 2025, vol. 279, pt. b, [art. no.] 127384, str. 1-13, ilustr. ISSN 1359-4311.



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RAEYMAEKERS, Jakob, ARHAR, Klara, MOŽE, Matic, COLINET, Pierre, GOLOBIČ, Iztok, STEELANTD, Johan, VETRANO, Maria Rosaria. Impact of electrode surface texturing on hydrogen bubble dynamics during proton exchange membrane water electrolysis. Experimental thermal and fluid science. 2025, vol. 169, [article no.] 111538, 12 str., ilustr. ISSN 1879-2286.

BERCE, Jure, ZUPANČIČ, Matevž, MOŽE, Matic, GOLOBIČ, Iztok. Local temperature distribution of a plate heat exchanger undergoing crystallization fouling. Heat and mass transfer. 2025, vol. 61, article no. 68, str. 1-10, ilustr. ISSN 0947-7411.

JEREB, Samo, MOŽE, Matic, ZUPANČIČ, Matevž, GOLOBIČ, Iztok. Towards accurate evaluation of pressure-induced Cassie-to-Wenzel wetting transition on superhydrophobic surfaces. Journal of colloid and interface science. Sept. 2025, vol. 694, [art. no.] 137697, str. 1-10, ilustr. ISSN 0021-9797.

KOVAČ, Nina, KAPUN, Barbara, MOŽE, Matic, GOLOBIČ, Iztok, KRAL], Slavko, MILOŠEV, Ingrid, RODIČ, Peter. Superhydrophobic coatings based on PMMA-siloxane-silica and modified silica nanoparticles deposited on AA2024-T3. Polymers. 2025, vol. 17, iss. 2, 1-22 str., ilustr. ISSN 2073-4360

MOŽE, Matic, SHANG, Yuheng, JEREB, Samo, KOVAČ, Nina, ŠTUCIN, Miha, ŠTRUS, Tim, RODIČ, Peter, ZUPANČIČ, Matevž, VETRANO, Maria Rosaria, GOLOBIČ, Iztok. Surface morphology effects on droplet spreading and rebound dynamics on subcooled superhydrophobic surfaces. Scientific reports. 2025, 15, article no. 29530, [22] str., ilustr. ISSN 2045-2322.

BERCE, Jure, HADŽIĆ, Armin, ZUPANČIČ, Matevž, MOŽE, Matic, GOLOBIČ, Iztok. Durable nonfluorinated stochastically hierarchical superhydrophobic interface for intense long-term phase change cooling. Small structures. Nov. 2025, vol. 6, issue 11, [article no.] 2500326, str. 1-12, ilustr. ISSN 2688-4062.

KOVAČ, Nina, MOŽE, Matic, KAPUN, Barbara, GOLOBIČ, Iztok, MILOŠEV, Ingrid, RODIČ, Peter. Enhanced corrosion resistance and self-cleaning of AlSi7Mg0.3 via superhydrophobic surface using laser structuring and stearic acid grafting. Surfaces and interfaces. 2025, vol. 61, art. 106089, str. 1-14, ilustr. ISSN 2468-0230.

MOŽE, Matic, RODIČ, Peter, ŠTRUS, Tim, ŠTUCIN, Miha, LOVŠIN, Robert, KOVAČ, Nina, JEREB, Samo, HADŽIĆ, Armin, ZUPANČIČ, Matevž, GOLOBIČ, Iztok, et al. Anti-icing performance and anti-corrosive properties of superhydrophobic nanosecond-laser-textured aluminum surfaces with a self-assembled monolayer coating. Surfaces and interfaces. Sep. 2025, vol. 72, [article no.] 107016, str. 1-19, ilustr. ISSN 2468-0230.

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PROJECTS

Slovenian Research and Innovation Agency. BEST. Boiling Enhancement by Surface Texturing. Iztok Golobič. 1.1.2022 - 31.12.2025

Slovenian Research and Innovation Agency. DroBFuSE. Interfacial phenomena of droplets and bubbles on functionalized surfaces investigated by advanced diagnostics for future environmental and enhanced heat transfer applications. Matevž Zupančič. 1.10.2023 - 30.9.2026

European Defence Agency. AMALIA. Additive Manufacturing of Metallic Auxetic Structures and Materials for Lightweight Armour. Iztok Golobič. 20.10.2022 - 19.10.2025

Slovenian Research and Innovation Agency. HyBReED. Development of resilient chemical energy storage with hydrogen and batteries. Iztok Golobič. 1.1.2024 – 30.6.2026

KRKA d.d. Izvedba študije centralnega hladilnega sistema (CHS) za lokacijo Ločna in študije optimalnih HVAC konceptov. Iztok Golobič. 7.7.2025 - 31.10.2025

Slovenian Research and Innovation Agency. Enhancing heat exchanger performance using advanced superhydrophobic coating. Matic Može. 01.01.2025 - 31.12.2027**.**

DOCTORAL DISSERTATIONS

BUCCI, Mattia. Transient temperature field and vapor bubble dynamics during boiling on low thermal capacitance heater with various surfaces : doctoral thesis. Mentor: Zupančič, Matevž.

Photo: Željko Stevanić, IFP d.o.o

Laboratory for Refrigeration and District Energy LAHDE

RESEARCH AREAS

Heat and Mass Transfer • Refrigeration • Caloric energy conversion • Heat pumps • Thermal control devices • District energy

DEPARTMENT HEAD Prof. dr. Andrej Kitanovski

DEPARTMENT MEMBERS Asst. Prof. dr. Urban Tomc, Asst. prof. dr. Katja Klinar, Tch. Asst. Nada Petelin, Jr. Res. dr. Miha Bobič, Simon Bogić, Tch. Asst. Katja Vozel, Jakob Perne, Tch. Asst. Blaž Velkavrh, Tch. Asst. Mihael Blatnik, Tch. Asst. Matevž Cimermančič, Tch. Asst. Izak Oberčkal Pluško, dr. Anubhav Viswakarma, Jr. Res. dr. Radel Gimaev, Tch. Asst. Dr. Darja Gačnik, Jr. Res. dr. Daniel Calleja Anta, Jr. Res. dr. Grega Belšak, Tch. Asst. Matija Kalin, Kamyar Dobakhti, Jure Javornik, Stella Cavalleri

ORIGINAL SCIENTIFIC ARTICLES

TOMC, Urban, PEIXER, Guilherme Fidelis, BAHL, Christian Robert Haffenden, NIELSEN, Kaspar K., LOZANO, Jaime A., BARBOSA, Jader R., KITANOVSKI, Andrej. Influence of layering and curie temperature uncertainty on the performance of multilayer active magnetic regenerators. Advanced functional materials. [Online ed.]. 2025, vol. 35, issue 52, 21 str., ilustr. ISSN 1616-3028.

REGIS DE MORAES, Victor, BRENNECKA, Geoff, TOMC, Urban, KITANOVSKI, Andrej, CERAR, Jan, TUŠEK, Jaka, JERMAN, Ivan, STERN-TAULATS, Enric, LÜNSER, Klara, MAÑOSA, Lluís, URŠIČ NEMEVŠEK, Hana. Airbrushing : a novel method for preparation of high-emissivity black coating for infrared measurement. Advanced materials interfaces. Nov. 2025, vol. 12, issue 21, [article no.] e00467, str. 1-8, ilustr. ISSN 2196-7350

GAČNIK, Darja, BRAKE, Marcel ter, DHALLÉ, Marc. Thermal modeling of LN [sub] 2-cooled terminals with integrated heat exchangers for superconducting applications. Applied thermal engineering. Nov. 2025, vol. 279, pt. a, [article no.] 127491, str. 1-18, ilustr. ISSN 1359-4311.

PEIXER, Guilherme Fidelis, TOMC, Urban, KITANOVSKI, Andrej, LOZANO, Jaime A., BARBOSA, Jader R. AI-driven Monte Carlo uncertainty analysis of Curie temperature effects on active magnetic regenerator performance. International Journal of Refrigeration. 2025, vol. 180, str. 518-527, ilustr. ISSN 1879-2081.

VOZEL, Katja, KITANOVSKI, Andrej. Numerical study of macroscopic thermal diodes : influence of interface topography and contact resistance. iScience. [Online ed.]. 2025, vol. 28, issue 11, [article no.] 113724, 64 str., ilustr. ISSN 2589-0042.

PROJECTS

Horizon Europe. INDY. Energy Independent and Efficient Deployable Military Camps. Andrej Kitanovski. 1.12.2022 - 31.1.2025

Horizon Europe. SENERGY NETS. Increase the Synergy among different ENERGY NETworkS. Andrej Kitanovski. 1.9.2022 - 31.8.2026

LIFE. LIFE21-CET-PDA-3DIVERSE Decentralization, Diversity and Dynamic load regulation – novel approaches to tangible energy transition with diversification of production sources. Andrej Kitanovski. 1.10.2022 - 30.9.2025

Gorenje d.o.o. Raziskovalno razvojno sodelovanje na področju toplotno snovnih procesov v gospodinjskih aparatih (Aneks 3). Andrej Kitanovski. 28.2.2024 - 1.3.2026

MIZŠ - ERA-NET. Cool BatMan. Battery Thermal Managament System Based on High Power Density Digital Microfluidic Magnetocaloric Cooling. Urban Tomc. 1.11.2022 - 31.10.2025

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Andrej Kitanovski. 1.1.2024 – 30.6.2026

Horizon Europe. MAGCCINE. Clean and efficient cooling in vaccine transportation using Rotating

Magnetocaloric Effect. Andrej Kitanovski. 1.10.2024 – 30.9.2028

Slovenian Research and Innovation Agency. Limited angle PET system. Andrej Kitanovski. 1.7.2024 –30.6.2027

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Andrej Kitanovski. 1.1.2024 – 30.6.2026

Horizon Europe. THERMINATOR. Electro-thermal energy converter using novel combined thermoacoustic and electrocaloric system. Katja Klinar. 1.1.2025 - 31.12.2027

Slovenian Research and Innovation Agency. Development of anisotropic thermally conducting and insulating substrates for recyclable flexible electronics. Andrej Kitanovski. 1.1.2025 - 31.12.2027

Horizon Europe, MSCA Doctoral Networks. HEAT4ENERGY. Magnetic ENERGY conversion for waste HEAT. Andrej Kitanovski. 1.1.2024 - 31.12.2027

DOCTORAL DISSERTATIONS

NOSAN, Simon. Energijsko učinkoviti magnetilni sistemi za magnetno hlajenje : doktorsko delo. Ljubljana. Mentor: Kitanovski, Andrej.

EQUIPMENT

System for the characterization of micro-thermal processes. Aris paket23.

AWARDS AND ACHIEVEMENTS

Asst. Prof. dr. Katja Klinar, has received the Dr. Ana Mayer Kansky Award for an outstanding doctoral dissertation.

Photo: Željko Stevanić, IFP d.o.o.

Laboratory for Sustainable Technologies in Buildings LOTZ

RESEARCH AREAS

Engineering sciences • Energy engineering • Renewable sources and technologies

DEPARTMENT HEAD Prof. dr. Sašo Medved

DEPARTMENT MEMBERS Assoc. Prof. dr. Ciril Arkar, Assoc. prof. dr. Uroš Stritih, Tch. Asst. dr. Eva Zavrl, Asst. Prof. dr. Primož Poredoš, Tch. Asst. dr. Suzana Domjan, Tch. Asst. dr. Tej Žižak, Tch. Asst. dr. Wilson Higgins Marangattil, Jr. Res. dr. Eneja Osterman, Tch. Asst. Dr. Ali Abdallah Yousef Mohammed, Tch. Asst. Žan Frumen, Tch. Asst. Dejan Trajkovski, Matevž Zupan, Tanja Perec Escuredo

ORIGINAL SCIENTIFIC ARTICLES

DOMJAN, Suzana, ROVAN, Jure, MEDVED, Sašo. Assessment of building renovation with modular ventilated FIPVT in terms of energy efficiency and indoor environment in office buildings. Applied thermal engineering. Nov. 2025, vol. 279, pt. a, [article no.] 127497, str. 1-17, ilustr. ISSN 1359-4311.

KOU, Xiaoxue, JIANG, Jiatong, XIE, Baoshan, SHAN, He, POREDOŠ, Primož, WANG, Ruzhu. Fewer temperature ties : scalable integration and broad selection of phase change materials for both heating and cooling. Energy & environmental science. 2025, vol. 18, issue 5, str. 2499-2510, ilustr. ISSN 1754-5706.

DOMJAN, Suzana, FINK, Rok, MEDVED, Sašo. Coupling the assessment of indoor environmental quality and cognitive performance in Building Information Modelling with integral indicators. Energy and buildings. [Print ed.]. 2025, vol. 330, [art. no.] 115354, str. 1-18, ilustr. ISSN 0378-7788.

POREDOŠ, Primož, GAO, Jintong, ALI, Abdallah Yousef Mohammed, SHAN, He, XU, Zhenyuan, ZAVRL, Eva, ŽIŽAK, Tej, TRAJKOVSKI, Dejan, ARKAR, Ciril, WANG, Ruzhu. The potential of waste heat utilization in solar multistage membrane distillation : an alternative to PV + RO systems?. Energy conversion and management. 2025, vol. 341, [article no.] 119977, 18 str., ilustr. ISSN 1879-2227.

POREDOŠ, Primož, SHAN, He, SHAO, Zhao, DENG, Fangfang, ZAVRL, Eva, ŽIŽAK, Tej, ARKAR, Ciril, GATARIĆ, Pero, WANG, Ruzhu. Switchable multicyclic adsorption-based atmospheric water harvesting

with solar and radiative sky cooling thermal concentration and heat pumps. Energy. 2025, vol. 332, [article no.] 137255, str. 1-18, ilustr. ISSN 1873-6785.

ŽIŽAK, Tej, MEDVED, Sašo, ARKAR, Ciril. Effect of solar photovoltaics on green roof energy balance and evapotranspiration. Sustainable cities and society. [Spletna izd.]. 2025, vol. 121, [article no.] 106206, 13 str., ilustr. ISSN 2210-6715.

KRAL], Aleš, KURNITSKI, Jarek, ŽNIDARŠIČ, Matjaž, MEDVED, Sašo, DOMJAN, Suzana, HALILOVIČ, Miroslav. Eliminating seasonal energy storage needs through envelope design : real-world cost analysis of quadruple glazing in office buildings. Sustainable energy technologies and assessments. 2025, vol. 84, [article no.] 104687, 9 str., ilustr. ISSN 2213-1396.

GRUDEN, Lucija, OSTERMAN, Eneja, MLAKAR, Urška, STRITIH, Uroš. Energy and ventilation use analysis in Slovenian elderly centers. REHVA Journal. 2025, vol. 62, iss. 1, str. 54-58, ilustr. ISSN 1307-3729.

PROJECTS

Slovenian Research and Innovation Agency. Living Walls for Future Sustainable Buildings and Cities. Ciril Arkar. 1.10.2022 - 30.9.2025

Slovenian Research and Innovation Agency. New Approaches for Continuous Atmospheric Water Harvesting with Hydrogels through Radiative Energy Exchange with Space and Waste Heat Utilization. Primož Poredoš. 1.7.2024 – 30.6.2027

European Commission (MSCA COFUND EUTOPIA-SIF), and Development Fund of the Republic of Slovenia. Novel multidisciplinary approaches to efficient thermal management and lifespan extension of concentrated photovoltaics using continuous evaporative desalination powered by air-conditioning waste heat. Primož Poredoš. 1.12.2024 – 30.11.2026.

Slovenian Research and Innovation Agency. Green Urban Societies of the Future (I. phase). Primož Poredoš. 1.11.2024 – 31.10.2025.

Horizon Europe. GeoS-TECHIS. Geothermal Source Thermal Energy for Cooling and Heating in

Industries with Steam. Uroš Stritih. 1.10.2024 – 30.9.2027

Horizon Europe, MSCA Cofund. PV-W2WFresh. Novel multidisciplinary approaches to efficient thermal management and lifespan extension of concentrated photovoltaics using continuous evaporative desalination powered by air-conditioning waste heat. Primož Poredoš. 1.12.2024 - 30.11.2026.

DOCTORAL DISSERTATIONS

ŽIŽAK, Tej. Toplotni odziv večfunkcijskih ozeljenih gradnikov stavb pri realnih vrednostih : doktorska disertacija. Mentor: Arkar, Ciril.

AWARDS AND ACHIEVEMENTS

Asst. Prof. Dr. Primož Poredoš received the Excellent in Science 2025 recognition awarded by the Scientific Research Council for Engineering Sciences within the Slovenian Research and Innovation Agency (ARIS).

06 TRIBOLOGY

The Tribology programme group is interdisciplinary and includes 15-20 member from different disciplines: mechanical engineering, physics, chemistry, materials and nanotechnologies.

The group is developing an energy-efficient, sustainable and at the same time more environment-friendly “green” operation of mechanical systems. Linking understanding of tribological and surface processes from nano- to macroscale with the aim of solving industrial problems is the group’s basic goal. The central closely-related areas of work are: contact engineering and surface mechanics, wear-resistant mechanical systems, protective surface coatings, lubrication and surface films, nanotribology, wetting, tribochemestry and adhesion processes, and power-control hydraulic design.

The group is also actively engaged in topography and real contact area models, advanced polymer, electrical and mechatronic contacts tribology, tribology in production processes, polymer gears and automotive applications, and water hydraulics.

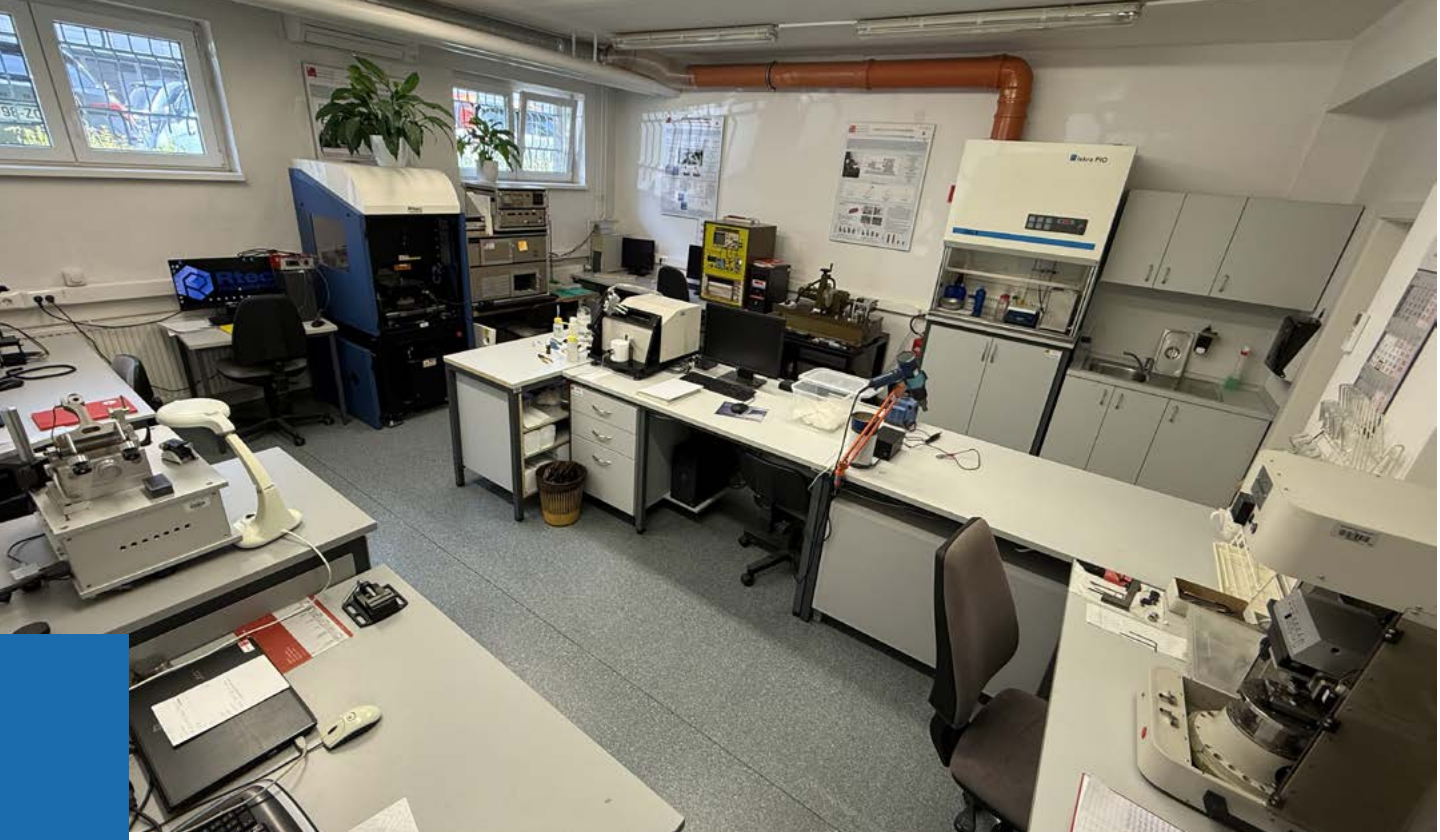

Photo: Željko Stevanić, IFP d.o.o.

Laboratory for tribology and interface nanotechnology TINT

RESEARCH AREAS

Wear • Lubrication • Friction • Surface engineering • Nanotribology • Interface nanotechnology • Maintenanc

DEPARTMENT HEAD Prof. dr. Mitjan Kalin

DEPARTMENT MEMBERS Asst. Prof. dr. Marko Polajnar, Asst. Prof. dr. Janez Kogovšek, Tch. Asst. dr. Blaž Žugelj, Tch. Asst. dr. Lucija Čoga, Tch. Asst. Urban Klanjšček, Tch. Asst. dr. Sebastjan Matkovič, Franc Kopač, Jr. Res. dr. Prashant Gangwani, Jr. Res. dr. Irfan Nadeem, Sr. Res. Assoc. Tomaž Požar, Jr. Res. Nejc Osolnik, Jr. Res. dr. Anastasia Samodurova, Jr. Res. AjeebRayan , Jr. Res. Mark Kuzman, Jr. Res. dr. Yunbo Hao, Tch. Asst. Jakob Živalič, Jr. Res. dr. Elton de Lima Savi, Jr. Res. dr. Parveen Kumar Jr. Res. dr. Sreed Sharma Kanakkillam, Jr. Res. dr. Neuma Pereira Das Merces, Jr. Res. dr. Khodor Nasser, Jr. Res. dr. Talha Bin Yaqub, Jr. Res. dr. Alaaeddin Al Sheikh Omar, Jr. Res. dr. Ajay Pratap Singh Lodhi, Jr. Res. dr. Hongbo Ju, Jr. Res. dr. Chigulla Sateesh Kumar, Jr. Res. Dr. Rahul Kumar, Jr. Res. dr. Abbas M. K. Al-Rjoub, Jr. Res. dr. Wang Yongqiang, Jr. Res. Zhang Yuanfei, Jožica Sterle

ORIGINAL SCIENTIFIC ARTICLES

LUAN, Jing, WANG, Lei, DONG, Songtao, FERNANDES, Filipe Daniel, CHOUKOUROV, Andrei, YANG, Junfeng, KALIN, Mitjan, CAVALEIRO, Albano, JU, Hongbo. Mutually enhanced mechanical and tribological properties in magnetron sputtered Mo2N/Ag–SiNx self-lubricating multilayered films via epitaxial growth design. Ceramics international. [Print ed.]. Oct. 2025, vol. 51, issue 25, pt. a, str. 43924-43932, ilustr. ISSN 0272-8842.

KALIN, Mitjan, JAN, Petra. Understanding the friction laws of Amontons and Coulomb by evaluating the real contact area. Friction. 2025, vol. 13, iss. 1, [art.] 9440986, 14 str., ilustr. ISSN 2223-7690.

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ČOGA, Lucija, POLAJNAR, Marko, SAMODUROVA, Anastasia, KALIN, Mitjan. Tribological properties of steel sheet with epoxy-based enamel coating under dry and lubricated conditions for stamping applications. Journal of Materials Research and Technology. May-Jun. 2025, vol. 36, str. 7666-7675, ilustr. ISSN 2238-7854.

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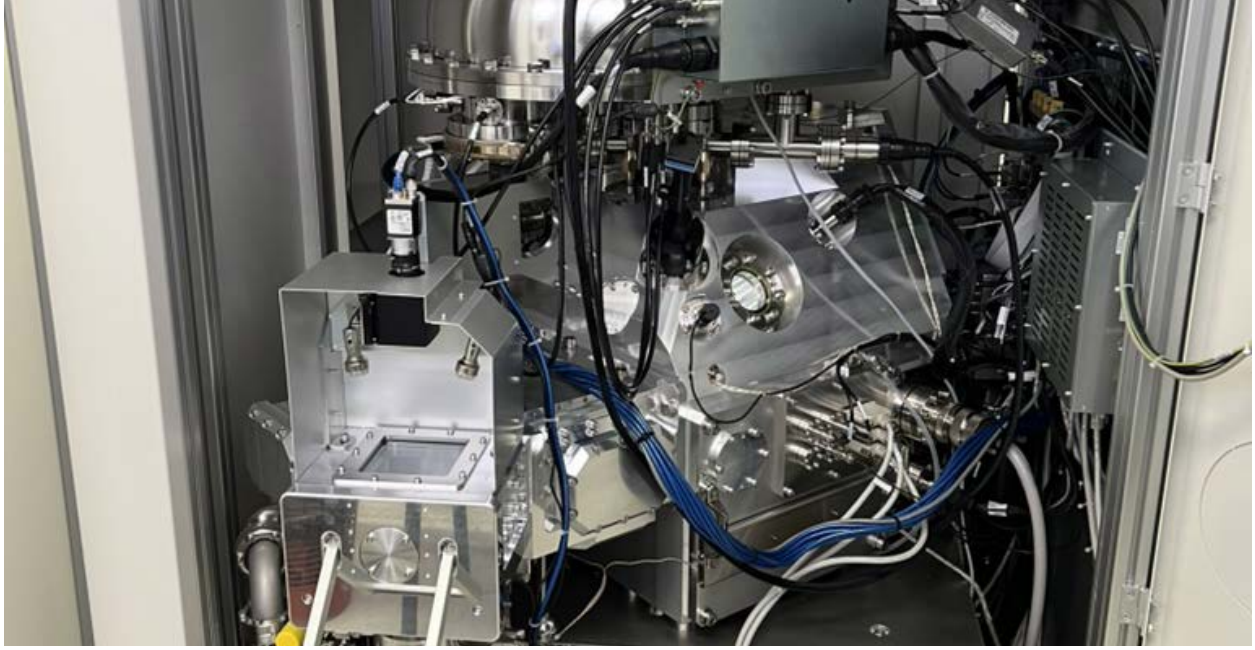

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PROJECTS

Slovenian Research and Innovation Agency. CODE-GM. Konstruiranje kontaktov na nano skali za visoko zmogljive, energetsko učinkovite in lahke komponente za zeleno mobilnost. Mitjan Kalin. 1.10.2022 – 30.9.2025

M-ERA.NET BilaTex – New generation of bioactive laser textured Ti/Hap implants. Marko Polajnar. 1.5.2024-30.4.2027

Slovenian Research and Innovation Agency. FRAC. Friction reduction with advanced contacts. Tomaž Požar. 1.1.2025 - 31.12.2027

Horizon Europe, MSCA Doctoral Networks. Patron. The Doctoral Network on Prognostics and heAlth management of nexT GeneRatiOn drivetraiNs. Marko Polajnar 1.2.2024 - 31.1.2028.

Horizon Europe, MSCA Cofund. Mobility GT. Surfaces and interfaces for sustainable green mobility- Mitjan Kalin 1.7.2024-30.6.2029

PATENTS

KLANJŠČEK, Urban, ARSHAD, Muhammad Shahid, KOBE, Spomenka, SAJE, Boris, KALIN, Mitjan. Naprava za kontrolirano nanašanje površinskega sloja z visoko vsebnostjo enakomerno porazdeljenih in ustrezno usmerjenih magnetnih delcev po postopku tridimenzionalnega tiskanja : patent SI26616A, 2025-09-30. Ljubljana: Urad RS za intelektualno lastnino, 2025.

NADEEM, Irfan, AKHTER, Rehan, NUSAIR KHAN, Aamir, TAUQIR, Anjum. Process to synthesize ultra-low frictional surfaces on light metals : patent number 144484, 2025-10-10. [S. l.]: Intellectual property Organisation Pakistan, 2025.

DOCTORAL DISSERTATIONS

GANGWANI, Prashant. Water-lubricated high-performance polymers : doctoral thesis. Ljubljana: [P. Gangwani], 2025. Mentor: Kalin, Mitjan. Co-mentor: Emami, Nazanin.

SIDDIQUI, M. Shoaib Naseem. Thermal analysis of polymer containing tribological contacts : doctoral thesis. Mentor: Kalin, Mitjan. Co-mentor: Golobič, Iztok.

EQUIPMENT

Test rig for the electro-tribological characterization of boundary surface films and contacts in a wide range of mechanical, thermal and electrical loads. Aris paket23.

AWARDS AND ACHIEVEMENTS

Prof. dr. Mitjan Kalin has been elected to the Board of Directors of the Society of Tribologists and Lubrication Engineers (STLE).

Prof. dr. Mitjan Kalin has received the highest academic recognition in tribology – the ASME Mayo D. Hersey Award.

Asst. Res. Dr. Irfan Nadeem received the Faculty Award for researchers under the age of 35 for outstanding research achievements.

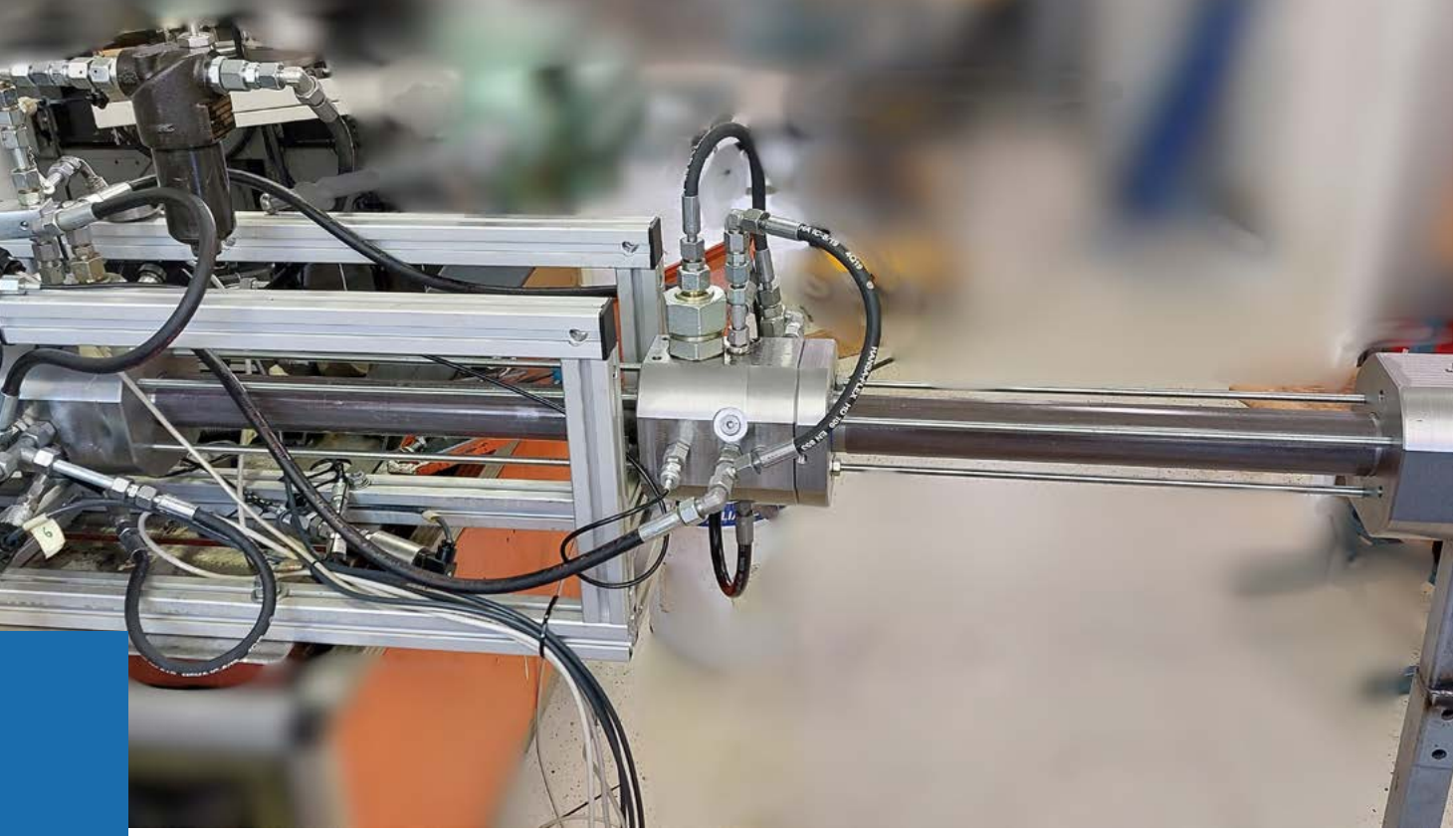

Photo: UL FME Archive

Laboratory for Fluid Power and Controls LFT

RESEARCH AREAS

Fluid power • Oil and water hydraulics • Numerical simulations • Hydraulic components and systems • Control • Component and system development • Durability tests • Diagnostics in hydraulics

DEPARTMENT HEAD Assist. Prof. dr. Franc Majdič

DEPARTMENT MEMBERS Rok Jelovčan, Tch. Asst. dr. Nejc Novak, Tch. Asst. dr. Ana Trajkovski, Jr. Res. Jan Pustavrh, Tch. Asst. Jan Bartolj, Jožica Sterle

ORIGINAL SCIENTIFIC ARTICLES

PUSTAVRH, Jan, TRAJKOVSKI, Ana, TIČ, Vito, POLAJNAR, Marko, BOHINC, Uroš, MAJDIČ, Franc. Analysis of different guide elements' designs in hydraulic cylinders. Applied sciences. April 2025, vol. 15, iss. 9, [article no.] 4738, 21 str., ilustr. ISSN 2076-3417.

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PROJECTS

Ministry of Agriculture, Forestry and Food - EIP. MOTIKA. Pospešeno okopavanje zelenjave. Franc Majdič. 19.5.2022 - 18.5.2025

Slovenian Research and Innovation Agency. SOFT LOGGING. Mehko robotski hidravlični vpenjalni sistem hlodovine . Franc Majdič. 1.10.2023 - 30.9.2026

Akrapovič d.d. Dodelava BTW 2. os. Franc Majdič. 24.4.2025 - 22.12.2025

PATENTS

OMAN, Simon, NAGODE, Marko, KLEMENC, Jernej, MAJDIČ, Franc, HOČEVAR, Marko, GOSAR, Aleš, ŠKRLEC, Andrej, OLAH, Laslo. Submersible pump assembly and method for use of same : European patent specification EP 4 093 970 B1, 2025-06-11. Munich: European Patent Office, 2025.

OMAN, Simon, NAGODE, Marko, KLEMENC, Jernej, MAJDIČ, Franc, HOČEVAR, Marko, GOSAR, Aleš, ŠKRLEC, Andrej, OLAH, Laslo. Submersible pump assembly and method for use of same : European patent specification EP 4 093 971 B1, 2025-06-11. Munich: European Patent Office, 2025.

DOCTORAL DISSERTATIONS

NOVAK, Nejc. Vpliv delcev na delovanje in trajnost zobniških črpalk : doktorsko delo. Ljubljana: [N. Novak], 2025. Mentor: Majdič, Franc. Co-mentor: Kalin, Mitjan.

EQUIPMENT

Advanced modular hydraulic power unit (MHPU) for research and development of hydraulic and other machine components. Aris paket23.

AWARDS AND ACHIEVEMENTS

Tch. Asst. dr. Nejc Novak received an Award for an outstanding contribution in the engineering category (Akademija strojništva 2025).

07 SYNERGETICS OF COMPLEX SYSTEMS AND PROCESSES

Development of new as well as optimisation of existing technologies, systems and processes with complex and time-varying properties requires an understanding of the mutual nonlinear interactions which can often lead to instabilities and even chaos, and are reflected in the corresponding temporal spatial structures.

The main aim of the research programme is to contribute to world science with regards to description and understanding of complex technological systems and processes. Methods of research are based on synergetic approach to complex systems which includes use of advanced methods of probability and statistics, information theory, chaotic dynamics, soft computing, data mining, adaptive empirical modelling, machine learning, methods of optimisation and predictive control. Within the context of the programme, research is conducted in the field of additive technologies using direct laser deposition of materials, in the field of adaptive information systems for automated monitoring, optimisation and control of complex technological systems and processes, and in the field of non-destructive diagnostics of loaded materials and products.

Photo: Željko Stevanić, IFP d.o.o

Laboratory for Synergetics LASIN

RESEARCH AREAS

Synergetics • Technology driven physics • Additive manufacturing • Direct laser deposition • Empirical modelling and industrial diagnostics • Optimisation and predictive control

DEPARTMENT HEAD Prof. dr. Edvard Govekar
DEPARTMENT MEMBERS Asst. Prof. dr. Primož Potočnik, Tch. Asst. dr. Andrej Jeromen, Tch. Asst. Jaka Simončič, Jr. Res. Rehman Hammad Ur, Assist. Jr. Res. dr. Nair Anish, Teja Pirnat

ORIGINAL SCIENTIFIC ARTICLES

POTOČNIK, Primož, NAIR, Anish, JEROMEN, Andrej, GOVEKAR, Edvard. Minimizing part deformation in laser deposition by evolutionary optimization of laser beam path. Engineering computations. Oct. 2025, vol. , issue , str. 1-14, ilustr. ISSN 0264-4401.

POTOČNIK, Primož. Model predictive control for autonomous ship navigation with colreg compliance and chart-based path planning. Journal of marine science and engineering. 2025, vol. 13, iss. 7, [art. no.] 1246, str. 1-22, ilustr. ISSN 2077-1312.

JEROMEN, Andrej, NAIR, Anish, RODIČ, Peter, SAČER, Denis, KAPUN, Barbara, ČATER, Maša, BRUNČIĆ, Ana, KOZLICA, Katarina, MILAČIČ ŠČANČAR, Radmila, CÖR, Andrej, GOVEKAR, Edvard, MILOŠEV, Ingrid, HORVAT, Simon. DED-LB manufactured Ti–6Al–4V–4Cu alloy : materials development, characterization, and in vivo biocompatibility. Journal of materials research and technology. [Spletna izd.]. Nov.-Dec. 2025, vol. 39, str. 5597-5611, ilustr. ISSN 2214-0697.

MEDE, Tijan, JEROMEN, Andrej, GOVEKAR, Edvard, MALLON, Michael, GODEC, Matjaž. Influence of particle size on powder velocity distribution at the nozzle outlet in Directed Energy Deposition. Materials & design. Nov. 2025, vol. 259, [article no.] 114680, str. 1-10, ilustr. ISSN 0264-1275.

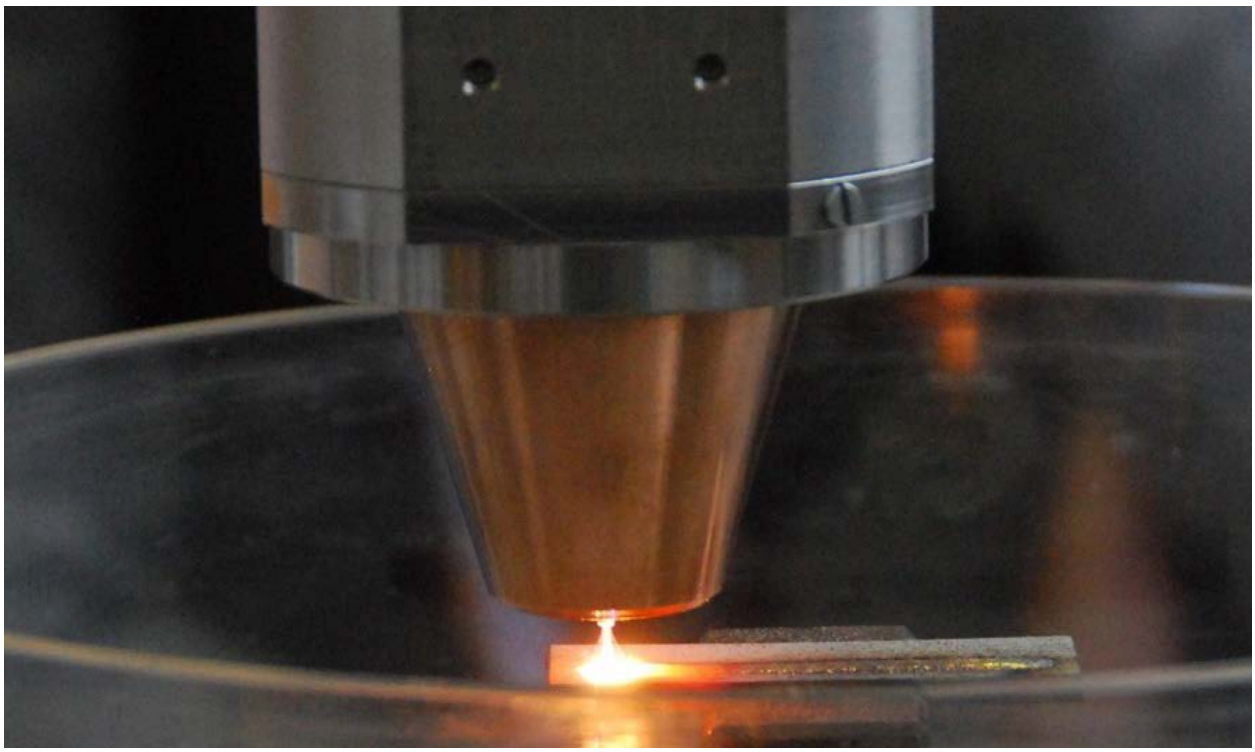


Photo: Željko Stevanić, IFP d.o.o

PROJECTS

Horizon Europe. SEAMAC. Strengthening the Excellence of Additive Manufacturing Capabilities. Edvard Govekar. 1.1.2023 - 31.12.2025

08 INNOVATIVE PRODUCTION SYSTEMS AND PROCESSES

The programme group Innovative manufacturing systems is continuing the research work from previous years with its main focus on the Smart factories concept.

The aim is to increase the efficiency and flexibility of manufacturing systems and processes (MSP), based on the principles of the Digital Factory, LEAN, AGILE and TQM and aligned with the Industry 4.0 guidelines. In constructing self-adjusting mechanisms of MSP with defined roles we are focusing on the development of an intelligent algorithm that would automatically suggest optimization steps and solutions. We will apply the above mentioned technologies, related to the Smart Factories concepts, also in the fields of smart forming tools, IceJet cutting, high-dynamic hydraulic positioning axes, intelligent MSP in the domain of assembly and packaging of the consumer products, etc.

In this way we are keeping pace with the evolution and the prospect of manufacturing systems and processes, which extends from the current state of the so-called LEAN manufacturing, through the paradigm of Manufuture to smart factories and further on to the concept of Remote factory.

Laboratory for Alternative Technologies LAT

RESEARCH AREAS

Non-traditional machining processes • Additive manufacturing and post-processing • Micromanufacturing technologies

DEPARTMENT HEAD Assoc. Prof. dr. Joško Valentinčič

DEPARTMENT MEMBERS Asst. Prof. dr. Andrej Lebar, Jr. Res. dr. Henri Orbanić, Asst. Prof. dr. Izidor Sabotin, Tch. Asst. dr. Marko Jerman, Pavel Drešar, Tch. Asst Kianiharchegani Ehsan, Jr. Res. Edaklavan Koroth Jithinraj, Tanja Plestenjak

PROJECTS

Horizon Europe. SEAMAC. Strengthening the Excellence of Additive Manufacturing Capabilities. Joško Valentinčič. 1.1.2023 - 30.6.2026

EQUIPMENT

Upgrade of metal 3D printing systems for aditive manufacturing of advanced materials and multimaterial parts. Aris paket23.

AWARDS AND ACHIEVEMENTS

Assist. Dr. Marko Jerman, Assoc. Prof. Dr. Joško Valentinčič, Pavel Drešar, Assist. Prof. Dr. Izidor Sabotin and Assist. Dr. Andrej Lebar received the 1st Rector's Award for Best Innovation in the Researchers category at the University of Ljubljana for their innovation IceJet – cleaner and more efficient cutting.

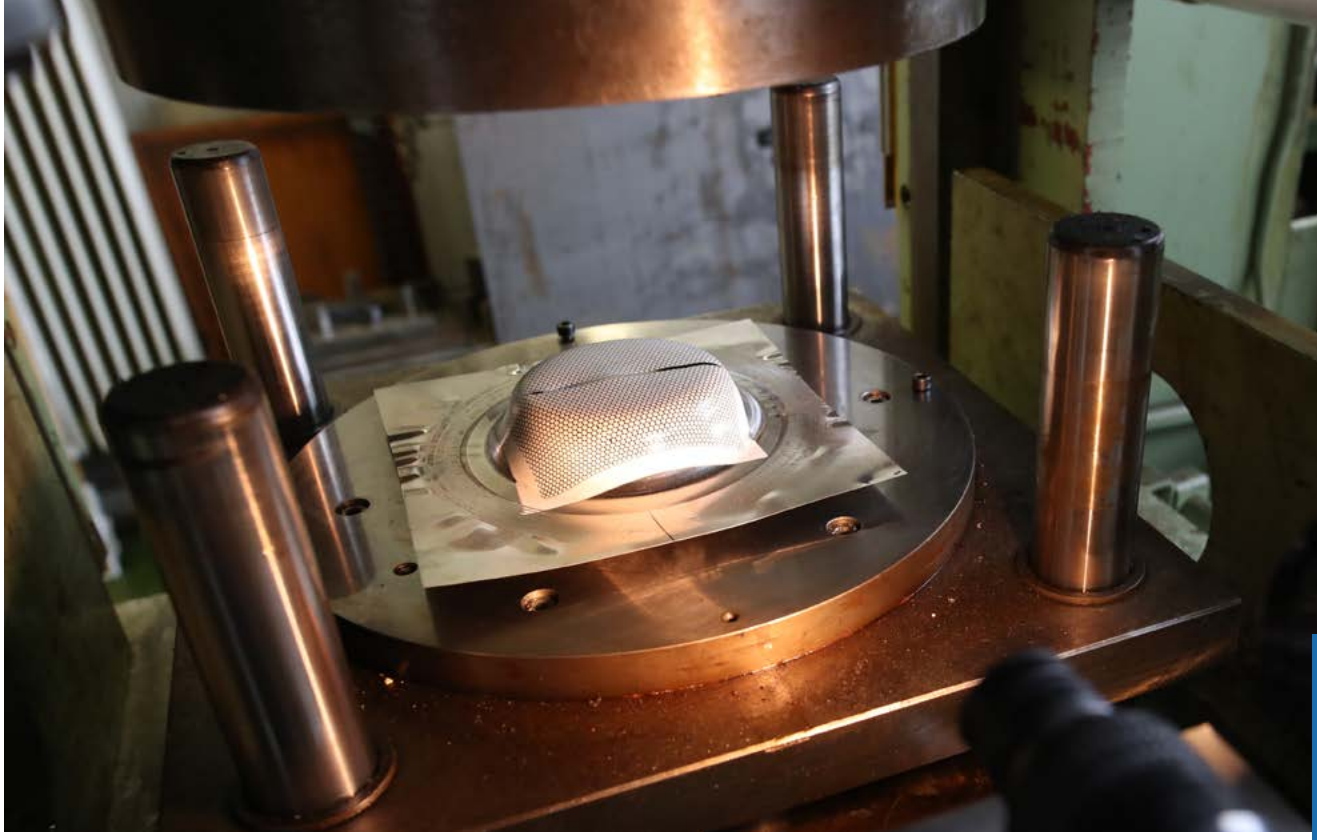


Photo: Željko Stevanić, IFP d.o.o.

Forming Laboratory LAP

RESEARCH AREAS

Theory of plasticity • Forming properties of materials • Forming processes • Biomimetics in forming • Tribology in forming, CARP, CAE, MKE

DEPARTMENT HEAD Assoc. Prof. dr. Tomaž Pepelnjak
DEPARTMENT MEMBERS Tch. Asst. dr. Luka Sevšek, Matjaž Rot, Jr. Res. Ema Stefanovska, Tanja Plestenjak

ORIGINAL SCIENTIFIC ARTICLES

STEFANOVSKA, Ema, PEPELNJAK, Tomaž. Optimising predictive accuracy in sheet metal stamping with advanced machine learning: A LightGBM and neural network ensemble approach. Advanced engineering informatics. May 2025, vol. 65, pt a, [art.] 103103, str. 1-17, ilustr. ISSN 1474-0346.

SEVŠEK, Luka, ŠIMIC, Marko, HERAKOVIČ, Niko, PEPELNJAK, Tomaž. Development of an innovative hydraulic press for incremental forming: machine and process evaluation using a hybrid two-step process. Materials & design. Oct. 2025, vol. 258, [article no.] 114602, str. 1-18, ilustr. ISSN 0264-1275.

PROJECTS

Dafra d.o.o. Izdelava digitalnega dvojčka mehatronskega štančnega orodja v okviru projekta »Pametno mehatronsko progresivno štančno orodje za izdelavo kombinacijskih setov tipskih izdelkov«. Tomaž Pepelnjak. 15.4.2024 - 14.4.2025

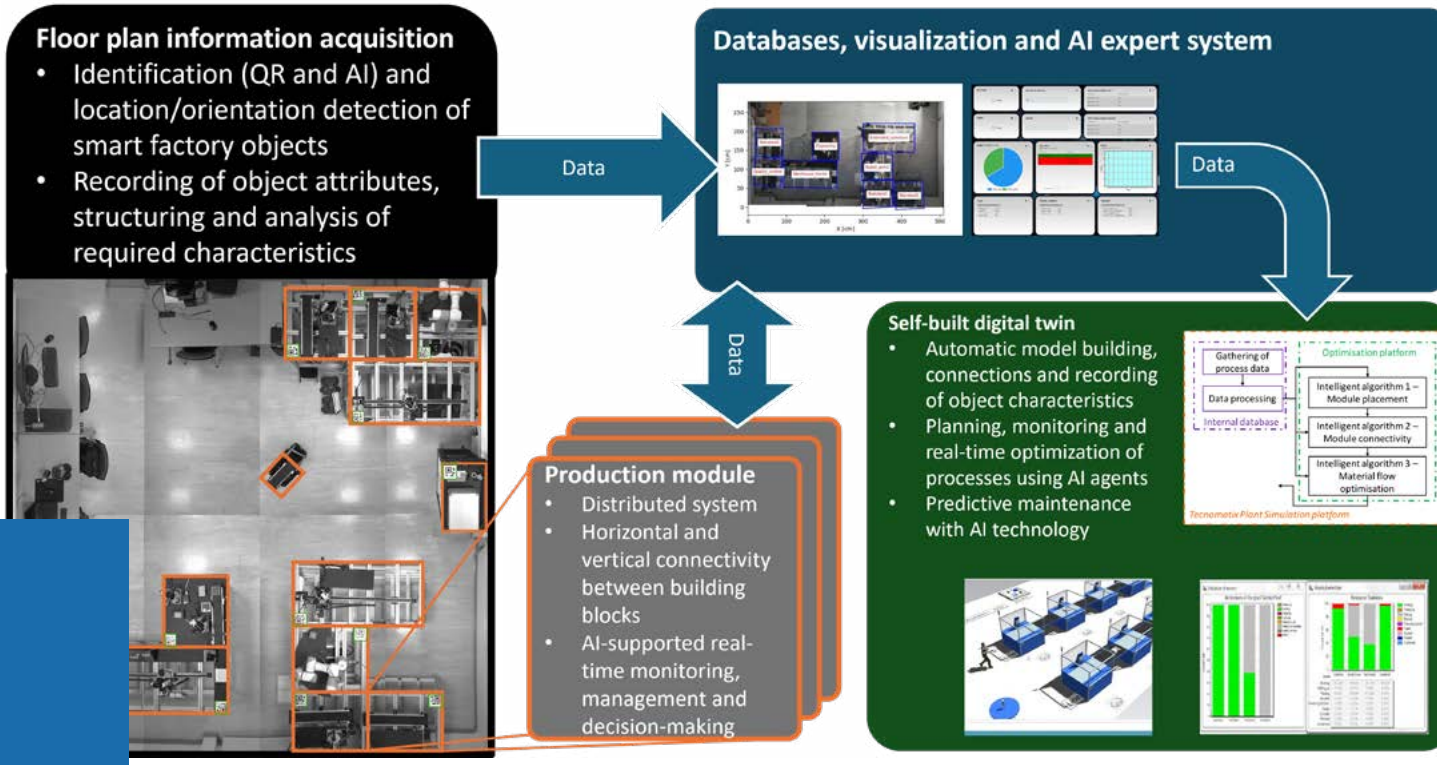
DOCTORAL DISSERTATIONS

SEVŠEK, Luka. Razvoj tehnologij inkrementalnega preoblikovanja na visoko-energijskih preoblikovalnih strojih : doktorsko delo. Mentor: Pepelnjak, Tomaž. Co-mentor: Šimic, Marko.

AWARDS AND ACHIEVEMENTS

Assist. Res. Ema Stefanovska received the Faculty Award for researchers under the age of 35 for outstanding research achievements.

Smart modular production



Laboratory for Handling, Assembly and Pneumatics
LASIM

RESEARCH AREAS

Smart Factories • Industry 4.0 and 5.0 • Digital Twins of Production and Logistics processes • IoT and 5G Technologies in Smart Factories • LPM-Lean Production Management Software • Production Logistics and Resources • Assembly and Handling • Smart Manual Workplaces and Ergonomics • Robotics in production • Smart Hydraulic and Pneumatic Systems • Piezo engineering

DEPARTMENT HEAD Prof. dr. Niko Herakovič

DEPARTMENT MEMBERS Assoc. Prof. dr. Marko Šimic, Asst. Prof. dr. Mihael Debevec, Asst. Prof. dr. Miha Pipan, Tch. Asst. dr. Hugo Zupan, Tch. Asst. dr. Matevž Resman, Edo Adrović, Tch. Asst. dr. Denis Jankovič, Tch. Asst. Jure Filip Vuzem, Blaž Dobravec, Jr. Res. Jakob Šturm, Petra Pintar, Tanja Plestenjak

ORIGINAL SCIENTIFIC ARTICLES

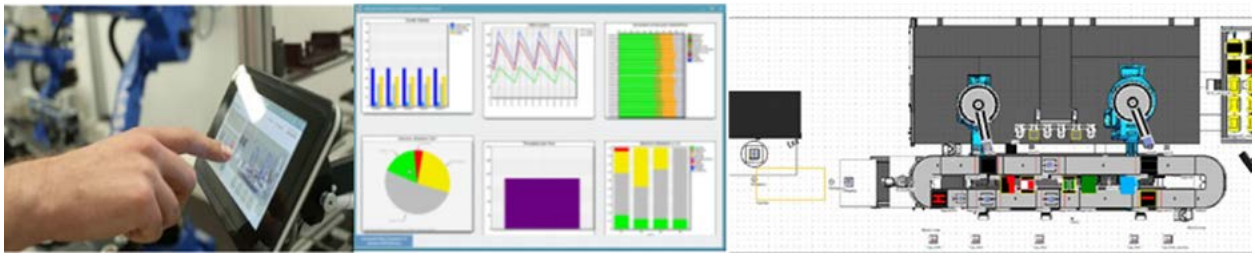
PIPAN, Miha, DEBEVEC, Mihael, HERAKOVIČ, Niko. Improved static model for pneumatic artificial muscle based on virtual work and bladder radial deformation work losses. Actuators. [Online ed.]. 2025, vol. 14, issue. 11, [article no.] 560, 17 str., ilustr. ISSN 2076-0825.

SEVŠEK, Luka, ŠIMIC, Marko, HERAKOVIČ, Niko, PEPELNJAK, Tomaž. Development of an innovative hydraulic press for incremental forming: machine and process evaluation using a hybrid two-step process. Materials & design. Oct. 2025, vol. 258, [article no.] 114602, str. 1-18, ilustr. ISSN 0264-1275.

RESMAN, Matevž, HERAKOVIČ, Niko, DEBEVEC, Mihael. Integrating digital twin technology to achieve higher operational efficiency and sustainability in manufacturing systems. Systems. 2025, vol. 13, no. 3 , [article no.] 180, 25 str., ilustr. ISSN 2079-8954.

RESMAN, Matevž, DEBEVEC, Mihael, HERAKOVIČ, Niko. Using digital twin technology to improve the organization of the supply chain in piece type of production. Systems. 2025, vol. 13, issue 7 , [article no.] 505, 10 str., ilustr. ISSN 2079-8954.

Intelligent solutions and technologies for Factories of the Future



VUZEM, Filip Jure, PIPAN, Miha, ZUPAN, Hugo, ŠIMIC, Marko, HERAKOVIČ, Niko. Automated generation of simulation models and a digital twin framework for modular production. Systems. 2025, vol. 13, iss. 9, [article no.] 800, 32 str., ilustr. ISSN 2079-8954.

PROJECTS

Slovenian Research and Innovation Agency. Research on the reliability and efficiency of edge computing in a smart factory using 5G technologies. Niko Herakovič. 1.10.2022 -30.9.2025

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Marko Šimic. 1.1.2024 – 30.6.2026

Horizon Europe. STAGE. Sustainable Transition to the Agile and Green Enterprise. Marko Šimic. 1.6.2022 - 31.5.2025

Horizon Europe. INNO2MARE. Strengthening the capacity for excellence of Slovenian and Croatian innovation ecosystems to support the digital and green transitions of maritime regions. Marko Šimic. 1.1.2023 – 31.12.2026

AWARDS AND ACHIEVEMENTS

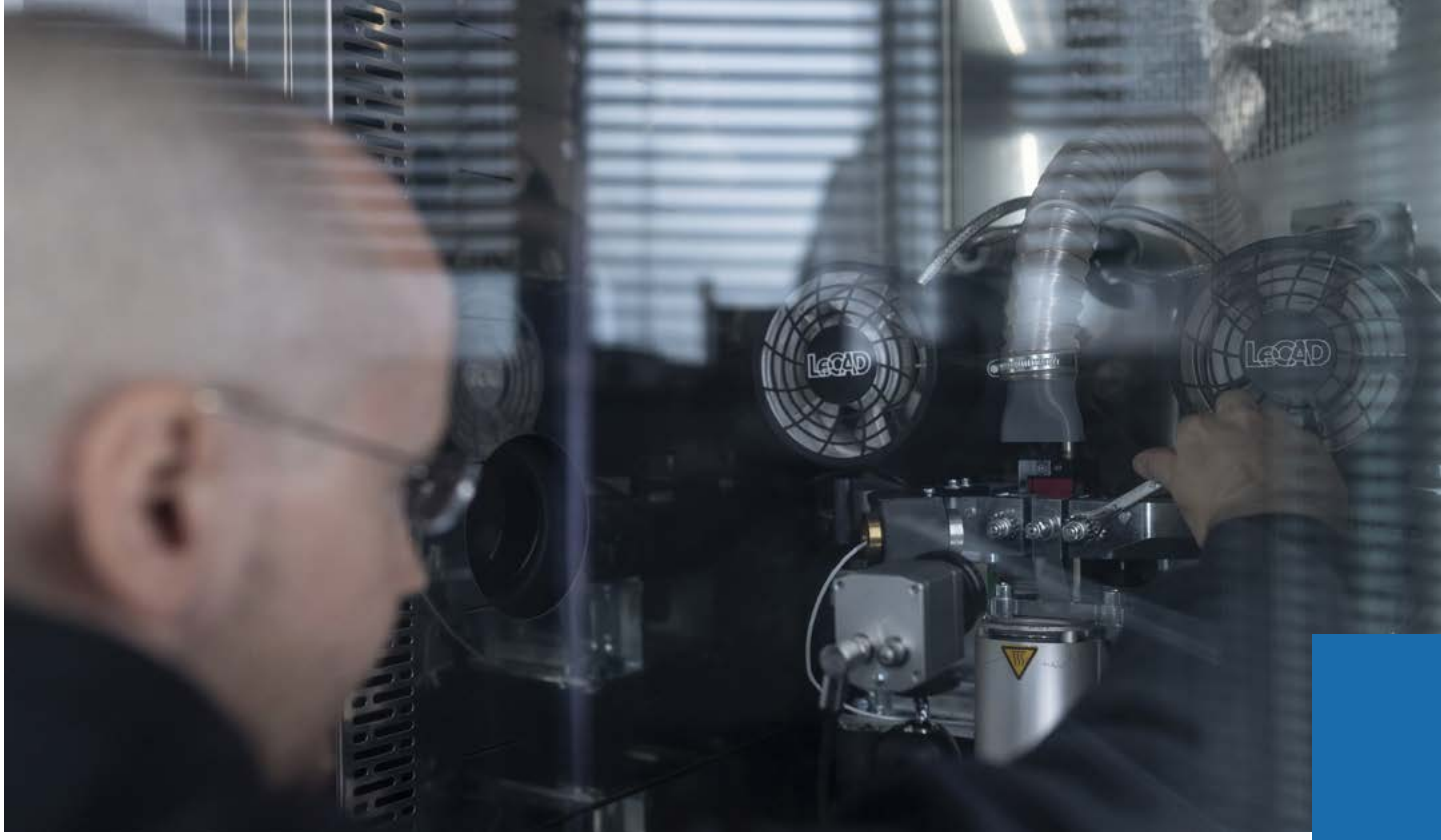
Prof. dr. Niko Herakovič has been appointed President of the Governing Board of the University of Ljubljana.

09 ENGINEERING DESIGN

The Engineering design programme group develops basic and applied knowledge needed for the development of new products: design models and methods of innovation, in-depth application of CFX methods, PDM/PLM methods for comprehensive management of information flows in companies, physical/mathematical modelling of polymer gears, and hybrid numerical methods with code development in the field of fusion (ITER) and wider (plasma simulation).

The research was carried out in four basic directions, providing knowledge in the field of design necessary for the innovative development of new products and their implementation. The group has established supercomputing structures in the Slovenian academic environment and is integrated into projects of the supercomputer association PRACE.

Together with domestic and foreign companies (Germany, Japan, China) the group participates in projects in the fields of fusion research (ITER, MSU-USA), auxiliary heart pump (TU Eindhoven and UT Houston) and development of polymer gears and gear trains. The group also implements the model of laboratories, linked to companies.



Laboratory for Engineering Design LECAD

RESEARCH AREAS

Engineering Design • ComputerAided Design • Technical Information System • Kansei Engineering • Polymer Gears Research • High- Performance Computing • Big Data Analysis • Computer-Intensive Methods and Applications • Mathematical Optimisation • Plasma Sheath Transition Research • Fusion Process Simulation • Integrated Modelling of Fusion

DEPARTMENT HEAD Assoc. Prof. dr. Nikola Vukašinović

DEPARTMENT MEMBERS Assoc. Prof. dr. Leon Kos, Jr. Res. dr. Janez Benedičič, Asst. Prof. dr. Vanja Čok, Asst. Prof. dr. Ivan Demšar, Asst. Prof. dr. Tadej Kanduč, Tch. Asst. dr. Pavel Tomšič, Tch Asst. dr. Bor Mojškerc, Tch. Asst. dr. Ivona Vasileska, Tch. Asst. dr. Jernej Kovačič, Jr. Res. dr. Stefan Costea, Matjaž Šubelj, Tch. Asst. dr. Matic Brank, Aleš Durjava, Tch. Asst. Aljaž Žafran, Mateja Maffi, Gašper Omahen, Leon Bogdanovič, Prof. dr. Janez Povh, Assist, Asst. Prof. dr. Tadej Kanduč, Asst. Prof. dr. Aleksander Grm, Tch. Asst. dr. Uroš Urbas, Tch. Asst. Luka Samsa, Asst. prof. dr. Simon Kulovec, Jr. Res. dr. Ezhilmathi Krishnasamy, Tch. Asst. Blaž Zgonec, Tch. Asst. Nermina Nuhanović, Gregor Simič, Renata Piščanec

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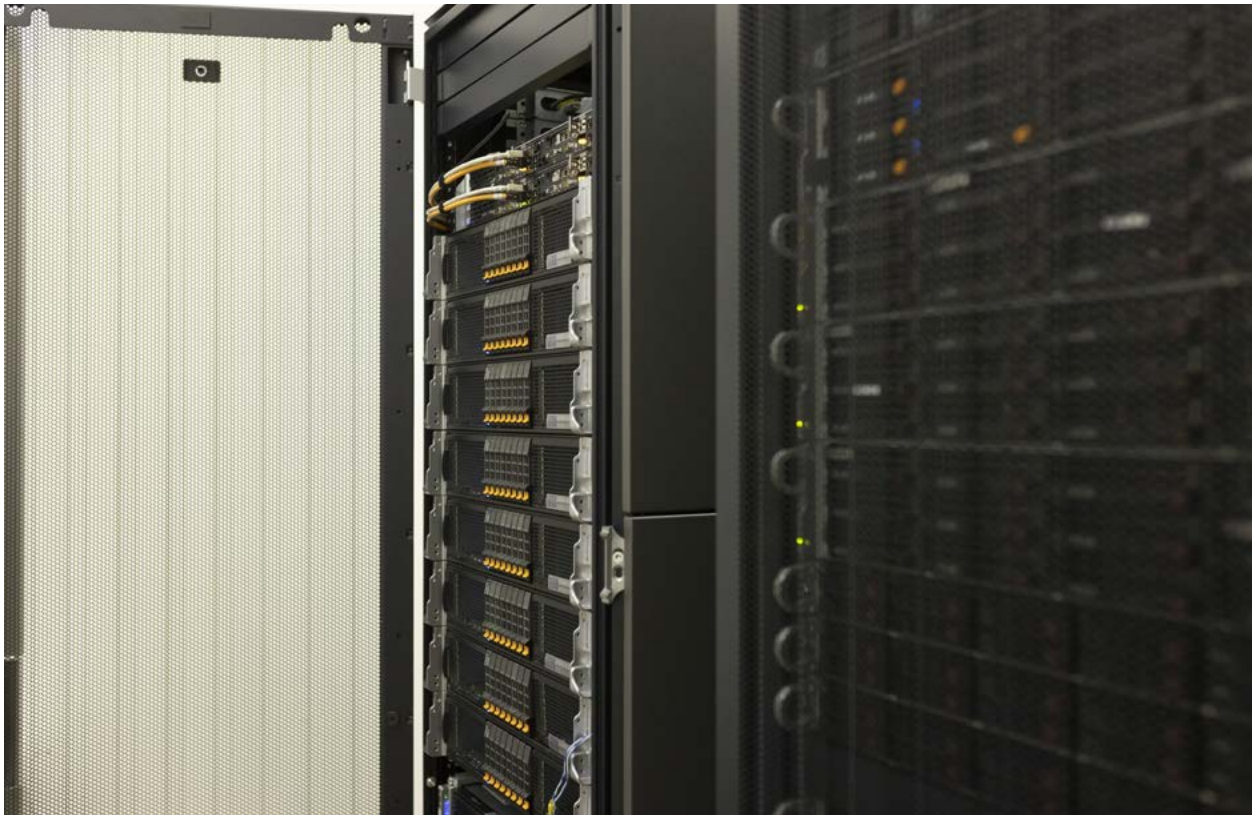

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PROJECTS

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Horizon 2020. EUMaster4HPC. European Master for High Performance Computing. Janez Povh. 1.1.2022 - 31.12.2025

Horizon Europe. Plasma-PEPSC. Plasma Exascale-Performance Simulations CoE – Pushing flagship plasma simulations codes to tackle exascale-enabled Grand Challenges via performance optimization and codesign. Leon Kos. 1.2.2023 – 31.12.2026

Slovenian Research and Innovation Agency. HEXAPIC. Delčna koda za heterogene računalniške arhitekture na ravni eksa. Leon Kos. 1.9.2024 - 31.8.2027

Horizon Europe. MAGRITTE. Recovering plasma-facing components temperatures in fusion devices from IR camera measurements. 1.9.2024 – 31.8.2026

Horizon Europe. EuroCC 2. National Competence Centres in the framework of EuroHPC Phase 2. Pavel Tomšič. 1.1.2023 – 31.12.2025

Horizon Europe. EXCELLERAT P2. European Centre of Excellence for Engineering Applications on HPC and associated technologies. Matic Brank. 1.1.2023 - 31.12.2026

Horizon Europe. EXCELLERAT P2. European Centre of Excellence for Engineering Applications on HPC and associated technologies. Matic Brank. 1.1.2023 - 31.12.2026

Erasmus+. GenAID. Generative AI aiding in Product Development. Vanja Čok. 1.9.2025 - 31.8.2028

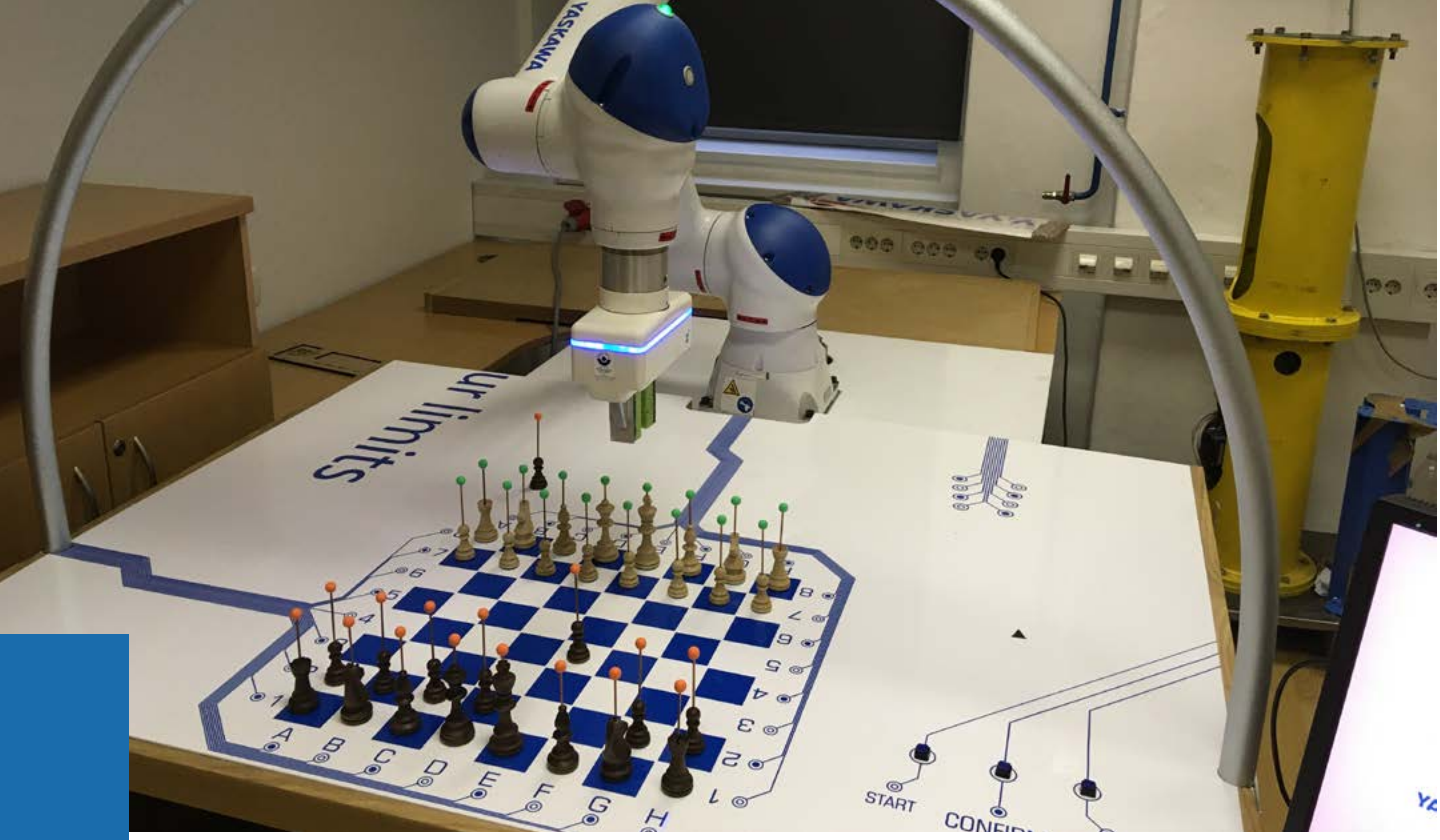
Digital Europe Programme. AIMED-HPC. Advanced Multi-objective optimization of Energy management systems using Deep neural networks and HPC for teal-time, multi-step energy forecasting. Nikola Vukašinovič. 30.1.2025 - 29.4.2026

Slovenian Research and Innovation Agency. A2FOMS. Optimizacijsko ogrodje pridružene in umetne inteligence za optimizacijo kompleksnih večfizikalne simulacijskih modelom. Leon Kos. 1.1.2025 - 31.12.2027

EQUIPMENT

Upgrade of High Performance Cluster Prelog (HPCFS-U3)

Chamber with a thermal imaging camera for precise active climate control during testing of polymer and polymer composite gears. Aris paket23.



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Laboratory for Material Handling and Machine Structures LASOK

RESEARCH AREAS

Load-bearing structures • Welded structures • Pressure vessels and pipelines • Lifting and transport devices • Development • Optimisation • Evaluation

DEPARTMENT HEAD Assoc. Prof. dr. Boris Jerman
DEPARTMENT MEMBERS Tch. Asst. dr. Jurij Hladnik, mag. Metod Čuk, Renata Piščanec

10 MECHANICS IN ENGINEERING

The Mechanics in engineering programme group consists of four laboratories: The Laboratory for Dynamics of Machines and Structures (LADISK), the Laboratory for Numerical Modelling and Simulation (LNMS), the Laboratory for Non-Linear Mechanics (LANEM) and the Laboratory for aeronautics (AEROL).

LADISK: Within the context of flexible multibody system dynamics, the research is focused on advanced methods of valid nonlinear dynamics modelling of rigid-flexible multibody systems with unilateral contacts or large displacements/deformations. In the field of structural dynamics, the group is focused on management of vibration fatigue and product noise. Here, the main emphasis is on research into valid models. Research activities are also geared toward smart structures with sensing function and the development of advanced optical methods for identifying dynamic parameters of structures.

LNMS: Long-term research activities are related to the constitutive modelling of the metallic materials response and the development of numerical methods in this field, whereby the numerical aspect of an effective integration of developed algorithms into the FEM programs is crucial. The more complex constitutive models also require the development of algorithms for inverse identification of model parameters.

LANEM: The theory of elasticity and thermoelasticity, geometric and material nonlinearities, stability, fluid mechanics, inelastic deformation, materials with shape memory, characterization of mechanical properties of materials, biomechanics.

AEROL: Development of unmanned aerial vehicles and systems, research into the possibility of controlling unmanned aerial vehicles using cameras and ground landmarks in areas without the GPS signal, aircraft calculation, calculation and measurement of resistance, lift and torque of aerodynamic bodies, measurement of aerodynamic properties and airflow around bodies in the wind tunnel, construction and testing components related to firearms, modelling and mold making for the manufacture of composite parts of unmanned aerial vehicles.

Photo: Željko Stevanić, IFP d.o.o.

Laboratory for Dynamics of Machines and Structures
LADISK

RESEARCH AREAS

Mechanics • Dynamics • Dynamics of machines and structures • Structural dynamics • Vibration fatigue • Mechanical vibrations • Nonlinear vibrations • Dynamics of rigid and flexible multibody systems • Structure-borne noise • Signal processing (CWT, HOS) • Rotor dynamics • Automatic fault detection in mechanical systems • Dynamics of moving continua • Digital image correlation methods

DEPARTMENT HEAD Prof. dr. Janko Slavič

DEPARTMENT MEMBERS Prof. dr. Miha Boltežar, Prof. dr. Gregor Čepon, Asst. Prof. dr. Martin Česnik, Asst. Prof. dr. Domen Ocepek, Assist. dr. Lorenzo Capponi, Jr. Assist. dr. Aleš Mihelič, Jr. Res., dr. Tibor Barši Palmić, Tch. Assist. dr. Miha Kodrič, Tch. Assist. dr. Miha Pogačar, Tch. Assist. dr. Domen Gorjup, Tch. Assist. dr. Klemen Zaletelj, dr. Martin Furlan, Tch. Asst. Gašper Krivic, Tch. Asst. Tim Vrtač, Jr. Res. Jure Korbar, Jr. Res. dr. Domen Kocbek, Tch. Assist. Jaša Šonc, Tch. Assist. Matic Mlinarič, Dubravka Nikčević, Tch. Assist. Tim Mušič, Tch. Assist. Marko Zupan, Tch. Assist. Rozalija Petrovčič, Gal Stanovnik, dr. Blaž Starc, Jr. Res. Filip Marušič, Gregor Ševerkar, Teja Pirnat

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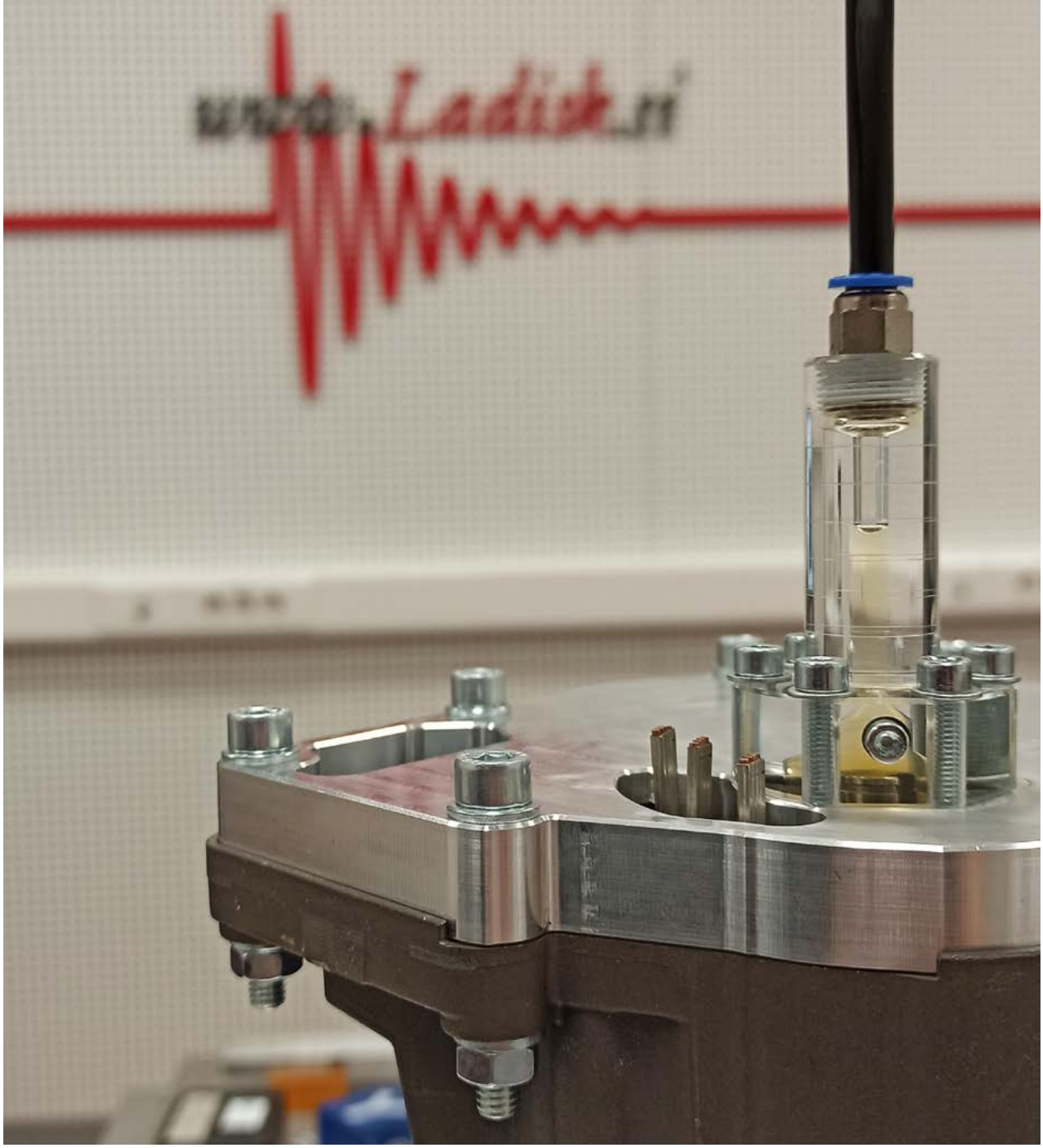

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PROJECTS

Mahle d.o.o. Modularni odprtokodni sistem za končno kontrolo izdelkov brez izmeta in za obdelavo velikih podatkov. Janko Slavič. 24.11.2023 - 30.6.2025

Domel d.o.o. Modularni odprtokodni sistem za končno kontrolo izdelkov brez izmeta in za obdelavo velikih podatkov. Janko Slavič. 10.11.2023 - 30.6.2025

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Janko Slavič. 1.1.2024 – 30.6.2026

Horizon Europe. ARTEMIDE. Outdoor space self-calibrating thermoelasticity-based fatigue damage identification. Janko Slavič. 1.10.2024 – 30.9.2026

European Space Agency ESA. DMSC. Feasibility study of using rigid-body dynamics model to reduce vibrations of miniature rotary integral Stirling cryocoolers. Tibor Barši Palmić. 19.6.2024 – 18.5.2025

European Space Agency ESA. On-demand 3D-printing of individualised space compliant structures with integrated self-sensing capability on-earth and in-orbit . Tibor Barši Palmič. 20.3.2025 - 20.12.2025

Kolektor ETRA. Delo na področju vibracij in hrupa energetskih transformatorjev. Janko Slavič. 1.1.2025 - 31.12.2029

Slovenian Research and Innovation Agency. Self-aware and Active 3D-Printed Dynamics Systems and Structures. Janko Slavič. 1.1.2025 - 31.12.2027

Horizon Europe. DiCiM. Digitalised Value Management for Unlocking the potential of the Circular Manufacturing Systems with integrated digital solutions. Gregor Čepon. 1.1.2023 - 31.12.2026

Gorenje d.o.o. Razvojno raziskovalno sodelovanje ter zakup kapacitet za numerične analize ter izvedbo meritev in preskusov. Gregor Čepon. 27.6.2021 - 27.6.2025

Horizon Europe. CREDIT. Circularity and Remanufacturing-Enabling DIgital Twins. Gregor Čepon. 1.1.2024 – 31.12.2027

Interreg Slovenia-Austria. ECirc4all. A Forward-looking Packaging Solutions From Innovation to Pilot Production: Advanced Moulded Packaging from Alternative Fibers enhanced with Nanocellulose. Miha Pogačar. 1.1.2025 - 31.12.2027

Horizon Europe, TMA MSCA Postdoctoral Fellowships. ARTEMIDE. Outdoor space self-calibrating thermoelasticity-based fatigue damage identification. Janko Slavič. 1.10.2024 - 30.9.2026

DOCTORAL DISSERTATION

VRTAČ, Tim. Hibridni digitalni dvojčki za identifikacijo lokaliziranih dinamskih sprememb z metodami strojnega učenja : doktorsko delo. Mentor: Čepon, Gregor.

EQUPMENT

Experimental system for close to real-time monitoring of multiaxial vibration fatigue Aris paket23.

AWARDS AND ACHIEVEMENTS

Prof. dr. Janko Slavič has received the D.J. DeMichele Award from the Society for Experimental Mechanics (SEM).

Assist. Gašper Krivic received the Faculty Award for researchers under the age of 35 for outstanding research achievements.

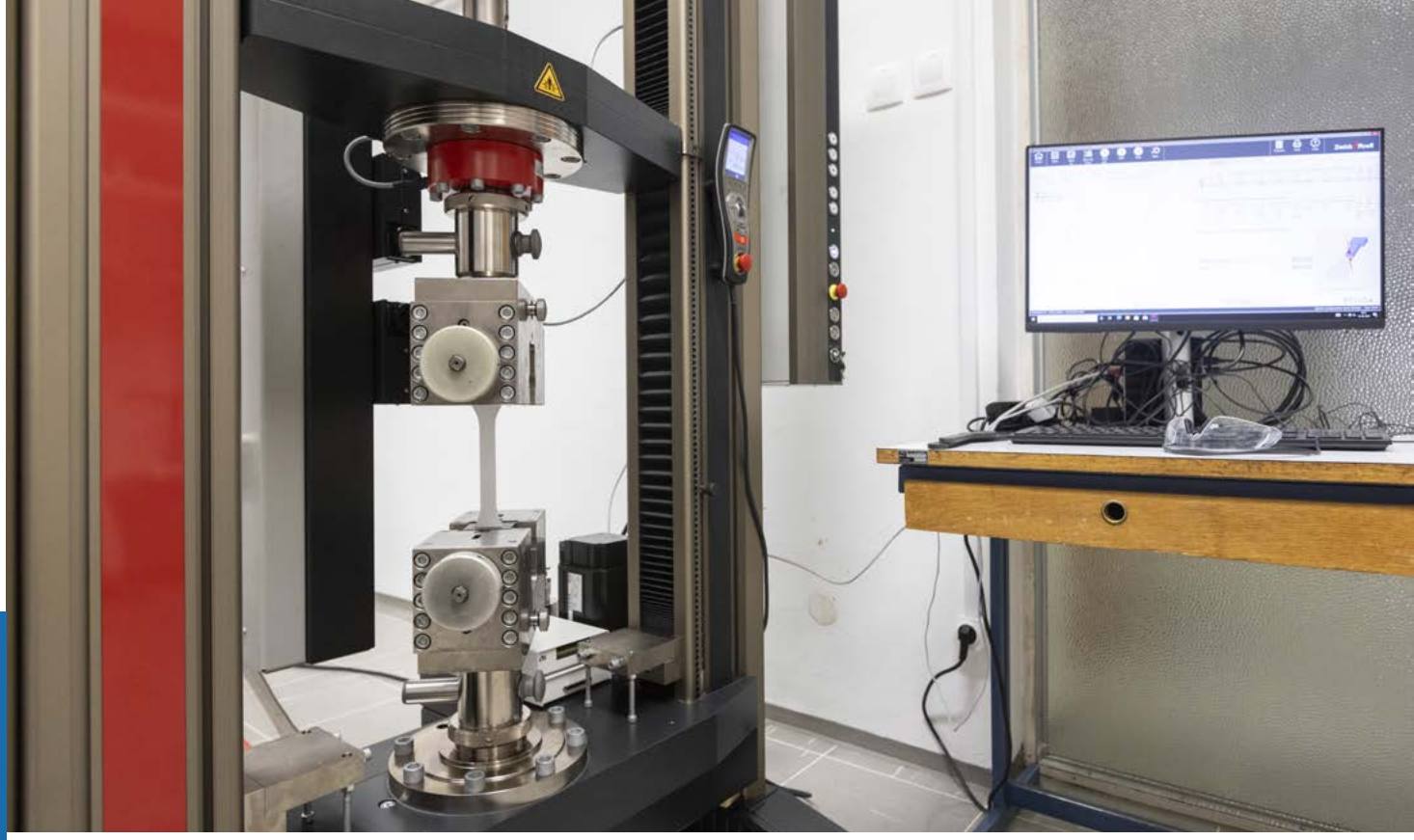


Photo: Željko Stevanić, IFP d.o.o

Laboratory for Non-Linear Mechanics LANEM

RESEARCH AREAS

Nonlinear mechanics • Stability • Mechanics of materials • Materials with shape memory

DEPARTMENT HEAD Assoc. Prof. dr. Miha Brojan

DEPARTMENT MEMBERS Asst. prof. dr. Jaka Tušek, Tch Asst. dr. Jan Zavodnik, Tch. Asst. Jonas Trojer, Jr. Res. dr. Tomaž Brzin, Tch. Asst. Enej Istenič, Jr. Res. dr. Damjan Lolić, dr. Tomaž Videnič, Tch. Asst. Urh Štempihar Jazbec, Jr. Res. dr. Žiga Ahćin, Jr. Res. dr. Stefano Dall'Olio, Jr. Res. Adam Plantarič, Jr. Res. Jan Cerar, Jr. Res. Tomaž Pšeničnik, Benjamin Burgar, Teja Pirnat

ORIGINAL SCIENTIFIC ARTICLES

ZAVODNIK, Jan, BROJAN, Miha. Spherical harmonics-based pseudo-spectral method for quantitative analysis of symmetry breaking in wrinkling of shells with soft cores. Computer methods in applied mechanics and engineering. [Print ed.]. Jan. 2025, vol. 433, pt. b, [art.] 117529, str. 1-19, ilustr. ISSN 0045-7825.

BRZIN, Tomaž, JAWED, Mohammad Khalid, BROJAN, Miha. Generative adversarial network-based inverse design of self-deploying soft kirigami composites for targeted shape transformation. Engineering applications of artificial intelligence. [Print ed.]. June 2025, vol. 149, [art. no.] 110417, 14 str., ilustr. ISSN 0952-1976.

CERAR, Jan, JAN, Petra, KALIN, Mitjan, KLEMENC, Jernej, TUŠEK, Jaka. Towards reliable Ni-Ti components : tribological insights and fatigue behaviour under cyclic compressive loads. Engineering failure analysis. 2025, vol. 179, [article no.] 109766, 21 str., ilustr. ISSN 1873-1961.

VELDIN, Tomo, TROJER, Jonas, BRANK, Boštjan, BROJAN, Miha. Wrinkling of thin plates and shells on shrinking substrates. Thin-walled structures. 2025, vol. 215, [article no.] 113504, 14 str., ilustr. ISSN 1879-3223.

Photo: UL FME Archive

PROJECTS

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Miha Brojan. 1.1.2024 – 30.6.2026

Slovenian Research and Innovation Agency. Morphing soft kirigami composite system for the design of flexible deployables and soft-robots. Miha Brojan. 1.10.2022 – 30.9.2025

Slovenian Research and Innovation Agency. COOL PRESS. Solid-state cooling with pressure: Development of barocaloric cooling device. Jaka Tušek. 1.10.2022 - 30.9.2025

Horizon Europe. FROSTBIT. First Regenerative sOlid-STate Barocaloric refrigerator. Jaka Tušek. 1.10.2024 - 30.9.2028

Horizon Europe. SMACool. Shape Memory Alloy based elastocaloric Cooling system. Jaka Tušek. 1.10.2024 - 30.9.2027

Slovenian Research and Innovation Agency. Advanced elastoclaoric regenerators. Jaka Tušek. 1.9.2024 - 31.8.2027

Horizon Europe. E-CO-HEAT. Elastocaloric COoling and HEAT-pumping. Jaka Tušek. 1.9.2024 - 28.2.2026

DOCTORAL DISSERTATIONS

ZAVODNIK, Jan. Evolucija deformacijskih vzorcev večplastnih viskoelastičnih struktur: doktorsko delo. Mentor: Brojan, Miha.

BRZIN, Tomaž. Inverse prediction of design parameters for forming soft morphing structures using deep generative models : doctoral thesis. Mentor: Brojan, Miha. Co-mentor: Jawed, M. Khalid

AWARDS AND ACHIEVEMENTS

Assist. Urh Štempihar Jazbec received an award for excellence in teaching.

Photo: Željko Stevanić, IFP d.o.o

Laboratory for Numerical Modelling and Simulation LNMS

RESEARCH AREAS

Mechanics • Numerical methods • Computer simulations of technological processes • Modelling of thermomechanical processes • Optimization of products and processes • Nuclear engineering • Constitutive modelling • Electromagnetism • Finite element method and boundary element method

DEPARTMENT HEAD Assoc. Prof. dr. Miroslav Halilovič

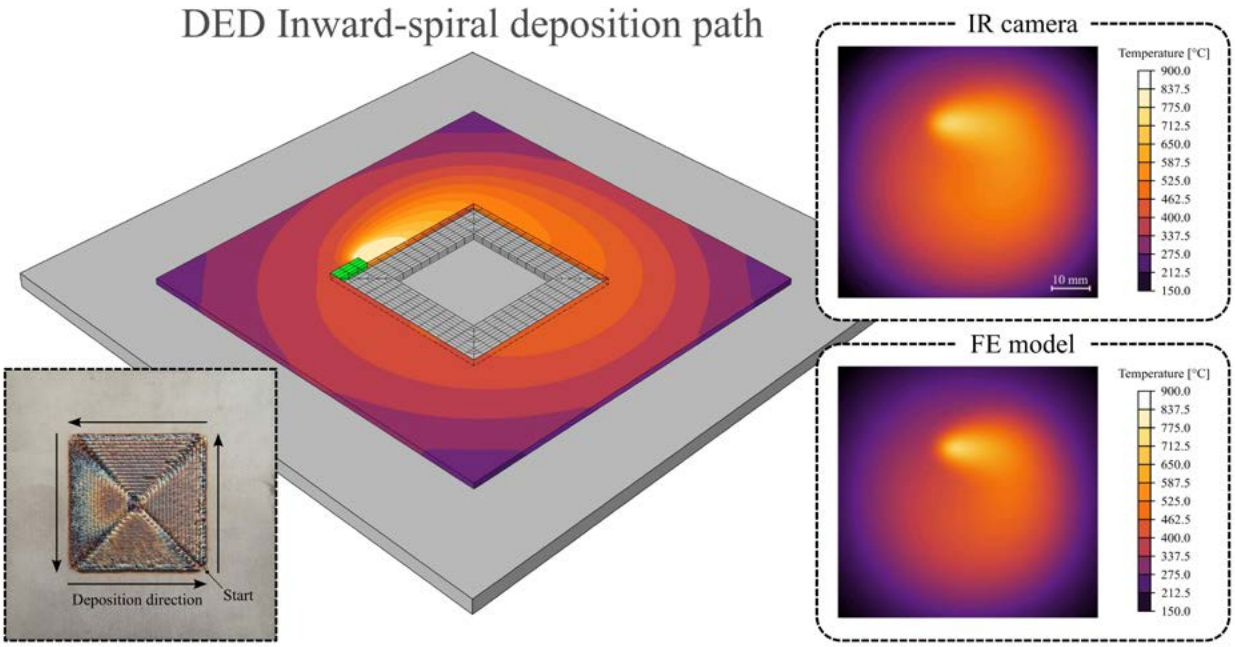
DEPARTMENT MEMBERS Assoc. Prof. dr. Nikolaj Mole, Asst. Prof. dr. Pino Koc, dr. Primož Rus, Asst. Prof. dr. Bojan Starman, Asst. Prof. dr. Janez Urevc, Tch. Asst. dr. Štefan Obid, Tch. Asst. Tomaž Kastelic, Tch. Asst. Dejan Kovšca, Tch Asst. dr. Andraž Maček, Andrej Bergauer, Teja Pirnat

ORIGINAL SCIENTIFIC ARTICLES

STARMAN, Bojan, PEPELNJAK, Tomaž, MAČEK, Andraž, HALILOVIČ, Miroslav, COPPIETERS, Sam. Inverse calibration of out-of-plane shear anisotropy parameters of sheet metal. International Journal of Solids and Structures. [Online ed.]. May 2025, vol. 313, [article no.] 113313, 20 str., ilustr. ISSN 1879-2146.

STARMAN, Bojan, CHEN, Bin, MAČEK, Andraž, ZHANG, Yi, HALILOVIČ, Miroslav, COPPIETERS, Sam. Characterising through-thickness shear anisotropy using the double-bridge shear test and finite element model updating. Materials. 2025, vol. 18, iss. 10, [article no.] 2220, 20 str., ilustr. ISSN 1996-1944.

NABERGOJ, Matija, UREVC, Janez, HALILOVIČ, Miroslav. Modelling of mechanical response of weldlines in injection-moulded short fibre-reinforced polymer components. Polymers. 2025, vol. 17, no. 19, [article no.] 2712, str. 1-20, ilustr. ISSN 2073-4360.



PROJECTS

Gorenje d.o.o. Raziskovalno razvojno sodelovanje ter zakup kapacitet za numerične analize ter izvedbo meritev ter preskusov. Miroslav Halilovič. 1.2.2025 - 31.1.2027

SAINT-GOBAIN, ZAG, Znanstveno raziskovalno središče Bistra Ptuj. SPL CYCLE 2. Izvedba pravnega varstva intelektualne lastnine in komercializacije rezultatov. Miroslav Halilovič. 1.7.2024 - 30.6.2027

NEK d.o.o. Izdelava neodvisnih analiz in strokovnega mnenja na poročila vezano na puščanje SI-53 cevovoda. Miroslav Halilovič. 19.12.2023 - 31.12.2025

DOCTORAL DISSERTATIONS

OBID, Štefan. Konstitutivno modeliranje materialov z upoštevanjem odvisnosti od napetostne troosnosti na osnovi elastičnega potenciala : doktorsko delo. Mentor: Halilovič, Miroslav.

EQUIPMENT

Micro-Wire EDM Machine Aris paket23.

AWARDS AND ACHIEVEMENTS

Assoc. Prof. dr. Miroslav Halilovič received an award for excellence in teaching. Tch. Asst. dr. Štefan Obid received an Award for the best contribution at Akademija Strojništva 2025.

Photo: Željko Stevanić, IFP d.o.o

Laboratory for aeronautics AEROL

RESEARCH AREAS

Construction mechanics • Special development know-how • Special constructions know-how

DEPARTMENT HEAD Sr. Instr. dr. Igor Petrović

DEPARTMENT MEMBERS Tch. Asst. Peter Pipp, Branimir Filovski, Tch. Asst. dr. Aleksej Majkić, Teja Pirnat

ORIGINAL SCIENTIFIC ARTICLES

PETROVIĆ, Igor, VUČAJNK, Filip, ŠPANIĆ, Valentina. Detection of fusarium head blight in wheat using ndvi from multispectral uas measurements and its correlation with don contamination. AgriEngineering. 2025, vol. 7, no. 2, [article no.] 37, 14 str., ilustr. ISSN 2624-7402.

PETROVIĆ, Igor, VUČAJNK, Filip, TRDAN, Stanislav, BERNIK, Rajko, VIDRIH, Matej. The influence of planting speed of a maize vacuum planter on plant spacing variability and ear parameters. Agronomy. Feb. 2025, vol. 15, issue 2, [article no.] 462, 16 str., ilustr. ISSN 2073-4395.

PROJECTS

Ministry of Defence. Strateška ureditev področja BLS. Igor Petrović. 2.9.2024 - 31.8.2025

11 SUSTAINABLE POLYMER MATERIALS AND TECHNOLOGIES

The Sustainable polymer materials and technologies programme group covers basic research on non-linear time-dependent behaviour of polymers and their composites which are regarded as dissipative systems. The programme is divided into three complementary research spheres:

SPHERE 1: Study of the structure-property relationship in polymeric materials (without changing their chemical composition) and the means of controlling their inherent topological structure. This allows us to control their physical properties and, consequently, to fit properties of polymeric materials to a particular application.

SPHERE 2: Development of experimental methods for analyzing dissipative time-dependent behaviour of materials that will allow characterisation and prediction of the durability of products made of polymeric materials.

SPHERE 3: Development of theoretical models and numerical tools which, together with new experimental methods, can be used to predict the mechanical behaviour of polymers and their nano-, micro-, and macrocomposites over a longer period of time.

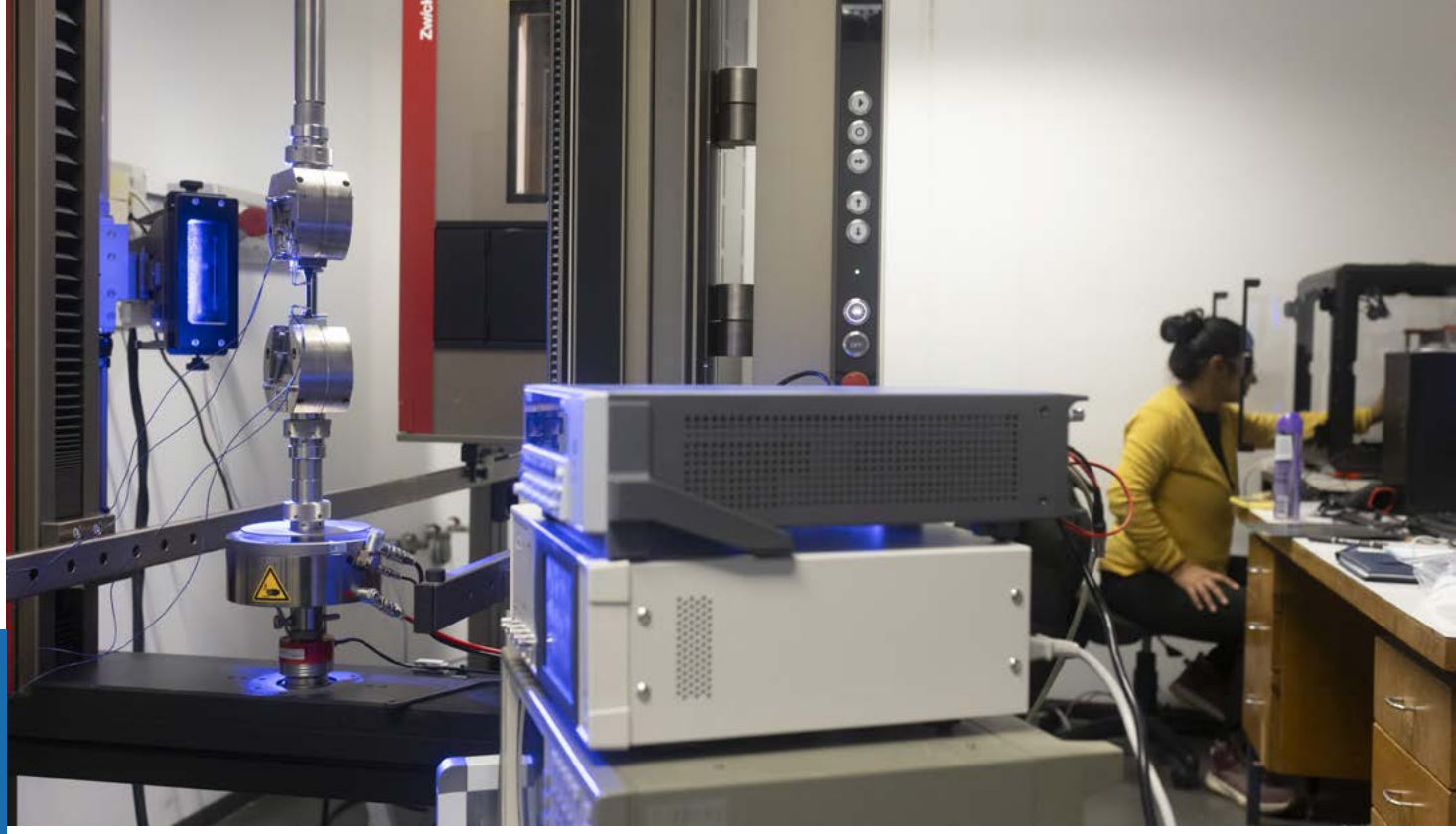


Photo: Željko Stevanić, IFP d.o.o

Laboratory for Experimental Mechanics LEM

RESEARCH AREAS

Polymers • Composites • Nanomaterials • Time-dependent behavior of materials • Experimental mechanics • Modelling of mechanical properties of materials • Technology of polymer processing • Material structure formation

DEPARTMENT HEAD Asst. Prof. dr. Lidija Slemenik Perše

DEPARTMENT MEMBERS Res. assoc. dr. Mohor Mihelčič, Asst. Prof. dr. Alen Oseli, Assist. dr. Urška Gradišar Centa, Assist. dr. Sadaf Mahrukh, Tch. Asst. Matic Šobak, Jr. Res. Stefan Serafimoski, Tch. Asst. Urban Kotnik, Jasna Gornik

ORIGINAL SCIENTIFIC ARTICLES

KOVAČ, Minka, BELE, Marjan, OREL, Boris, MEDEN, Anton, MIHELČIČ, Mohor. Microbial influence on fast-growing iron oxyhydroxide-based speleothems in the acidic environment of Sitarjevec mine, Slovenia. Applied geochemistry. [Print ed.]. 2025, vol. 182, [art.] 106313, str. 1-12, ilustr. ISSN 0883-2927.

SERAFIMOSKI, Stefan, ŠOBAK, Matic, VESEL, Alenka, SLEMENIK PERŠE, Lidija, OSELI, Alen. Structure-property relationship of established MWCNT network enhancing thermo-mechanical stability and electrical conductivity in TPU nanocomposites. Materials & design. 2025, vol. 260, [article no.] 115126, 10 str., ilustr. ISSN 1873-4197.

KOVAČ, Minka, BELE, Marjan, OREL, Boris, MIHELČIČ, Mohor. Bacterial and chemical interactions with iron oxide/hydroxide stalagmites using ATR-IR spectroscopy and its 4th derivative spectra. Mine water and the environment. 2025, vol. 44, str. 661–675, ilustr. ISSN 1616-1068.

HUSKIĆ, Miroslav, SLEMENIK PERŠE, Lidija, OREL, Boris, MIHELČIČ, Mohor. Isotactic polypropylene (iPP) foils : correlation of core and shell crystallinity with mechanical properties obtained by nanoindentation. Polymers. 2025, vol. 17, no. 6, [article no.] 736, 18 str., ilustr. ISSN 2073-4360.

ANŽLOVAR, Alojz, MIHELČIČ, Mohor, ŠVAB, Iztok, PAHOVNIK, David, ŽAGAR, Ema. Dynamic crosslinking of LDPE by nitroxide radical coupling of a dicyclopentadiene dicarboxylic acid and its dynamic properties. Polymers. 2025, vol. 17, iss. 11, [article no.] 1536, str. 1-15, ilustr. ISSN 2073-4360.

OSELI, Alen, ŠOBAK, Matic, SLEMENIK PERŠE, Lidija. Experimental and analytical framework for predicting nonlinear viscoelastic–viscoplastic behavior of polymers. Polymers. 2025, vol. 17, issue 23, [article no.] 3095, 22 str., ilustr. ISSN 2073-4360.

GRADIŠAR CENTA, Urška, MIHELČIČ, Mohor, STERNIŠA, Meta, SLEMENIK PERŠE, Lidija. Tackling microbial adhesion to surfaces by adding mesoporous SiO2 nanoparticles to nanocomposite based on PVDF-HFP and PVP polymers. Surfaces and interfaces. 2025, vol. 56, [article no.] 105713, str. 1-12, ilustr. ISSN 2468-0230.

PROJECTS

Slovenian Research and Innovation Agency. Sustainable polymer materials and technologies. Lidija Slemenik Perše. 1.1.2020 - 31.12.2027

EIT Manufacturing. RAPTOR. Rapid Additive Prototyping and Technologies for Optimized Resources. Lidija Slemenik Perše. 1.6.2024 - 30.11.2025

EQUIPMENT

Advanced modular and integrative measuring system for multifunctional analysis of smart materials and their composites. Aris paket23.

12 ADVANCED MANUFACTURING TECHNOLOGIES FOR HIGH QUALITY AND SUSTAINABLE PRODUCTION

Slovenian industry has a significant impact on the development of economy, employment, innovations and export. A large part of the economy depends on the competitiveness of the manufacturing industry. Thus, the concept of rapid production, innovative machining technologies, manufacturing technology management and the idea of sustainable development are becoming key research areas for increasing the competitiveness of the Slovenian processing industry.

Long-term research content focuses on the development, transfer and research support of high-performance machining technologies (cutting, 3D printing, etc.), including the implementation of sustainable development considerations in manufacturing technologies in response to environmental, social and economic challenges. The focus is not limited to innovations in technology, but also on providing integrated development solutions.

The research domains of the programme group are complementary, and to a certain extent interdisciplinary, comprised of:

- advanced machining processes;
- technology and resource efficiency;
- quality engineering for manufacturing;
- human-centered manufacturing.

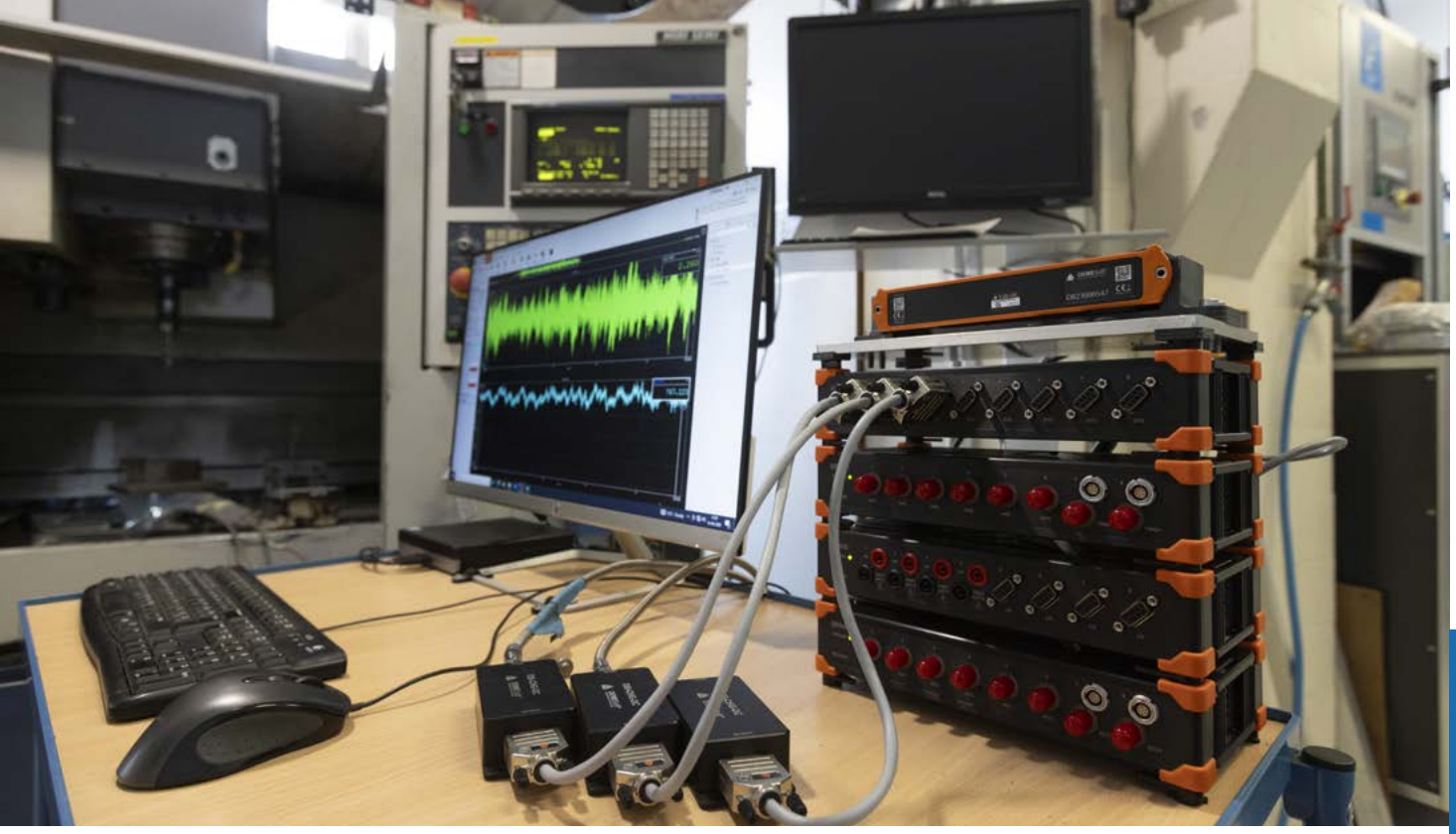


Photo: Željko Stevanić, IFP d.o.o

Laboratory for Machining LABOD

RESEARCH AREAS

Technology and product planning • Sustainable development of machining processes • Research of machining processes • Development of new machining processes (cryogenic machining, the novel dry machining) • Characterization of material machinability • High-speed hard milling for the tool industry • Machine tools • Machining process sensors • Reverse engineering • 3D prototype printing • Characterization of machining surface quality • Product precision and accuracy

DEPARTMENT HEAD Prof. dr. Franci Pušavec

DEPARTMENT MEMBERS Prof. dr. Peter Krajnik, Res. Assoc. dr. Radovan Dražumerič, Jr. Res. dr. Awais Ikram, Tch. Asst. dr. Damir Grguraš, Tch. Asst. dr. Jaka Dugar, Tch. Asst. dr. Matjaž Kern, Vinko Rotar, Tch. Asst. dr. Luka Sterle, Tch. Asst. dr. Deepa Kareepadath Santhos, Tch. Asst. Luka Kastelic, Tch. Asst. Vid Gostiša, Jr. Res. Leja Udovč, Stella Cavalleri

ORIGINAL SCIENTIFIC ARTICLES

DROBNIČ, Matej, DRNOVŠEK, Aljaž, PUŠAVEC, Franci, ČEKADA, Miha. Effect of liquid CO2 on wear behaviour of TiAlN hard coating at elevated temperatures. Coatings. 2025, vol. 15, iss. 5, 1-16 str., ilustr. ISSN 2079-6412.

PROJECTS

Erasmus+ (Erasmus Mundus). META4.0. Manufacturing 4.0 by intElligent and susTAinable technologies. Franci Pušavec. 1.11.2022 - 31.12.2028

Slovenian Research and Innovation Agency. Research on near dry cryogenic machining for transition to cleaner and waste free production in mass automotive industry. Franci Pušavec. 1.10.2023 - 30.9.2026

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Franci Pušavec. 1.1.2024 – 30.6.2026

Slovenian Research and Innovation Agency. Basic Investigation of the Applicability of Artificial Intelligence Based Predictive Models to Improve the Quality of Production with Advanced Machining Processes. Franci Pušavec. 1.3.2024 - 28.2.2027

DOCTORAL DISSERTATIONS

DUGAR, Jaka. Analiza vpliva tehnologije odrezavanja ZnO keramike z definirano geometrijo na končno kakovost izdelkov : doktorsko delo. Ljubljana. Mentor: Pušavec, Franci.

KAREEPADATH SANTHOSH, Deepa. Analysis of cooling-lubrication methods on the performance of grinding processes : doctoral thesis. Ljubljana. Mentor: Krajnik, Peter. Co-mentor: Pušavec, Franci.

AWARDS AND ACHIEVEMENTS

Assist. dr. Matjaž Kern received an award for excellence in teaching.

Photo: Željko Stevanić, IFP d.o.o

Laboratory for Quality Assurance LAZAK

RESEARCH AREAS

Quality planning and control • Quality assurance of processes, products and services • Technology and innovation management • 3D digitization and reverse engineering • Machine tools precision and accuracy measurement

DEPARTMENT HEAD Assoc. Prof. dr. Davorin Kramar
DEPARTMENT MEMBERS Tch. Asst. Mark Porenta, Tch. Asst. dr. Damir Grguraš, Stella Cavalleri

ORIGINAL SCIENTIFIC ARTICLES

KRAMAR, Davorin, MIJUŠKOVIĆ, Goran, CICA, Djordje. Analysis and optimization of micro-milling parameters for improving part quality in ultrafine graphite with varying workpiece inclination angles. Advances in production engineering & management. 2025, vol. 20, no. 1, str. 75-86, ilustr. ISSN 1854-6250.

KRAŠ, Ana, KRAMAR, Davorin, MILOŠEV, Ingrid. Characterisation of the deposition and protection performance of Zr conversion coatings on steel and zinc substrates using the response surface methodology. Corrosion science. Jan. 2025, vol. 242, [art. no.] 112551, str. 1-21, ilustr. ISSN 1879-0496.

KRAŠ, Ana, KRAMAR, Davorin, MILOŠEV, Ingrid. Experimental approach and assessment of Zr conversion coatings on Al alloy using response surface methodology. Corrosion science. June 2025, vol. 249, [article no.] 112824, 15 str., ilustr. ISSN 1879-0496.

MILOŠEV, Ingrid, RODIČ, Peter, KAPUN, Barbara, SAČER, Denis, NAIR, Anish, KRAMAR, Davorin, JEROMEN, Andrej, GOVEKAR, Edvard. Composition, microstructure and corrosion resistance of DED-LB additively manufactured Ti–6Al–4V alloy : comparison with wrought alloy. Journal of alloys and compounds. Jun. 2025, vol. 1033, [art. no.] 181280, str. 1-19, ilustr. ISSN 1873-4669.

CICA, Djordje, TEŠIĆ, Saša, MARKOVIC, Milisav, SREDANOVIĆ, Branislav, BOROJEVIĆ, Stevo, ZEL]KOVIĆ, Milan, KRAMAR, Davorin, PUŠAVEC, Franci. Multi-objective optimization of milling Ti-6Al-4V alloy for improved surface integrity and sustainability performance. Machines. 2025, vol. 13, iss. 3, [art. no.] 221, str. 1-17, ilustr. ISSN 2075-1702.

KRAMAR, Davorin, CICA, Djordje. Experimental investigation and optimization of tool life in high-pressure jet-assisted turning of Inconel 718. Metals. 2025, iss. 5, [art. no.] 477, vol. 15, str. 1-18, ilustr. ISSN 2075-4701.

13 PRODUCTION SYSTEMS, LASER TECHNOLOGIES AND MATERIALS WELDING - PLAS

The research programme Production systems, laser technologies and materials welding integrates four research fields which are of key importance for the development of modern manufacturing.

The Production systems field focuses on:

- concepts of distributed manufacturing systems, including their structuring and control;
- concurrent product development concepts;
- principles of product-service systems, on-line monitoring and remote control;
- development of mechatronics and cyber-physical systems applications.

The research in the Laser systems field is aimed at:

- Fiber and hybrid laser sources, and pulsed laser sources;
- laser measuring systems for simultaneous 3D shape and color measurement of bodies in real time;
- adaptive control of laser systems based on identification, monitoring and adaptive process control;
- opto-mechatronic systems based on optical elements with free surfaces, electrically focus-tunable lenses and microlens arrays.

Research in the field of Laser machining processes, surface modification and non-destructive testing is geared towards:

- development of new laser machining processes for surface finishing and improvement of mechanical properties;
- optimisation of various laser processes in terms of surface integrity;
- development of a method for non-destructive testing based on monitoring of die-casting process of reinforced polymeric materials using acoustic emission signals;
- testing of glued joints by means of ultrasound.

The Joining of materials section performs the following research:

- analysis of the chemical composition of joining accelerators;
- optimisation of welding parameters and mutual weldability of dissimilar materials;
- repair-welding of tools for extending the in-service tool life, filler materials;
- development of design welding, friction stir welding and other joining technologies;
- applying different materials with high-energy arc procedures.

These topics are highly relevant for advances of manufacturing science as well as for the economic and social development of Slovenia. The research is conducted in a close cooperation with the industry.

Photo: Željko Stevanić, IFP d.o.o

Laboratory for Mechatronics, Production systems and Automation LAMPA

RESEARCH AREAS

Mechatronics • Robotics • Machine Vision • Automation • Control Systems • Artificial Intelligence • Blockchain • Production Systems *Material Flow • Project Management

DEPARTMENT HEAD Prof. dr. Podržaj Primož

DEPARTMENT MEMBERS Asst. Prof. dr. Tomaž Berlec, Asst. Prof. dr. Drago Bračun, Tch. Asst. dr. Marko Corn, Asst. Prof. dr. Marjan Jenko, Asst. prof. dr. Dominik Kozjek, Tch. Asst. Anja Juriševič, Tadeja Kavčič, Matic Kelvišar, Tch. Asst. Nejc Kozamernik, Tch. Asst. dr. Andreja Malus, Jr. Res. Jan Pleterski, Tch. Asst. dr. Tomaž Požrl, Jr. Res. Jernej Puc, Asst. Prof. dr. Lidija Rihar, Asst. dr. Dunja Ravnikar, Tch. Asst. dr. Nejc Rožman, Dominik Rupert, Tch. Asst. dr. Luka Selak, Asst. prof. dr. Gašper Škulj, Assoc. Prof. dr. Rok Vrabič, Jr. Res. dr. Tena Žužek, Tch. Asst. Jure Dvoršak, Assist. Martina Benko Loknar, Tch. Asst. Matija Grulović, Jr. Res. dr. Igor Reznichenko, Jasna Gornik

ORIGINAL SCIENTIFIC ARTICLES

ĐURIĆ, Mario, SELAK, Luka, BRAČUN, Drago. Hybrid design optimization methodology for electromechanical linear actuators in automotive LED headlights. Actuators. [Online ed.]. 2025, vol. 14, issue 10, [article no.] 465, 30 str., ilustr. ISSN 2076-0825.

PODRŽAJ, Primož, KLOBČAR, Damjan. Review of advanced resistance welding technologies and control methods for joining state-of-the-art materials in lightweight and electric vehicle manufacturing. Advanced technologies and materials. 2025, vol. 50, no. 1, str. 23-32, ilustr. ISSN 2620-0325.

BERLEC, Tomaž, CORN, Marko, VARL]EN, Sergej, PODRŽAJ, Primož. Exploring decentralized warehouse management using large language models : a proof of concept. Applied sciences. 2025, vol. 15, iss. 10, [art. no.] 5734, str. 1-35, ilustr. ISSN 2076-3417.

VRABIČ, Rok, MALUS, Andreja, DVORŠAK, Jure, KLANČAR, Gregor, ŽUŽEK, Tena. Bio-inspired traffic pattern generation for multi-AMR systems. Applied sciences. 2025, vol. 15, iss. 5, 22 str., ilustr. ISSN 2076-3417.

URGO, Marcello, LANZA, Gisela, VRABIČ, Rok, GYULAI, Dávid. Future-proof production scheduling and control. CIRP annals. 2025, vol. 74, issue 2, str. 971-991, ilustr. ISSN 1726-0604.

KOZAMERNIK, Nejc, BRAČUN, Drago. A novel FuseDecode Autoencoder for industrial visual inspection : incremental anomaly detection improvement with gradual transition from unsupervised to mixed-supervision learning with reduced human effort. Computers in industry. Jan. 2025, vol. 164, [art.] 104198, str. 1-19, ilustr. ISSN 0166-3615.

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SELAK, Luka, ŠKUL], Gašper, KOZJEK, Dominik, BRAČUN, Drago. Prediction of environment-related operation and maintenance events in small hydropower plants. Machine learning and knowledge extraction. 2025, vol. 7, no. 4, [article no.] 163, str. 1-33, ilustr. ISSN 2504-4990.

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YILDIRIM, Kerim, KOZJEK, Dominik, VANWERSCH, Pol, NAGARAJAN, Balasubramanian, CASTAGNE, Sylvie. Exploring material removal dynamics during femtosecond laser micromachining by in-situ acoustic emission monitoring with physics-based and data-driven analysis. Optics and laser technology. [Print ed.]. 2025, vol. 192, pt. c, article no. 113721, str. 1-15, ilustr. ISSN 0030-3992.

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PROJECTS

Erasmus+. TET. The Evolving Textbook. Primož Podržaj. 1.9.2022 - 31.8.2025

Erasmus+. BLISS. Blended Learning Implementation for reSilient, acceSsible and efficient higher education. Primož Podržaj. 1.2.2022 - 31.1.2025

Erasmus+. DERHE. Digital Education Readiness in the field of Higher Education. Tomaž Berlec. 1.12.2023 - 30.11.2026

Erasmus+. FabLab. Developing competences on the Internet of Things through digital fabrication laboratories. Tomaž Berlec. 1.9.2022 - 31.8.2025

Erasmus+. TAI. Teaching Artificial Intelligence. 1.9.2024 - 31.8.2027

Erasmus+. GEMS. Graceful Equalizing of Mechatronics Students. Gašper Škulj. 1.11.2022 - 31.10.2025

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Rok Vrabič. 1.1.2024 – 30.6.2026

FLEXIDO d.o.o. Izvedba optimizacije in prehod iz ročne na avtomatizirano proizvodno celico v okviru projekta Oplast. Tomaž Berlec. 12.12.2024 - 30.3.2025

Erasmus+. PATH-AI. Promoting Accountable and Transparent Human-centered AI in Higher Education. Primož Podržaj. 1.9.2025 - 31.8.2028

Erasmus+. MultAI-PASS. Multimodal AI for Personalized Adaptive Student pathwayS. Primož Podržaj. 1.9.2025 - 31.8.2028

PEER-REVIEWED HIGHER EDUCATION TEXTBOOKS

VRABIČ, Rok. Robotski sistemi. 1. izd. Ljubljana: samozal., 2025. 138 str., ilustr. ISBN 978-961-07-2533-6.

BRAČUN, Drago. Strojni vid. Ljubljana: Laboratorij za mehatroniko, proizvodne sisteme in avtomatizacijo, Fakulteta za strojništvo, 2025. 1 spletni vir (1 datoteka PDF (III, 101 str.)), ilustr. ISBN 978-961-7187-24-3.

DOCTORAL DISSERTATIONS

KOZAMERNIK, Nejc. Razvoj sistema globokega učenja za vizualni nadzor kakovosti izdelkov v velikoserijski proizvodnji : doktorsko delo. Mentor: Bračun, Drago. Co-mentor: Potočnik, Primož.

EQUIPMENT

Simulated lunar Terrain for Autonomous Rover Testing (START)

Study of human-robot interaction. Aris paket23.

AWARDS AND ACHIEVEMENTS

Asst. prof. dr. Dominik Kozjek received the Faculty Award for researchers under the age of 35 for outstanding research achievements.

Photo: Željko Stevanić, IFP d.o.o

Laboratory for photonics and laser systems FOLAS

RESEARCH AREAS

Laser sources • Fiber and hybrid lasers • Photonics • Optical fiber processing • Laser transfer printing • Laser micro- and nano-processing • Laser treatment and diagnostic in medicine • High speed photography • Laser interferometric methods • Optodynamics

DEPARTMENT HEAD Prof. dr. Rok Petkovšek

DEPARTMENT MEMBERS Asst. Prof. dr. Vid Agrež, Tch. Asst. dr. Darja Horvat, Tch. Asst. dr. Žiga Lokar, Asst. Prof. dr. Jaka Mur, Res. Assoc. dr. Jaka Petelin, Tch. Asst. dr. Uroš Orthaber, Tch. Asst. dr. Luka Černe, Tch. Asst. dr. Jernej Jan Kočica, Tch. Asst. dr. Matevž Marš, Tch. Asst. Miha Jelenčič, Jr. Res. Janko Tuta, Jr. Res. Gašper Hribar, Jr. Res. dr. Andrej Vrečko, Jasna Gornik

ORIGINAL SCIENTIFIC ARTICLES

AGREŽ, Vid, ZEVNIK, Jure, LOKAR, Žiga, DULAR, Matevž, PETKOVŠEK, Rok. Flow dynamics in cavitation induced micro pumping. Experimental thermal and fluid science. 2025, vol. 169, [article no.] 111540, 13 str., ilustr. ISSN 1879-2286.

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PETELIN, Jaka, MARŠ, Matevž, MUR, Jaka, PETKOVŠEK, Rok. In-situ measurements of residual heating during pulse-on-demand femtosecond laser surface microprocessing. Optics and laser technology. [Print ed.]. Nov. 2025, vol. 190, [article no.] 113201, str. 1-8, ilustr. ISSN 0030-3992.

PETELIN, Jaka, KOČICA, Jernej Jan, MUR, Jaka, PETKOVŠEK, Rok. 2.5D femtosecond laser microstructuring of complex surface patterns. Surfaces and interfaces. 2025, vol. 61, [article no.] 106099, 6 str., ilustr. ISSN 2468-0230.

MUR, Jaka, BUSSMANN, Alexander, PAULA, Thomas, ADAMI, Stefan, ADAMS, Nikolaus, PETKOVŠEK, Rok, OHL, Claus-Dieter. Micro-jet formation induced by the interaction of a spherical and toroidal cavitation bubble. Ultrasonics sonochemistry. 2025, vol. 112, [art. no.] 107185, 18 str., ilustr. ISSN 1350-4177.

PROJECTS

Horizon Europe. ENLIGHTEN. European Non-Line-of-Sight Optical Imaging. Rok Petkovšek. 1.12.2022 - 30.11.2026

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Rok Petkovšek. 1.1.2024 – 30.6.2026

PATENTS

PETKOVŠEK, Rok, PETELIN, Jaka. A fast and highly sensitive reflective fiber-optic hydrophone = Schnelles und hochempfindliches reflektierendes faseroptisches Hydrophon = Hydrophone à fibre optique par réflexion rapide et hautement sensible : European patent specification, EP 4 302 055 B1, 2025-07-02. München: European Patent Office, 2025.

DOCTORAL DISSERTATIONS

MARŠ, Matevž. Laserski sistem s pulzi na zahtevo za mikroobdelave : doktorsko delo. Ljubljana. Mentor: Agrež, Vid. Co-mentor: Petkovšek, Rok.

KOČICA, Jernej Jan. Precise laser processing with highly adaptive laser sources : doctoral dissertation. Ljubljana. Mentor: Petkovšek, Rok. Co-mentor: Agrež, Vid.

EQUIPMENT

Equipment for characterization of laser optical channels in water and air. Aris paket23.

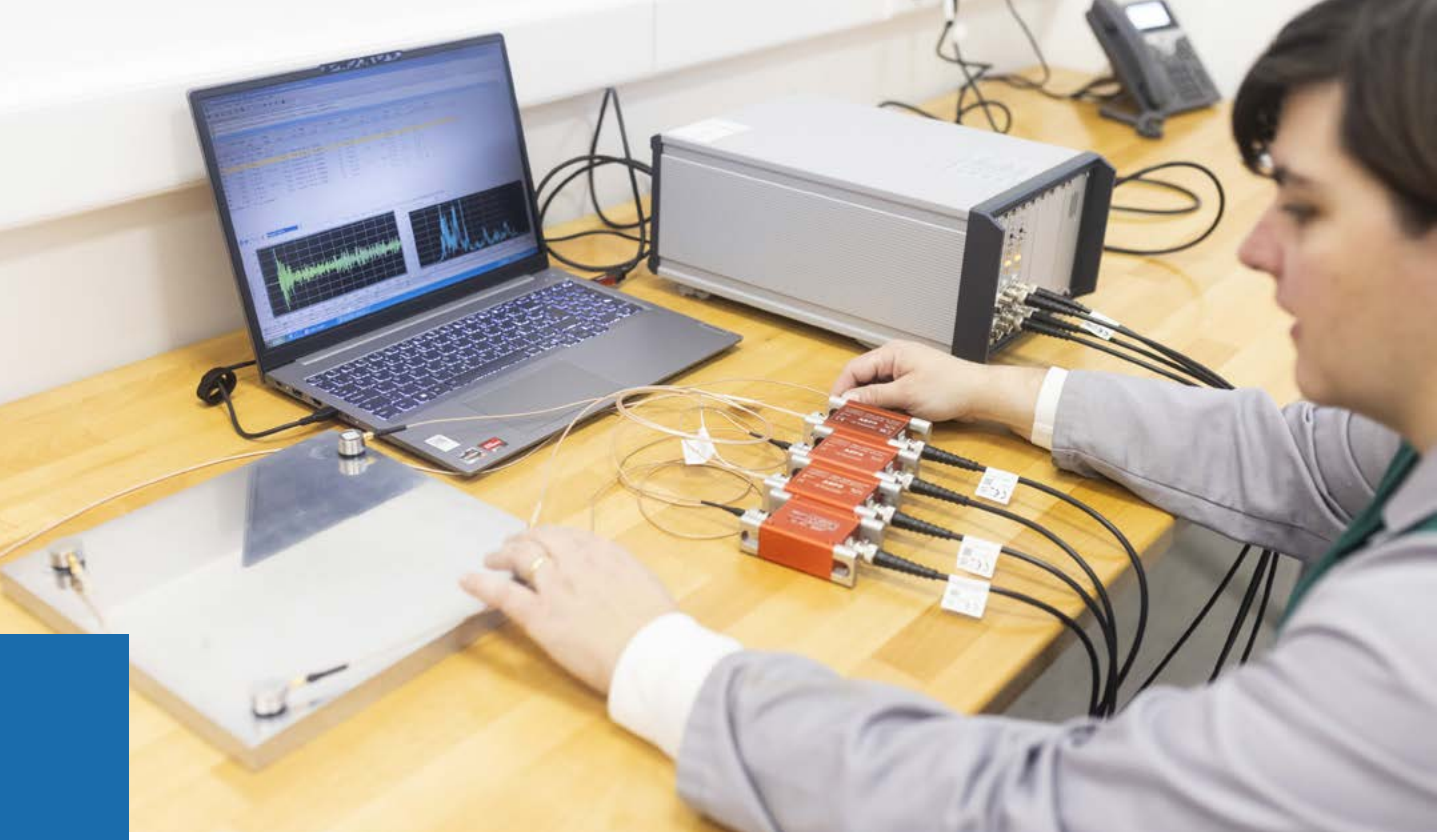

Photo: UL FME Archive

Laboratory for Heat Treatment and Materials Testing
LATOP

RESEARCH AREAS

Heat treatment • Laser surface hardening • Shot peening of surfaces • Surface integrity • Measurement of residual stresses • Determination of microstructures • Modelling of casting processes • Determination of tool life

DEPARTMENT HEAD Prof. dr. Roman Šturm

DEPARTMENT MEMBERS Asst. Prof. dr. Zoran Bergant, Asst. Prof. dr. Tomaž Kek, Asst. Prof. dr. Sebastjan Žagar, Vane Kralj, Jr. Res. Jan Šmalc, Jr. Res. Nik Kristjan Ceraj, Anja Senegačnik, Dušanka Grubor Železnik

ORIGINAL SCIENTIFIC ARTICLES

BABIČ, Matej, ŠTURM, Roman, RUCKI, Mirosław, SIEMIĄTKOWSKI, Zbigniew. Application of machine learning method for hardness prediction of metal materials fabricated by 3D selective laser melting. Applied sciences. 2025, vol. 15, iss. 23 (12832), str. 1-18, ilustr. ISSN 2076-3417.

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ŠMALC, Jan, ZAKY, Adam, MARKOLI, Boštjan, ŠTURM, Roman. Microstructural stability and high-temperature mechanical behavior of Al–Ni–Zr alloy strengthened by L12-Al3Zr precipitates. Materials. 2025, vol. 18, issue 13, [article no.] 3068, 13 str. ISSN 1996-1944.

KEK, Tomaž, BERGANT, Zoran, ŠTURM, Roman. Ellipsoidal acoustic emission patterns in basalt bio-epoxy laminates under different loading angles. Polymer testing. Nov. 2025, vol. 152, [article no.] 109013, str. 1-11, ilustr. ISSN 0142-9418.

EQUIPMENT

Acoustic emission acquisition device with sensors. Aris paket23.

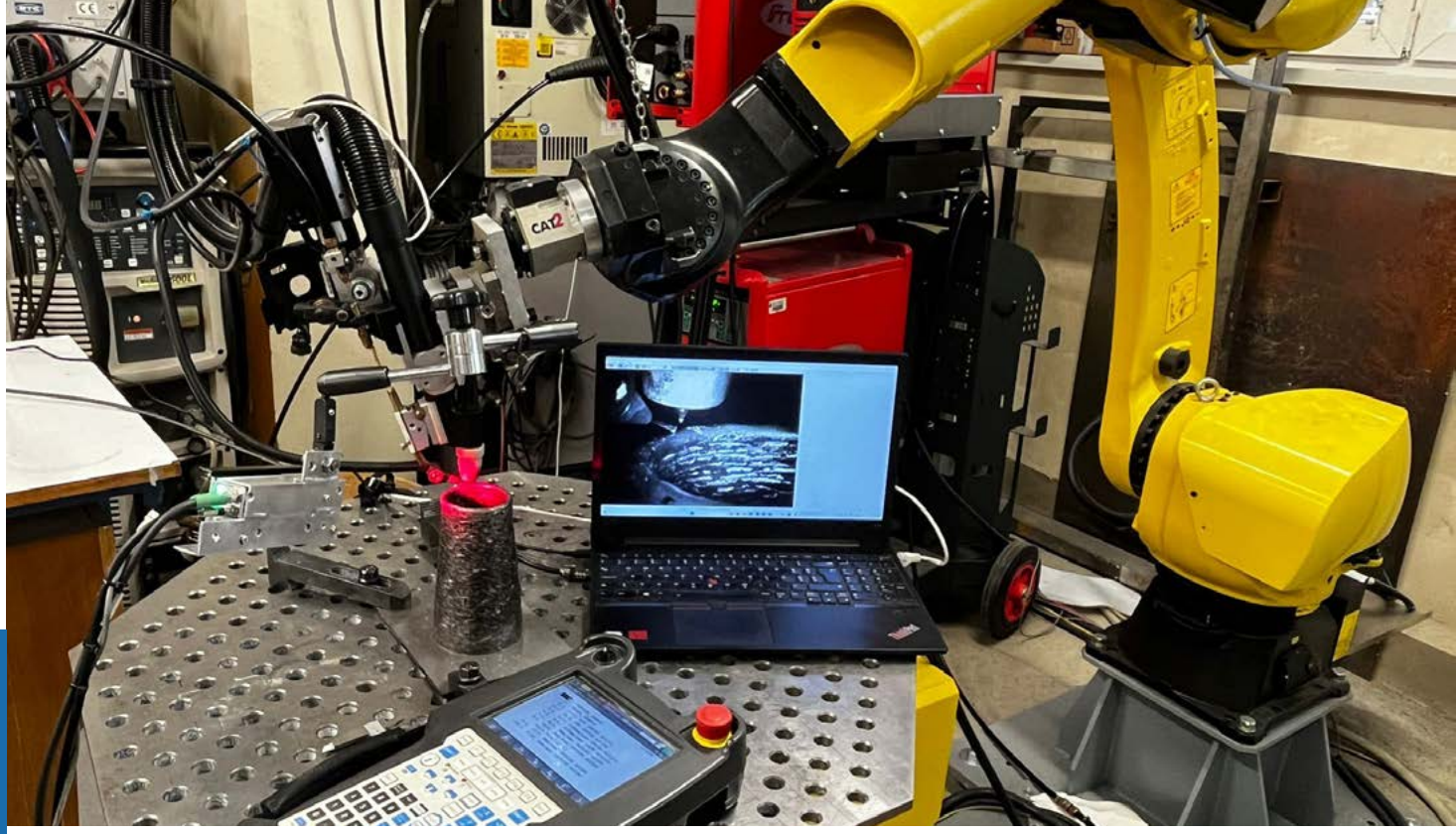

Photo: UL FME Archive

Laboratory for Welding LAVAR

RESEARCH AREAS

Technologies of material joining and assembly (arc welding, laser welding, friction stir welding, resistance welding, ultrasonic welding) Technologies of thermal cutting • Wire arc additive manufacturing • Materials science • Production technologies • Resistance spot & μ-resistance spot welding • Weldability of metallic materials and polymers • Welding machines and devices • Additive and auxiliary welding materials • Chemical and metallurgical processes in welding • Surface modification Technologies • Microstructural and mechanical testing • XRD Residual stress measurement

DEPARTMENT HEAD Assoc. Prof. dr. Damjan Klobčar

DEPARTMENT MEMBERS Asst. Prof. dr. Uroš Trdan, Tch. Asst. Mirza Imširović, Prof. dr. Borut Kosec, Jr. Res. dr. Aljaž Ščetinec, dr. Matej Pleterski, Mohammadreza Ghavi, Tch. Asst. Klemen Pregeljc, Anže Pevc, Dušanka Grubor Železnik

ORIGINAL SCIENTIFIC ARTICLES

LINDIČ, Maja, KLOBČAR, Damjan, NAGODE, Aleš, MOLE, Nikolaj, ŽUŽEK, Borut, VUHERER, Tomaž. Heat treatment optimisation of 18 % Ni maraging steel produced by DED-ARC for enhancing mechanical properties. Journal of advanced joining processes. Jun. 2025, vol. 11, 100312, str. 1-12. ISSN 2666-3309.

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PROJECTS

Horizon Europe/SBEP. CORRASBlue: Coastal Corrosion Risk Management through Digital twin model for a Sustainable Blue Economy. Uroš Trdan. 30.8.2025 - 29.8.2028

Slovenian Research and Innovation Agency. The influence of the thermal history on the microstructure and mechanical properties of additively manufactured materials. Damjan Klobčar. 1.1.2024 - 31.12.2027

Slovenian Research and Innovation Agency. Improvement of functional and structural performance of super-elastic shape memory alloys by high-intensity laser shock waves (SuperShocked). Uroš Trdan. 1.1.2025 - 31.12.2027

Erasmus+. ANGIE. Academic Network for Green and Innovative Europe. Damjan Klobčar. 1.9.2023 - 28.2.2026

Erasmus+. SMARTIE. Synergistic Management and Advancement of Artificial intelligence in European Higher Education. Damjan Klobčar. 1.10.2024 - 30.9.2027

Kolektor Mobility d.o.o. Raziskovalno in razvojno delo na področju spajanja bakra in bakrenih zlitin. Damjan Klobčar. 9.2.2023 - 30.11.2026

Bosch Rexroth. FSW varjenje hladilnika elektromotorja. Damjan Klobčar. 1.11.2025 - 25.10.2026

PATENTS

LOGAR, Andraž, ČERNIVEC, Gregor, KLOBČAR, Damjan. Method for producing a cooling channel in a winding for a welding transformer and winding comprising a cooling channel for a welding transformer = Verfahren zur Herstellung eines Kühlkanals in einer Wicklung für einen Schweisstransformator und Wicklung mit einem Kühlkanal für einen Schweisstransformator = Procédé de production d'un canal de refroidissement dans un enroulement d'un transformateur de soudage et enroulement comprenant un canal de refroidissement pour un transformateur de soudage : European patent specification, EP 4 270 426 B1, 2025-01-01. Munich: European Patent Office, 2025.

DOCTORAL DISSERTATIONS

MACERL, Matjaž. Mikrostruktura in lastnosti zlitin na osnovi Al-Mn-Cu, obdelanih s trenjem in mešanjem : doktorska disertacija. Maribor. Mentor: Bončina, Tonica. Mentor: Klobčar, Damjan.

AWARDS AND ACHIEVEMENTS

Tch. Asst. Klemen Pregeljc received the Award for an outstanding contribution in the category of research (Akademija strojništva 2025).

14 OPTODYNAMICS

Optodynamics explores the dynamic aspects of light-to-substance interaction, which are the basis of most laser machining processes and laser-based medical interventions. Since optodynamic responses are an important source of information on the interaction between light and matter, their simultaneous detection and analysis can provide effective control over all laser processes.

The recent discovery of the programme group's researchers on characteristics of mechanical waves induced due to reflection of light is the basis for an important progress in resolving the dilemmas regarding the momentum of light in transparent media. Basic research into optodynamics leads to new applied research.

The programme also enables the development of new approaches in research on:

- laser-induced mass transfer;
- manipulation of nanoparticles;
- microfluidics;
- laser micro- and nanoprocessing;
- laser-based non-destructive testing and its transfer into practice.

The program is also oriented towards the further development and optimisation of new, more efficient and safer medical laser systems. The results of the programme are closely related to the Master's and Doctoral education programs at Faculty of Mechanical Engineering.

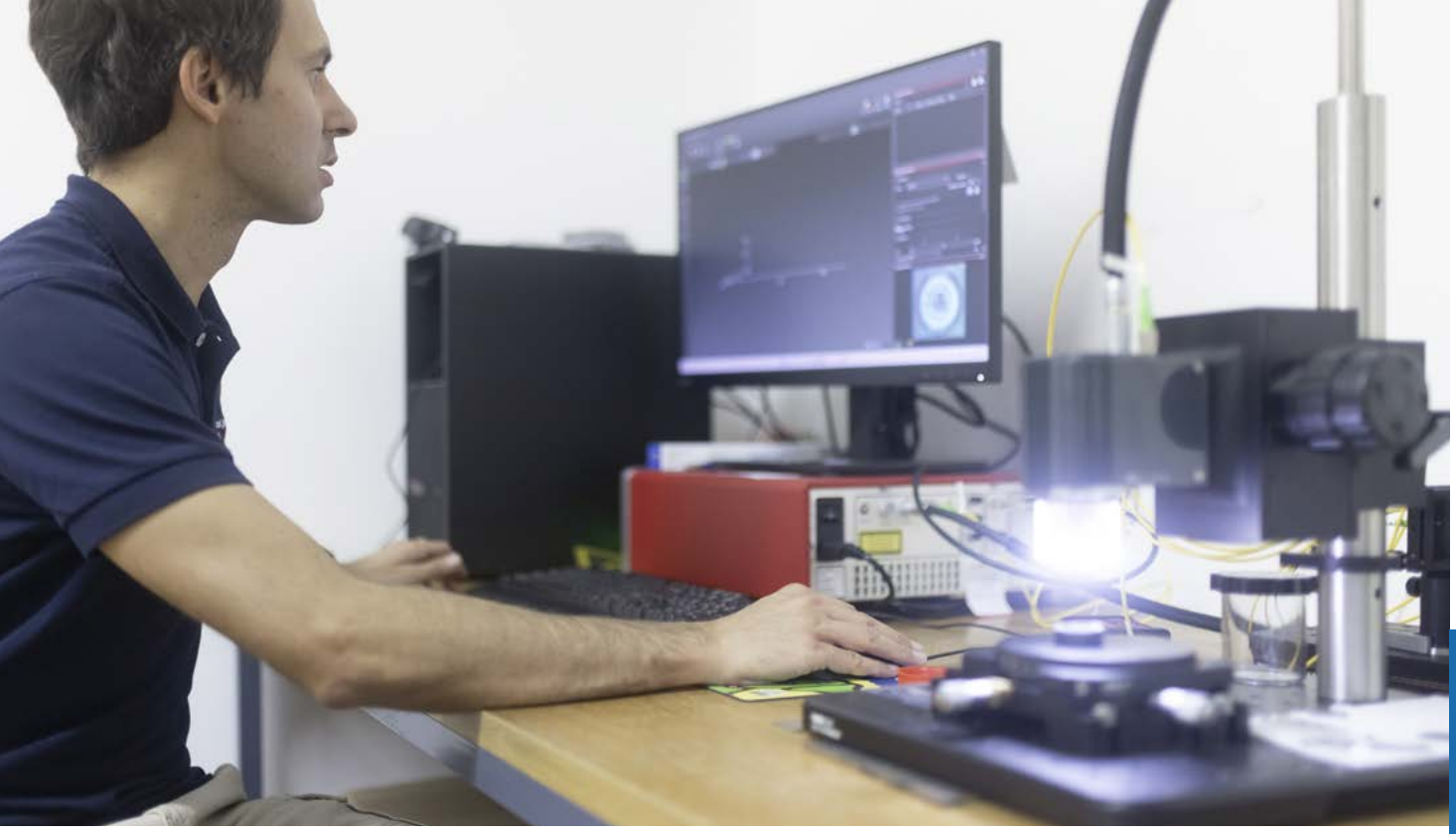

Photo: Željko Stevanić, IFP d.o.o

Laboratory for Laser Techniques LASTEH

RESEARCH AREAS

Laser measuring methods • Laser triangulation • Fiber-optic sensors • Fast photography • Interferometry • Laser machining processes • Laser micro and nano structuring • Adaptive control of laser processes • Medical laser procedures • Optodynamics

DEPARTMENT HEAD Prof. dr. Matija Jezeršek

DEPARTMENT MEMBERS Assoc. Prof. dr. Peter Gregorčič, Tch. Asst. dr. Aleš Babnik, dr. Urban Pavlovčič, dr. Ladislav Grad, Jr. Res. dr. Nejc Lukač, Tch. Asst. dr. Luka Hribar, Asst prof. dr. Daniele Vella, Tch. Asst. dr. Matjaž Kos, Tch. Asst. Gaia Kravanja, Tch. Asst. Tine Brežan, Jr. Res. Rida Ahmed, Jr. Res. Dominik Šavli, Tch. Asst. dr. Jure Košir, Jr. Res. Rezaei Ali, Tch. Asst. Laura Levstik, Tch. Asst. Matej Čampelj, Jasna Gornik

ORIGINAL SCIENTIFIC ARTICLES

ČAMPEL], Matej, JEZERŠEK, Matija. Towards motion correction in robotized medical procedures using real-time 3D body measurement. 3DBODY.TECH journal. 2025, vol. 2, 10 str. ISSN 3042-576X.

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VOLK, Marko, ŠAVLI, Dominik, MOLAN, Katja, TERLEP, Saša, LEVIČNIK HOEFFERLE, Špela, TROST, Mojca, GAŠPIRC, Boris, LUKAČ, Matjaž, JEZERŠEK, Matija, STOPAR, David. Er:YAG laser biofilm removal from zero-gap periodontal/peri-implant model system mimicking clinical attachment loss. Journal of biomedical optics. Feb. 2025, vol. 30, issue 2, str. 025002-1-025002-11, ilustr. ISSN 1083-3668.

STRAUS, Izidor, KRAVANJA, Gaia, HRIBAR, Luka, KRIEGL, Raphael, SHAMONIN, Mikhail, DREVENŠEK OLENIK, Irena, JEZERŠEK, Matija, KOKOT, Gašper. Laser micromachining for polymer surface

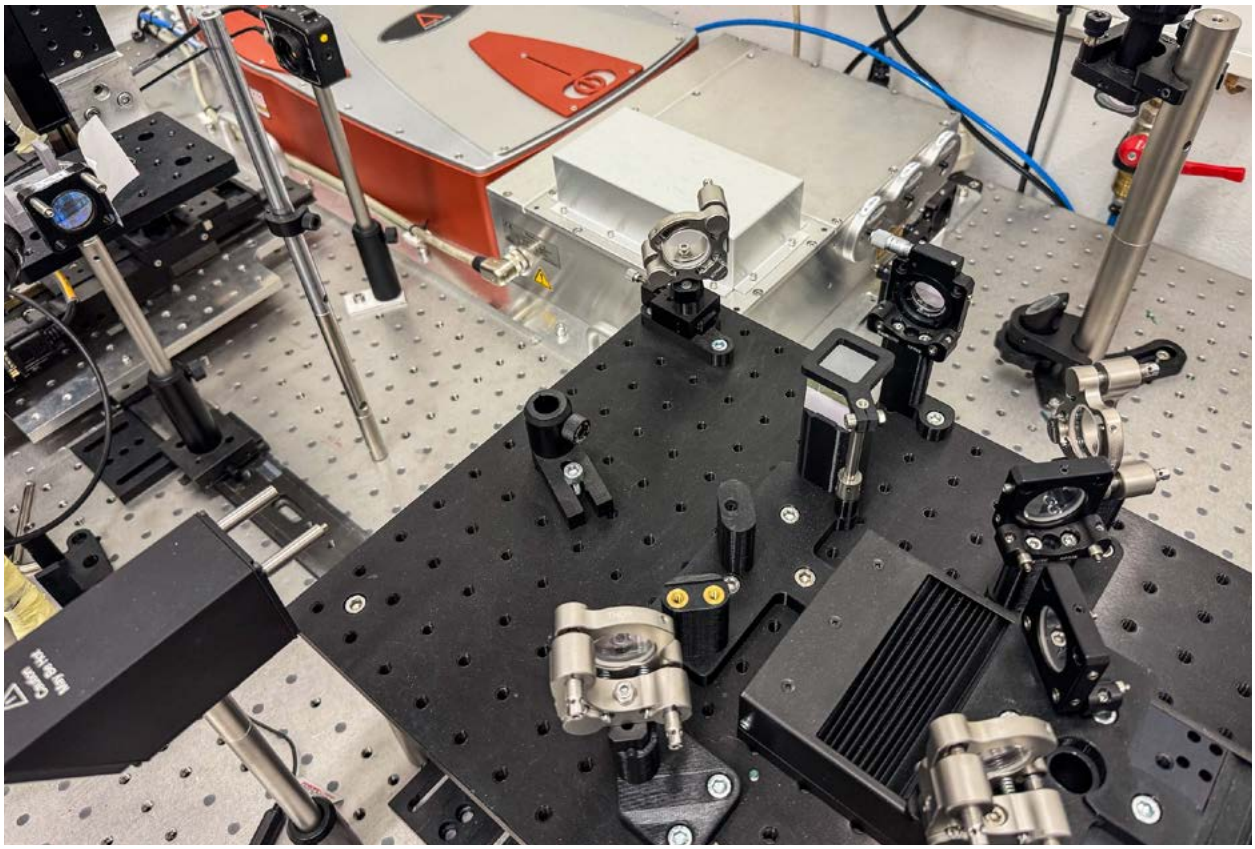

Photo: Željko Stevanić, IFP d.o.o

topography design. Journal of visualized experiments. 19 Sep. 2025, [iss.]223, [article no.] e68126, str. 1-15, ilustr. ISSN 1940-087X.

VELLA, Daniele, VENGUST, Damjan, UMEK, Polona, REZAEI, Ali, JEZERŠEK, Matija, MRZEL, Aleš. Efficient decoration of graphene oxide with a narrow size distribution of noble metal nanoparticles : green reduction and integration into a thermoelastic composite. Synthetic metals. Aug. 2025, vol. 313, [article no.] 117894, str. 1-10, ilustr. ISSN 1879-3290.

ŠAVLI, Dominik, VOLK, Marko, MOLAN, Katja, TERLEP, Saša, LEVIČNIK HOEFFERLE, Špela, BABNIK, Aleš, TROST, Mojca, GAŠPIRC, Boris, LUKAČ, Matjaž, STOPAR, David, JEZERŠEK, Matija. The effect of surface roughness on the Er:YAG laser-induced photoacoustic removal of bacteria in zero-gap periodontal/peri-implant pocket model. Ultrasonics sonochemistry. Sep. 2025, vol. 120, [article no.] 107458, str. 1-12, ilustr. ISSN 1350-4177.

PROJECTS

Fotona d.o.o. Raziskave in razvoj naprednih medicinskih laserskih sistemov. Matija Jezeršek. 1.1.2022 - 31.12.2025

DOCTORAL DISSERTATIONS

KRAVANJA, Gaia. Laser structuring of magnetorheological elastomers for smart multifunctional surfaces : doctoral thesis. Ljubljana. Mentor: Jezeršek, Matija. Co-mentor: Chamonine, Mikhail.

PATENTS

LUKAČ, Matjaž, LUKAČ, Nejc, TAŠIČ MUC, Blaž, ZORMAN, Anže, PERHAVEC, Tadej. Non-ablative resurfacing of soft tissues : United States Patent, US12226152B2, 2025-02-18. Alexandria: United States Patent and Trademark Office, 2025.

Slovenian Research and Innovation Agency. GREENTECH. Hybrid Technologies for Green Factories of the Future. Matija Jezeršek. 1.1.2024 – 30.6.2026

Slovenian Research and Innovation Agency. 2D-UltraS. Two-dimensional materials-based

piezophotonic composites for tailor-made ultrasounds stimulation in biological systems. Daniele Vella. 1.10.2023 – 30.9.2026

Slovenian Research and Innovation Agency. LTS4EB. Laser-Textured Surfaces for Enhanced Material Biocompatibility. Peter Gregorčič. 1.7.2025 - 30.6.2026

Slovenian Research and Innovation Agency. SurfBioApps. Uporaba laserja za izboljšanje biokompatibilnosti površine kovinskih materialov za nove biomedicinske aplikacije. Peter Gregorčič. 1.1.2025 - 31.12.2027

EQUIPMENT

Measuring system for real-time control of surface topography during laser processing. Aris paket23.

UNIT FOR SUPPLEMENTARY DIVISION EDZ

The Faculty of Mechanical Engineering also hosts the Unit for Supplementary Division, which is not part of research groups, but operates independently as an organisational unit. The Unit for Supplementary Division covers the areas of mathematics and sports as the key supplementary factors contributing to the teaching process.

Photo: Žan Rutar

UNIT FOR SUPPLEMENTARY DIVISION EDZ

MEMBERS Žiga Bratuž, Iztok Novak, Aleš Lavrič

ACTIVITIES

- Organization of indoor sports activities for students (basketball, volleyball, futsal, badminton, floorball, fitness, dancing...)
- Organization of outdoor sports activities for students (hiking, alpine skiing, running, kayaking...)
- Cooper's physical fitness testing for students
- Participation in various competitions of University of Ljubljana or Slovenian university sports association (basketball league, volleyball league, futsal league, beach volley league, padel league, various one day tournaments)

THE BEST PERFORMANCES OF FME STUDENTS AND EMPLOYEES IN 2025 COMPETITONS

The Faculty of Mechanical Engineering basketball team placed second in the University basketball league
The Faculty of Mechanical Engineering curling team placed third in the University of Ljubljana curling championshipLev Bjelobaba placed third in the University of Ljubljana tenis championship
Blaž Smrkolj placed first in the University of Ljubljana badminton championship.
Eva Maučec placed third in the University of Ljubljana orienteering championship
Urban Žnidaršič placed third among employees in the University of Ljubljana orienteering championship
Žiga and Luka Ferjančič were part of the University of Ljubljana team that won the Basketball University National Championship

Photo: UL FME Archive

Mathematics Research Team RSMAT

DEPARTMENT HEAD Asst. Prof. dr. Darja Rupnik Poklukar

DEPARTMENT MEMBERS Prof. ddr. Janez Žerovnik, Assoc. Prof. dr. Aljoša Peperko, Asst. Prof. dr. Boštjan Gabrovšek, Tch. Asst. dr. Helena Zakrajšek, Asst. dr. Simon Brezovnik, prof. dr. Aleš Vavpetič, Tch. Asst. Bor Bregant, Teja Pirnat

ORIGINAL SCIENTIFIC ARTICLES

BREZOVNIK, Simon, RUPNIK POKLUKAR, Darja, ŽEROVNIK, Janez. The 2-rainbow domination number of Cartesian product of cycles. Ars mathematica contemporanea. [Tiskana izd.]. 2025, vol. 25, no. 3, 17 str., ilustr. ISSN 1855-3966.

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PROMOTION OF MECHANICAL ENGINEERING

The year 2025 was a successful and forward-looking one for the Faculty of Mechanical Engineering of the University of Ljubljana. It was marked by a wide range of educational programmes, promotional activities, research achievements, and events that further strengthened our connections with schools, industry, and the wider public. Students, secondary school pupils, and young researchers created, explored, and innovated in the faculty's laboratories and at partner institutions, demonstrating that mechanical engineering through innovation, technological progress, and interdisciplinary knowledge plays a vital role in shaping the future.

MECHANICAL ENGINEERING AMONG YOUTH – COOPERATION WITH SECONDARY SCHOOLS AND GYMNASIUMS

In 2025, the faculty's promoters of mechanical engineering visited numerous secondary schools across Slovenia—from gymnasiums to technical and vocational programmes. They introduced students to various fields of mechanical engineering, their practical applications, and the opportunities offered by studying at the Faculty of Mechanical Engineering.

Although the visits did not include hands-on demonstrations or laboratory equipment, they were designed to help young people understand how mechanical engineering connects creativity, technology, and the solving of contemporary challenges. The presentations offered a clearer insight into the breadth and importance of engineering and encouraged students to consider pursuing technical studies.

INFORMATIVA 2025

At Informativa 2025, held on 17 and 18 January at the Ljubljana Exhibition and Convention Centre, the Faculty of Mechanical Engineering presented itself within the University of Ljubljana's "university town." Visitors were introduced to the world of engineering creativity and the faculty's study programmes. The exhibition stand showcased several student projects, including the Edvard Rusjan Team's unmanned aerial vehicle and a handcrafted wooden accordion, and offered visitors the chance to try a driving simulator.

Photo: UL FME Archive

SUMMER RESEARCH CAMP "EXPLORE AND DRIVE THE FUTURE"

At the end of June and beginning of July, the faculty hosted the Summer Research Camp "Explore and Drive the Future," attended by secondary school pupils from across Slovenia. Under the guidance of researchers from participating laboratories, the students explored modern engineering topics such as 3D modelling, prototyping, robotics, aerodynamics, modular servomotors, and smart

devices. Work in the laboratories gave them hands-on experience of the research process and the opportunity to develop their own ideas while confronting real engineering challenges. The camp once again confirmed strong youth interest in research and its crucial role in shaping future generations of engineers.

Photo: UL FME Archive

Photo: Željko Stevanić, IFP d.o.o

SUMMER SCHOOL OF MECHANICAL ENGINEERING

In the last week of August, the faculty once again organized the Summer School of Mechanical Engineering, which welcomed more than one hundred primary school pupils from all over Slovenia. Guided by mentors, the participants learned how products, devices, and technological systems are created and were introduced to 3D printing, laser engraving, robotics, computer modelling, HPC computing, renewable energy sources, and the basics of design.

The programme encouraged creativity, technical thinking, and problem solving through play and hands-on work. A notable highlight was a dedicated workshop for girls, emphasizing the importance of including women in technical fields and breaking stereotypes. In 2025, the Summer School reaffirmed its status as one of the most important national promotional programmes in technical education.

Photo: Željko Stevanić, IFP d.o.o

Photo: Željko Stevanić, IFP d.o.o

ŠTeKam 2025 STUDENT CONFERENCE

In early September, the eleventh ŠTeKam Student Technical Conference took place, offering university students and final year secondary school pupils the opportunity to present their research work. This year saw a record number of submissions—42 in total—with 31 contributions presented publicly. The conference provides young participants with their first research experiences, public speaking before a professional audience, and preparation for further academic pursuits, including applications for the Zois Scholarship. Contributions published in the conference proceedings (COBISS) represent an important reference for future academic development. Once again, ŠTeKam confirmed its role as one of the key developmental events for young talent.

Photo: UL FME Archive

MECHANICAL ENGINEERING DAYS – TECHNICAL MUSEUM OF SLOVENIA

In the second half of September, the Technical Museum of Slovenia hosted the Mechanical Engineering Days, designed for visitors of all generations. The event showcased advanced projects by students and researchers, including mobile robots, unmanned aircraft, a hydrogen powered car, laser technologies, smart sensor systems, and realistic welding simulations. The programme presented to the wider public the creative power of mechanical engineering and its direct impact on everyday life, inspiring young people to pursue technical professions.

Photo: UL FME Archive

Photo: UL FME Archive

OPEN FACULTY DAY

At the start of the new academic year, the faculty once again opened its laboratories to students and visitors, offering insight into research groups, current projects, and opportunities within mechanical engineering studies. Meetings with researchers, student teams, and mentors provided young people with firsthand knowledge of academic and developmental pathways and encouraged them to engage in research already during their studies. The event highlighted the value of an open and accessible research environment that fosters curiosity, collaboration, and innovation.

Photo: Željko Stevanič, IFP d.o.o.

PESKOVNIK – THE OPEN LABORATORY

In 2025, Peskovnik continued to serve as a central hub for student creativity and innovation. At the final presentation, students showcased a diverse range of projects developed throughout the year—from giant slalom skis, a pellet extruder, a graphic calculator, a surfboard, and a foosball table, to an advanced twoaxis can knocking robot using computer vision. The event demonstrated the remarkable interdisciplinarity, initiative, and technical expertise of participating students, confirming Peskovnik as an essential space where science, practical work, and innovative ideas evolve into real prototypes and technological solutions.

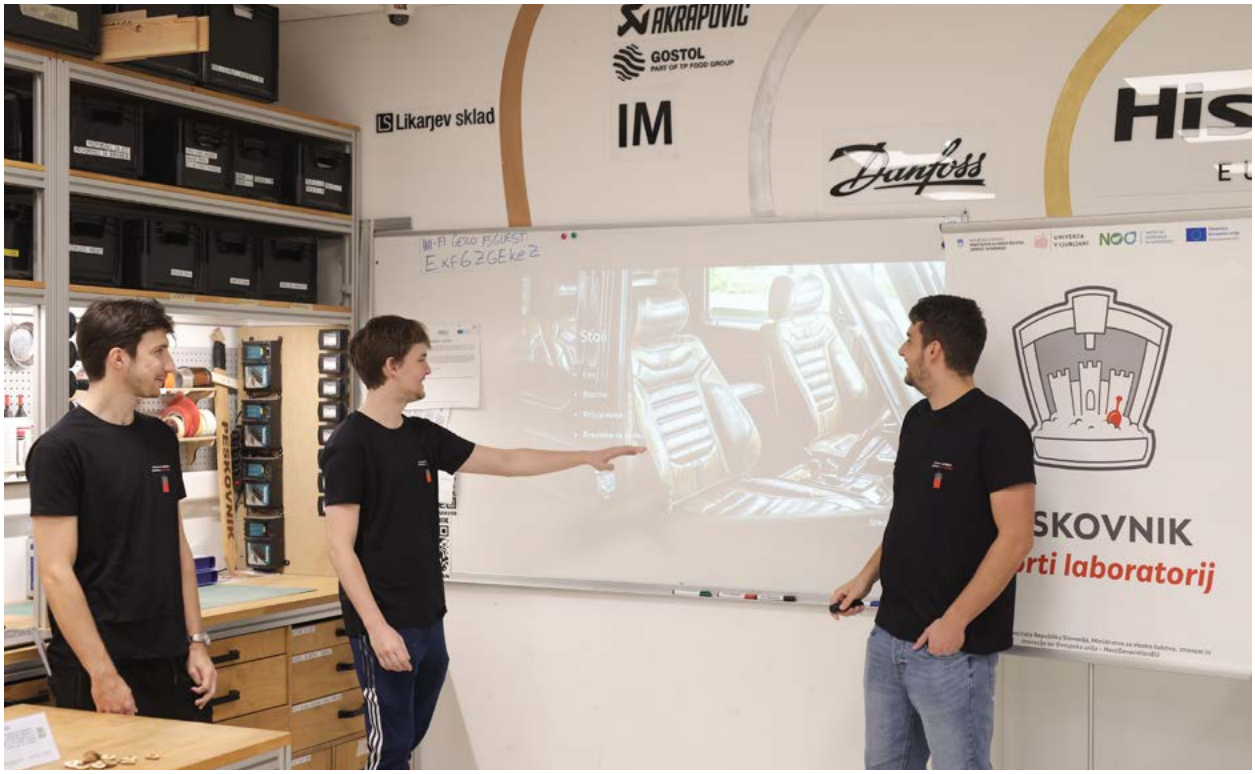

Photo: UL FME Archive

PRESENCE AT FAIRS

Throughout 2025, the faculty strengthened its visibility and influence through active participation at fairs and professional events, including MOS, MIS Celje, Informativa, SIDEC, the Mechanical Engineering Academy, and the Technology Arena. By presenting research projects, student teams, and study programmes, the faculty introduced modern engineering to the broader public and prospective students, highlighting the role of mechanical engineering in the technological development of society.

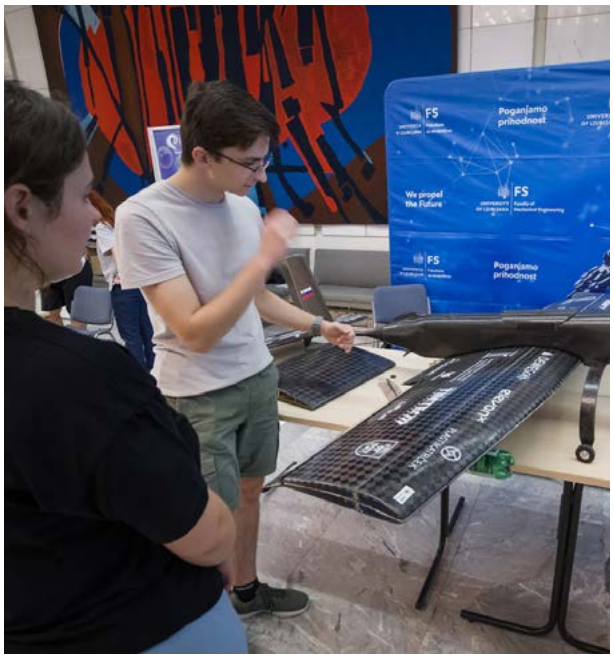

Photo: UL FME Archive

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Photo: Inženirka leta organizer's archive

ENCOURAGING WOMEN IN ENGINEERING

Promoting diversity and inclusion in engineering remains a key part of the mission of the Faculty of Mechanical Engineering, University of Ljubljana. The faculty strives to create a supportive environment in which young people—regardless of gender or background—have equal opportunities to develop their talents and contribute to technological progress.

We are particularly proud of our alumna, development engineer Rebeka Kropivšek Leskovar from Interblock, who was named Engineer of the Year 2024 in January 2025. Her professional achievements serve as an important role model for young generations and underscore the importance of women in modern engineering. The award ceremony at Cankarjev dom once again highlighted the importance of visible female role models in technical professions.

The faculty is also actively involved in promoting female mechanical engineers and nominates candidates each year for the national Engineer of the Year initiative, either from among its staff or graduates. Through this effort, we aim to increase the visibility of women in engineering, encourage girls to pursue technical studies, and contribute to building a more inclusive and diverse engineering community.

University of Ljubljana,

Faculty of Mechanical Engineering

Aškerčeva cesta 6, 1000 Ljubljana, Slovenia

Telephone: +386 1 4771 200

Fax: +386 1 2518 567

E-mail: dekanat@fs.uni-lj.si

Splet: http://www.fs.uni-lj.si/

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