ΠΕΡΙΓΡΑΜΜΑ ΜΑΘΗΜΑΤΟΣ

FACULTY/SCHOOL	TECHNOLOGY		
DEPARTMENT	ENVIRONMENTAL SCIENCES		
LEVEL OF STUDY	*Undergraduate*		
COURSE UNIT CODE	**NEW COURSE**	**SEMESTER**	ELECTIVE
COURSE TITLE	ANAEROBIC PROCESSES – APPLICATIONS IN ENVIRONMENT & ENERGY		

INDEPENDENT TEACHING ACTIVITIES In case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits	**WEEKLY TEACHNG HOURS**	**CREDITS**
THEORETICAL BACKGROUND	3	3
Προσθέστε σειρές αν χρειαστεί. Η οργάνωση διδασκαλίας και οι διδακτικές μέθοδοι που χρησιμοποιούνται περιγράφονται αναλυτικά στο 4.	3	3

COURSE TYPE Background knowledge, Scientific expertise, General Knowledge, Skills Development	BACKGROUND
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION &EXAMINATION/ASSESSMENT:	GREEK
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A: Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework. Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and

APPENDIX B: Guidelines for writing Learning Outcomes

The purpose of the course is to acquaint the student with the anaerobic biological processes and their use for the protection and restoration of the environment as well as for the production of bioenergy.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, Adapting to new situations Decision-making Individual/Independent work Group/Team work, Working in an international environment, Working in an interdisciplinary environment, Introduction of innovative research, Project planning and management, Respect for diversity and multiculturalism, Environmental awarenesss, Social, professional and ethical responsibility and sensitivity to gender issues, Critical thinking, Development of free, creative and inductive thinking.

- Search, analyze and synthesize data and information, using the necessary technologies
- Decision making
- Autonomous work
- Teamwork
- Project design and management
- Respect for the natural environment
- Promoting free, creative and inductive thinking

(3) COURSE CONTENT

Theory

Aerobic and anaerobic processes, kinetics, nutrient and micronutrient requirement, main inhibitors and their effect on the kinetics: ammonia, pH, heavy metals, nutrient deficiency. Applications into environmental protection: municipal sludge processing, denitrification, sludge stabilization, soil remediation. Types of anaerobic bioreactors and their characteristics. Anaerobic digestion for waste treatment and co-generation of thermal and electrical energy. Kinetics of biomethane production and raw materials. Biological, chemical and physical methods of hydrogen sulfide elimination in anaerobic digestors. Thermophilic versus mesophilic anaerobic digestion: advantages and disadvantages. Thermophilic processes for the production of raw chemicals.

(4) TEACHING METHODS-ASSESSMENT

MODES OF DELIVERY **Face-to-face, in-class lecturing, distance teaching and distance learning etc.**	• Lectures in the classroom or by distance • Team discussion • Laboratory exercises
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY **Use of ICT in teaching, Laboratory Education, Communication with students**	• Powerpoint. • View video material • e-mail. • e-class
COURSE DESIGN **Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of**	

Activity	*Semester Workload*
Lectures	39
Problem solving	5
Team Working-Laboratory	5

<table>
<tr><td>bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. The study hours for each learning activity as well as the hours of selfdirected study are given following the principles of the ECTS.</td><td>
<table>
<tr><td>Educational visits</td><td>10</td></tr>
<tr><td>Homework(s)</td><td>6</td></tr>
<tr><td>Individual Theory Study</td><td>10</td></tr>
<tr><td>Course total (25 hours of workload per credit unit)</td><td>75</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS
Detailed description of the evaluation procedures:

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, openended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.</td><td>• Midterm (optional, exam or homework assignment) = 40%
• 60% final exam, or 100% if midterm exam is not given</td></tr>
<tr><td colspan="2"><u>SUGGESTED BIBLIOGRAPHY:</u>
1. Wikipedia: https://en.wikipedia.org/wiki/Anaerobic_digestion
2. Κέντρο Ανανεώσιμων Πηγών Ενέργειας (ΚΑΠΕ), Εγχειρίδιο Βιοαερίου, Σιούλας Κωνσταντίνος, Teodorita Al Seadi, Dominik Rutz, Heinz Prassl, Michael Köttner, Tobias Finsterwalder, Silke Volk, Rainer Janssen, www.lemvigbiogas.com/BiogasHandbookGR.pdf
3.EPA, ‘’Anaerobic digestion and its applications, October 2015’’: https://www.epa.gov/sites/production/files/2016-07/documents/ad_and_applications-final_0.pdf
4. Scientific publications

<u>Complementary bibliography</u>
Instructor class notes</td></tr>
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