9.4 CE0913 – Coastal Engineering and Shore Protection Works

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL		
ACADEMIC UNIT	CIVIL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**CE0913**	**SEMESTER**	**9**
COURSE TITLE	**Coastal Engineering and Shore Protection Works**		

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	No
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/CIV172/

(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*

In this course, elements of water wave mechanics, coastal circulation and coastal currents, as well as hydrodynamic loading of marine structures are presented.

Elements of coastal engineering:are also presented: coastal morphology, erosion, sediment transport mechanisms in coastal environments, long- and cross-shore sediment transport in the surfzone, sedimentary budget, coastal infrastructure impact on the shoreline, shore - parallel and transverse protection systems, hard vs soft shore protection.

By the end of this course the student will have good working knowledge and understanding of the above topics, and will be able to:

- Predict the wave climate of coastal area based on wind data and maps of the wider area, using the appropriate wave energy spectrum
- Determine the design wave characteristics.
- Estimate design wave transformations as it approaches the seashore, due to shoaling, refraction, diffraction (if it encounters a coastal structure), wave breaking and run-up. Wave characteristics at different distances and water depths from the seashore will be needed either for the design anf dimensioning of port and coastal works, or the estimation of wave -induced currents and sediment transport parallel and perpendicular to the shore
- To make a preliminary assessment of the evolution of the coastline after the construction of a coastal structure.
- To assess the sediment budget of a coast, and, if needed, propose “hard” and/or “soft” shore protection works.

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	*Search for, analysis and synthesis of data and information, with the use of the necessary technology*
Adapting to new situations	*Adapting to new situations*
Decision-making	*Decision-making*
Working independently	*Working independently*
Team work	*Team work*
Working in an international environment	*Working in an international environment*
Working in an interdisciplinary environment	*Working in an interdisciplinary environment*
Production of new research ideas	*Production of new research ideas*

The course aims that the student acquires - practice the following general skills:

- Search for, analysis of, and synthesis of data and information, implementing appropriate technologies
- Decision-taking
- Independent work - Team work - Working in an international / interdisciplinary environment
- Respect natural environment - Social, professional and ethical responsibility

(3) **SYLLABUS**

ELEMENTS OF WATER WAVE MECHANICS
- Detailed description of two-dimensional waves
- (small amplitude linear wave theory, non-linear waves of finite amplitude)
- Offshore-to-nearshore wave transformation
- (Refraction, diffraction, breaking, reflection and wave run-up on a beach)
- Wind-generated waves
- (Wind driven wave generation, Statistical analysis of waves and wave spectra, Wind-wave prediction)
- Coastal water circulation
- Tidal currents, Wind and wave generated currents, Density currents.

COASTAL STRUCTURES
- Function, Design, Construction issues
- Hydrodynamic loading of coastal structures

COASTAL SEDIMENT TRANSPORT - COASTAL MORPHOLOGY
- Sediment transport mecahnisms in coastal environments
- Sediment motion threshold and quantitative methods for estimating specific sediment yield
- Long- and cross-shore sediment transport
- Sediment budget of a costal system

Coastal structures' effects on shorelines
Introduction to shore protection works. Environmental impacts
"Hard" and "soft" methods to protect coasts from erosion
Coastal protection structures parallel and perpendicular to the shore
Artificial beach nourishment, Grain size of the nourished sand

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in-class teaching. When needed, distance teaching (synchronous/asynchronous)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of I.C.T. in Teaching and Student Communication
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***
In Class (/Distance) Teaching	52
Literature Study	43
Exercises / Paradigms	28
Project assignment / Essay	27
Course total	**150**

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.*	Language of evaluation: Greek Written examination, 2,5-hours Problem solving, Multiple choice test, Questions and Answers, Written Essay / Project The evaluation criteria are announced to the students well before the examination; weights per subject /exercise are explicitly indicated. The examination results (including total / partial grading) are announced on the web. Students may require to have access to their tests, they may ask for clarifications on mistakes, grading etc.

(5) ATTACHED BIBLIOGRAPHY

Greek Bibliography:

1. Δασκαλάκης, Μ. Κ., «Λιμάνια Θαλάσσια Κύματα Λιμενικά Έργα», Εκδόσεις ΣΕΛΚΑ - 4Μ ΕΠΕ, 2009.
2. Καραμπάς, Θ., Κρεστενίτης, Ι., Κουτίτας, Χ., « Ακτομηχανική - έργα προστασίας ακτών [ηλεκτρ. βιβλ.]», Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών, Αθήνα, 2015. [Διαθέσιμο στο: http://hdl.handle.net/11419/2095].
3. Καρύμπαλης, Θ. Ευθύμιος, «Παράκτια Γεωμορφολογία», Εκδόσεις Ίων, 2010.
4. Κουτίτας, Κ., «Εισαγωγή στην Παράκτια Τεχνική και τα Λιμενικά Έργα» , Εκδόσεις Ζήτη, Θεσσαλονίκη, 1998.

5. Κρεστενίτης, Ι., Κομπιάδου, Κ., Μακρής, Χ., Ανδρουλιδάκης, Ι., Καραμπάς, Θ., «Παράκτια Μηχανική – Περιβαλλοντική Θαλάσσια Υδραυλική», Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών, Αθήνα, 2015. [Διαθέσιμο στο: http://hdl.handle.net/11419/2789].

Foreign Bibliography:

1. U.S. Army Corps of Engineers, "Coastal Engineering Manual", Engineer Manual, Publication No: EM 1110-2-1100–Parts I- V & Appendix, Proponent CECW-EW, Washington D.C., 2008.
2. U.S. Army Corps of Engineers, "Environmental Engineering for Coastal Shore Protection," Engineer Manual, Publication No: EM 1110-2-1204, Proponent CECW-EH-W, Washington D.C.,1989.
3. Sleath, J.F.A., "Sea Bed Mechanics," Wiley, New York, 1984.
4. Sumer, M.B. and Fredsoe, J., "The mechanics of Scour in the Marine Environment," World Scientific, 2002.
5. Reeve, D., Chadwick, A.J. and Fleming, C., "Coastal Engineering: Processes, Theory and Design Practice," Taylor & Francis, 2004.