COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Biosystems & Agricultural Engineering		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**BAE_460**	**SEMESTER**	**4TH**
COURSE TITLE	**GENETICS**		

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	3	
Tutorials	2	
Laboratory	0	
TOTAL	**5**	**5**
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*	Background General Knowledge Skills development
PREREQUISITE COURSES:	There are no prerequisite courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek .-For Erasmus students in English
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 aim of the course is to give students an accurate presentation of the basic concepts and laws of heredity, incorporating where possible the latest scientific findings, to introduce them to the structure, organization and expression of genetic material and to provide them with the basics. to understand at the molecular level the diversity of organisms.

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
Production of new research ideas
Respect for the natural environment
Promoting free, creative and inductive thinking

(3) SYLLABUS

• PRINCIPLES OF MENDELIC INHERITANCE: Mendel's experiments (Mono-Di-Tribridisms). Application of Mendelian genetics in humans. Analysis of genealogical trees. Introduction to hereditary diseases
• THE CHROMOSOMIC THEORY OF INHERITANCE: Linking mitosis and reduction with the transfer of characteristics. Racial chromosomes and sex-linked genes.
• EXTENSIONS OF MENDEL ANALYSIS: The diversity of allelic relations. The multiple alleles. The lethal alleles. The effect of multiple genes on the formation of a trait. Gene penetration and expressiveness. Phenomena. Introduction of statistics in genetic analysis.
• ANALYSIS OF CONNECTED GENES: The discovery of binding. Recombination. Gene binding to racial chromosomes. Connection maps. Connection analysis with 3-point intersections. The phenomenon of interference. Reduction separation and recombination.
• GENETIC MAPPING: Genetic maps. Genetic markers (characteristics and categories). The study of connection in humans. Lod score calculation. Gene cloning based on their chromosomal topography.
• PHYSICAL MAPPING: Physical maps. Cytogenetic mapping. In situ fluorescence hybridization (FISH). Somatic cell hybrids. Natural maps of genomic clones.
• HUMAN GENOME MAPPING PROGRAM: Objectives. Sequencing strategies. Construction of a physical map of genomic clones. Chromosomal walking. In silico sequence analysis and databases. Number of genes encoding proteins. Gene density. RNA-encoding genes. Number of genes and complexity. Genetic diversity (single-nucleotide SNPs polymorphisms, copy number polymorphisms).
• CHROMOSOME MUTATIONS: The topography of chromosomes. Types and mechanisms of induction of structural and numerical chromosomal abnormalities. Deficiencies, permutations, duplications, bicentric and eccentric chromosomes, abnormal euploids and aneuploids. Effect and detection on the human phenotype. Deactivation of the X chromosome.
MUTATIONS: Mutations in somatic and germ cells. Natural and artificial mutations. The molecular basis of mutations. Effects of mutations. Directed mutagenesis in vitro. Randomity of mutations. Mutation selection systems. The Ames test. Shifting elements and shifting mechanisms. Mutations from trinucleotide replication extensions. Repair mechanisms.
MECHANISMS OF GENETIC RECONSTRUCTION: General homologous recombination. The Holliday and Meselson-Radding models. Homologous recombinant proteins. Gene conversion.
• EXTERNAL INHERITANCE: Organ organ genome organization. Mitochondrial DNA replication. Genetic code of mitochondria. Inheritance of mitochondria and chloroplasts. Polymorphism in mitochondrial DNA.
• MULTI-FACTORY INHERITANCE: Basic statistical concepts. Genotypic and phenotypic distributions. The heritability of a trait. Affinity coefficient. Estimation of heritability rate based on twin studies. Identification of genetic factors in multifactorial diseases.
PRINCIPLES OF GENETICS OF BACTERIA AND IONS: Bacteria as model organisms. Development methods and selection indicators. Bacterial and viral chromosomes. Plasmids. Bacterial conjugation. The discovery of the fertility factor F. Bacterial transformation. Recombination mapping. The genetics of phages. The phenomenon of switching.
Each course is accompanied by tutorial exercises or computer simulation exercises.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face teaching, Experiential activities, Laboratory training

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of ICT (power point) in Teaching
• Use of ICT (power point) in Laboratory Training
• Use of ICT in Communication with students (Learning process support through the electronic platform e-class).</td></tr>
<tr><td>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</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td></td><td></td></tr><tr><td>UNGUIDED STUDY</td><td>37</td></tr><tr><td>Study hours. Literature survey</td><td>49</td></tr><tr><td>Course total</td><td>125</td></tr></table></td></tr>
<tr><td>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.</td><td>1. The main assessment criteria focus on understanding and correlating the knowledge that students gain from the course with other knowledge. Particular emphasis is placed on whether they have developed the ability to apply this knowledge to crop selection and to assess the impact of these changes on the environment. Emphasis is also placed on demonstrating critical ability and justifying the choices they make in each problem.
2. Evaluation is dynamic. It mainly involves problem solving. is done orally or in writing or with a combination of the two, with or without pre-examination on the basic principles of the course, with or without exculpatory advances and with other test or inventive methods, depending on the composition of the dynamics and the needs of the audience.
3. The above are done in the Greek language. For foreign language students (eg Erasmus students) conducted in English</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- *Κλασική και Μοριακή Γενετική, Κ. Τριανταφυλλίδης, Εκδόσεις Αδελφών Κυριακίδη, 2001.*
- *Εισαγωγή στη Γενετική, Αλαχιώτης Σ., Εκδόσεις Ελληνικά Γράμματα Α.Ε. Αθήνα, 2005.*
- *Genes VII, B. Lewin, 7th edition, Oxford University Press, 1999.*
- *An Introduction to Genetic Analysis, Griffiths A. J. F. et al., 7th edition, W H Freeman & Co, 2000.*
- *Principles of Population Genetics, Hartl D. L and Clark A. G., 3rd edition, Sinauer Assoc., 1997.*

Other sources:

- *Nature*
- *Science*
- *Proceedings of National Academy of Sciences, USA (PNAS)*
- *Nature Reviews Genetics*
- *Nature Reviews Molecular Cell Biology*
- *Molecular Cell*
- *Microbiology and Molecular Biology Reviews*
- *EMBO Journal*
- *Molecular Biology and Evolution*
- *Molecular and Cellular Biology*
- *Trends in Biotechnology (TIBTECH)*