COURSE OUTLINE

(1) GENERAL

SCHOOL	ANIMAL BIOSCIENCES		
ACADEMIC UNIT	DEPARTMENT OF ANIMAL SCIENCE		
LEVEL OF STUDIES	Undergraduate [Free Elective]		
COURSE CODE	3210	**SEMESTER**	5th
COURSE TITLE	MICROBIAL BIOTECHNOLOGY		

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 (ECTS)**
Lectures	3	1.56
Practical Lab Courses	2	1.04
Group class presentation (selected topics/ scientific articles)		1.20
Autonomous study (personal assignment)		1.20
Total	**5**	**5**
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
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek (Teaching & Exams)
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	English (Teaching & Exams)
COURSE WEBSITE (URL):	

(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*

Upon successful completion of the course, the student will be able to:
• Demonstrate an understanding of Industrial Fermentations and the microorganisms employed at such scale.
• Possess knowledge of microbial growth models and the factors influencing them.
• Comprehend microbial metabolism and the production of high value-added products derived from microorganisms, as well as the biotechnological methods applied for their production.
• Possess knowledge of the methods used to study microbial populations in the environment.
• Recognize the prospects of Microbial Biotechnology in the production of useful energy sources, chemicals, and bioactive molecules.

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...* *.....*

- Retrieval, analysis, and synthesis of data and information, utilizing the necessary technologies.
- Adaptation to new situations.
- Decision-making.
- Independent work.
- Teamwork.
- Generation of new research ideas.
- Project design and management.
- Exercising critical thinking and self-reflection.
- Application of knowledge in practice.

(3) SYLLABUS

1. From antiquity to Manuel Sarri the Tenedian, and from Antonie van Leeuwenhoek to Genetic Engineering – Concept and "Shades" of Biotechnology.
2. Microorganisms of Industrial Fermentations: fungi, yeasts, bacteria, and their physiological characteristics.
3. The main application areas of microbial biotechnology.
4. Omics technologies in microbial biotechnology.
5. Microbial genomes and bacteriophages.
6. Methods for studying microbial ecology.
7. Key metabolic pathways utilized and the products produced by microorganisms.
8. Microbial growth kinetics: growth in bioreactors under semi-continuous feed and continuous culture; balances and equations.
9. Applications: production of bioalcohols, organic acids, biofuels, lipids, and microbial protein.
10. Applications: microbial production of amino acids, exemplified by *Corynebacterium glutamicum*.
11. Applications: cultivation of edible fungi.

(4) TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD *Face-to-face, Distance learning, etc.*	Direct (face to face).
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Specialized software for supporting teaching, managing bibliographies and scientific data, laboratory training, and communication with students.
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.*	

Activity	***Semester workload***
Lectures	39
Practical Lab Courses	26
Group class presentations	30
Autonomous study	30
Course total (25 h of workload per ECTS)	***125***

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	
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.*	I. Written final examination (50%), of graduated difficulty, including: • Multiple-choice questions. • Short theoretical development questions. • Problems/exercises based on the theoretical knowledge presented in lectures. II. Laboratory exercises (30%). III. Group and individual assignments (20%). Accordingly, the final grade is calculated as the sum of the three above components.

(5) ATTACHED BIBLIOGRAPHY

Eudoxus:

1. Microbiology and Microbial Technology, Author: Georgios Angelis, UNIBOOKS Publications, Athens, 2017.
2. Brock Biology of Microorganisms, Authors: Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl, ITE-Crete University Press, Crete, 2018.

Relevant scientific journals:

Enzyme and Microbial Technology, Bioresource Technology, Journal of Applied Microbiology, Applied Microbiology and Biotechnology, Applied and Environmental Microbiology, Microbial Biotechnology.