

PhD course Biological characterization of biomaterials

Course code: FTN0044

5 credits

General course objective/s and learning outcomes

The aim of the course is to provide students with a deep understanding of how biomaterial-biological system interactions are investigated *in vitro* and *in vivo* along a biomaterial development process. The course will also give an insight into legislation, ethics and commercialization aspects of biomedical materials.

At the end of the course, the student should be able to:

- Explain the principles of protein-biomaterial interactions as well as the methods commonly used to characterize such interactions.
- Account for *in vitro* models used to assess blood-biomaterial interactions and the parameters to be evaluated.
- Explain and compare different *in vitro* methods commonly used to evaluate cell-biomaterial interactions.
- Identify the design parameters for the *in vivo* evaluation of biomaterials, taking into consideration ethical issues.
- Select *in vitro* and *in vivo* tests/studies to evaluate the biocompatibility of a biomaterial towards a specific application.

Course contents

The course consists of 13 two-hour (45min x 2) sessions. The students also work on a case study project that is presented at the end of the course.

The content of the course is the following:

- 1) Basics about cells and biomaterials
- 2) Protein-biomaterial interactions
- 3) Blood-biomaterial interactions
- 4) 2D and 3D models to characterize biomaterials *in vitro*
- 5) Single cell analysis using droplets & microfluidic systems to characterize biomaterials *in vitro*
- 6) Evaluation of biocompatibility
- 7) Animal testing
- 8) Legislation and ethics
- 9) Planning research towards commercialization.

Instruction

In general, each lecture session is divided in 45 min lecture + 45 min interactive activities (seminar/discussion/work in groups). This is done to ensure the students engage in their own learning process.

Assessment (form of examination)

The examination is divided in three parts: 30% assignments + 40% individual project + 30% active participation in seminars and activities. Attendance to 80% of the lectures is required.

Recommended prerequisites:

Master's level or equivalent (e.g. Civilingenjör), with specialization in materials engineering, biotechnology, chemistry, biology or in another appropriate discipline. Experience in biomaterials and cell culture would be advantageous.

Contact persons (course responsible teachers)

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Next course is planned to take place during 2023.