ΠΕΡΙΓΡΑΜΜΑ ΜΑΘΗΜΑΤΟΣ

FACULTY/SCHOOL	TECHNOLOGY			
DEPARTMENT	ENVIRONMENTAL SCIENCES			
LEVEL OF STUDY	*Undergraduate*			
COURSE UNIT CODE	**NEW COURSE**	**SEMESTER**	G (7^{th})	
COURSE TITLE	RECYCLABLE FORMS OF 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			5	6
			5	6
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 for the student to become acquainted with the various forms of recyclable energy which are presently used and those which are in the process of development. Their contribution to the protection of the environment will be analyzed, particularly with respect to

the global warming.
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

Air pollutants and their sources, effect of air pollution on the environment: global warming, depletion of stratospheric ozone, acid rain. Carbon balance and analysis of the concepts of carbon positive, carbon neutral, carbon negative. Natural resources-fossil fuels and their contribution to environmental degradation. Introduction to renewable forms of energy: Earth energy balance, solar irradiation and its characteristics. Passive and active solar collectors: thermal and electrical energy production. Rankine cycle: conversion of thermal to electrical energy. Design of active solar collectors. Types of semiconductor materials and photon conversion efficiency. Wind power and basic principles of wind turbines. Power curve and wind parks. Energy efficiency of wind turbines. Cost analysis of solar and wind energy parks. Primary biomass and waste biomass valorization for energy production: bioethanol, gasification and pyrolysis of biomass, biogas production, biohydrogen, biodiesel, biochar and its significance into attaining a carbon negative balance. Hydroelectric energy. Geothermal energy and geothermal heat pumps. Tidal energy, oceanic energy, surface and subsurface current energy exploitation.

(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 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.

Activity	***Semester Workload***
Lectures	65
Problem solving	15
Team Working	10
Educational visits	15
Homework(s)	15
Individual Theory Study	30
Course total (25 hours of workload per credit unit)	***150***

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.

- Midterm (optional, exam or homework assignment) = 40%
- 60% final exam, or 100% if midterm exam is not given

SUGGESTED BIBLIOGRAPHY:

1. Ασκήσεις και Προβλήματα για τις Ανανεώσιμες Πηγές Ενέργειας, Γιάννης Βουρδουμπάς, Εκδοτικός Οίκος Σέλκα – 4Μ, ISBN10: 9608257662, ISBN13: 9789608257665, Μάρτιος 2011

2. Ενεργειακή Διαχείριση και Ανανεώσιμες Πηγές Ενέργειας, Εύα Μαλεβίτη, Εκδόσεις Πεδίο, 2013, ISBN: 978-960-546-107-2 130

3. Περιβάλλον και Ανανεώσιμες Πηγές Ενέργειας, Καπλάνης, Σ., Εκδόσεις ΙΩΝ, ISBN: 960-411-429-8

4. Renewable Energy: Sources for Fuels and Electricity, Thomas B. Johansson, Laurie Burnham, Island Press, 1993, ISBN: 1559631384, 9781559631389.

5. De Paor, D.G. (1996), Structural Geology and Personal Computers, Pergamon Press.

Complementary bibliography

Instructor class notes