

ADMISSION TO DOCTORAL STUDIES

Session September 2026

Field of doctoral studies: Medicine

Doctoral supervisor: Prof. Dr. Dr. Monica FLORESCU

TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

TOPIC 1: *Evaluation of the clinical and molecular impact of chronic exposure to exogenous environmental factors on health: correlation with molecular and functional biomarkers*

Contents / Main aspects to be considered - *Study of the relationship between the level of exposure to exogenous environmental factors (chemical and physical) and changes in health status. The analyses will use screening tools to assess clinical impact and biophysical methods to assess physiological and molecular effects associated with exposure, to correlate the intensity and duration of exposure with the severity of clinical and molecular changes, to monitor and prevent chronic exposure, and to correlate them with clinical impact.*

Possible applications: *endocrinology, haematology, internal medicine, oncology, autoimmune or inflammatory diseases, psychiatry, neurology, occupational medicine, and public health/epidemiology.*

Recommended bibliography:

- Lafta, Methaq hadi, et al., Toxic effects due to exposure heavy metals and increased health risk assessment (leukemia), Reviews on Environmental Health, vol. 39, no. 2, 2024, pp. 351-362.
- de Lima Andrade, E., da Cunha e Silva, D.C., de Lima, E.A. et al. Environmental noise in hospitals: a systematic review. Environ Sci Pollut Res 28, 19629–19642 (2021).
- Talapko, J.; et al. Health Effects of Ionizing Radiation on the Human Body. Medicina 2024, 60, 653.
- Bartel, L.; Mosabbir, A. Possible Mechanisms for the Effects of Sound Vibration on Human Health. Healthcare 2021, 9, 597.
- Sharif, S., et al., Neuroenhancement and the Use of Cognitive Enhancers among University Students: Molecular Mechanisms and Psychological Implications. Frontiers in Pharmacology, 2022, 13, 856725.
- Boutros, G. H., et al., The Impact of Sports Nutrition Supplements on the Gut Microbiome and Mental Health in Young Athletes: A Systematic Review." Nutrients, 2024, 16(3), 412.
- Cano-Montoya, J., et al., Energy Drink Consumption and its Association with Sleep Quality, Anxiety, and Stress Biomarkers in University Students: A Cross-Sectional Study." International Journal of Environmental Research and Public Health, 2023, 20(5), 4501.

☒ Scientific Doctorate

☒ Professional Doctorate

☒ without tuition fee (state budget funded)

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TOPIC 2: *Dynamics of circadian systems under technological and social pressure: Biophysical modeling of psychosomatic resilience in young people.*

Contents / Main aspects to be considered - *investigating the mechanisms of desynchronization of biological rhythms among young people, under the combined impact of hybrid pedagogical*

environments and digital social pressure, using the theoretical apparatus of biophysics. The research proposes to quantify the "social jet lag" and correlate functional indicators with clinical markers of mental health. The final objective is to develop a predictive model of human resilience in the face of contemporary technogenic stress.

Possible applications: *occupational medicine and public health/epidemiology, psychiatry, neurology.*

Recommended bibliography:

- Forger, D. B. (2017). *Biological Clocks, Rhythms, and Oscillations: The Theory of Biological Timekeeping*. MIT Press.
- Wahl, S., et al. (2019). "The inner clock—Blue light sets the human rhythm." *Journal of Biophotonics*, 12(12), e201900102.
- Roenneberg, T., & Merrow, M. (2016). "The Circadian Clock and Human Health." *Current Biology*, 26(10), R432-R443.
- Alfonsi V, Scarpelli S, D'Atri A, Stella G, De Gennaro L. Later School Start Time: The Impact of Sleep on Academic Performance and Health in the Adolescent Population. *Int J Environ Res Public Health*. 2020, ,17(7), 2574.
- Gan H, Xu L, Tong C. Digital Sleep Disruption: Unraveling the Network Structure of Technology Use and Sleep Problems Through Network Analysis. *CNS Neurosci Ther*. 2026, ,32(2), e70778.
- Natale V., A. Andreose, V. Bacaro, S. Giovagnoli, F. Giudetti, M. Grimaldi, L. Tonetti, E. Crocetti, Dissecting circadian and homeostatic processes in adolescents: An actigraphic study, *Sleep Medicine*, 2025, 134,106738.

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TOPIC 3: *Nanomedicine in early diagnosis, disease monitoring, and evaluation of the efficacy and safety of drugs and therapies*

Contents / Main aspects to be considered - *Exploration and development of minimally invasive methods based on sensors, microfluidics, nanomaterials, biophysical and computational/AI methods for detection and quantification. The aim is to detect molecules (biomarkers, drugs) and specific biophysical parameters (mechanical, electrical, optical, transport) with medical relevance and correlate them with clinical impact.*

Possible applications: *internal medicine, metabolic diseases, infectious diseases, haematology, oncology, COVID-long, autoimmune or chronic inflammatory diseases*

Recommended bibliography:

- Haowei Duan, Shuhua Peng, Shuai He, Shi-Yang Tang, Keisuke Goda, Chun H. Wang, and Ming Li, Wearable Electrochemical Biosensors for Advanced Healthcare Monitoring, *Adv. Sci.* 2025, 12, 2411433.
- Arora, P., Bhagat, S., Krishnendu, M.R. et al. Emerging trends of biomedical nanotechnology in nutrition, health monitoring and disease diagnosis. *3 Biotech* 15, 152 (2025).
- S. Bakhtiari doost, C. Musuroi, M. Volmer*, M. Florescu*, Optoelectronic Microfluidic Device for Point-of-Care Blood Plasma Viscosity Measurement, *Lab on a Chip*, 2024, 24, 3305.
- Ghazizadeh E, Naseri Z, Deigner HP, Rahimi H, Altintas Z. Approaches of wearable and implantable biosensor towards of developing in precision medicine. *Front Med (Lausanne)*. 2024, 18;11:1390634.
- Kumari, M., Gupta, V., Kumar, N. et al. Microfluidics-Based Nanobiosensors for Healthcare Monitoring. *Mol Biotechnol* 66, 378–401 (2024).
- Raheja, I.K., Kumar, P., Rajashekarappa, K.K. et al. Nanobiosensors for Early Detection of Cancer: A Recent Update. *Biomedical Materials & Devices* (2024).

➤ Danfeng Lu, Chenxi Yang, Luyang Chen, Congjun Cao, Weimin Xia, Guanglei Li, Dan Wen, Advances in the noninvasive and minimally invasive sample collection for wearable electrochemical sensors, Electroanalysis. 2024;36:e202300385.
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TOPIC 4: <i>Nanotherapeutic strategies for selective delivery, increased efficiency and reduced toxicity</i>
Contents / Main aspects to be considered - <i>Design, development and validation of functional nanosystems for targeted delivery of drugs/bioactive compounds, optimized for the disease, with a well-defined molecular profile. The aim will be to reduce systemic toxicity and increase therapeutic efficiency by physicochemical characterization of the binding, diffusion and time-course release of drugs/bioactive compounds through artificial membranes, real-time monitoring of the interaction between the delivery system and the model membrane and their correlation with clinical impact.</i> Possible applications: <i>oncology, dermatology, rheumatology/inflammation, chronic lung diseases, diabetes, neurology.</i>
Recommended bibliography: ➤ Arora, P., Bhagat, S., Krishnendu, M.R. et al. Emerging trends of biomedical nanotechnology in nutrition, health monitoring and disease diagnosis. 3 Biotech 15, 152 (2025). ➤ K. Ukaegbu, E. Allen, K. K. H. Svoboda, Reactive Oxygen Species and Antioxidants in Wound Healing: Mechanisms and Therapeutic Potential, International Wound Journal, 2025; 22:e70330. ➤ Cheng X, Xie Q, Sun Y. Advances in nanomaterial-based targeted drug delivery systems. Front Bioeng Biotechnol. 2023;11:1177151. ➤ A. Hiwrale, S. Bharati, P. Pingale, A. Rajput, Nanofibers: A current era in drug delivery system, Heliyon, 9 (9), 2023, e18917. ➤ M. David, T.A. Enache, L. Barbu-Tudoran, C. Bala, M. Florescu, Biologically Synthesized Gold Nanoparticles with Enhanced Antioxidant and Catalytic Properties, Pharmaceuticals, 2024, 17(9), 1105. ➤ Yang, L., Zhang, D., Li, W. et al. Biofilm microenvironment triggered self-enhancing photodynamic immunomodulatory microneedle for diabetic wound therapy. Nat Commun 14, 7658 (2023). ➤ Singh B, Kim K, Park MH. On-Demand Drug Delivery Systems Using Nanofibers. Nanomaterials (Basel). 2021 Dec 16;11(12):3411.
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