Course Outline: "5102 - Molecular Biology"

1. General information

FACULTY/SCHOOL	Physical Education, Sport Science & Nutrition		
DEPARTMENT	Nutrition & Dietetics		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	**5102**	**SEMESTER**	**5th**
COURSE TITLE	**Molecular Biology"**		

INDEPENDENT TEACHING ACTIVITIES in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	2	
Laboratory Exercises	2	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4	**4**	**5**

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise General Knowledge
PREREQUISITE COURSES	No
LANGUAGE OF INSTRUCTION	GREEK
LANGUAGE OF EXAMINATION/ASSESSMENT	GREEK
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.uth.gr/courses/DND_U_210/

2. LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:Συμβουλευτείτε το ***APPENDIX A***

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Molecular biology course aims to bring the students in touch with the genome structure and role. The students will be taught the structure and function of DNA, RNA and proteins. Furthermore, the genetic variability, as well as the diseases that are caused by it will be assessed. Finally, the students will become familiar with the concept of personalized genetic medicine and the diagnostic value of molecular biology. After the course the students will be able to identify and know the basic principles of molecular biology and more specifically the use of omic technologies. Furthermore, they will be able to understand the connection between genes and diseases, the importance of genetic variation and the place of molecular biology in the modern science era.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, Adapting to new situations Decision-making Individual/Independent work Group/Team work Working in an international environment Working in an interdisciplinary environment Introduction of innovative research

Project planning and management Respect for diversity and multiculturalism Environmental awareness Social, professional and ethical responsibility and sensitivity to gender issues Critical thinking Development of free, creative and inductive thinking …… (Other…….citizenship, spiritual freedom, social awareness, altruism etc.) …….

- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Individual/Independent work
- Group/Team work
- Introduction of innovative research
- Development of free, creative and inductive thinking

3. COURSE CONTENT

Theoretical content

1.Basic principles of molecular biology: Definitions and fields of molecular biology

2. The genetic information flow. The role of macromolecules in the genetic information flow.

3. Inheritance and basic genetic principles: Inheritance. Genes, alleles, chromosome, genetic position, genotype, phenotype, polymorphisms, genetic variations.

4. Mendelian inheritance principles. Mendelian genetics in humans and populations. Genealogical trees' analysis.

5. The chromosomic theory. Characteristics inheritance and mitosis-meiosis. Sex chromosomes and their genes.

6. Allelic gene relationships. Multiple alleles, death inducing genes, genetic variability.

7. Induction of genetic variability and genetic diseases: Genetic mutations. Somatic and genetic cell mutations. Natural and technical mutations. The molecular base of mutations and their effects. Mutational randomness and population polymorphisms. Induced mutations in vitro.

8. Genetic recombination. Mechanisms and variability effect. DNA repair mechanisms.

9. Chromosomal mutations. Structural and arithmetic chromosomal mutations. Mechanisms inducing mutations. X chromosome deactivation. Factors that affect the genetic material and can cause mutations.

10. Genomics and omic technologies: Definitions and categories. Basic principles of omic technologies. Their role in genetic diseases diagnosis.

11. Foodomics. Their relation with the microbiome and the induction of diseases.

12. Genetic diagnosis and genetic diseases: Karyotype, DNA analysis, Molecular analysis. Prenatal testing- assisted reproduction.

13. Clinical applications- DNA, RNA and protein analysis in diseases diagnosis. Clinical incidence of inherited diseases: cause analysis, diagnostic methods, ways of treatment. Molecular diagnosis and gene therapy in cancer.

Laboratory exercises

- Mitosis phase recognition
- DNA isolation
- RNA isolation

- Allele identification, gene testing
- Omic technics: protein identification
- Omic technics: carbohydrates, lipids identification
- Karyotype. Chromosomal diseases diagnosis.
- Inheritance pattern identification.
- Review research paper methodology
- 4x Debate/ journal club

7. TEACHING METHODS - ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc..*	Face-to-face, in -class lecturing, distance teaching	
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	For the teaching the following tools will be used: a) power point documents during lectures b) pdf files with the lectures, that will be assessable via the eclass platforms c) simulation programs, that are used during the lectures and are assessable via the eclass platform. d) video files regarding the subject of the lecture e) electronic databases for relative information search. f) clinical scenarios (Problem Based Learning). The students can get in touch with the instructor either directly (through face to face contact or email) or indirectly (through notes posted on the poster boards, the website of the Department and the eclass platform).	
COURSE DESIGN *Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.*	***Activity/Method***	***Semester workload***
	Lectures	10 × 2 = 20
	Presentations	3 × 2 = 6
	Laboratory exercises	3 × 2 = 6
	Laboratory report	20
	Preparation of public presentation	33
	Preparation for the exams	40
	Total	***125***
STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Evaluation of the theoretical part of the course (60%): Students will be evaluated based on their performance in a multiple-choice exam at the end of the semester Evaluation in the lab section of the course (40%): Students will be evaluated through a bibliographic review paper. The lab paper will contain an oral presentation (40%) and a written manuscript (60%). The students will make a presentation of their work and a discussion will follow, with questions by the instructor and their co-students, in order to be evaluated of the theoretic knowledge they have obtained. While, the written manuscript will be evaluated based on the content and the presentation of the selected subject.	

8. SUGGESTED BIBLIOGRAPHY

-Suggested bibliography:

- Basic molecular biology principles, Burton E. Tropp
- Human molecular genetics, G. Dedousis.
- Lewin's Genes XII, Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick

Relevant Scientific Journals:

-Nature
-Science
-Nature Genetics
-Human Molecular Genetics
-Nature Structural and Molecular Biology
-Molecular cell