**COURSE OUTLINE**

1. **GENERAL**

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| **SCHOOL** | HEALTH SCIENCES |
| **ACADEMIC UNIT** | BIOLOGICAL APPLICATIONS AND TECHNOLOGIES |
| **LEVEL OF STUDIES** | undergraduate |
| **COURSE CODE** | ΒΕΥ403 | **SEMESTER** | 4th |
| **COURSE TITLE** | GENETICS |
| **INDEPENDENT TEACHING ACTIVITIES**  | **WEEKLY TEACHING HOURS** | **CREDITS** |
| Lectures and lab courses | 6 | 6 |
| **COURSE TYPE** | general background |
| **PREREQUISITE COURSES:** | - |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek (instruction and examination)English (examination) |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | yes |
| **COURSE WEBSITE (URL)** | <http://ecourse.uoi.gr/course/view.php?id=1283><http://www.bat.uoi.gr/show-lesson?l_id=8> |

1. **LEARNING OUTCOMES**

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| **Learning outcomes** |
| By the completion of the course the students will be able to understand, recognize and describe the basic meanings concerning the transmission mechanisms of the genetic material, the contribution of genotype and environment in the expression of phenotype, the genetic rearrangement and gene mapping synthesis, the variations in the level of chromosome and the genetic diversity in the level of populations. They will be able to combine the knowledge they obtained in order to estimate, process and solve problems. In addition, they will be in the position to deal in terms of evaluation and interpretation with certain scientific questions. |
| **General Competences**  |
| * Search for, analysis and synthesis of data and information, with the use of the necessary technology
* Team work
* Production of free, creative and inductive thinking
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1. **SYLLABUS**

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| **Theory class*** Introduction to genetics: Classical and modern genetics, basic concepts of genetics, geneticists and genetic research.
* Mendelian genetics: Mendel’s principles, crosses, statistical analysis of genetic data, Mendelian genetics in humans.
* Chromosomal basis of inheritance, sex chromosomes and sex determination.
* Extension of Mendelian genetic principles: multiple alleles, modifications of dominance relationships, gene interactions, the effect of environmental parameters to the formation of the phenotype.
* Gene mapping in eukaryotes: genetic recombination, construction of genetic maps, tetrad analysis in haploid eukaryotes, human gene mapping.
* Variation in the number and the structure of chromosomes.
* Genetics of bacteria and bacteriophages: genetic analysis of bacteria, horizontal gene transfer, mapping in bacteria and bacteriophages.
* Non-mendelian genetics: mitochondria and chloroplasts, organization of exonuclear genomes, rules of non-mendelian inheritance, examples, maternal effect.
* Population genetics: Hardy-Weinberg law, genetic variation in space and time, in natural populations, forces that change the frequence of genes in populations, summary of the effects of evolutionary forces on the genetic structure of a population, the role of genetics in conservation biology, speciation.

**Laboratory course*** Observation of *Drosophila melanogaster* species, distinction between males and females, and phenotypes. Monohybrid – dihybrid crosses, sex-linked traits, analysis of F1 and F2 offsprings.
* Phenocopies. *Drosophila melanogaster* wild type treatment with phenocopying agents, checking the heritability of the observed traits.
* Extentions of Mendelian genetics: multiple alleles. Study and statistic analysis of blood groups.
* Genetic linkage. Gene mapping in *Drosophila melanogaster*.
* Genetic analysis in prokaryotes I. Bacterial conjugation between *Escherichia coli* strains, transmission of exochromosomal inheritance.
* Genetic analysis in prokaryotes ΙΙ. *Escherichia coli* transduction by λ phage, plaque formation.
* Population genetics. Hardy-Weinberg equilibrium in a *Drosophila melanogaster* population.
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1. **TEACHING AND LEARNING METHODS – EVALUATION**

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| **DELIVERY** | Face-to face in the class and the lab |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY**  | Support of the learning procedure via the electronic platform “e-course” Communication with students via email & ecourse |
| **TEACHING METHODS** |

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| ***Activity*** | ***Semester workload*** |
| Lectures | 40 |
| Laboratory practice | 20 |
| Lab essay writing | 10 |
| Individual studying | 80 |
| Course total  | ***150*** |

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| **STUDENT PERFORMANCE EVALUATION** | **Theory (80 %, should be ≥ 5)** Written exams including; * Short- or middle answer questions (75%)
* Problem solving (25%)

**Lab course (20%)** * Lab presence (general presence, lab essays grade) (60 %)
* Written exam (40 %)
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1. **ATTACHED BIBLIOGRAPHY**

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| * Russell P.J. **iGenetics – A Mendelian Approach,** Pearson, 2006. ISBN-10: 080534666X • ISBN-13: 9780805346664
* [Hartwell,](http://www.utopiapublishing.gr/SearchShop2.aspx?CategoryId=0&TableLookupStr=603@1232033@) Hood, [Goldberg](http://www.utopiapublishing.gr/SearchShop2.aspx?CategoryId=0&TableLookupStr=603@1232035@), [Reynolds](http://www.utopiapublishing.gr/SearchShop2.aspx?CategoryId=0&TableLookupStr=603@1232036@), [Silver](http://www.utopiapublishing.gr/SearchShop2.aspx?CategoryId=0&TableLookupStr=603@1232037@). **Genetics – from genes to genomes**, McGraw Hill Education, 2015, ISBN-13: 978-0073525310.
* <http://flybase.net>
* <http://fruitfly.org>
* <http://klinefeltersyndrome.org>
* <http://www.ds-health.com> (Down Syndrome: Health Issues)
* <http://biology-pages.info> (Kimball’s Biology pages)
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