Transilvania University of Brașov
INTERDISCIPLINARY DOCTORAL SCHOOL

ADMISSION TO DOCTORAL STUDIES **Session September 2026**

Field of doctoral studies: Engineering and management
Doctoral supervisor: Prof.dr.eng., dr marketing Angela Repanovici

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: ***Intelligent System for Ecotourism Management Based on Information Architectures, Data Analytics, and Digital Sustainability***

Contents / Main aspects to be considered –

Analysis of *smart tourism* and *smart destination* concepts, including digital ecosystems, interoperability, and data-driven tourism management.

Design of an integrated information architecture for ecotourism management, covering data collection, processing, interoperability, and decision-support systems.

Application of data analytics, business intelligence, and data science techniques to optimize tourist flows, resource allocation, and environmental impact reduction.

Study of digital sustainability models, ESG principles, and the role of digital transformation in sustainable tourism development.

Development and evaluation of intelligent tools for monitoring tourist behavior, managing environmental resources, and preventing overtourism.

Exploration of *Digital Twin* technologies for simulating ecotourism scenarios, forecasting environmental impact, and supporting strategic planning.

Assessment of post-pandemic transformations in tourism and the acceleration of digitalization, automation, and resilience strategies.

Proposal of an intelligent ecotourism management model integrating sustainability principles, data-driven decision making, and emerging digital technologies.

Recommended bibliography:

Buhalis, D.; Leung, R. *Smart Hospitality—Interconnectivity and Interoperability towards an Ecosystem*. International Journal of Hospitality Management. Amsterdam: Elsevier, 2018.

Gretzel, U.; Sigala, M.; Xiang, Z.; Koo, C. *Smart Tourism: Foundations and Developments*. Electronic Markets. Cham: Springer, 2015.

Huang, C.-W.; Goo, J.; Nam, K.; Yoo, C. *Smart Tourism Technologies in Travel Planning: The Role of Exploration and Exploitation*. Information & Management. Amsterdam: Elsevier, 2017.

Koo, C.; Shin, S.; Gretzel, U.; Hunter, W.; Chung, N. *Conceptualization of Smart Tourism Destination Competitiveness*. Asia Pacific Journal of Information Systems. Seoul: KAIT, 2016.

Perkumienė, D.; Pranskūnienė, R. *Overtourism: Between the Right to Travel and Residents' Rights*. Sustainability. Basel: MDPI, 2019.

Sharda, R.; Delen, D.; Turban, E. *Business Intelligence, Analytics, and Data Science: A Managerial Perspective*. Harlow: Pearson, 2020.
UNWTO. *Tourism and the Sustainable Development Goals – Journey to 2030*. Madrid: World Tourism Organization, 2020.

Prerequisites / Remarks: *to be adapted/ completed/ deleted*

☐X Scientific Doctorate

☐X Professional Doctorate

☐X without tuition fee (state budget funded)

☐X with tuition fee or with funding from other sources than the state budget

TOPIC 2: *Research on the Development of an Intelligent Architecture Based on Artificial Intelligence for Adaptive Air Quality Monitoring and Control in Smart Home Applications*

Contents / Main aspects to be considered –

Analysis of indoor air pollution and its impact on human health; identification of key pollutants (PM2.5, VOCs, CO_2, humidity, temperature).

Study of modern air-quality monitoring technologies: IoT sensors, microcontrollers, wireless communication protocols, and smart home integration.

Development of an intelligent architecture for Smart Home environments, including: sensor layer, edge-computing layer, AI-based decision layer, and user interface.

Application of machine learning algorithms for air-quality prediction, anomaly detection, and optimization of ventilation and filtration systems.

Integration of user feedback and thermal-comfort models into adaptive environmental control strategies.

Implementation of a real-time AI-driven control system capable of automatically adjusting environmental parameters.

Exploration of the *Home Digital Twin* concept for simulating air-quality scenarios and testing optimization strategies.

Experimental validation of the proposed architecture through prototyping, real-environment testing, and performance evaluation.

Recommended bibliography:

González-Martín, J. et al. *A state-of-the-art review on indoor air pollution and strategies for indoor air pollution control*. Chemosphere. Amsterdam: Elsevier, 2021.
Saini, J.; Dutta, M.; Marques, G. *A comprehensive review on indoor air quality monitoring systems for enhanced public health*. Sustainable Environment Research. 2020.
Salamone, F. et al. *Integrated method for personal thermal comfort assessment and optimization through users' feedback, IoT and machine learning*. Sensors. 2018.
Xu, R.; Jin, W.; Kim, D. *Edge computing-based environment optimization scheme using PSO for efficient thermal comfort control in residential space*. Actuators. Basel: MDPI, 2021.
Nguyen, T. A. *Home Digital Twins*. Amsterdam: Elsevier, 2026.

Prerequisites / Remarks: *to be adapted/ completed/ deleted*

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☐X Professional Doctorate

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TOPIC 3: ***Research on Structural and Mechanical Changes Induced by Sterilization in Medical Devices Manufactured through Additive Technologies***
Contents / Main aspects to be considered – Analysis of additive manufacturing technologies used for medical devices: FDM, SLA, SLS, and polymer/composite materials suitable for clinical applications. Study of sterilization methods applicable to 3D-printed medical devices: steam sterilization, gamma irradiation, ethylene oxide, plasma, UV. Evaluation of physicochemical changes induced by sterilization: thermal degradation, oxidation, mass variation, moisture absorption, surface modifications. Assessment of mechanical changes after sterilization: tensile strength, compressive strength, hardness, elasticity, dimensional stability. Investigation of microstructural changes using specific techniques (SEM, DSC, FTIR, optical microscopy). Determination of material compatibility with various sterilization methods and analysis of the impact on biocompatibility. Development of a predictive model describing the behavior of 3D-printed materials depending on sterilization method and process parameters. Formulation of recommendations for standardizing sterilization procedures for personalized 3D-printed medical devices.
Recommended bibliography: Bakhtiar, S. M. et al. *3D Printing Technologies and Their Applications in Biomedical Science*. În: *Omics Technologies and Bio-Engineering*. Academic Press, 2018. Wiseman, J. et al. *Sterilization of bedside 3D-printed devices for use in the operating room*. Annals of 3D Printed Medicine. 2022. Stewart, S. A. et al. *Evaluation of sterilisation techniques for 3D-printed implantable devices*. RPS Pharmacy and Pharmacology Reports. 2023. Sharma, N. et al. *Effects of Steam Sterilization on 3D Printed Biocompatible Resin Materials for Surgical Guides*. Journal of Clinical Medicine. 2020. Pérez-Davila, S. et al. *3D-Printed PLA Medical Devices: Physicochemical Changes and Biological Response after Sterilisation Treatments*. Polymers. 2022.
Prerequisites / Remarks: ***to be adapted/ completed/ deleted***
☐**X Scientific Doctorate** ☐**X Professional Doctorate**

☐ **X without tuition fee (state budget funded)**

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

Doctoral supervisor,

Prof. Dr. Eng., Dr. Marketing Angela Repanovici

Coordinator of the field of doctoral studies,

Prof. Dr. Eng. Adriana Florescu