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Basic Information:
Course Title: FUNDAMENTALS OF TISSUE ENGINEERING AND REGENERATIVE MEDICINE
Lecturer: Prof. Rumiana Dimitrova Tzoneva, PhD
Phone:. 02 979 32 42
Email: tzoneva@bio21.bas.bg
Total Teaching Hours: 20 hours of lectures and 10 hours of exercises.

Annotation (up to 150 words)

The specialised doctoral course offers in-depth interdisciplinary training at the interface of cell biology, biotechnology, materials science and clinical medicine. The curriculum balances the acquisition of fundamental theoretical knowledge with practical research skills.

In the foundational block, doctoral students study the biological processes of cell cytotoxicity, functionality, stem cell plasticity and the influence of the microenvironment. The criteria for the design, surface structuring and biocompatibility of artificial scaffolds and biomaterials are analysed.

The practical component develops skills in in vitro cell culture, bioreactor control and cell printing. Doctoral students master the methodological design of in vitro drug toxicity models and in vivo animal experiments. In parallel with the lecture course, a laboratory practicum is also planned, which aims to familiarise doctoral students with basic methods and laboratory techniques for working with cell cultures and different types of biomaterials, as well as with visualisation using different types of microscopy techniques.

The course prepares independent researchers capable of transforming fundamental scientific concepts into applied therapeutic alternatives for the needs of translational medicine.

Course content (brief description by topics or modules)
Topic / Module 1: Evolution of ideas in regenerative medicine
Topic / Module 2: Research on embryonic and mesenchymal cells. Ethical issues
Topic / Module 3: Types of biomaterials. Design of scaffolds used in tissue engineering
Topic / Module 4: Types of biomaterials. Design of scaffolds used in tissue engineering

Teaching and assessment methods
Essay and interview

Competencies acquired as a result of training (3–5 points)
• Practical learning of modern procedures for in vitro cell cultivation,
• Assessment of biocompatibility of materials used in tissue engineering and regenerative medicine
• Assessment of cellular functionality when using different scaffolds
• Interpretation of scientific and applied data in real medical practices (orthopedics, cardiology, neurology, etc.)

Literature:

- Tissue Engineering and Regenerative Medicine A nano approach, Murugan Ramalingam, Pekka Vallittu, Ugo Ripamonti, Wan-Ju Li, CRC Press
- Culture of human tumor cells, Roswitha Pfragner, R. Ian freshney, JohnWiley&Sons Inc.
- Culture of cells for Tissue Engineering, Gordana Vunjak-Novakovic, R. Ian Freshney, JohnWiley&Sons Inc.

Additional information (optional) (e.g., special requirements, laboratory equipment, prior knowledge)

A lab coat and working in sterile conditions are required