COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Environment		
ACADEMIC UNIT	Department of Environment		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	244KEY	SEMESTER	5
COURSE TITLE	Environmental 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
Theory-Lectures	2	
Exercises	1	
Total credits		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*	Optional Compulsory
PREREQUISITE COURSES:	Not required
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (tutorials)
COURSE WEBSITE (URL)	http://www.env.aegean.gr/studies/undergraduate-degree/curriculum/environmental-biotechnology/

(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*

Knowledge

- To describe the basic principles of microbiology and biochemical processes related with waste and wastewater treatment
- To recognize products produced by microorganisms during treatment
- To describe existing and emerging technologies that are important in the area of environmental biotechnology

Skills

- To distinguish the appropriate biological process for the treatment of waste and wastewater
- To determine microbial growth rates, biomass yield, substrate concentration and removal rate using basic chemostat theory

Competence

- To design the appropriate bioprocess in relation with characteristics of wastes
- To combine different biological processes for waste and wastewater treatment

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

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Respect for the natural environment
- Team work

(3) SYLLABUS

1. Introduction to Environmental Biotechnology
2. Bioprocess kinetics and types of bioreactors
3. Composting
4. Laboratory exercise- Solid waste composting/preparation and monitoring of process
5. Membrane bioreactors
6. Anaerobic digestion
7. Design of anaerobic digesters
8. Laboratory exercise- Biochemical methane potential tests
9. Fungi Biotechnology
10. Laboratory exercise- Fungi growth/application for wastewater treatment
11. Algae Biotechnology
12. Laboratory exercise- Algae growth
13. Microbial fuel cells

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Power point, use of e-mail
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*	
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.*	Language of evaluation: Greek A. Compulsory final examination (40%) - Multiple choice questionnaires - Short-answer questions - Problem solving B. Laboratory exercises (40%) C. Team assay (20%)

Activity	*Semester workload*
Lectures	26
Exercises	24
Team assays	20
Literature analysis	62
Course total	***132***

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Λυμπεράτος Γ., Παύλου Σ. 2010. Εισαγωγή στη Βιοχημική Μηχανική. Εκδόσεις Τζιόλα, ISBN: 978-960-418-290-9
2. Shule, M.L, Kargi F. 2005. Μηχανική Βιοδιεργασιών. Εκδόσεις ΕΜΠ., ISBN: 960-254-653-0
3. Ντούγιας Σ., Αιβαζίδης Α., Μελίδης Π. 2012. Περιβαλλοντική Μικροβιολογία, Εκδόσεις Έμβρυο, ISBN: 978-960-8002-66-1
4. Rittmann B.E., Perry L. 2001. Environmental Biotechnology: Principles and Applications. McCarty, McGraw-Hill Education - Europe, ISBN: 978-0071181846.
5. Evans GM, Furlong JC. 2003. Environmental Biotechnology. Theory and Application. Willey and Sons, ISBN: 0-470-84372-1

- Related academic journals:

1. Water Research, Elsevier
2. Bioresource Technology, Elsevier
3. Applied Microbiology and Biotechnology, Springer
4. Environmental Science and Technology, ACS Publications
5. Waste Management, Elsevier