COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF APPLIED BIOLOGY AND BIOTECHNOLOGY		
DEPARTMENT	BIOTECHNOLOGY/ FOOD SCIENCE & HUMAN NUTRITION		
STUDY LEVEL	BACHELOR OF SCIENCE		
COURSE CODE	275	**SEMESTER**	3rd
COURSE TITLE	MOLECULAR BIOLOGY		

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**	**ECTS**
Lectures	3	1,56
Practicals (lab work)	2	0,56
Group class presentation (selected topics/scientific papers)		1,60
Autonomous study (personal assignment)		2,28
TOTAL	TOTAL	**6**

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Field of Science
PREREQUISITES	-
LANGUAGE	Greek (Teaching & Exams)
IS THE COURSE OFFERED for ERASMUS STUDENTS?	YES (in English) (Teaching & Exams)
COURSE WEB PAGE	-

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*

On completion of the course the student should:

- Gain in-depth understanding of the molecular basis of information flow from DNA and understand how the genes are regulated
- Be able to discuss the processes of DNA replication, transcription, protein synthesis and processing
- Acquire knowledge towards to some methods and experimental techniques used in biological research
- Be able to analyze, evaluate and decide on a case by case applicability of appropriate molecular tools for fingerprinting analyses
- improved their capacity for critical thinking through a detailed analysis and evaluation of scientific concepts, experimental designs and literature review
- gain expertise in data handling associated with mastering graphics, word processing software packages and statistics

- Develop critical thinking and presentation skills by delivering a report and presenting a scientific paper
- understand how advances in molecular biology technologies can be used to produce high value industrial products (nutraceuticals, cosmetics, agrochemicals, medicinal materials) and contribute to modern society's health and well-being

General Competencies

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 differences 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

- Technically proficient in commonly used laboratory techniques, with minimal support
- Work in groups.
- Collaboration skills
- Make informed decisions on biological issues
- Work independently
- Develop critical thinking skills

3. COURSE CONTENT

1) Genes are DNA. (Structure of B-DNA. DNA is a double helix. Nucleic acids hybridize by base pairing. Supercoiling affects the structure of DNA)
2) The interrupted Gene (exon, intron, exons are conserved)
3) Messenger (mRNA) and Transfer RNA (tRNA) (The Central Dogma of Molecular Biology, mRNA life cycle. monocistronic, polycistronic, the cloverleaf secondary structure, specific base modifications)
4) Protein synthesis: The ribosome (structure, initiation stage, elongation stage and termination stage, the translation factors)
5) The Genetic Code (structure, origin, wobble hypothesis, mutations)
6) Transcription (bacterial RNA polymerase, promoter, sigma factors)
7) The operon (positive or negative regulation, the lac operon, the *E. coli* tryptophan operon is controlled by attenuation, autogenous regulation).
8) Regulatory RNAs. miRNAs and post-transcriptional regulation of gene expression in eukaryotes
9) The replicon (replication fork, origin of replication)
10) DNA replication is a complex process (the replication machinery, DNA polymerase, primase, ligase, methylation)
11) Chromosomes (the bacterial genome, euchromatin, heterochromatin, banding patterns)
12) Nucleosomes (DNA is coiled in arrays of nucleosomes , the histone octamer, histone variants, the chromatin fiber, transcription)
13) Promoters utilized by RNA polymerase II (promoter elements, enhancers, silencers, CG islands)
14) RNA splicing and processing πο(RNA splicing, alternative splicing, the spliceosome,

eukaryotic mRNA is modified, polyadenylation, 5-capping)

4. TEACHING and LEARNING METHODS

<table>
<tr><td>TEACHING METHOD
Face-to-face, Distance learning, etc</td><td>Direct</td></tr>
<tr><td>USE OF INFORMATICS and COMMUNICATION TECHNOLOGIES
Use of ICT in teaching, laboratory education, communication with students</td><td>Power point presentations.

Student contact electronically.</td></tr>
<tr><td>TEACHING ORGANISATION

Lectures, Seminars, Laboratory Exercises, Field Exercise, Literature Study & Analysis, Tutorial, Internship, Clinical Exercise, Interactive Teaching, Educational Visits, Study Preparation (Project), Written assignments, Independent study

The student's study hours for each learning activity are listed, so that the total workload at the semester level corresponds to ECTS standards.</td><td>
<table>
<tr><th>Δραστηριότητα</th><th>Φόρτος Εργασίας Εξαμήνου</th></tr>
<tr><td>Lectures</td><td>39 h</td></tr>
<tr><td>Practical Lab Courses</td><td>14 h</td></tr>
<tr><td>Group class presentations</td><td>40 h</td></tr>
<tr><td>Autonomous study</td><td>57 h</td></tr>
<tr><td>Course total
(25 hours of student work load per ECTS)</td><td>150
(6 ECTS)</td></tr>
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<tr><td>STUDENT EVALUATION

Evaluation Methods, Formative or Inferential, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Other / Others

Expressly specified assessment criteria are stated and whether and where they are accessible to students.</td><td>The final grade for the course is determined by the overall results for the different parts of the examination.

I. Written final examination (50%)
Exam questions will be developed from lecture, and assigned reading material. Exams will take the format of multiple choice and short-answers to questions.

II. Laboratory exercises/practicals (10%).

III. Group and small autonomous works (40%).

The grade will be based on writing assignments for every laboratory exercise, from attendance and class participation</td></tr>
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5. BIBLIOGRAPHY

1. Lewin's Βασικές αρχές Γονιδίων (2022), BROKEN HILL PUBLISHERS LTD

2. Βασικές αρχές Μοριακής Βιολογίας (Ακαδημαϊκές Εκδόσεις Ι. Μπάσδρα και Σία Ο.Ε)

3. Genes VIII, Ελληνική Μετάφραση, Ομάδα συγγραφέων, 2004, Εκδόσεις Μπάσδρα και ΣΙΑ ΟΕ. Αλεξανδρούπολη

4. I-Genetics, Ελληνική Μετάφραση, Ομάδα συγγραφέων, 2009, Εκδόσεις Μπάσδρα και ΣΙΑ ΟΕ. Αλεξανδρούπολη

5. The Cell, A Molecular Approach, 5th Edition, G.M. Cooper and R.E. Hausman, Eds, 2009, Sinauer Assosciates, Inc. Publishing, USA-

Συναφή επιστημονικά περιοδικά:

Nature, Science, Cell, Plant Molecular Biology, The Plant Cell, Gene, PNAS USA, Molecular Cell Biology

Current Biology , Plant Journal, New Phytologist, Molecular Plant, eLife, Nature Plants, Plants, Developmental Cell, J. Experimental Botany, Trends in Plant Science, EMBO J.