COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	MINERAL RESOURCES ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	MRE924	SEMESTER	9
COURSE TITLE	RENEWABLE ENERGY SOURCES		

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
COURSES		
EXCERCISES		
TOTAL	4	4
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*	SPECIAL BACKGROUND
PREREQUISITE COURSES:	YES
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://eclass.uowm.gr/courses/MRE186/

(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 be able to:

- understand and describe the operation of the various renewable energy systems,
- calculate the energy efficiency of RES systems (elaboration of energy studies),
- analyze data and measurements and determine the potential of various renewable energy sources in specific areas (solar, wind, geothermal, hydrodynamic, biomass),
- evaluate – assess economic and technical studies for the installation of renewable energy sources (wind farms, thermal and photovoltaic solar systems)

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…*
	…….

1. Independent work
2. Teamwork
3. Working in an interdisciplinary environment
4. Generating new research ideas

(3) SYLLABUS

The course aims to provide the necessary knowledge on issues of Renewable Energy Sources (RES). More specifically, the following topics are covered:

- Solar energy - solar radiation, measurements and analysis, active and passive solar systems for heating and cooling.
- Hydroelectric power- small hydroelectric plants.
- Geothermal energy - heat storage methods - agricultural and industrial applications.
- Wind energy - wind potential.
- Biomass - systems for the production, storage and utilization of biomass products - biodiesel – bioethanol.
- Tidal and sea waves energy.
- Nuclear fusion.
- Hybrid systems. Interconnection with an electricity network.
- Energy economy, parameters optimization, environmental impacts.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face lectures.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Use of a projection system and special software installed in the PCs of a laboratory, organization and scheduling of the course and the communication with students using the asynchronous e-learning platform ‘open eclass’.</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>55</td></tr>
<tr><td>Laboratory exercises</td><td>25</td></tr>
<tr><td>Study on lectures and exercises</td><td>20</td></tr>
<tr><td>Total course</td><td>100</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></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.</td><td>Language of evaluation: Greek

Theory: Final written examination 50%
(Short-answer questions, open-ended questions).
Laboratory: Oral examination, written examination 50%

The evaluation criteria are given on the relevant page of the course on the asynchronous e-learning platform ‘open e-class’ and are analyzed to the students at the beginning of the semester.</td></tr>
</table>

(5) SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:

Energy, Environment and Sustainable Development
Book Code in Eudoxus: 94645312
Version: 1st/2020
Authors: Polyzakis Apostolos
ISBN: 978-618-83590-6-2
Type: Textbook
Testator (Publisher): Polyzakis Apostolos & Co. EE

BEYOND FOSSIL FUELS. THE JOURNEY OF RETURNING TO RENEWABLE ENERGY
Book Code in Eudoxus: 68370257
Version: 1st/2017
Authors: ALEXIS LOUKOURGIOTIS, CHRISTOS KORDOULIS, SOTIRIS LYKOURGIOTIS
ISBN: 978-960-524-492-7
Type: Textbook
Testator (Publisher): FOUNDATION OF TECHNOLOGY & RESEARCH-UNIVERSITY PUBLICATIONS OF CRETE

Energy and environment

Book Code in Eudoxus: 31384
Edition: 1st ed./2002
Authors: Tsatiris Michael N.
ISBN: 978-960-402-056-0
Type: Textbook
Testator (Publisher): G. DARDANOS - K. DARDANOS G.P.

Climate change policy
Book Code in Eudoxus: 24331
Edition: 1st ed./2010
Authors: Giddens Anthony
ISBN: 978-960-455-807-0
Type: Textbook
Testator (Publisher): METAIXMIO PUBLISHING S.A.

- Related academic journals:

Nature Energy
Energy and Environmental Science
Renewable and Sustainable Energy Reviews
Energy Conversion and Management
Renewable Energy
Green Energy and Environment
International Journal of Electrical Power and Energy Systems
Wind Energy
Energy & Fuels
Sustainable Energy and Fuels
Sustainable Energy Technologies and Assessments
Geomechanics for Energy and the Environment
Energy, Ecology and Environment
Energy Efficiency
Energy Sources, Part B: Economics, Planning and Policy
Geothermal Energy
Journal of Electrochemical Energy Conversion and Storage
Journal of Renewable and Sustainable Energy
Energy Exploration and Exploitation
Energy Sources, Part A: Recovery, Utilization and Environmental Effects
Clean Energy