

## ETY804 - Biomaterials and Biomedical Engineering

### COURSE DESCRIPTION

#### (1) GENERAL COURSE INFORMATION

<b>SCHOOL</b>	Engineering		
<b>DEPARTMENT</b>	Materials Science and Engineering		
<b>LEVEL OF EDUCATION</b>	Undergraduate		
<b>COURSE CODE</b>	ETY804	<b>SEMESTER</b>	8
<b>COURSE TITLE</b>	Biomaterials and Biomedical Engineering		
<b>TEACHING ACTIVITIES</b>	<b>WEEKLY TEACHING HOURS</b>	<b>CREDIT UNITS</b>	
<i>in case the credit units are awarded in distinct parts of the course e.g. Lectures, Laboratory Exercises, etc. If credits are awarded uniformly for the entire course, indicate the weekly teaching hours and the total credits</i>			
Lectures and Tutorials	4	4	
<i>The organization of teaching and the teaching methods used are described in detail below.</i>			
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skills development</i>	General / Special Background		
<b>REQUIRED COURSES:</b>	-		
<b>LANGUAGE OF TEACHING AND EXAMINATIONS:</b>	Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS:</b>	-		
<b>COURSE WEBSITE (URL):</b>	<a href="http://medlab.cc.uoi.gr/?page_id=5968">http://medlab.cc.uoi.gr/?page_id=5968</a>		

#### LEARNING RESULTS

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*Description of the learning outcomes of the course, the specific knowledge, skills and abilities of the appropriate level that the students will acquire after the successful completion of the course.*

*Consult Appendix A.*

- *Description of the Level of Learning Outcomes for each cycle of studies according to the Qualifications Framework of the European Higher Education Area*
- *Descriptive Levels 6, 7 & 8 of the European Qualifications for Lifelong Learning Framework and Annex B*
- *Summary Learning Outcome Guide*

**Knowledge:** Through the course of "Biomaterials and Biomedical Engineering", the student will have the necessary theoretical background for the selection of appropriate biomaterials. More specifically, the aim of this course is to study the properties of biomaterials and the correlation of their structure with their properties, as well as the study of their main effect on the biological environment. Additional knowledge is provided for the development of medical devices, since biomaterials are mainly used as parts of medical devices. Students will also be provided with knowledge of the regulatory environment for medical devices.

**Skills acquired:** This theoretical background will allow the student to evaluate the properties of each biomaterial, as well as to address technical problems in the field of biomaterials.

Specifically, at the end of this course the student may have the following skills:

- To propose and develop ways of controlling the raw materials that will be used to

- provide with biomaterials with the desired properties.
- To propose the design of materials with high standards.
- To propose the development of materials with resistance to adverse conditions, such as the biological environment.
- To investigate new advanced materials with special physicochemical properties.
- To use biomaterials in specific applications and devices.
- To be able to plan the production of medical devices.
- To be able to design biomaterial processing methods.

For this reason, the theoretical principles will be presented, as well as practical problems so that the students will receive complete training in the specific technical and research field.

#### **General Abilities**

*Taking into account the general skills that the graduate must have acquired (as they are listed in the Diploma Supplement and are listed below)*

*Search, analyze and compose data and information, using the necessary technologies*

*Adaptation to new situations*

*Decision making*

*Autonomous work*

*Teamwork*

*Work in an international environment*

*Work in an interdisciplinary environment*

*Production of new research ideas*

*Project design and management*

*Respect for diversity and multiculturalism*

*Respect for the natural environment*

*Demonstration of social, professional and moral responsibility and sensitivity on gender issues*

*Practice criticism and self-criticism*

*Promoting free, creative and inductive thinking*

*.....*

*Others.....*

#### **Specific skills**

- Search, analyze and synthesize data and information, using the necessary technologies
- Autonomous work
- Teamwork
- Project Design and Management
- Practice criticism and self-criticism
- Promoting free, creative and inductive thinking
- Work in an interdisciplinary environment

## **(1) CONTENT OF COURSE**

Biomaterials and Biomedical Engineering is a compulsory subject for students of the Department of Materials Science and Engineering of the University of Ioannina. The course includes introductory topics related to biomaterials, types of biomaterials, the use of biomaterials and special applications. Similar courses are offered at all Universities abroad, both undergraduate and postgraduate courses in biomaterials. The teaching of the course is based on the international experience and the existing experience in the Department of Materials Science and Engineering, and includes the following sections:

- Introduction to Biomaterials - Materials for Biomedical Applications
- Biomaterial Types - Chemical Structure - Biomaterial Properties
- Mechanical Properties of Biomaterials
- Biomaterials Types – Production Processes
- Biomaterials Applications
- Biodegradable Materials
- Surface Properties - Protein Interactions - Cell Interactions
- Interaction with Human Body - Inflammation - Injury - Infections

## **(2) TEACHING AND LEARNING METHODS - EVALUATION**

<b>TEACHING METHOD.</b>	Face to face	
<b>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</b> Use of Information and Communication Technology (ICT) in Teaching, in Laboratory Education, in Communication with students	-In teaching -In communication with the students -In the execution of the homeworks	
<b>ORGANIZATION OF TEACHING</b> <i>The teaching methods are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Study &amp; analysis of bibliography, Tutoring, Practice (Installation), Clinical Exercise, Artistic Workshop, Interactive teaching, Creative work, Artistic working visits / Writing, Project study. etc.</i>  <i>The study hours of the student for each learning activity are listed as well as the hours of non-guided study according to the principles of ECTS</i>	<b>Activity</b>	<b>Semester Workload</b>
	Lectures	39
	Tutorial	13
	Assignment Writing	24
	Study	24
	Course total	100
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process</i>  <i>Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Test Development Questions, Problem Solving, Written Work, Job Search, Job Search / Reference, Oral Examination, Oral Examination Others</i>  <i>There are explicitly defined assessment criteria and if and where they are accessible to students.</i>	The evaluation language is Greek.  Hoeworks are given in three sets, counting for 30% of the total.  Also, the final assessment includes a written exam with five problems that students must answer.	

### (3) ATTACHED BIBLIOGRAPHY

#### *Suggested bibliography*

- Students have access to the slides of the course (on the web site of the course).
- J.S. Temenoff, A.G. Mikos, Βιοϋλικά – Η Διεπαφή μεταξύ της Επιστήμης των Υλικών και της Βιολογίας, Εκδόσεις Utopia, 2017.
- J. Park and R.S. Lakes, Biomaterials an Introduction, 3rd Edition, Springer, New York, 2007.
- B.D. Ratner, A.S. Hoffman, Biomaterials Science, 2nd Edition: An Introduction to Materials in Medicine, Elsevier Academic Press, San Diego, 2004.
- Biomaterials, Edited by J.Y. Wang and J.D. Bronzino, CRC Press, Boca Raton, 2007.