COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
DEPARTMENT	FOOD SCIENCE AND NUTRITION		
EDUCATION LEVEL	*Undergraduate*		
LECTURE CODE	ΒΠ-314	**SEMESTER**	3rd
LECTURE TITLE	Molecular Biology		

SELF-ENDED TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS (ECTS)**
LECTURES	4	4
LABORATORY EXERCISES	2	2
	6	6

COURSE TYPE	Scientific Area Molecular Biology
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://food.uth.gr/theodoros-goulas/

2. LEARNING OUTCOMES

Learning outcomes

Upon successful completion of the course, the student will be able to:

- Understands the basic concepts concerning the flow of genetic information, its storage in different parts of the cell and the various structures, functionality and regulation of gene expression.
- Understands and uses the methods and techniques used to understand the transfer of genetic information as well as the first stage analysis of DNA.
- Applies DNA and RNA analysis methods.
- Has knowledge of the processes and methods for applications of the molecular analysis of biomolecules.
- Can distinguish the basic differences between DNA, RNA and protein biomolecules
- Understands the concepts of replication, transcription and translation as well as the first concepts of gene cloning.
- Uses basic bioinformatics tools to extract information from databases.
- Understands the importance of Molecular Biology in Food Science and Nutrition

General Skills

1. Search, analysis and synthesis of data and information, also using the necessary technologies.
2. Adaptation to new situations.
3. Decision making.
4. Autonomous work.
5. Group work.
6. Generation of new research ideas.
7. Project planning and management.

8. Exercise criticism and self-criticism
9. Promotion of free, creative and inductive thinking

3. COURSE CONTENT

Theory

1st Week
Introduction to Molecular Biology. The genetic material. Central dogma of Molecular Biology

2nd Week
Structure and function of proteins.

3rd Week
Structure and basic properties of DNA and RNA.

4th Week
Techniques of Molecular Biology.

5th Week
Prokaryotic and eukaryotic chromosome. Structure of the eukaryotic gene.

6th Week
Introduction to Genetic Analysis. Escherichia coli, Saccharomyces cerevisiae and Drosophila melanogaster as model organisms.

7th Week
Replication of DNA in prokaryotic and eukaryotic cells.

8th Week
DNA damage and repair. Double-strand break repair and homologous recombination.

9th Week
Bacterial transcription and regulation of gene expression.

10th Week
Protein Synthesis. Structure of the ribosome.

11th Week
Case study_1: Galactosidases from Bifidobacterium bifidum, isolation, characterization and use in food biotechnology (2 hours)
Case study_2: The main toxin of Bacteroides fragilis, isolation, characterization and determination of its tertiary structure (2 hours)

12th Week
Contribution of Molecular Biology to Food Science and Nutrition

13th Week
Recap of the basic concepts of Molecular Biology

Laboratory Exercises

1st Week
Analysis of genes with the help of bioinformatics

2nd Week
Isolation of DNA from bacteria.

3rd Week
Analysis of DNA by gel electrophoresis

4th Week
Polymerase chain reaction

5th Week
Restriction enzymes and DNA ligases

6-7th Week
Cloning of genes in plasmids

8th Week
Bacterial transformation

9th Week
DNA sequencing and analysis of results.

10-11th Week
Gene overexpression in Escherichia coli.

12th Week
Using the CRISPR molecular scissors

13th Week
Recapitulation of the basic principles of laboratory methods

4. TEACHING AND LEARNING METHODS - ASSESSMENT

Delivery method	In person.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Specialized Software (ChimeraX, Pymol, Geneious, SnapGene)
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Lectures	52 (13 week x 4 hours)
Laboratory Exercises	12 (6 Lab Works. x 2 hours)
Report of laboratory exercises	10
Elaboration of a study	28
Preparation for written exam	48 (12 lect. x 4 hours)

	Total Course (25 workload hours per credit unit)	*150* **(6 ECTS)**
STUDENT EVALUATION	I. Written exam (70 %) of graded difficulty that includes: - Multiple choice questions - Short questions - Questions of crisis and development II. Laboratory exercises (10%): - Participation and performance during the laboratory exercise III. Group work (20%) Therefore, the overall grade is obtained as a sum of the above three individual evaluations.	

5. SUGGESTED BIBLIOGRAPHY

-Suggested Bibliography :

1. Βασικές Αρχές Μοριακής Βιολογίας, Burton E. Tropp
2. Μοριακή Κυτταρική Βιολογία, Harvey Lodish, Arnold Berk, Chris Kaiser, Monty Krieger, Anthony Bretscher, Hidde Ploegh, Angelica Amon, Kelsey Martin
3. Μοριακή Βιολογία του Κυττάρου, Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter, John Wilson, Tim Hunt
4. Εισαγωγή στις αρχές της μοριακής βιολογίας & διαγνωστική πρακτική, Αικατερίνη Χαρβάλου, Δήμητρα Χούχουλα
5. Lewin's Γονίδια X, Krebs J.

- Related scientific journals:

Nature
Science
Cell
Plant Molecular Biology
The Plant Cell
Gene
PNAS USA
Molecular Cell Biology
Current Biology
Plant Journal