PhD Program in Bioengineering and Robotics

Curriculum: Bioengineering

Research themes

Bioengineering is a discipline that integrates physical, chemical, mathematical, computational sciences and engineering principles to study biology, medicine, behavior, and health.

Bioengineering advances fundamental concepts, creates knowledge from the molecular to the organ systems levels, and develops innovative biologics, materials, processes, implants, devices, and informatics approaches for the prevention, diagnosis, and treatment of disease, for patient rehabilitation, and for improving health and well-being (NIH Working Definition of Bioengineering—July 24, 1997).

The PhD curriculum in Bioengineering implements the evolution of a long-standing tradition of the Bioengineering School of the University of Genova, characterized by a marked *experimental* and *technological* vocation, providing advanced training and research experience for graduate students interested in: *in vitro* electrophysiology, cellular mechanobiology, microscopy, tissue engineering, neural control of the movements, motor learning and neuromotor recovery, as well as neuroengineering, micro- and nano-technologies, assistive and rehabilitation technologies, integrated perceptual systems.

The research activities, mainly conducted at the Department of Informatics, Bioengineering, Robotics and System Engineering (DIBRIS), cover a variety of areas and offers potential collaborations with other departments at the University of Genova, as well as with leading national and international research institutions. This will ensure a unique scientific environment to the students to carry out international research projects.

The main research interests lie within the following broad themes:

- Neuroengineering
- Molecular and cellular engineering
- Interaction and rehabilitation engineering
- Health informatics

The training will start with plans tailored to the need and interests of each individual student and aimed at bringing all students to a common understanding of the key scientific aspects and investigation tools of the different research themes. This will be obtained also by planning exchange of students for 6 to 12 months with national and international laboratories where particularly interesting experimental techniques and/or strategic scientific approaches are well established.

The ideal candidates are students with a higher level university degree willing to be involved in multidisciplinary studies and to work in a team of scientists coming from different background but sharing common objectives. The proposed themes are presented in details in the following indicating tutors and place where the research activity will be developed.

International applicants are encouraged and will receive logistic support with visa issues, relocation, etc.

1. **Drug discovery using 3D tissue engineering techniques and organ-on-chip systems.**

Tutors: Silvia Scaglione, Marco Massimo Fato

Tutors Affiliation: React4life SPA, DIBRIS Scuola Politecnica

Project Description

The project aims to improve the development of new innovative methods for translational research and drug discovery using 3D tissue engineering techniques and organ-on-chip systems. The project integrates advanced statistical analysis approaches to demonstrate the robustness and predictive ability of these in vitro models compared to preclinical in vivo models. The aim is to validate the efficacy of these models in various fields, such as oncology, therapeutic efficacy studies and pharmacokinetics, with a focus on innovative models such as the gut-on-chip.

Requirements: aptitude for experimental research, teamwork.

References:

- Fedi, A. Vitale, C, Fato, M. Scaglione, S. "A Human Ovarian Tumor & Liver Organ-on-Chip for Simultaneous and More Predictive Toxo-Efficacy Assays" Bioengineering, 2023, 10(2), 270
- A Fedi, C Vitale, G Ponschin, S Ayehunie, M Fato, S Scaglione "In vitro models replicating the human intestinal epithelium for absorption and metabolism studies: A systematic review" Journal of Controlled Release 2021, 335, pp 247-268
- Marrella A, Varani G., Aiello M., Vaccari I., Vitale C., Mojzisek M., Degrassi C., Scaglione S. "3D fluid-dynamic ovarian cancer model resembling systemic drug administration for efficacy assay" ALTEX 2021; 38(1), pp 082-094.

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