COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF APPLIED BIOLOGY AND BIOTECHNOLOGY		
DEPARTMENT	BIOTECHNOLOGY		
STUDY LEVEL	BACHEROL OF SCIENCE		
COURSE CODE	3603	**SEMESTER**	9th
COURSE TITLE	SYSTEMS BIOLOGY		

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**	**ECTS**
Lectures	4	2,08
Practical Lab Courses	1	0,52
Group class presentation (selected topics/ scientific articles)		0,80
Autonomous study (personal assignment)		1,60
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	SUM:	5,0

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Filed of Science
PREREQUISITES	
LANGUAGE	Greek (Teaching & Exams)
IS THE COURSE OFFERED for ERASMUS STUDENTS?	English (Teaching & Exams)
COURSE WEB PAGE	www.aua.gr/plantdevelopment

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 this course the students will acquire new knowledge and specific skills on the following subjects:

• Will have knowledge of the modules concerning the components of biological systems from simple molecules and how they are combined, to mononuclear cells (colony) or multicellular organisms and how they communicate, whole organisms in a population and how they can be regarded as biological components, and modules pertaining to entire species and how they coexist or interact with other species.

• Will gain knowledge on the processes governing the dynamics of living systems through quantitative measurements and analyses

• Will learn the methods and techniques for massive analyses at the level of genomics or transcriptomics.

• Will be capable to compose complex networks in protein, gene, cell or organism level.

• Can compose mathematical information models based on mathematical or computer analysis.

• Can analyze, evaluate and decide on a case by case applicability of techniques and

methods of computing and describe the dynamic behavior of biological systems. • Can work with fellow students to create and present a comprehensive study based on a given theoretical background, experimental procedure, results and discussion. This is done using/combining the data, processing the experimental laboratory exercises, and accessing to on-line libraries and journals.

• This study is given in PDF or DOC format and requires basic background knowledge of computer skills, using different programs as well as analysis by EXCEL and also mathematics and bioinformatics analysis.

• Can promote social awareness regarding the decisive contribution of several genes in gene therapy and in other biology and medical fields in general, existence and development of novel products and services for everyday use.

General Competencies

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 differences 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

1) Retrieve, analyze and synthesize data and information relying on use of necessary technologies.
2) Adjust to new situations.
3) Decision making.
4) Work autonomously.
5) Work in groups.
6) Create novel scientific projects.
7) Design and develop research projects/experiments.
8) Be critical and self-critical.
9) Apply knowledge to practice.

3. COURSE CONTENT

1. Introduction to Systems Biology
2. Retrospection to the basic theories of DOS / Windows and UNIX / Linux.
3. Implementing algorithms in deciphering biological relationships.
4. Probability and computer theory.
5. Bioinformatics, DNA alignment and protein homology algorithms.
6. Functional genomics.
7. Analysis of entire prokaryotic and eukaryotic genomes (data management).
8. Gene networks and signal transduction pathways.
9. Transcriptional profiles, methodologies and analysis
10. Methods for the analysis of protein structure.
11. Genetic epidemiology, parametric and non-parametric linkage analysis, QTL analysis
12. Mathematical models describing developmental processes and signal transduction in plants
13. Mathematical models of animal growth

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>TEACHING METHOD
Face-to-face, Distance learning, etc</td><td>Direct (face to face).</td></tr>
<tr><td>USE OF INFORMATICS and COMMUNICATION TECHNOLOGIES
Use of ICT in teaching, laboratory education, communication with students</td><td>Power point presentations, student contact electronically.</td></tr>
<tr><td>TEACHING ORGANISATION

Lectures, Seminars, Laboratory Exercises, Field Exercise, Literature Study & Analysis, Tutorial, Internship, Clinical Exercise, Interactive Teaching, Educational Visits, Study Preparation (Project), Written assignments, Independent study

The student's study hours for each learning activity are listed, so that the total workload at the semester level corresponds to ECTS standards.</td><td><table><tr><th>Teaching Method</th><th>Effort</th></tr><tr><td>Lectures</td><td>52h</td></tr><tr><td>Practical Lab Courses</td><td>13 h</td></tr><tr><td>Group class presentations</td><td>20 h</td></tr><tr><td>Autonomous study</td><td>40 h</td></tr><tr><td>Course total (25 hours of student work load per ECTS)</td><td>125 h (5 ECTS)</td></tr></table></td></tr>
<tr><td>STUDENT EVALUATION

Evaluation Methods, Formative or Inferential, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Other / Others

Expressly specified assessment criteria are stated and whether and where they are accessible to students.</td><td>I) Written final examination (50%) with ranking difficulty on the basis of the issues and subjects presented during theoretical courses. The exams will include:
- Questions of multiple choice.
- Questions of theoretical knowledge.
- Theoretical problems to be resolved.

II) Laboratory exercises/ practical courses (30%). Students individually or in groups will provide a written report before the beginning of the next exercise. The grade of lab courses will be based on the writing reports, attendance and class participation.

III) Group and small autonomous assignments (20%).</td></tr>
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5. BIBLIOGRAPHY

-***Προτεινόμενη Βιβλιογραφία :***

3. The Cell, A Molecular Approach, 5th Edition, G.M. Cooper and R.E. Hausman, Eds, 2009, Sinauer Assosciates, Inc. Publishing, USA

-Συναφή επιστημονικά περιοδικά:

BMC Systems Biology, Bioinformatics and Systems Biology I, International Journal of Systems Biology PLOS Computational Biology, Molecular Biosystems, Systems and Synthetic Biology, Nature, Science Cell, PNAS, Current Biology