COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
ACADEMIC UNIT	CROP SCIENCE		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CRS_200	**SEMESTER OF STUDIES**	2nd
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	
Laboratory Exercises	2	
Total	4	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:	Typically, there are no prerequisite courses. Students must have basic knowledge of Biology.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (English)
COURSE WEBPAGE (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 aims at introducing the students to the basic concepts and principles of genetics as well as to the applications of genetic analysis in agriculture.

By completing this course, the students are expected to have achieved the following skills and capabilities:

- Comprehensive and detailed understanding of the basic concepts of genetics and heredity.
- Understand the relationship between phenotype and genotype.
- To understand basic principles of Mendelian inheritance.
- To describe cell division & chromosome segregation

- To explore multifactorial inheritance.
- To understand chromosome structure, chromatin organization and variation.
- Understanding the concepts of Linkage and the concept of sex determination and sex-linked inheritance.
- To gain knowledge about the organellar inheritance.
- To understand the role of mutations
- To gain knowledge regarding the basic concepts of quantitative and population genetics
- Gain the knowledge required to design, execute, and analyze the results of genetic experimentation.
- The ability to evaluate conclusions that are based on genetic data.
- The ability to recognize the experimental rationale of genetic studies as they are described in peer-reviewed research articles and books.

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*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Teamwork	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above):

Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
Decision making
Independent work
Teamwork
Production of new research ideas
Promotion of free, creative and inductive thinking

3. SYLLABUS

1. Introduction to Genetics principles
2. Cellular and chromosomal organization. The cell cycle – mitosis, meiosis
3. Mendelian Genetics. Mendel laws, monohybrid and dihybrid crosses etc.
4. Independent assortment. Statistical analysis in Mendelian genetics: Probability laws, chi square analysis, pedigree analysis.
5. The Chromosome theory of inheritance. Genes and chromosomes. Sex linkage and chromosomes. Sex determination.
6. Extensions of Mendelian analysis. Multiple alleles, incomplete, partial and complete dominance.
7. Gene interactions. Epistasis, lethal genes, Gene expression and the environment, penetrance and expressivity.
8. Quantitative traits
9. Genetic recombination, and linkage. Chromosome mapping.
10. Chromosome mutations.
11. Organellar inheritance
12. Bacterial and viral genetics
13. Principles of population genetics

Problems solving in:

- Monohybrid cross, calculation of probabilities and pedigree analysis.
- Dihybrid cross. Modified dihybrid ratios, problems with more than two genes.

- Epistatic and non-epistatic interactions.
- Sex chromosomes.
- Linkage and chromosome mapping.
- Calculation of genotypic and allele frequencies in populations. Hardy – Weinberg equilibrium testing.

4. TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face lectures.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	Use of Information and Communication Technologies (ICTs) (e.g. Microsoft PowerPoint) in teaching. The contents of the course of each chapter are uploaded on the internet, that the students can freely download using a password which is provided to them at the beginning of the course.
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*	<table><tr><th>***Activity***</th><th>***Semester workload***</th></tr><tr><td>Lectures (3 contact hours per week x 13 weeks)</td><td>39</td></tr><tr><td>Laboratory Exercises (2 contact hours per week x 13 weeks)</td><td>26</td></tr><tr><td>Reports writing – Final exam</td><td>10</td></tr><tr><td>Hours for private study of the student, preparation mid-term or/and final examinations-e-class studies</td><td>50</td></tr><tr><td>***Total number of hours for the Course (25 hours of workload per ECTS credit)***</td><td>***125 hours (total student workload)***</td></tr></table>
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.*	Final mandatory written examination, full length questions and / or multiple-choice questions, as well as questions based on the laboratory work. Minimum pass grade= 5, scale 0-10. All the above are taking place in Greek as well as in English for foreign students (e.g. ERASMUS students) if any.

5. ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

1. Genetics: From Genes to Genomes, 2nd Edition 2nd Edition by Hartwell, Leland, Hood, Leroy, Goldberg, Michael L., Reynold. Mc Graw, 2004.
2. Concepts of Genetics. William S. Klug, Michael R. Cummings, Charlotte A. Spencer, Michael A. Palladino, ©2018 Pearson
3. iGenetics: A Molecular Approach. Peter Russell. Pearson 2009.
4. Genetics: Analysis and Principles 5th Edition Robert J. Brooker. McGraw-Hill Education

5. An introduction to genetic analysis. Doebley, John, Griffiths, Anthony, Sean, Carroll, Wessler, Susan, FREEMAN MACMILLAN.

6.

- *Related academic journals:*

1. PLOS Genetics
2. Frontiers in Genetics
3. HEREDITY
4. Biochemical Genetics
5. Nature Genetics
6. Nature Plants