COURSE OUTLINE

(1) GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPT. OF PHYSICS		
LEVEL OF STUDIES	GRADUATE		
COURSE CODE	**M146**	**SEMESTER**	**2**
COURSE TITLE	BIOPHYSICS		

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**
	4	7
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background, specialised general knowledge, skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

(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*

The course provides highly specialized state-of-the-art knowledge in topics of Biophysics to the student, with emphasis on the physical processes involved in living biosystems, biomimetic systems and the advanced experimental techniques for their study. Upon succesful completion of this course the student will be able to:

- understand the detailed quantum mechanical principles and thermodynamics of biological processes
- analyze quantitatively images and spectra from various techniques
- perform simple simulations of molecules
- use the basic functions of optical microscopes
- interprete the basic features of in vivo and in vitro medical images
- propose suitable experimental techniques, combinations and modifications for the study of certain biological systems

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	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
	Respect for the natural environment

Decision-making *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*
Search for, analysis and synthesis of data and information, with the use of the necessary technology *Working independently* *Working in an interdisciplinary environment* *Production of free, creative and inductive thinking*	

(3) SYLLABUS

Locomotion in living organisms.
Optical and magnetic tweezers.
Mechanics of living cells, relevance to cancer and metastasis.
DNA sequencing techniques.
Fluorescent proteins, Förster resonance energy transfer (FRET).
Confocal microscopy, Coherent anti-Stokes Raman spectroscopy and microscopy (CARS), Two-photon microscopy.
Super-resolution microscopy: Stimulated emission depletion (STED), Ground state depletion (GSD), single molecule localization.
Magnetic Resonance Imaging techniques.
Solid-state NMR.
Biosensors.
Introduction to Computational Biophysics, atomistic simulations, molecular dynamics, density functional theory, algorithms used in imaging.
Biomimetic systems: active swimmers, molecular machines, molecular motors.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Most lectures are given as Powerpoint presentations. Lecture presentations and other material are available to the students through the ecourse website of the University of Ioannina. The same system is used for uploading weekly homework and communication with students.
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	52
Lab exercises	13
Study of bibliography	30
Independent study	30
Essay writing	34
Preparation of presentation	13
Final exams	3
Course total	175

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of*	Weekly homework Oral presentation Written final exam

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.*	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

"Principles of Physical Biochemistry", Kensal E van Holde, Curtis Johnson, Pui Shing Ho, Prentice Hall 2005
"Biophysics, an Introduction" R. Glaser, Springer 2012, 2nd edition
"Physical models of living systems", P. Nelson, W. H. Freeman 2015

- Related academic journals:

Biophysical Journal, Nature, New Journal of Physics, Soft Matter