COURSE OUTLINE

1. GENERAL

SCHOOL	School of Engineering		
DEPARTMENT	Environmental Engineering		
LEVEL OF STUDIES	Level 7		
COURSE CODE	**Ε7ΥΠ**	**SEMESTER**	**9th**
COURSE TITLE	Design of RES Systems		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area, Skill Development
PREREQUISITES:	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	
COURSE URL:	https://eclass.duth.gr/courses/TMC384/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose of the course is to provide students with sufficient knowledge about

- ✓ technologies for electricity generation from renewable energy sources (such as solar and wind energy),
- ✓ energy storage systems,
- ✓ power electronics and
- ✓ the design, implementation, and control of renewable energy systems.

After the successful completion of the course students will be able to:

1. understand the basic principles of res energy production and storage systems' operation
2. identify the appropriate ways to store energy from RES
3. design small-scale power systems based on RES

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
Decision making	*Sustainability*
Autonomous work	*Demonstration of social, professional and moral responsibility and*
Teamwork	*sensitivity to gender issues*
Working in an international environment	*Critical thinking*
Working in an interdisciplinary environment	*Promoting free, creative and inductive reasoning*

Production of new research ideas
Search, analysis and synthesis of data and information, ICT Use Autonomous work Teamwork Critical thinking

3. COURSE CONTENT

1. Introductory course – Hybrid Power Systems (HPS)
2. Photovoltaic Systems
3. Wind Turbine Systems
4. Simulation of RES Systems Operation
5. Electricity Storage Systems
6. Operation Principles of Electronic Power Devices
7. Energy Control and Management of HPS
8. Levelized Cost of Energy (LCOE) from RES
9. HPS Operation Optimization
10. RES Systems Design. Case Study I
11. RES Systems Design. Case Study II
12. RES Systems Design. Case Study III
13. RES Systems Design. Case Study IV

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching and in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	39
Bibliographic research & analysis	85
Writing assignments	26
Total workload	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	Language of Assessment: Greek 1st Autonomous Work (20%) 2nd Autonomous Work (30%) Teamwork (60%)

5. SUGGESTED BIBLIOGRAPHY

1. Yatish T. Shah (2021) Hybrid Power Generation, Storage, and Grids, CRC Press, ISBN: 9781003159421
2. Djamila Rekioua (2020) Hybrid Renewable Energy Systems - Optimization and Power Management Control, Springer Nature Switzerland, ISBN 978-3-030-34021-6
3. Ersan Kabalci (2021) Hybrid Renewable Energy Systems and Microgrids, Academic Press an imprint of Elsevier, ISBN: 978-0-12-821724-5

ANNEX OF THE COURSE OUTLINE

Alternative ways of examining a course in emergency situations

Teacher (full name):	Costas ELMASIDES
Contact details:	kelmasid@env.duth.gr
Supervisors: (1)	NO
Evaluation methods: (2)	Written assignment and exercises
Implementation Instructions: (3)	The writing assignment and exercises must be posted on the e-class the date set by the department for the exam period at the end of the semester.

(1) Please write YES or NO

(2) Note down the evaluation methods used by the teacher, e.g.

- *written assignment* or/and exercises
- written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

(3) In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:

a) in case of **written assignment and / or exercises:** the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and any other necessary information.

b) in case of **oral examination with distance learning methods:** the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.