

ADMISSION TO DOCTORAL STUDIES

Session September 2025

Field of doctoral studies: Materials engineering

Doctoral supervisor: Prof. dr. eng. Mircea Horia Țierean

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *Research on the influence of laser texturing of the metal substrate surface on the quality of the joint with 3D printed polymers*

Contents / Main aspects to be considered

- Current state of the art of laser texturing.
- Obtaining joints between 3D printed polymers and metals with laser textured surfaces.
- Characterization of polymer-metal joints (optical microscopy and SEM, roughness, wetting and mechanical properties).

Recommended bibliography:

1. Belej, C., Meier, B., Amancio-Filho, S.T. Manufacturing of Metal–Polymer Hybrid Parts Using a Desktop 3–Axis Fused Filament Fabrication 3D-Printer. *Metals*, 2023, 13, 1262.
2. Belej, C., Effertz, P.S., Meier, B., Amancio-Filho, S.T. Additive manufacturing of metal–polymer hybrid parts: the influence of as-printed LPBF surface roughness on the joint strength, *Frontiers in Materials*, 10:1202281, 2023.
3. Kasaei, M.M., Carbas, R.J.C., Marques, E.A.S., da Silva, L.F.M., A novel joining technology for metal and polymer sheets, *Journal of Advanced Joining Processes*, Volume 9, 2024, 100184.
4. Moldovan, E.R.; Concheso Doria, C.; Ocaña, J.L.; Istrate, B.; Cimpoesu, N.; Baltes, L.S.; Stanciu, E.M.; Croitoru, C.; Pascu, A.; Munteanu, C.; Țierean, M.H. Morphological Analysis of Laser Surface Texturing Effect on AISI 430 Stainless Steel. *Materials*, 2022, 15, 4580.
5. Moldovan, E.R.; Concheso Doria, C.; Ocaña, J.L.; Baltes, L.S.; Stanciu, E.M.; Croitoru, C.; Pascu, A.; Roata, I.C.; Țierean, M.H. Wettability and Surface Roughness Analysis of Laser Surface Texturing of AISI 430 Stainless Steel. *Materials*, 2022, 15, 2955.
6. Moldovan, E.R., Concheso Doria, C., Ocaña Moreno, J.L., Baltes, L.S., Stanciu, E.M.; Croitoru, C., Pascu, A., Țierean; M.H., Geometry Characterization of AISI 430 Stainless Steel Microstructuring Using Laser. *Archives of Metallurgy and Materials*, 2022, volume: 67, issue: 2, 645–652.
7. Obilor, A.F., Pacella, M., Wilson, A. et al. Micro-texturing of polymer surfaces using lasers: a review. *Int J Adv Manuf Technol*, 120, 103–135, 2022.

Prerequisites / Remarks: *Graduate of a master's degree program in the field of Materials Engineering, Industrial Engineering, Mechanical Engineering, Environmental Engineering.*

☒ **Scientific Doctorate (full-time only)**

☒ **Professional Doctorate (full-time or part-time)**

☒ **without tuition fee (state budget funded)**

☒ **with tuition fee or with funding from other sources than the state budget**

TOPIC 2: *Research on the application of laser texturing of metal surfaces to medical devices*

Contents / Main aspects to be considered

- Current state of the art of laser texturing.
- Obtaining hydrophilic and hydrophobic surfaces by laser texturing for medical devices.
- Characterization of textured medical device surfaces (optical microscopy and SEM, roughness, wetting and mechanical properties).

Recommended bibliography:

1. Chen, H.; Zhang, Y.; Zhang, L.; Ding, X.; Zhang, D. Applications of bioinspired approaches and challenges in medical devices. *Bio-Des. Manuf.* 2021, *4*, 146–148.
2. Huang, Y., Yang, R., Li, M.G., Recent Advances in Laser Manufacturing: Multifunctional Integrative Sensing Systems for Human Health and Gas Monitoring, *Adv. Funct. Mater.*, 2024, *34*, 2407503.
3. Li, C.; Yang, L.; Liu, N.; Yang, Y.; Zhao, J.; Yang, P.; Cheng, G. Bioinspired surface hierarchical microstructures of Ti6Al4V alloy with a positive effect on osteoconduction. *Surf. Coat. Technol.* 2020, *388*, 125594.
4. Lu, L.; Wang, H.; Guan, Y.; Zhou, W. Laser microfabrication of biomedical devices. *Chin. J. Lasers*, 2017, *44*, 59–73.
5. Wang, H., Deng, D., Zhai, Z., Yao, Y., Laser-processed functional surface structures for multi-functional applications-a review, *Journal of Manufacturing Processes*, Volume 116, 2024, 247–283.
6. Du, X., Liu Z., Zhang, Z., Du, C., Sui, J., Wang, C., Functional surfaces of medical devices based on laser processing: a review[J]. *Diamond & Abrasives Engineering*, 2024, *44*(2): 206-220.
7. Xu, Z.; Wang, Y.A.; Ng, V.; Yin, H.; Xu, S. Advancements in Laser-Processed Functional Surfaces for Medical Devices: A Current Review. *Nanomaterials* 2025, *15*, 999.

Prerequisites / Remarks: *Graduate of a master's degree program in the field of Materials Engineering, Industrial Engineering, Mechanical Engineering, Environmental Engineering.*

☒ **Scientific Doctorate (full-time only)**

☒ **Professional Doctorate (full-time or part-time)**

☒ **without tuition fee (state budget funded)**

☒ **with tuition fee or with funding from other sources than the state budget**

Doctoral supervisor,

Prof. dr. eng. Mircea Horia Țierean

Signature

Coordinator of the field of doctoral studies,

Prof. dr. eng. Mircea Horia Țierean

Signature