COURSE OUTLINE

1. GENERAL

SCHOOL	Agricultural Sciences		
ACADEMIC UNIT	BIOSYSTEMS& AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	BAE 903	**SEMESTER**	9th
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	
Tutorials	2	
Laboratory	0	
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*	Specialised general knowledge, Skills Development
PREREQUISITE COURSES:	There are no prerequisite courses. However, students must have basic knowledge of General and Inorganic Chemistry, Organic Chemistry, Agricultural Physical Chemistry, Agricultural Hydraulics and Irrigation
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek .-For Erasmus students in English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/

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:
1. Has realized Industrial Fermentations and the microorganisms used on such a scale
2. He has knowledge of the tools and techniques of Enzyme-Microbial Technology and Microbial Fermentations related to food production as well as their applications in White Biotechnology.
3. Uses the methodologies of Microbial and Enzyme Technology regarding their use in Food Biotechnology and White Biotechnology.
4. Has an understanding of the metabolism and products of high added value produced by microorganisms and the biotechnological methods used for their production
5. Has knowledge of methods for studying microbial populations in the environment.

6. He has realized the prospects of Microbial Biotechnology in the production of useful energy, chemical 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	*Project planning and management*
information, with the use of the	*Respect for difference and multiculturalism*
necessary technology	*Respect for the natural environment*
Adapting to new situations	*Showing social, professional and ethical responsibility and*
Decision-making	*sensitivity to gender issues*
Working independently	*Criticism and self-criticism*
Team work	*Production of free, creative and inductive thinking*
Working in an international	*……*
environment	*Others…*
Working in an interdisciplinary	*…….*
environment	
Production of new research ideas	

At the end of this course the student will have further developed the following general skills:
Search, analysis and synthesis of data and information, also using the necessary technologies
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Generating new research ideas
Respect for the natural environment
Exercise criticism and self-criticism
Promotion of free, creative and inductive thinking

3. SYLLABUS

. Historical approaches – Economic components.
2. The main fields of application of microbial biotechnology.
3. Standard and oxidative fermentations and bioconversions and their applications in the Food Industry and White Biotechnology. Lactic fermentation, alcoholic fermentation, formic fermentation, acetic fermentation, propanediol fermentation, butanediol fermentation, acetone-butanol-ethanol fermentation, acetic fermentation, malolactic bioconversion, coc.
4. Microbial biotechnology and food production: Technologies for the production of bread and pastries. Production technologies of alcoholic beverages. Acid production technologies. Production technologies of edible olives and vegetable fermentation products.
5. Microbial biotechnology and production of added value products: Production of bioalcohols, organic acids, biofuels, lipids and microbial protein.
6. The -omic technologies in the Biotechnology of microorganisms.
7. Microbial Genomes, Bacteriophages.
8. Methods of studying microbial ecology.
9. Applications: Production of amino acids by microorganisms. The example is Corynebacterium glutamicum.
10. Applications: Cultivation of edible fungi. 12. Legal framework for the production of genetically modified organisms and food (National/European).
• 13. Ethical issues of Food Biotechnology.

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face to face deliveries.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of ICT (power point) in Teaching
• Use of ICT (power point) in Laboratory Training
• Video presentation
• Use of ICT in Communication with students (Learning process support through the electronic platform e-class).</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>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Tutorials</td><td>26</td></tr>
<tr><td>Study and literature survey</td><td>20</td></tr>
<tr><td>Exams</td><td>10</td></tr>
<tr><td>Unguided study</td><td>30</td></tr>
<tr><td>Course total</td><td>125</td></tr>
</table>
</td></tr>
<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, 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.
1</td><td>1. The main assessment criteria focus on understanding and correlating the knowledge that students gain from the course with knowledge from other courses.
The evaluation is continuous and dynamic. It mainly includes short project work, solving problems or answering open questions. Exams are conducted orally or in writing or a combination of the two, with or without pre-examination of the key topics of the course, with or without progressions and by other inventive methods, depending on the dynamics and the needs of the audience</td></tr>
</table>

5. RECOMMENDED LITERATURE in Greek

1. Μικροβιολογία και Μικροβιακή Τεχνολογία", Συγγραφέας: Γεώργιος Αγγελής, Εκδόσεις "Σταμούλης ΑΕ", Αθήνα 2007.
2. 2. " BROCK ΒΙΟΛΟΓΙΑ ΤΩΝ ΜΙΚΡΟΟΡΓΑΝΙΣΜΩΝ", Συγγραφείς: Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl, ΙΤΕ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ., Κρήτη 2018.

Συναφή επιστημονικά περιοδικά:

3. Enzyme and Microbial Technology, Bioresource Technology, Journal of Applied Microbiology, Applied Microbiology and Biotechnology, Applied and Environmental Microbiology, Microbial BiotechnologyΚωδικός Βιβλίου στον Εύδοξο: 11312