ETE 919 – Computational Modeling in Biomedical Engineering

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETE919	**SEMESTER**	10th
COURSE TITLE	Computational Modeling in Biomedical Engineering		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures / Case Studies	3	3
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	specialized general knowledge
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	LECTURES IN GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	-
COURSE WEBSITE (URL)	http://medlab.cc.uoi.gr/?page_id=6298

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

- Upon successful completion of the course students will have acquired:
- • **Knowledge** on computer modeling and computer problem solving of Biomedical technology which they acquire through teaching based on books, manuals and bibliographic sources as well as laboratory practice
- • **Problem-solving skills** related to human tissues, bones, etc. that stem from students' laboratory practice in the use of computer tools, methods and programs
- • **Abilities and skills** of using a tool for solving differential equations and modeling with the method of finite elements that stem from the laboratory exercise of students in them
- • **Ability** to apply computer modeling techniques in other research and technical fields besides biomedical technology**.**

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma

Supplement and appear below), at which of the following does the course aim?	
Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search, analysis and synthesis of data and information, using the necessary technologies
- Autonomous work
- Teamwork
- Project design and management
- Exercise criticism and self-criticism
- Promoting free, creative and inductive thinking

(3) SYLLABUS

Computational Modeling in Biomedical Engineering is an optional compulsory course for students of the Department of Materials Science and Engineering of the University of Ioannina. The course concerns the spring semester and is an introduction to the computational methods of biomedical technology. It covers very basic issues concerning the medium, tissues and computer methods of solving problems related to human tissues. In all the Universities abroad, similar courses are given in Departments of Engineering, while there are departments which give undergraduate and postgraduate degrees in biomedical technology. 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 teaching sections which will be taught in the course:

• Human Tissues
• Finite elements
• Discrete solution methods
• Introduction to biomechanics
• Bone modeling

The teaching is done by presenting theoretical modules and presenting problems in practice.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in the class
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• In teaching • In communication with students • In completing the work
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

Activity	***Semester workload***
Lectures	39
Laboratory practice	13
Homework - project	23
Course total	***75***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure*	LANGUAGE OF EVALUATION: Greek METHOD OF EVALUATION:

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The student undertakes the implementation of a large project which at the end of the course is presented and examined orally. The final exam is oral and includes questions and topics that students should answer. The questions are related to the work undertaken by the students, but also to the theory of the course.

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

- Introduction to Biomedical Engineering, John Enderle, Susan Blanchard, Joseph Bronzino, Second Edition, Elsevier Academic Press, Amsterdam, 2005.
- Principles and Models of Biological Transport, Friedman, Morton H. 2nd ed., 2008, Springer Verlag.
- Biomedical Engineering, W. Mark Saltzman, Cambridge University Press, 2009