

Title: "Advanced Techniques in Tissue Engineering: Materials and Biofabrication"

Instructor : Nehar Celikkin, PhD (Team 32)

E-mail : ncelikkn@ichf.edu.pl

Proposed Dates : 05.11.2024 – 17.12.2024

Registration Deadline : 29.10.2024

Course Description: This PhD-level lecture series will delve into the critical aspects of biomaterials and biofabrication techniques used in tissue engineering and regenerative medicine. The course will emphasize the four main material groups—polymers, metals, ceramics, and composites—and explore advanced biofabrication approaches.

Course Objectives:

- To provide an in-depth understanding of biomaterials from various material groups.
- To explore advanced biofabrication techniques relevant to organ-on-chip systems, drug delivery systems, tissue engineering, and regenerative medicine.
- To analyze current research in the field.
- To encourage critical thinking and proposal development for projects.

Week-by-Week Outline: (2h lectures per week)

Week 1: Introduction to Tissue Engineering and Biomaterials

Historical context

Basic concepts and terminology

Week 2: Polymers in Tissue Engineering

Polymer properties and classifications

Scaffold design and fabrication with polymers

Bioresorbable polymers

Week 3: Metals and Ceramics in Tissue Engineering

Biocompatible metals

Ceramic biomaterials

Applications and challenges

Week 4: Composite Biomaterials For Tissue Engineering Applications

Polymer-metal composites

Polymer-ceramic composites

Week 5: Biofabrication Techniques

3D printing and bioprinting

Electrospinning

Microfabrication techniques

Week 6: Organ-on-a-Chip Technologies

Microfluidics and lab-on-a-chip

Organ-on-a-chip applications

Integration with biomaterials

Week 7: Research Proposals and Future Directions

Students will develop and present research proposals related to tissue engineering and regenerative medicine.

Discussion of emerging trends and future directions in the field.

Assessment Methods: Final written exam and research proposal presentation