COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Science			
ACADEMIC UNIT	Physics			
LEVEL OF STUDIES	Undergraduate (Postgraduate course offered to undergraduate students)			
COURSE CODE	**10EK312**	**SEMESTER**	**8**	
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**
	Lectures		4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised knowledge			
PREREQUISITE COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS				
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/PHYS380/			

(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*

The course offers the student the knowledge regarding the basic concepts of energy and the conversion of renewable energy sources into heat and electricity. It describes the methodology for estimating the energy potential, the available technology, and the environmental impacts of introducing renewable energy sources into the built and natural environment. The basic forms of technologies for solar energy, wind energy, geothermal energy, wave energy, and biomass are presented. Moreover, other forms of energy such as hydroelectric energy and green hydrogen are mentioned. Lastly, the principle of bioclimatic design in combination with the exploitation of new materials and renewable energy sources (RES) are described.

Upon successful attendance and completion of the course, the student is able to:

- Recognize the basic concepts of energy.
- Describe the principles of operation of the technologies that exploit renewable energy sources (RES).
- Understand the basic principles of energy production and conversion.
- Recognize the types of renewable energy sources and their potential applications in different environments.
- Estimate the types of technologies (active, passive, renewable) that can be implemented in the built and natural environment.
- Evaluate and analyse the basic characteristics of the available energy potential from RES.
- Recognize the principles of bioclimatic design and the exploitation and integration of RES with the aim of optimizing their energy performance.

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…*

The course aims at the following general competences:

- Working independently
- Analytical and synthetic thinking
- Critical thinking
- Decision Making
- Respect for the natural environmen

(3) SYLLABUS

- Forms of Energy. Principles of conversion and conservation of energy. Storage and transfer of energy.
- Solar Energy: Earths' radiation balance. Physical principles for power generation, energy content and conversion in photovoltaics. Applications.
- Wind energy: Physical principles for power generation, energy content and forms of conversions. Wind turbines. Applications.
- Biomass: Biophysical principles for power generation, energy content and forms of biomass. Applications.
- Geothermal energy: Physical principles for power generation, energy content and forms of conversions. Applications.
- Energy from Waves, Tides and Osmosis: principles for power generation, energy content and forms of conversions. Applications.
- Other forms of energy (hydroelectric energy, hydrogen).
- Principles of Bioclimatic and Sustainable building design. Innovative materials (cool, thermochromic etc). Energy efficiency.
- Solar and Wind Energy potential in Greece

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Yes

Electronic communication with the students using ICT.
Computer-aided lectures, eclass platform</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>52</td></tr>
<tr><td>Individual Study/ Study and Analysis of bibliography / Preparation</td><td>98</td></tr>
<tr><td>Problem solving</td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total</td><td>150</td></tr>
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<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>Final written exams in Greek</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Ήπιες και ανανεώσιμες πηγές ενέργειας (Λιώκη-Λειβαδά, Ασημακοπούλου) ΣΥΜΜΕΤΡΙΑ
- Συμβατικές και Ήπιες μορφές ενέργειας (Μπαλαράς, Αργυρίου, Καραγιάννης) ΤΕΚΔΟΤΙΚΗ
- Ενέργεια, Περιβάλλον και Αειφόρος Ανάπτυξη (Πολυζάκης) PowerHeatCool
- Bent Sørensen (Auth.) - Renewable Energy. Physics, Engineering, Environmental Impacts, Economics and Planning- Academic Press (2017)
- Martin Stutzmann, Christoph Csoklich - The Physics of Renewable Energy – Springer (2022)

Related academic journals (Indicative list):

- Energy and Buildings
- Buildings
- Science of the Total Environment
- Renewable Energy
- Energies
- Sustainability