COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
ACADEMIC UNIT	ANIMAL PRODUCTION, FISHERIES AND AQUACULTURE		
LEVEL OF STUDIES	UNDERGRATUATE		
COURSE CODE	**AS_601**	**SEMESTER**	**5th**
COURSE TITLE	Population Genetics and Breeding		

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**
	5	6
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*	general background, special background, specialised general knowledge,
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK. I t can be taught in English in case of foreign students' presence.
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 student, at the end of the relevant Learning Process, is in a position:

- Explains the basic principles of population and quantitative genetics.
- Describes the Hardy-Weinberg Law and explains the necessary conditions for its implementation.
- Explain the consequences of the deviation from the conditions of application of the Hardy-Weinberg law.
- Calculates the gene frequencies and evaluates when a population is in a Hardy-Weinberg balance.
- Know the indicators of population and quantitative genetics and their usefulness.
- Explains the application of the principles of genetic improvement to animal populations.
- Describes the use of biotechnology to improve animal populations.
- Develops a broodstock management program, based on the principles of genetics.
- Apply basic laboratory methods for DNA manipulation.
- Analyzes laboratory results and estimates frequencies of alleles of DNA genetic

sites.

- Explains the methodology of identifying parents and people's population.

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*
Team work	*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…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Decision-making
Working independently
Team work
Respect for the natural environment
Criticism and self-criticism
Production of free, creative and inductive thinking

3. SYLLABUS

Lectures:

1. Introduction to Population Genetics. Concepts of population genetics - qualitative characters in the populations.
2. Introduction to molecular methods (Molecular markers).
3. Hardy- Weinberg Law.
4. Violations of the Hardy-Weinberg Law and evolutionary forces acting in the direction of changing gene frequencies.
5. Statistics on genetic improvement and population genetics (indexes).
6. Genetic Improvement, quantitative characters, inheritance of quantitative characters.
7. Heritability and methods of estimation.
8. Principles of genetic selection.
9. Breeding values, resemblance between relatives.
10. Multiple character selection, genetic correlations.
11. Spread of genetic gain.
12. Inbreeding and cross systems (hybridization).
13. New technologies (genomic, proteomic, QTL analysis, GWAS, mono-rabbit populations, chromosomal manipulations, interdental fish) and their application to genetic improvement.

Lab exercises:

The Laboratory focuses on the training of students in the analysis of population and / or quantitative genetics data by project analysis in groups.

1. Project Analysis (I & II)
    a. Analysis and population structure detection or
    b. Estimation of genetic parameters of quantitative characters.
2. Project Analysis (I & II) - Creating Groups
3. Analysis of required molecular laboratory data for each case.

4. Presentation of appropriate basic genetic analysis programs for each case (Genpop, FSTAT, VITASSIGN, PAPA, Wombat, etc.) I
5. Presentation of appropriate basic genetic analysis programs for each case (Genpop, FSTAT, VITASSIGN, PAPA, Wombat, etc.) II
6. Presentation and training in creating input files for each case
7. Data Analysis I.
8. Data analysis II
9. Data Analysis III
10. Interpretation of results (genetic frequency estimation, population indices (FST, FIS, co-incidence index) or parental identification methods and quantitative genetic parameters)
11. Presentation of the results of groups I.
12. Presentation of group results II

1. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face teaching. During the course the students will be invited to approach a research question and write a brief bibliographic essay, form their own questions to their colleagues based on the new information and participate in the interaction and learning activities after the lectures (eg coaching of colleagues, questioning their colleagues, class summary, "teach my classmate", etc.).
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	○ Power Point in lectures ○ Power Point in laboratory exercises ○ Using the e-Class platform for: ➢ Distribution of lectures ➢ Self-assessment exercises ➢ Learning streamline ➢ Deposit, monitoring and evaluation of work ➢ "After-class" activities ➢ Laboratory Examinations ➢ Progress evaluation
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***
1. Lectures (3 hours X 13 weeks)	39
2. literature search and reading connected with (1) (2 hours X 13 weeks)	26
3. Self-evalution exesrcises in e-Class (1 hours X 13 weeks)	13
4. LAB exercises (2 hours X 13 weeks)	24
5. Writing short lab reports or lab evaluation connected to (4) (1	12

hours X 13 weeks)	
6. Participation in the "after class" activities (2hours X 13 weeks)	26
7. Study and preparation for the evaluation workload	7
8. Final exams	3
Course total *(6X25)*	***150***

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.

The evaluation will be done in Greek unless there is necessity for an avluation in English because of the presebce of foreign students.

The evaluation will be done as following:

Writing short lab reports or lab evaluation (Average of the report grades)	20%
Participation in the "after class" activities (Average)	15%
Participation in the "after class" activities (Average)	15%
Final exams	50%

Minimum grade to pass: 5 (Range: 0-10)

In the case of evaluation failure (in theory of the lab) the exams will be repeated but the follow up of the lab exercises it is not obligatory as long as the student was present in all the necessary lab exercises.
The evaluation grades of the other activities (eg after class) will be valid for the next two (2) years, meaning four (4) semesters from the typical semester taught.

2. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Lynch, M., & Walsh, B. (1998). *Genetics and analysis of quantitative traits* (Vol. 1, pp. 535-557). Sunderland, MA: Sinauer.

Walsh, B., & Lynch, M. (2018). *Evolution and selection of quantitative traits*. Oxford University Press.

Gillespie, J. H. (2004). *Population genetics: a concise guide*. JHU Press.

Hamilton (2011). Population Genetics. Wiley-Blakwell.

Bourdon (2013) Understanding Animal Breeding: Pearson New International Edition. Pearson Education Limited

- Related academic journals:

Genetics
Heredity
Genetics Selection Evolution
Animal Genetics
Animal Breeding
Aquaculture