

Additive Manufacturing and Rapid Product Development Research Centre

Contact details

Name	Additive Manufacturing and Rapid Product Development	
Acronym	AMaRaP	
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Areas of expertise

3D Printing (SLM - Selective Laser Melting; SLS - Selective Laser Sintering; FDM - Fused Deposition Modelling); Production Engineering (Innovative manufacturing for product development); **Rapid Tooling** (Investment Casting, Silicone Rubber Molding, Metal Spray Tooling); **Medical Applications of AM** (Prototypes, Customized Implants, New biocompatible materials); **Industrial Engineering** (Laser Beam Machining, Water Jet Cutting, Electrical Discharge Machining); **CAD/CAM/CAE** (Applied Industrial design for products and technologies); **Concurrent engineering** (Methodologies and software tools in **Design for Manufacture and Assembly-DFMA**); **Composite Materials** (Manufacturing composite materials, reinforced with carbon/glass fibber).

Team

Prof. Nicolae Bâlc, Prof. Petru Berce, Prof. Mircea Ancău, Prof. Domnița Frățilă, Assoc. Prof. Alina Popan, Assoc. Prof. Dan Leordean, Assoc. Prof. Alexandru Popan, Prof. Paul Bere, Prof. Răzvan Păcurar, Assoc. Prof. Emilia Sabău, Senior Lect. Horea Chezan, Senior Lect. Cosmin Cosma, Assoc. Prof. Adrian Trif, Assoc. Prof. Vlad Bocăneț.

Representative projects

National project: "TEFAIMP – Manufacturing Technologies for customized 3D Implants", Code SMIS 320844, Contract nr. 241/01.04.2025, Duration: 36 months (01.04.2025 – 30.03.2028), Budget 8.625.252 lei, Director: Prof. Nicolae BALC

ESA Contract Nr. 4000138822/22/NL/AR/ces (European Space Agency), „Application Assessment of Additive Manufacturing Capabilities for AlSi10Mg Preliminary Development of Process Parameter (AlAMa)", Period: 05.09.2023-05.01.2024, Director: Prof. N. BALC

H2020 – DiCoMI, „Directional Composites through Manufacturing Innovation", 2018–2023, TUCN Leader: Prof. N. BALC, <http://www.dicomi.eu>;

PP H2020, Contract 71/2022: "Fabricația inovativă a compozitelor prin tipărire 3D", 2022-2023, Director Prof. N. BALC

H2020 – AMaTUC, „Boosting the scientific excellence and innovation capacity in additive manufacturing of the TUC-N", 2016–2018, Coordinator: Prof. N. BALC. www.amatuc.com;

Erasmus+ KA2 – DigiMan, „Digital Manufacturing Master Degree to set specialists for the dawn of the Industry 4.0", 2019 – 2022, TUCN Leader: Prof.N. BALC, <http://www.digimanproject.eu>;

FP7 – Adm-ERA, „Reinforcing Additive Manufacturing research cooperation between the Central Metallurgical Research and Development Institute and the European Research Area", 2011–2013, TUCN Leader: Prof. N. Balc; <http://www.fp7-admera.org>;

Bridge Grant – OpTi-DeP, Optimizarea tipăririi 3D pentru Aplicații Dentare Personalizate, 2016-2018, Director: Prof. N. Bâlc;

Bridge Grant – PreMCo, „Dezvoltarea posibilităților de prelucrare a materialelor compozite avansate prin tăiere de precizie cu jet de apă", 2016-2018, Director: Assoc.Prof. Alexandru Popan; <http://www.premco.utcluj.ro>;

Bridge Grant, „Optimizarea materialelor compozite polimerice armate cu fibre și a tehnologiei de fabricație utilizate în construcția elementelor de caroserie pentru vehicule electrice", 2016-2018, Director: Assoc.Prof. Paul Bere;

PP H2020, "Support AMaTUC", 2016-2018, Director Prof. N. BALC

PCCA – PECIFCO, „Implanturi cranio-faciale personalizate obtinute prin prototipare inovativa 3D din materiale compozite ranforsate cu fibra de sticla", 2014-2017, TUCN Coord: Prof. N. BALC

Significant results

Selected publications in the last 3 years:

1. Stanciu A., Vilau C., Balc N. „Analysis of the Mechanical Behavior of Tree-like Fractal Structures in SLM-Manufactured Components”, MATERIALS, vol. 18, no. 10, 2025. <https://doi.org/10.3390/ma18102215> (FI = 3.2)
2. Eichler, F., Balc N., Bremen S., Sauren J. „Influence of Adjusted Melt Pool Geometries on Residual Stress in 316L LPBF Processes”, METALS, vol. 15, no. 9, 2025. <https://doi.org/10.3390/met15091010> (FI = 2.5)
3. Matis A., Min-Uh Ko, Kraft R., Balc N. „Process Development to Repair Aluminum Components, Using EHLA and Laser-Powder DED Techniques”, JOURNAL OF MANUFACTURING AND MATERIALS PROCESSING, vol. 9, no. 8, 2025. <https://doi.org/10.3390/jmmp9080255> (FI = 3.3)
4. Eichler, F.; Balc, N.; Bremen, S.; Nink, P.; „Investigation of Laser Powder Bed Fusion Parameters with Respect to Their Influence on the Thermal Conductivity of 316L Samples”, JOURNAL OF MANUFACTURING AND MATERIALS PROCESSING, Volume 8, Issue 4, 2024, DOI10.3390/jmmp8040166 (FI: 3,3);
5. Popan, IA; Bocnet, V; Softic, S.; Popan, AI; Panc, N; Balc, N, „Artificial Intelligence Model Used for Optimizing Abrasive Water Jet Machining Parameters to Minimize Delamination in Carbon Fiber-Reinforced Polymer”, APPLIED SCIENCES-BASEL, Volume 14, Issue 18, 2024, DOI10.3390/app14188512 (FI: 2.5);
6. Rusu, M; Balc, N, Moldovan, M, Cuc, S, Petean, I, Cosma, C, Leordean, D, „Recycled PET Composites Reinforced with Stainless Steel Lattice Structures Made by AM”, POLYMERS, Volume 15, Issue 23, 2023, DOI10.3390/polym15234591 (Q1, FI: 5)
7. Abbas, K, Hedwig, L, Balc, N, Bremen, S, „Advanced FFF of PEEK: Infill Strategies and Material Characteristics for Rapid Tooling”, POLYMERS, Volume 15, Issue 21, 2023, DOI 10.3390/polym15214293 (Q1, FI: 5)
8. Birlescu, A, Balc, N, „Computational Model for Tree-like Fractals Used as Internal Structures for AM Parts”, APPLIED SCIENCES-BASEL, Volume 13, Issue 20, 2023, DOI10.3390/app132011187 (FI: 2.7)
9. Pascu, S, Balc, N, „Process Parameter Optimization for Hybrid Manufacturing of PLA Components with Improved Surface Quality”, POLYMERS, Volume 15, Issue 17, 2023, DOI 10.3390/polym15173610 (Q1, FI: 5)
10. Popan, IA, Cosma, C, Popan, AI, Panc, N, Filip, D, Balc, N, „Correction of Shape Error at Cut-In and Cut-Out Points in Abrasive Waterjet Cutting of Carbon Fiber Reinforced Polymer (CFRP)”, MACHINES, Volume 11, Issue 8, 2023, DOI 10.3390/machines11080800 (Q2, FI: 2.6)

Selected Books

11. Balc, N., Cosma C., Capitol de carte : “Selective Laser Melting: From Research to Industrial Applications” Autori.: Titlul cărții: “Digital Product Design and Manufacturing”, Taylor&Francis, <http://taylorandfrancis.com> / ISBN: 978-1-032-83559-4 (hbk) / ISBN: 978-1-003-51819-8 (ebk) / DOI: 10.1201/9781003518198.
12. Berce, P., Bâlc, N., Păcurar R., ș.a., (2014), *Tehnologii de fabricație prin adaugare de material și aplicațiile lor*, Editura Academiei Romane, București.
13. Berce, P., Bâlc, N., Leordean Dan, ș.a., (2015), *Aplicațiile medicale ale tehnologiilor de fabricație prin adăugare de material*, Editura Academiei Romane, București - Awarded with “Henri Coandă” prize of Romanian Academy, 2017.
14. Nicolae Balc, Dan Leordean, Editors: “Research and Applications in Manufacturing Engineering”, MATEC Web of Conferences – EDP Sciences, France, Volume 299, 2019, ISBN- ISBN: 978-2-7598-9083-5, <https://www.matec-conferences.org/articles/mateconf/abs/2019/48/contents/contents.html>
15. Nicolae Balc, Editor: “Modern Technologies in Manufacturing”, MATEC Web of Conferences – EDP Sciences, France, Volume 137, 2017, ISBN- ISBN: 978-2-7598-9083-5, <https://www.matec-conferences.org/articles/mateconf/abs/2017/51/contents/contents.html>
16. Nicolae Balc, Editor: “Modern Technologies in Manufacturing”, Trans Tech Publications - Applied Mechanics and Materials, Switzerland, Vol. 808, 394 pagini, 2015, ISBN-13: 978-3-03835-653-0, <http://www.scientific.net/AMM.808/book>

International Patents:

17. „Actuating Device”, registered in USA and Germany; N. Balc, D. Leordean, No. US9199358 B2, 2016; <http://www.google.ch/patents/US9199358>
18. Betätigungsvorrichtung – European patent, owner: DE-STA-CO Company, D. Leordean, N. Bâlc, ș.a., No. EP2433750; <http://www.google.com/patents/EP2433750A1?cl=en>;

Scientific events organized by AMaRaP: **The International Conference on Modern Technologies in Manufacturing** - MTeM 2025, 2023, 2019, 2017, 2015, 2013 and 2011”, held in Cluj-Napoca, Romania - <https://mtem.utcluj.ro/>

The offer addressed to the economic environment

Research & development	Rapid Product Development; Rapid Tooling and Additive Manufacturing Design for Competitive Manufacturing of Industrial Products,
Consulting	External evaluation of products/projects Rapid product development; Rapid Prototyping and Rapid tooling for large volume production. Design for Manufacture and Assembly; Mechanical analysis (CAE, FEA) and simulations.
Training	Training for people from industry, in the following fields: - 3D Printing for Rapid Product Development; Rapid Tooling. - Virtual Engineering for Competitive Manufacturing; Simulations of products functionality; FEA. - Topological design and integrated applied design

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