

Master title: Biomaterials for tissue engineering

a) Faculty of Engineering in Foreign Languages

b) Short description and main objectives:

The master's 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 a 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.

c) Other information

Master program entitled Biomaterials for tissue engineering 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 asses 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; double degree is possible, incoming Erasmus students, partnership to industry/companies, possibility to develop master thesis related to industry, etc.).

All the courses of the program are open for Erasmus incoming students.

d) website: <http://ing.pub.ro/admitere-master-biote-biomateriale-pentru-ingineria-tesuturilor/>

e) **Contact person:** Conf.Dr.Ing. Alexandru Mihai GRUMEZESCU, master coordinator,
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f) **Curriculum:**

Year	Sem	Subject name	Weekly number of hours				Evaluation form (E/C)	ECTS
			Lecture	Tutorial	Lab work	Project		
1	1	Tissue biochemistry	2	0	0	0	E	4
1	1	Cell and tissue biology	2	0	2	0	E	4
1	1	Stem cells and regenerative medicine	1	0	1	0	E	4
1	1	Nanomedicine: from concept to current and emerging applications	2	0	2	0	E	4
1	1	Nanobiomaterials for tissue engineering	2	0	0	0	E	4
1	1	Research practice	12				V	10
1	2	Molecular and cellular engineering	2	0	2	0	E	4
1	2	Biomaterials characterization by advanced techniques	1	0	3	0	E	4
1	2	Tissue engineering and regenerative medicine	2	0	2	0	E	4
1	2	Debilitating diseases of tissues	2	0	0	0	E	4
1	2	Biomedical devices and prostheses	2	0	0	0	E	4
1	2	Research practice	12				V	10
2	3	Nanobiotxicology	2	0	0	0	E	4
2	3	Advanced techniques for the characterization of biological active substances	1	0	3	0	E	4
2	3	Medical imaging for tissue reconstruction and regeneration	1	0	3	0	E	4
2	3	Mechanisms of tissue regeneration and remodeling	2	0	0	0	E	4
2	3	<i>In vitro</i> and <i>in vivo</i> models for tissue reconstruction and regeneration	2	0	2	0	E	4
2	3	Research practice	12				V	10
2	4	Research practice and prepare dissertation	27				V	28
2	4	Ethics	1				V	2