NDUSTRIAL ENGINEERING AND MANAGEMENT

NATIONAL CENTRE OF INNOVATIVE MANUFACTURING

Contact details

<table>
<thead>
<tr>
<th>Name</th>
<th>National Centre of Innovative Manufacturing</th>
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<tr>
<td>Acronym</td>
<td>FABRIN</td>
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| Logo | ![Logo](image) |

| Site | http://www.tcm.utcluj.ro |

| Address | 103-105, B-dul Muncii, Room: G14; B07; G19; C04; M201, M203; B05; B06; G15; C03, 400641, Cluj-Napoca, Romania |

| Faculty | Machine Building Faculty, Manufacturing Engineering Department |

| Department | Manufacturing Engineering Department |

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| Director | Prof. Dr. Eng. Petru Berce |

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Areas of expertise

- **Industrial Engineering** (Laser Beam Machining, Water Jet Cutting, Electrical Discharge Machining, Rapid Prototyping of complex parts and master models for Rapid Tooling, etc.);
- **Flexible Manufacturing Systems** (CNC Manufacturing Systems);
- **CAD/CAM Systems** (Applied Industrial design for products and technologies);
- **Production Engineering** (Innovative Manufacturing for product development and Rapid Tooling technologies);
- **Automotive Engineering** (Competitive Manufacturing of car components);
- **Composite Materials** (Manufacturing technologies of complex parts made out of composite materials enforced with carbon fiber);
- **Engineering and Technologies** (Concurrent engineering, Methodologies and Software tools in Design for Manufacture and Assembly);
- **Biomedical engineering** (Prototypes, customized implants, new biocompatible materials);
- **Operational Research** (Development of algorithms for solving TSP, Flowshop Scheduling, Optimal Nesting etc.);
- **Technology Processes Optimization Development of algorithms** (for linear and nonlinear optimization, without/with constraints).

Team and key skills

- **Prof. Dr. Eng. Petru BERCE**: Director of FABRIN Center.
- **Prof. Dr. Eng. Nicolae Bălc**: Director of TENEFABCO Laboratory.
- **Prof. Dr. Eng. Mircea ANCAU**: Director of OPT Laboratory.
- **Prof. Dr. Eng. Marius BULGARU**: Coordinator of Metrology Laboratory.
- **Assoc. Prof. Dr. Eng. Mihai DAMIAN**: Coordinator of CAD-CAM Laboratory.
- **Prof. Dr. Eng. Olimpia Roș**: Field of Expertise: Design for Environment, Recycling.
- **Assoc. Prof. Dr. Eng. Alexandru Cărean**: Field of Expertise: CNC Machining.
- **Assoc. Prof. Dr. Eng. Domnița Frățilă**: Field of Expertise: Competitive Manufacturing.
- **Senior Assist. Prof. Dr. Eng. Răzvan Păcurar**: Field of Expertise: Rapid Tooling.

Infrastructure

Applied research and experimental tests are on going using the following equipment, available within the FABRIN Laboratories:
- Vacuum Casting Machine, MCP 001 PLC, used to manufacture Silicone Rubber Moulds and to produce complex parts by Vacuum Casting, in small volume production (30-50 parts);
- Equipment for Metal Spray Tooling, MCP-MK 8, used for injection moulding in medium volume production;
- 2 ovens for thermal polymerization used to produce Silicone Rubber Molds and complex parts;
- Electrical Discharge Machine with massive electrode (Agietron C – AT 100 C) with CNC control and automated tool change possibility of different electrodes, in finishing the cavities of complex parts made out into hard materials;
- EDM Wire Cutting Machine with high accuracy for micro-fabrication, used for accurate cutting in hard metals. The smallest increment for CNC movements of the machine along x-y axes is 0.1 μm (1 tens of micro meter);
- Semi-automated machine for injection moulding of plastic parts, MCP 100 KSA, specialized for Rapid Prototyping and for working with soft mold, made by Metal Spray Tooling;
- Special oven DTM type, for post-processing the metal parts made by Selective Laser Sintering;
- Water Jet Cutting Machine, OMAX 2626, used for 2D cutting of complex parts in metal, marble, glass, etc. and for complex 3D shaping;
- Modern equipment for Rapid Metal Casting, Indutherm VC 1000 D;
- CNC turning machine, Lynx 220;
- CNC machining centre, with 3 axes, simultaneously controlled, Haas Tool Room;
- CNC machining centre, with 5 axes, simultaneously controlled, DMU 50;
- Digital apparatus for roughness measurements, Mitutoyo SJ-2010;
- System for metallographic analysis (microscope XDS 3MED, camera Optikam Pro5);
- RP systems: LOM 1015, FDM 1650;
- Selective Laser Sintering equipment (SLS 2000);
- Selective Laser Melting equipment: MCP Realizer SLM;
- CNC Milling Center with 4 axes: DMG 63;
- CNC measurement and scanning equipment: PRISMO Navigator 71915;
- CMM complex measuring and scanning equipment, VideoCheckIP;
- CNC measurement equipment: ECLIPSE 500;
- Particular software such as: CAD programs, MATLAB, VISUAL C++ compiler.

Development strategy

The strategy of the FABRIN research centre is based on the co-operation of its research laboratories: FARAP, TENEFABCO and OPT. The hardware equipment and human resources from these laboratories will be used for cooperation with industry and for research projects funded from national and European resources.

Representative projects

“Adm-ERA Reinforcing Additive Manufacturing research cooperation between the Central Metallurgical Research and Development Institute and the European Research Area”, local coordinator (TUCN) in FP7 Project no. 295016, budget 496.634 €; TUCN budget = 72.106 € (Local coordinator – Prof. N. Bâlc);
BIOMAPIM “New Biocompatible Materials for personalized implants made by SLS and SLM” (2010-2013) Deputy Director of a major research project – PCCE, contract no. 5/2010, budget 6.790.297 RON; Director – Prof. P. Berce, Deputy Director – Prof. N. Bâlc.

Significant results


International Patent: „Acting Device”, registered in USA and Germany;
- Competitive Manufacturing techniques transferred to industrial partners and used in commercial contracts with companies from Germany and England:

The offer addressed to the economic environment

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<tr>
<th>Research &amp; development in core areas</th>
<th>Develop new materials, suitable for Rapid Prototyping using the SLS and SLM equipment. Development of optimization algorithms.</th>
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<tr>
<td>Consulting</td>
<td>External evaluation of products/projects: Select the optimal RP technological route; Consulting in the area of operational research (industrial application of combinatorial optimization: calculation of minimum path length, optimal nesting, flowshop scheduling etc.).</td>
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<td>Applied engineering services</td>
<td>Rapid development of new products; RP services</td>
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<td>Training</td>
<td>We offer training in the field of Numerical Optimization Techniques in Computer Aided Design. Training for people from industry, in the following fields: - Use modern CAD systems for integrated applied design; - Rapid Tooling; - Modern Manufacturing Technologies; - Using the modern RP equipment; - CNC machining; - Metrology and Quality Engineering.</td>
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![Fig. 1. EDM-Wire Cutting](image1)

![Fig. 2. Investment Casting](image2)

![Fig. 3. Vacuum Casting / Silicone Rubber Molding](image3)
Fig. 4. Water Jet Cutting / Milling

Fig. 5. CNC Milling Center with 4 axes

Fig. 6. CNC Milling Center with 3 axes