Transilvania University of Brașov
INTERDISCIPLINARY DOCTORAL SCHOOL

ADMISSION TO DOCTORAL STUDIES **Session September 2025**

Field of doctoral studies: Mechanical Engineering
Doctoral supervisor: Prof. dr. eng. Mariana Domnica STANCIU

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *Research on the physical, mechanical and rheological properties of naturally coloured wood*

Contents / Main aspects to be considered

- *types of natural wood colours (classification, inventory, wood species).*
- *mechanical tests of wood samples with colours.*
- *applications of wood with defects (higher valorisation).*

Recommended bibliography:

Li, R.; Li, J.; Shi, J.; Zhang, Y.; Sun, Y.; Chen, Y.; Liu, Z. Fluorescence Properties of *Pterocarpus* Wood Extract. *Forests* **2023**, *14*, 1094. https://doi.org/10.3390/f14061094

Zhang, H.T.; Nesterov, E.E. Novel solid-state fluorescent chemosensors based on the photoexcitation energy migration: General design and applications. In *Abstracts of Papers of the American Chemical Society*; American Chemical Society: Washington, DC, USA, 2006; Volume 231

Krishnamoorthy, G. Fluorescence spectroscopy for revealing mechanisms in biology: Strengths and pitfalls. *J. Biosci.* **2018**, *43*, 555–567.

Krishna S, Chowdhury KA (1935) Fluorescence of wood under ultraviolet light. Indian Forster 61: 221–228

Peters, F. B.; Rapp, A. O. (2021) Wavelength-dependent photodegradation of wood and its effects on fluorescence. Holzforschung, vol 76, no.1, pp. 60-67. DOI 10.1515/hf-2021-0102

Prerequisites / Remarks: *knowledge of the anatomy, physical, mechanical and chemical properties of wood; knowledge of the anisotropic characteristics of wood; CAD design skills*

- ✓ **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 mechanical and acoustic properties of lignocellulosic biomimetic structures*

Contents / Main aspects to be considered

- ✓ Design of biomimetic structures
- Mechanical and acoustic testing of biomimetic structures,
- Simulation of static and dynamic behaviour of biomimetic structures,
- Applications of biomimetic structures.

Recommended bibliography:

Ball, P. (2009) Shapes: Nature's Patterns: A Tapestry in Three Parts; OUP Oxford: Oxford, UK.
Vincent, J. F.V.; Bogatyreva, O. A.; Bogatyrev, N.R.; Bowyer, A.; Pahl, A-K.(2006) Biomimetics: its practice and theory. J. R. Soc. Interface. 3471–482 http://doi.org/10.1098/rsif.2006.0127.
Mcnulty, T.; Bhate, D.; Zhang, A.; Kiser, M.A.; Ferry, L.; Suder, A.; Bhattacharya, S.; Boradkar, P. A. (2017) Framework for the Design of Biomimetic Cellular Materials for Additive Manufacturing. In Proceedings of the 28th Annual International Solid Freeform Fabrication Symposium, Austin, TX, USA, 7–9 August 2017; pp. 2188–2200.
Zhao, M.; Li, X.; Zhang, D. Z.; Zhai, W. (2023) Geometry effect on mechanical properties and elastic isotropy optimization of bamboo-inspired lattice structures, Additive Manufacturing, Volume 64:103438, https://doi.org/10.1016/j.addma.2023.103438
Park, K-M.; Min, K-S.; Roh, Y-S. (2022) Design Optimization of Lattice Structures under Compression: Study of Unit Cell Types and Cell Arrangements. Materials. 15(1):97. https://doi.org/10.3390/ma15010097.

Prerequisites / Remarks: *advanced CAD design knowledge, knowledge of fundamental concepts of strength of materials calculation; mechanical and acoustic testing skills; knowledge of biomimetic structures*

- ✓ ☐ **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. ing. Mariana Domnica STANCIU

Signature

Coordinator of the field of doctoral studies,

Prof. dr. ing. Maria Luminița SCUTARU

Signature