COURSE OUTLINE

1. GENERAL

SCHOOL	APPLIED BIOLOGY & BIOTECHNOLOGY		
ACADEMIC UNIT	BIOTECHNOLOGY		
LEVEL OF STUDIES	UDERGRADUATE		
COURSE CODE	**3210**	**ΕΞΑΜΗΝΟ ΣΠΟΥΔΩΝ**	5th (autumn semester)
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**
Lectures	3 (x13 wks)	1,56
Practical Lab Courses	2 (x13 wks)	1,04
Group class presentation (selected topics/ scientific articles)	2,3 (x13 wks)	1,20
Autonomous study (personal assignment)	2,3 (x13 wks)	1,20
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	SUM: 9,6 (x13 wks)	5,0

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Filed of Science
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek (Teaching & Exams)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	English (Teaching & Exams)
COURSE WEBSITE (URL)	Under construction

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 this course the students will acquire new knowledge and specific skills on the following subjects:

- Basic overview of a broad spectrum of Microbial Biotechnology applications, socioeconomical impact.
- Understand the basic genetic of microorganisms and the respective tools for applying microbial genetic engineering.
- Appreciate the significance of -omic technologies in modern microbial biotechnology
- Usage of microorganisms in Industrial fermentations
- Knowledge and expertise of the enzyme and microbial technology and the microbial biotransformations related to the production of food-based products and to the applications of white biotechnology

- Knowledge and methodologies of the microbial and enzyme technology related to the food biotechnology and the industrial biotechnology
- Metabolism and added value compounds produced by microorganisms used in industrial scale fermentations. Optimization of production using biotechnological methods.
- Perspectives of modern Microbial Biotechnology in production of bioenergy and biochemical or bioactive high added value materials, amino acids and alternative food sources.

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	*Project planning and management*
Decision-making	*Respect for difference and multiculturalism*
Working independently	*Respect for the natural environment*
Team work	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Working in an international environment Working in an interdisciplinary environment	*Criticism and self-criticism*
Production of new research ideas	*Production of free, creative and inductive thinking*
	……
	Others…
	…….

1) Retrieve, analyze and synthesize data and information relying on use of necessary technologies.
2) Adjust to new situations.
3) Decision making.
4) Work autonomously.
5) Work in groups.
6) Create novel scientific projects.
7) Design and develop research projects/experiments.
8) Be critical and self-critical.
9) Apply knowledge to practice.

3. SYLLABUS

1) Historic considerations and presentations / economics of microbial biotechnology
2) Basic sectors and applications of microbial biotechnology
3) Microorganism genetics, mutagenesis, recombinant DNA tools
4) Genetic engennering of microorganisms and its application in Microbial Biotechnology
5) -Omic technologies and their applications in Microbial Biotechnology
6) Microbial genomes and Bacteriophages
7) Typical fermentations and transformations and their applications in food and white biotechnology; lactic acid fermentation; alcohol fermentation; formic fermentation; 2,3-butanediol fermentation; 1,3-propanediol fermentation; ABE fermentation; acetic acid fermentation; malolactic bioconversion
8) Microbial food biotechnology: production of bread, vinegar, alcoholic beverages, olives, fermented vegetables
9) Microbial biotechnology for added-value chemicals: production technologies of single-cell protein, single-cell oil, alcohols, organic acids, etc
10) Other applications of Microbial Biotechnology: Industrial production of aminoacids (the example of *Corynebacterium glutamicum*, edible mushrooms.

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Direct (face to face).</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Power point presentations, student contact electronically.</td></tr>
<tr><td>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.

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</td><td>
<table>
<tr><th>Δραστηριότητα</th><th>Φόρτος Εργασίας Εξαμήνου</th></tr>
<tr><td>Lectures</td><td>39 h = 1.56 ECTS
(13 wks x 3 h)</td></tr>
<tr><td>Practical Lab Courses</td><td>26 h = 1.04 ECTS
(13 wks x 2 h)</td></tr>
<tr><td>Group class presentations</td><td>30 h = 1.2 ECTS
(13 wks x 2,3 h)</td></tr>
<tr><td>Autonomous study</td><td>30 h = 1.2 ECTS
(13 wks x 2,3 h)</td></tr>
<tr><td>Total</td><td>125 h
(5 ECTS)</td></tr>
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<tr><td>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,</td><td>I) Written final examination (50%) with ranking difficulty on the basis of the issues and subjects presented during theoretical courses. The exams will include:
- Questions of multiple choice.
- Questions of theoretical knowledge.
- Theoretical problems to be resolved.

II) Laboratory exercises/ practical courses (30%). Students individually or in groups will provide a written report before the beginning of the next exercise. The grade of lab courses will be based on the writing reports, attendance, and class participation.

III) Group and small autonomous assignments (20%).</td></tr>
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5. Recommended Literature

1. " **BROCK Biology of Microorganisms**", Authors: Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl, 2018.

-Relevant Scientific Journals:

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