**COURSE OUTLINE**

1. **GENERAL**

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| **SCHOOL** | Health Sciences |
| **ACADEMIC UNIT** | Department of Biological Applications and Technologies |
| **LEVEL OF STUDIES** | Undergraduate |
| **COURSE CODE** | **BEE713** | **SEMESTER** | **7th, 9th**  |
| **COURSE TITLE** | Molecular Ecology and Conservation 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** |
|  | 5 | 5 |
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| *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* | Special background – specialized general |
| **PREREQUISITE COURSES:** | ΒΕΥ902-Evolutionary Biology |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** |  |
| **COURSE WEBSITE (URL)** | http://ecourse.uoi.gr/course/view.php?id=490 |

1. **LEARNING OUTCOMES**

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| **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*
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| During the last decades, significant changes occur worldwide (i.e. global climate change, elevated impact of human activities on the environment) posing a continuously growing risk on global biodiversity through the degradation and fragmentation of ecosystems, local extinctions of animal and plant species, emergence and spread of pathogenic diseases etc.Molecular Ecology is a rapidly developing field of research that uses molecular tools to investigate and understand the ecological and evolutionary processes that occur within natural populations, species and communities.An important component of Molecular Ecology is Conservation Genetics which is the application of genetics in the conservation of species as dynamic entities capable to cope with environmental change. Among other applications, Conservation Genetics deals with the genetic management of small populations, the resolution of taxonomic uncertainties, the definition of management units within species, as well as the use of molecular analyses in forensics. The course combines molecular biology and genetics with evolutionary ecology and conservation biology, aiming at introducing the students to use methods and techniques in the investigation and resolution of environmental issues and the design of management strategies for wildlife protection.Upon completion of the course, students will be able to understand the processes and factors that shape species distributions and the genetic properties of natural populations, to choose the appropriate methods and techniques depending on the question, to analyze raw data using specialized software and interpret the results towards the evaluation of the conservation status of natural populations. |
| **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 for, analysis and synthesis of data and information, with the use of the necessary technology*
* *Working independently*
* *Team work*
* *Working in an interdisciplinary environment*
* *Respect for the natural environment*
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1. **SYLLABUS**

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| 1. Molecular biology and Genetics in Evolutionary Ecology - Molecular techniques in Ecology – Current trends
2. Molecular markers: properties and applications
3. Population genetic analyses: Analysis of single populations – Genetic variation indices – Effective population size
4. Factors affecting genetic variation – Natural selection – Genetic drift – Bottlenecks – Mating systems
5. Between population variation - genetic population structure – F-statistics – Gene flow – Isolation by Distance
6. Landscape genetics: influence of landscape characteristics in genetic variation – Barriers to gene flow – Fragmentation - Metapopulations
7. Intra-specific phylogenies – Phylogeography – Molecular markers in phylogeography – Molecular clocks – Phylogenetic trees – Comparative and applied phylogeography
8. Conservation Genetics – Description and organization of genetic variation – Loss of genetic variation in small populations – Inbreeding – Genetically viable populations – Management Units – Genetic management of wild populations – Reintroductions and Translocations – Genetic management of populations in captivity – Genetics of endangered and invasive species
9. Ecological genomics - Conservation genomics – Adaptive genetic variation

**Laboratory exercises:** 1. DNA sequences: manual inspection – alignment – genetic databanks - GenBank - BLAST
2. Genotyping of microsattelites
3. Description and organization of genetic variation – analysis of population genetic data
4. Genetic population structure – Estimation of recent gene flow and migration
5. Phylogenetic analyses
6. DNA barcoding: identification of unknown biological samples
7. Conservation genetics: translocations in animal populations
8. Population size estimation with the use of genetic data
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1. **TEACHING and LEARNING METHODS - EVALUATION**

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| **DELIVERY***Face-to-face, Distance learning, etc.* | Face-to-face |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** *Use of ICT in teaching, laboratory education, communication with students* | * Use of specialized genetic data analysis software
* Support of the learning process through the online e-course platform
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| **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* |

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| ***Activity*** | ***Semester workload*** |
| Lectures | 26 |
| Laboratory practice | 30 |
| Analysis and presentation of scientific article (individually) | 10 |
| Essay writing (weekly basis) | 20 |
| Independent study | 40 |
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| Course total  | ***126*** |

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| **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.* | Ι. Written final exam (60%) that includes:*- multiple choice questionnaires**- short-answer questions* *- open-ended questions**- Judgment questions*- *Practical test: solving problems using data analysis software - interpret results and draw conclusions*II. Presentation of individual work - seminar (20%)III. Performance in laboratory exercises and evaluation of laboratory reports (20%) |

1. **ATTACHED BIBLIOGRAPHY**

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| *- Suggested bibliography:*- Beebee, T. & Rowe, G. – An introduction to Molecular Ecology. Oxford University Press.- Frankham, R., Ballou, JD. & Briscoe, DA. – Introduction to Conservation Genetics. Cambridge University Press.- Freeland, J.R., Kirk, H. & Petersen, S.D. - Molecular ecology. Wiley-Blackwell.- Pianka E.R. – Evolutionary Ecology. Crete University Press.*- Related academic journals:**-* Molecular Ecology (<http://onlinelibrary.wiley.com/journal/10.1111>)- Conservation Genetics ([http://www.springer.com/life+sciences/ecology/journal/10592](http://www.springer.com/life%2Bsciences/ecology/journal/10592)) |