Universitatea Transilvania din Brașov

**Interdisciplinary Doctoral School**

## ADMISSION TO DOCTORAL STUDIES Session September 2022

**Field of doctoral studies: Materials engineering**
**Doctoral supervisor: Assoc. Prof. dr. chem. Cătălin Croitoru**

## TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

**TOPIC 1:** *Functional polymer and composite materials using the Fused Filament Fabrication (FFF) technology*

**Content / Main aspects to be considered**

- Obtaining optimized recipes for making 3D printing filaments (polymer blends, polymer/ ceramic or polymer/metal composite compounds including also recycled secondary raw materials) and their characterization (structure, mechanical, thermal properties, etc.);
- Characterization of the polymeric and composite functional materials obtained through FFF (tribo-mechanical, thermal, morpho-structural characterization, etc.) and their recommendation for various applications;
- Optimization of the FFF process parameters for the realized recipes.

**Recommended bibliography:**


1. Muralidhara, H.B.; Banerjee, S. (editors). 3D Printing Technology and Its Diverse Applications. CRC Press, 2021. ISBN: 978-1-77188-978-0.
2. Goodship, V.; Middleton, B.; Cherrington, R. Design and Manufacture of Plastic Components for Multifunctionality: Structural Composites, Injection Molding, and 3D Printing. Elsevier, 2015. ISBN: 978-0-323-34061-8.
3. Subramanian, M.N. Basics of Polymers Fabrication and Processing Technology. Momentum Press, 2015. ISBN: 978-1-60650-582-3.
4. Osswald, T.A.; Menges, G. Material Science of Polymers for Engineers (3rd edition). Hanser Publishers, 2012. ISBN: 978-1-56990-514-2.
5. Seymour, R.B.; Carraher, C.E. Structure – Property Relationships in Polymers. Plenum Press, 1984. ISBN: 978-1-4684-4750-7.


**Prerequisites / Remarks:** *studies in engineering, chemistry or physics*

**TOPIC 2:** *Functional hydrogel materials based on synthetic polymers and biopolymers*

**Content / Main aspects to be considered**

- Obtaining of chemical/physical crosslinked hydrogels from synthetic and/or natural polymers for environmental depollution applications (adsorbent materials for organic compounds and heavy metal ions from wastewaters), sensoristics and controlled release of active ingredients;

- Characterization of the morphology, structure, composition and interaction between the components of the hydrogel system.

**Recommended bibliography:**


1. Ninago, M.D.; López, O.V.; Horst, M.F. The Applications of Hydrogels. 2021, ISBN: 978-1-68507-219-3.
2. Thakur, V.K.; Thakur, M.K (editori). Hydrogels: Recent Advances. Springer, 2018. ISBN: 978-981-10-6077-9.
3. Haider, S.; Haider, A. (editori) Hydrogels. IntechOpen, 2018. ISBN: 978-1-78923-368-1.
4. Chu, Y. Hydrogels Based on Natural Polymers. Elsevier, 2020. ISBN: 978-0-12-816421-1. Oliveira Monteiro da Silva Abreu, F. Physical Hydrogels for Drug Delivery Applications: Physical Hydrogels. Eliva Press, 2022. ISBN: 978-1-63648-153-1.


**Prerequisites / Remarks:** *studies in engineering, chemistry, physics or pharmacy*

**Doctoral supervisor,**

Assoc. Prof. dr. chem. Cătălin Croitoru

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**Coordinator of the field of doctoral studies,**

Prof. Dr. Mircea Horia Tierean

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