



## MASTER PROGRAMME

### Biomaterials for Tissue Engineering (BioTE)

(2 years, 4 semester)

#### OBJECTIVES OF THE PROGRAMME

The masters program proposed the following general objectives:

(a) Specialization and improvement of pre-Bologna university graduates:

- engineers; - chemists; - biochemists; - doctors; - biologists; - pharmacists; - expert in the above enumerated categories.

(b) Empowering and improving the need of undergraduate/ graduates of Bologna cycle for carrying out research, to search quality consultancy and expertise in the field of medical engineering and biomaterials science.

With the proposed courses - which include teaching, practice and research – the master program ensures both an fundamental and applied training in engineering sciences (especially materials science and bioengineering) and biomedical applications.

The master program brings together basic and applied sciences disciplines.

In the context of European requirements, it is necessary the development of trained specialists able to work in proper conditions of safety and quality in research laboratories and bio-medical facilities, and to develop and implement new approaches in regenerative medicine, and biomaterials and tissue engineering.

This program aims to combine between engineering, chemistry, materials science, biology, anatomy, physiology and physics, ensuring the development, improvement and introduction in the national and international HR staff very competitive specialists on an emerging and interesting area- medical engineering .

The program directly addresses the staff working in the fields of materials engineering, regenerative medicine, development of prosthetic devices, biochemistry, pharmacy, and all those interested in the vast field of medical engineering and biomaterials for applications in tissue regeneration.

Knowing the great national and international interest, new approaches and methods for obtaining, investigation and analysis of materials with biomedical applications has become a necessity acute for those working in the fields of medical engineering and regenerative medicine.

# **PRACTICAL SKILLS AQUIRED DURING THE MASTER'S PROGRAM**

## **BIOMATERIALS FOR TISSUE ENGINEERING**

Master program will provide:

- developing skills in sciences, particularly medical engineering, materials science and engineering and biochemistry (deepening and broadening of knowledge, skills and abilities necessary for training specialists).
- acquisition of double / multiple skills by studying interdisciplinary sciences during the master's program.
- formation of skills related to interpersonal communication, teamwork, rapid insertion of human resources on the market.
- empowerment and improvement of university graduates with specialized knowledge (fundamental science - applied science): Bologna, pre-Bologna students, engineers, biochemists, physicians, biologists, etc.
- acquiring skills to identify and solve current biomedical problems and assess efficiency of currently available ones.
- practicing communication skills and problem solving (questioning).
- developing skills necessary for the design of biomaterials applicable in molecular, cellular and / or tissue engineering.
- development of interdisciplinary skills in line with policies and strategies specific in various medical specialties in the fields of engineering, material science, biochemistry, medicine.
- theoretical and applicative knowledge regarding the potential of biochemistry and implications in tissue reconstruction and regeneration of tissue.
- theoretical and practical skills will enable student's work in adequate conditions in research laboratories and innovation in the field of regenerative medicine, but also in some industrial areas that are aiming at the development of biomedical instruments on regeneration and remodeling of tissues and organs, such as for obtaining organs and tissues *in vitro*.
- correlation of the properties of morphological, physiological and molecular traits of cells and tissues with the development of tissues, organs and organisms with specific characteristics and the possibility of handling them through the application of engineering techniques.
- use the processes and principles of cellular signaling and tissue development to develop methods and approaches for efficient regeneration and tissue engineering,

- preparation and characterization of biomaterials for biomedical use, mainly in regenerative medicine.
- the application of knowledge and skills acquired through learning and practice work in a dedicated tissue culture laboratory by using biomaterials.
- knowledge and understanding of stem cell biology and applications, as well as the modalities of their differentiation to different cell types and molecular mechanisms that participate in tissue regeneration.
- using the principles for understanding biological processes to obtain reproducible results and the appropriate interpretation of the information provided by them.
- understand and correlation of physiological processes with molecular and cellular engineering approaches to change / develop applications useful for tissue engineering and regeneration.
- linking physiological processes with different molecular and genetic engineering methods applicable at the molecular and supramolecular structures.
- using engineering principles, molecular and supramolecular assemblies useful in the design of new structures for tissue regeneration or reconstruction and modification of cells for biomedical applications.
- determine or check the main structural and compositional characteristics of biomaterials, by using advanced characterization methods and techniques.
- linking concepts of materials science with notions of biophysics, biology and anatomy adequate to characterize the structural, micro and nanostructure of biomaterials, given the interdependence between structure and physicochemical properties of functional biomaterials.
- linking various functional, morphological and metabolic features with debilitating tissue disorders.
- understanding the necessity of development of prosthetic devices and medical interest materials for improving the quality of life in patients with debilitating diseases of different tissues or to increase their life expectancy.
- use a variety of traditional and complementary methods of training and evaluation - questioning, theoretical and practical projects.
- ability to analyze and evaluate the work in the field and the gained experience.
- ability compiling research projects and exploitation of research results.

# TARGET GROUPS

**- 2 years, 4 semesters - is suitable for graduates from specialties:**

- medical engineering, chemical engineering, materials science - engineers – plan: four years to complete the cycle II - Bologna - Predoctoral master;
- Engineering and Management – plan: five years;
- biologists, biochemists, chemists, cycle II - Bologna - Predoctoral master,
- pharmacists and doctors, cycle II - Bologna - Predoctoral master;
- Other Cycle II - Bologna - Predoctoral master;
- pharmacists, physicians or other specialties of biochemical and technological faculties, or interdisciplinary;

Doctoral conducting internship in the fields of medical engineering, chemical engineering, biochemistry, medicine or interdisciplinary.