1.1.1 Marine renewable energy systems

GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	CIVIL ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ΥΔΡ017	**SEMESTER**	9th
COURSE TITLE	Marine renewable energy systems		

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**
	4	5
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*	Specialization Course
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

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, students will be able to:

- Determine the marine wave and/or wind resources in coastal and offshore areas.
- Identify the structural elements of marine energy systems and assess their critical loading conditions (hydrodynamic, aerodynamic).
- Calculate and evaluate energy production from marine energy systems.
- Design the basic structural infrastructure of marine energy systems.
- Develop and assemble computational models for the analysis of offshore wind turbines and wave energy converters.
- Specify the requirements of computational codes for reliable coupled analysis of marine energy 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 *Project planning and management*

information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

The course contributes to the following skills:
_Search for, analysis and synthesis of data and information
_Adapting to new situations
_Decision-making
_Working independently
_Working in an interdisciplinary environment
_Project planning and management
_Respect for the natural environment
_Production of free, creative and inductive thinking

SYLLABUS

Course Description:
The course aims to provide students with the fundamental theoretical background for the course 'ΥΔΡ017 Marine Renewable Energy Systems'. It includes the necessary material for understanding computational modeling, analysis, and design of energy systems in a marine environment (offshore wind turbines, wave energy converters), as well as computational simulation using appropriate software codes.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Learning process support (teaching and communication with students) through PowerPoint lectures, through the online course website, through the electronic e-learning platform and through additional electronic communication with students (online announcements and comments, emails, etc.). Additional material (lecture presentations, educational videos, useful sites, and scientific articles) posted on the e-learning platform. Teacher-student collaboration time either in person or via teleconference.
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*	

Activity	*Semester workload*
Lectures	40
Practice/exercises	12
Project(s)	15
Individual study	63
Course total (26 hours workload per ECTS credit)	***130***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure*	Evaluation Language: Greek Written Examination with Extended Response Questions (Formative and/or Conclusive)

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.*	Theory Assessment (70% of the final grade): • Written progress exam (10% of the final grade) which includes: o Extended Response Theoretical Questions (Formative and/or Inferential) o Solving problems-exercises • Final written exam (60% of the final grade) which includes: o Extended Response Theoretical Questions (Formative and/or Inferential) o Solving problems-exercises Assignment Assessment (30% of the final grade): • Written assignment This course description text with the evaluation criteria is accessible to students in the Department's study guide (Department website) and on the course's website. The outline is communicated orally to the students during the first lecture.

ATTACHED BIBLIOGRAPHY

• [In Greek] Καραμπάς Θεοφάνης, Δήμας Αθανάσιος, Λουκογεωργάκη Ευαγγελία, ΑΚΤΟΜΗΧΑΝΙΚΗ ΚΑΙ ΛΙΜΕΝΙΚΑ ΕΡΓΑ, Εκδόσεις ΔΙΣΙΓΜΑ, 2020, ISBN: 978-618-5242-92-3. Κωδικός Βιβλίου στον Εύδοξο: 94690348
• Anaya-Lara, Offshore Wind Energy Technology, Εκδόσεις HEAL-Link Wiley UBCM ebooks - John Wiley Sons, 2018, ISBN: 9781119097808. Κωδικός Βιβλίου στον Εύδοξο: 91721601
• Pecher A., Kofoed J.P., Handbook of Ocean Wave Energy, HEAL-Link Wiley UBCM ebooks - Springer International Publishing, 2017, ISBN: 9783319398891. Κωδικός Βιβλίου στον Εύδοξο: 75486625
• Greaves D., Iglesias G., Wave and Tidal Energy, HEAL-Link Wiley UBCM ebooks - John Wiley Sons, 2018, ISBN: 9781119014492. Κωδικός Βιβλίου στον Εύδοξο: 91726099
• Karimirad M., Michailides C., Nematbakhsh A., Offshore Mechanics: Structural and Fluid Dynamics for Recent Applications, Εκδόσεις John Wiley Sons, 2018, ISBN: 978-1-119- 21662-9
• Chakrabarti Subrata K., Handbook of Offshore Engineering, Elsevier Ltd., ISBN 978-0-08- 044381-2, 2005.