COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P+L Hour*	*Credits*	*ECTS*
MECHANICS OF WATER WAVES	CE 570	1	3+0+0	3	10

Prerequisites	-

Language of Instruction	English
Course Level	Master's Degree (Second Cycle Programmes)
Course Type	Departmental Elective
Course Coordinator	-
Instructors	Asst. Prof. M. Adil AKGÜL
Assistants	-
Goals	This course aims to provide the attendants with knowledge on water waves, their types and physical properties starting from their development and prediction extending to their engineering properties and wave forces on coastal and marine structures.
Content	Classification of water waves. Mechanism of wave development. Fundamental definitions, dispersion equation. Engineering wave properties, kinetical and kinematical parameters, group velocity, wave energy. Wave theories. Small amplitude (linear) wave theory and its applications. Nonlinear theories: Higher order Stokes waves, cnoidal waves, solitary waves, other wave theories. Ranges of validity for wave theories. Random waves, statistical fundamentals and measurement. Spectral models. Wave estimation. Wave-sea bottom and wave-structure interactions: Shoaling, refraction, diffraction. Wave breaking, runup and rundown. Wave overtopping. Storm surge, swell and tsunami waves. Ship waves. Introduction to wave forces on engineering structures.

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Ability to calculate engineering wave properties by using suitable wave theories	2,4,9	1,2	A,C
2) Ability to calculate wave forces on coastal and offshore structures by using compliant methods	2,4,7,9	1,2	A,C
3) Ability to use simple numerical tools for the estimation and transformation of water waves and wave force calculations.	4,7,9	1,2	A,C

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Laboratory, 4: Case-study

Assessment Methods:	A: Exams, B: Experiment, C: Homework, D: Project

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Introduction. Main definitions and classification of water waves. Generation of gravity waves.	Lecture Notes and Textbook
2	Fundamental equations of wave mechanics. Dispersion relationship. Small amplitude wave theory. Deepwater and shallow water cases.	Lecture Notes and Textbook
3	Engineering properties of regular waves, kinetic and kinematical properties. Wave power and wave energy. Group velocity.	Lecture Notes and Textbook
4	Nonlinear wave theories. Ranges of validity of different wave theories.	Lecture Notes and Textbook
5	Irregular waves. Measurement and analysis. Wave spectra and statistical representation. Directional wave spectrum. Spectral wave models.	Lecture Notes and Textbook
6	Estimation of gravity waves. Wave climate analysis. Assignment of design waves.	Lecture Notes and Textbook
7	Wave-sea bottom interaction: Shoaling, refraction and diffraction. Wave breaking. Calculation of breaker depth.	Lecture Notes and Textbook
8	Midterm Exam	Lecture Notes and Textbook
9	Numerical models and simplified calculation methods for wave estimation and transformation.	Lecture Notes and Textbook
10	Wave-structure interaction: Wave runup and rundown.	Lecture Notes and Textbook
11	Wave overtopping and wave transmission.	Lecture Notes and Textbook
12	Storm surge, swell, tsunami waves. Tides and ship waves.	Lecture Notes and Textbook
13	Introduction to wave forces on coastal and marine structures: Seawalls, breakwaters, pipelines and piles.	Lecture Notes and Textbook
14	Potential theory and its application on wave force evaluation.	Lecture Notes and Textbook
15	Numerical models.	Lecture Notes and Textbook

RECOMMENDED SOURCES	
Lecture Notes	Notes prepared by the instructor

Textbooks	1) Dean, R.G., Dalrymple, R.A. (2000). Water Wave Mechanics for Engineers and Scientists. World Scientific Publishing. 2) Young, I.R. (1999). Wind Generated Ocean Waves. Elsevier Publishing.

MATERIAL SHARING	
Documents	Lecture notes and additional documents, guidelines and codes shall be submitted by the instructor
Assignments	Homeworks are returned to students after they are graded
Exams	Exams questions are solved if demanded

ASSESSMENT

IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	1	50
Quizzes	-	-
Assignment	6	50
Lab Work	-	-
Term Project	-	-
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM

No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Attains knowledge through wide and in-depth investigations his/her field and surveys, evaluates, interprets, and applies the knowledge thus acquired.					
2	Has a critical and comprehensive knowledge of contemporary engineering techniques and methods of application.		√			
3	By using unfamiliar, ambiguous, or incompletely defined data, completes and utilizes the required knowledge by scientific methods; is able to fuse and make use of knowledge from different disciplines.					

4	Has the awareness of new and emerging technologies in his/her branch of engineering profession, studies and learns these when needed.		√			
5	Defines and formulates problems in his/her branch of engineering, develops methods of solution, and applies innovative methods of solution.					
6	Devises new and/or original ideas and methods; designs complex systems and processes and proposes innovative/alternative solutions for their design.					
7	Has the ability to design and conduct theoretical, experimental, and model-based investigations; is able to use judgment to solve complex problems that may be faced in this process.					√
8	Functions effectively as a member or as a leader in teams that may be interdisciplinary, devises approaches of solving complex situations, can work independently and can assume responsibility.					
9	Has the oral and written communication skills in one foreign language at the B2 general level of European Language Portfolio.			√		
10	Can present the progress and the results of his investigations clearly and systematically in national or international contexts both orally and in writing.					
11	Knows social, environmental, health, safety, and legal dimensions of engineering applications as well as project management and business practices; and is aware of the limitations and the responsibilities these impose on engineering practices.					
12	Commits to social, scientific, and professional ethics during data acquisition, interpretation, and publication as well as in all professional activities					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 14x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	7.5	105
Midterm examination	1	3	10
Homework	6	15	90
Project	-	-	-
Final examination	1	3	3
Total Work Load			250
Total Work Load / 25 (h)			10
CTS Credit of the Course			10