COURSE OUTLINE

1. GENERAL

SCHOOL	APPLIED BIOLOGY AND BIOTECHNOLOGY		
ACADEMIC UNIT	BIOTECHNOLOGY		
LEVEL OF STUDIES	*Undergraduate*		
COURSE CODE	3050	**SEMESTER**	**8th**
COURSE TITLE	GENETICS OF MODEL ORGANISMS		

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 and Practicals	5	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (4).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS :	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	e-class https://mediasrv.aua.gr/eclass/modules/auth/opencourses.php?fc=37

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 delves into concepts of Genetics in Model Organisms.

This course aims to introduce students to Model Organisms in terms of their contribution in Genetics and in experimental research.

It also refers to the genome, life cycle, advantages, genetic studies and applications of Model Organisms.

Finally, the aim of the course is to help students understand the methodology of accessing Genetic problems using suitable Model Organisms.

Laboratory exercises aim to deepen the understanding of the concepts and applications presented in the theory.

After successfully completing this course, students will:

- have acquired knowledge on the Genetics of Model Organisms and their importance to research. Specifically, students learn about the following organisms: *E.coli*, *S.cerevisiae* – study of the cell cycle, *C. elegans* – study of apoptosis, *D.* melanogaster – study of body plan development, *M. musculus* – generation and functional analysis of transgenic animals, *D. rerio* – cardiac valve development and tissue regeneration, *A. thaliana* – study of development and hormonal control systems, *T. thermophila* – study of telomeres and telomerase, planaria - study of tissue regeneration.
- have acquired competencies in the techniques of Genetic analysis and genetic manipulation in Model Organisms. Techniques include: mutagenesis, genetic selection and screening, horizontal DNA transfer, production of transgenic animals / plants, study of development, laboratory models of human disease.
- have become familiar with the new techniques that now facilitate the consolidation of new organisms as laboratory models.
- have acquired knowledge on the process of sequencing a genome, and the contribution of bioinformatics to the functional analysis of the genome.
- have developed their ability to access Genetics problems
- be able to propose appropriate organisms models for the study of specific biological processes and human diseases.
- have become familiar with the use of online tools such as: Genome data viewer to analyze chromosomes, genes and compare genomes; the OMIM database to find information about phenotypes, alleles and heredity; Primer3 and PrimerBLAST for PCR primer design; CHOP-CHOP for proper design and selection of pair sgRNAs for targeted gene knockout using CrispR/Cs9 system; Mendeley for the management of bibliography/references.
- have developed the ability to critically read a scientific publication.

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	*Production of new research ideas*
Adapting to new situations	*Project planning and management*
Decision-making	*Respect for differences and multiculturalism*
Working independently	*Respect for the natural environment*
Team work	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Working in an international environment	*Criticism and self-criticism*
Working in an interdisciplinary environment	*Production of free, creative and inductive thinking*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work
- Working in an international environment
- Working in an interdisciplinary environment
- Production of new research ideas

3. SYLLABUS

I. Introduction and history of Model Organisms
II. From genes to genomes
III. *Escherichia coli* (*E. coli*) as a model organism
IV. The yeast *Saccharomyces cerevisiae* as a model organism
V. *Caenorhabditis elegans* as a model organism
VI. *Drosophila melanogaster* as a model organism
VII. *Mus musculus* as a model organism: advantages and applications

VIII. Zebrafish *Danio rerio*: advantages and applications
IX. The plant model *Arabidopsis thaliana*: advantages and applications
X. Beyond the classic model organisms
XI. Lab practicals: Using the Genome data viewer online tool at NCBI for analysis of genes, chromosomes, and genome comparison. Use of the OMIM (Online Mendelian Inheritance in Man) database at NCBI. Designing primers for PCR using the online tools Primer3 and primerBLAST. Design and preparation of samples for Sanger sequencing, evaluation of sequencing results. Experimental design of gene inactivation with the CRISPR / Cas9 method through appropriate online tools. Laboratory demonstration of *Drosophila*. Managing references with the bibliography tool Mendeley. Critical reading of a scientific publication.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face, in class
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Power point presentations, instructive videos, bioinformatics skills practicals/tutorials. **Course material also made available to the students via the e-class platform.**
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 work (tutorials) focused on Genetics problem-solving in smaller groups	26
Preparation for lab practicals	13
Independent study	47
Course total (Total contact hours and training)	***125***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *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.*	Theory: • Written Examination: Including multiple choice and short answer questions. (50% of final grade) Practicals: • Written Examination: Including multiple choice, short answer questions, and problem solving. (35% of final grade) • Weekly graded laboratory homework. (15% of final grade)

5. SUGGESTED BIBLIOGRAPHY

-Suggested bibliography :
-Relevant scientific journals:

Genetics: From genes to genomes. Fourth Edition. Hartwell Leland, Hood Leroy, Goldberg Michael, Reynolds Ann, Silver Lee. McGrawHill Education.