



RESEARCH GROUPS CATALOGUE

DEPARTMENT OF MECHANICAL
ENGINEERING TECHNOLOGY

Split, 2026

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GROUP FOR ADVANCED MANUFACTURING TECHNOLOGIES

Head of the Group:
Prof. Dražen Bajić, PhD

<https://www.croris.hr/osobe/profil/8940?lang=en>

Scientific Fields:
Engineering – Mechanical Engineering

Brief Description of the Research Group:

The research group focuses on the application and optimization of advanced manufacturing technologies and materials. Its research covers machining, metal forming, welding, casting, additive manufacturing, and the application of CAD/CAM systems.

Special emphasis is placed on automated and robotic manufacturing processes, mathematical modelling, microforming, and reverse engineering. Through research on advanced and difficult-to-machine materials, material recycling, and the monitoring and control of manufacturing processes, the group develops innovative and sustainable engineering solutions for industrial applications.

1. RESEARCH TEAM

Faculty members in teaching and research positions:

- Prof. Sonja Jozić, PhD
- Prof. Branimir Lela, PhD
- Assist. Prof. Jure Krolo, PhD

Other faculty researchers:

- Ivana Dumanić Labetić, PhD – Senior Research Assistant
- Edin Karišik, PhD – Senior Research Assistant
- Boris Delipetar – Research Assistant
- Marijana Čelić – Research Assistant

2. EXPERTISE AND KNOW-HOW

- Machining
- Metal forming
- Additive manufacturing
- CNC machine tools
- Robotic welding
- Mathematical modelling of manufacturing processes
- CAD/CAM systems
- Manufacturing process monitoring and control
- Materials recycling
- Reverse engineering

3. RESEARCH INFRASTRUCTURE

Laboratories

- CAD/CAM Laboratory
- Machine Tools Laboratory
- Metal Forming Laboratory
- Welding Laboratory

Equipment

- CAD/CAM software packages (3DEXPERIENCE, CATIA, CIMCO, ESPRIT, WinNC, Autodesk Moldflow, NOVAFlow & Solid)
- EMCO PC Turn 50 CNC lathe
- SPINNER VC560 CNC machining centre equipped with a Cold Air Gun 610 BSP Vortec compressed-air cooling system and a Minimum Quantity Lubrication (MQL) system
- HAAS ST-10Y turn-mill centre
- Sodick VN400Q wire electrical discharge machining (Wire EDM) machine
- ZCorp Z250 3D printer
- Stratasys FDM 170 3D printer
- KISTLER cutting force and torque measurement system
- DWSOFT machining vibration monitoring system
- Filmetrics/KLA 3D optical profilometer for evaluating machined surface integrity (dimensional accuracy and surface roughness) and measuring tool wear
- MITUTOYO SJ301 surface roughness tester
- Two hydraulic presses (70 t and 100 t capacity) equipped with forming tools, dynamic and static force measurement systems, linear incremental encoder, and related instrumentation
- Robotic welding cell for both online and offline programming
- Olympus SZ61 optical microscope

4. KEY PROJECTS AND REFERENCES

- HRZZ – Alurecss: Recycling of aluminium alloys in the solid and semi-solid state
- SPIN – AxisTech: Strategic partnership for the development of innovative machining centres
- IRI S3 – ReforsTech: Strengthening R&D capacities for globally competitive, green, and innovative technologies and services
- IRI S3: Development of lightweight polymer vehicle body components to improve vehicle energy efficiency

5. COLLABORATION OPPORTUNITIES

The group's research expertise includes:

- Machining
- Metal forming
- Welding
- Casting
- Additive manufacturing
- CAD/CAM technologies

Particular emphasis is placed on automated and robotic manufacturing, mathematical modelling, microforming, and reverse engineering. Through research on advanced and difficult-to-machine materials, material recycling, and manufacturing process monitoring and control, the group develops innovative and sustainable engineering solutions tailored to industrial needs.

Opportunities for Industrial Collaboration

- Product design using the CATIA 3D CAD platform
- Design and manufacturing of prototypes using additive manufacturing technologies or CNC machining on advanced machine tools
- Machinability studies of difficult-to-machine materials
- Surface integrity evaluation using a 3D optical profilometer

6. CONTACT

Head of Research Group: Drazen.Bajic@fesb.hr

General Contact: projekti@fesb.hr

GROUP FOR MATERIALS ENGINEERING AND TRIBOLOGY

(InMaT)

Head of the Group:

Assist. Prof. Nikša Čatipović, PhD

<https://www.croris.hr/osobe/profil/31662?lang=en>

Scientific Field:

Mechanical Engineering

Brief Description of the Research Group:

The research group specializes in the development, characterization, and optimization of metallic and non-metallic materials, as well as surface coatings. It possesses expertise in material selection, heat treatment, surface protection of metals, and non-destructive testing of materials. The group's competencies include metallographic analysis, mechanical property testing, and tribological investigations, together with the development of innovative solutions aimed at improving the durability, reliability, and functionality of materials. Through its research and development activities, the group contributes to the advancement of materials and technologies for a wide range of industrial applications.

1. RESEARCH TEAM

Faculty members in teaching and research positions:

- Assoc. Prof. Jelena Čulić-Viskota, PhD

Other faculty researchers:

- Karla Kunac, M.Eng. in Industrial Engineering – Research Assistant
- Karla Antunović, M.Eng. in Mechanical Engineering – Research Assistant
- Damir Jurić, M.Eng. in Mechanical Engineering – Research Assistant
- Petar Ljumović, M.Eng. in Mechanical Engineering – Laboratory Technician

2. EXPERTISE AND KNOW-HOW

- Material selection
- Heat treatment and surface protection of metals
- Non-destructive testing (NDT) of materials
- Metallographic analysis
- Mechanical property testing
- Tribology
- Development and research of novel metallic and non-metallic materials
- Development and research of surface coatings

3. RESEARCH INFRASTRUCTURE

Laboratories

- Heat Treatment Laboratory
- Mechanical Testing Laboratory

- Non-Destructive Testing Laboratory
- Metallographic Testing Laboratory
- Advanced Materials and Tribology Laboratory

Equipment

- Optical microscopes, metallographic image analyzer, microhardness tester, precision balances
- Laboratory furnaces with and without controlled atmosphere capability, salt bath system for isothermal heat treatment
- Equipment for testing fundamental mechanical properties, including strength, hardness, toughness, ductility, fatigue resistance, and dynamic durability
- Ultrasonic testing (UT), magnetic particle testing (MT), radiographic testing (RT), penetrant testing (PT), and eddy current testing (ET) equipment
- Tribological testing equipment for friction and wear analysis, single-screw extruder for the development of novel polymer filaments for 3D printing, and vacuum infusion equipment for composite material manufacturing

4. KEY PROJECTS AND REFERENCES

- PoC SBPolyFil
- INTERREG Italy-Croatia AI4BLUE
- INTERREG Danube D4AM

5. COLLABORATION OPPORTUNITIES

The research group specializes in materials engineering and comprehensive material characterization, offering extensive opportunities for collaboration with academic institutions, industrial partners, and research and development centers. The group's expertise encompasses advanced material selection methodologies supported by 3D modelling and the Design-Expert software package, as well as optimization of material selection under predefined constraints.

Particular attention is devoted to non-destructive testing methods, metallographic characterization of material structures, and heat treatment processes aimed at optimizing mechanical properties, including strength, hardness, and toughness. The group also demonstrates strong expertise in the field of tribology, with a focus on detailed investigations of material surface wear and degradation mechanisms.

Significant experience has been gained in the development and testing of metallic and polymeric foams, as well as biopolymeric materials, with emphasis on their mechanical, structural, and functional properties. Collaboration opportunities include joint research projects, the development of novel materials and technologies, mechanical and structural testing, optimization of manufacturing processes, and the resolution of specific industrial challenges.

The group is open to bilateral collaborations, participation in European research programmes (such as Horizon Europe, Interreg, and related initiatives), joint doctoral studies, and knowledge and technology transfer activities with industry. Such partnerships foster innovative solutions in materials engineering and contribute to the development of competitive products and manufacturing processes.

6. CONTACT

Head of Research Group: Niksa.Catipovic@fesb.hr

General Contact: projekti@fesb.hr

GROUP FOR INDUSTRIAL ENGINEERING (IENG)

Head of the Group:

Assoc. Prof. Nikola Gjeldum, PhD

<https://www.croris.hr/osobe/profil/6961?lang=en>

Scientific Field:

Mechanical Engineering and Basic Technical Sciences

Brief Description of the Research Group:

The Industrial Engineering Research Group focuses on the development and application of advanced approaches to managing manufacturing, logistics, and service systems in accordance with the concepts of Industry 4.0 and Industry 5.0. The group's expertise includes multi-criteria decision-making, Lean, Green and Digital Management, process modelling and simulation, digital twins, IoT and machine-to-machine (M2M) communication, and Manufacturing Execution System (MES) development. The group actively develops a Learning Factory and smart manufacturing demonstration laboratories, conducts research on quality management and complex assembly systems, and participates in international research and educational initiatives.

1. RESEARCH TEAM

Faculty members in teaching and research positions:

- Associate Professor Nikola Gjeldum, PhD
- Full Professor Boženko Bilić, PhD
- Associate Professor Marko Mladineo, PhD

Other faculty researchers:

- Professor Emeritus Ivica Veža, PhD
- Marina Crnjac Žižić, PhD, Senior Teaching and Research Assistant
- Amanda Aljinović Meštrović, PhD, Senior Teaching and Research Assistant

2. EXPERTISE AND KNOW-HOW

- Research and implementation of modern organisational principles based on Lean, Green and Digital Management through projects and industrial case studies.
- Development of scalable Manufacturing Execution Systems (MES) for communication with and data acquisition from manufacturing, assembly, and service workstations.
- Development and implementation of Industry 4.0/5.0 technologies in industrial environments and laboratory settings.
- Development of Machine-to-Machine (M2M) communication using the MQTT (Message Queuing Telemetry Transport) protocol.
- Application of multi-criteria decision-making methods to improve engineering design, manufacturing, logistics, and service systems and processes.
- Development of the FESB Learning Factory, inspired by laboratories and institutions within the International Association of Learning Factories (IALF) and adapted to Croatian industrial needs.

- Management of assembly systems using proprietary control algorithms based on assembly system complexity indicators.
- Modelling and simulation of real assembly processes through digital twins using robots, sensors, actuators, IoT platforms, and Siemens Tecnomatix Plant Simulation software.
- Development of decision-support procedures for Mixed-Model Assembly Line (MMAL) balancing through the integration of assembly complexity indicators.
- Quality management in Industry 4.0/5.0.
- Design and development of unique complex electro-mechanical assemblies and mechanisms for material handling and transport applications.

3. RESEARCH INFRASTRUCTURE

Laboratories

- Industrial Engineering Laboratory
- Laboratory for Dimensional, Form and Position Measurement

Equipment

- Server with eight workstation PCs
- Plotter
- 80 Siemens PLM software licences (NX CAD, Tecnomatix, Teamcenter)
- Two 3D printers
- 3D scanner
- 3D television with 3D glasses
- Pick-by-Light warehouse support system
- FESTO Pick & Place assembly station
- Six assembly workstations for gearbox assembly with supermarket storage systems
- Conveyor belt for gearbox assembly line
- Four reconfigurable assembly workstations for different products
- RFID- and Raspberry Pi-based assembly monitoring and control system with LCD displays
- FRANKA collaborative robot
- Automated Guided Vehicle (AGV) with automated load unloading
- Five VisTable software licences
- Machine tools for machining small workpieces (cutting, drilling, turning, and milling)
- MarForm MMQ 200/T20W instrument for measuring form, orientation, position, and runout deviations
- Various measuring instruments
- Servo-electric drive development workstation
- Arduino-based simulation workstation

4. KEY PROJECTS AND REFERENCES

- An Excellence-Based Curriculum for the Improvement of LEAN & Green Management Skills in SMEs (EXCURS), 2022–2025, International, Erasmus+, Project Coordinator: Begona Benito
- Development of an Integrative Procedure for the Management of Production and Service Improvement Processes (DEPROCIM), 2017–2019, International, Unity

through Knowledge Fund (UKF), Project Leader: Assistant Professor Nikola Gjeldum, PhD

- Logistics Personal Excellence by Continuous Self-Assessment (LOPEC), 2012–2014, International, EU Leonardo da Vinci Programme, Project Leader: Professor Vera Hummel, PhD
- Implementation projects and follow-up collaboration with a total of nine industrial companies that served as pilot partners in the EXCURS, DEPROCIM, and LOPEC projects.
- Collaborative research and technology transfer projects with more than ten industrial partners.

5. COLLABORATION OPPORTUNITIES

- Scientific and professional collaboration with universities, faculties, and members of the International Association of Learning Factories (IALF) in the development of Learning Factory concepts and the preparation of EU-funded research projects.
- Industrial collaboration in manufacturing and service process improvement, Lean & Green Management, implementation of Industry 4.0/5.0 manufacturing paradigms, and Manufacturing Execution System (MES) development.

6. CONTACT

Head of Research Group: Nikola.Gjeldum@fesb.hr

General Contact: projekti@fesb.hr