

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

585005133 - Maritime engineering

DEGREE PROGRAMME

58CI - Grado en Ingeniería Civil

ACADEMIC YEAR & SEMESTER

2017/18 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	585005133 - Maritime engineering
No of credits	6 ECTS
Type	Compulsory
Academic year of the programme	Third year
Semester of tuition	Semester 6
Tuition period	February-June
Tuition languages	English
Degree programme	58CI - Grado en Ingeniería Civil
Centre	Escuela Técnica Superior de Ingeniería Civil
Academic year	2017-18

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
David Romero Faz (Subject coordinator)	Puertos	david.romero@upm.es	Sin horario. Previa solicitud vía correo electrónico
Jose Maria Valdes Fernandez De Alarcon	Puertos	josemaria.valdes@upm.es	Sin horario. Previa solicitud vía correo electrónico

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Prior knowledge required to take the subject

3.1. Prerequisite (passed) subjects

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3.2. Other required learning outcomes

El plan de estudios Grado en Ingeniería Civil no tiene definidos requisitos para esta asignatura.

4. Prior knowledge recommended to take the subject

4.1. Recommended (passed) subjects

- Física

4.2. Other recommended learning outcomes

El plan de estudios Grado en Ingeniería Civil no tiene definidos otros conocimientos previos para esta asignatura.

5. Skills and learning outcomes *

5.1. Skills to be learned

CG03 - Organizar y planificar.

CG04 - Demostrar compromiso con la preservación del medio ambiente y la sostenibilidad.

CG08 - Demostrar capacidad de comunicación oral y escrita en lengua inglesa.

CG09 - Poseer y comprender conocimientos científico-técnicos para el ejercicio de la profesión de Ingeniero Técnico de Obras Públicas, incluyendo funciones de asesoría, análisis, diseño, cálculo, proyecto, construcción, mantenimiento, conservación y explotación.

CG10 - Conocer y comprender los múltiples condicionamientos de carácter técnico y legal que se plantean en la construcción de una obra pública, y demostrar capacidad para emplear métodos contrastados y tecnologías acreditadas, con la finalidad de conseguir la mayor eficacia en la construcción dentro del respeto por el medio ambiente y la protección de la seguridad y salud de los trabajadores y usuarios de la obra pública.

CG12 - Demostrar capacidad para proyectar, inspeccionar y dirigir obras, en su ámbito.

CG15 - Demostrar capacidad para el mantenimiento, conservación y explotación de infraestructuras, en su ámbito.

5.2. Learning outcomes

RA535 - Conocimiento de los indicadores de sobrellenado y realimentación, así como del diseño preliminar de alimentaciones de playas.

RA543 - Conocimiento del proyecto de dragado, sus condicionantes técnicos y ambientales, el tipo de dragas existentes y su adecuación al tipo de terreno y necesidades de dragado.

RA536 - Conocimiento básico de los aspectos más relevantes de la ley de costas así como de la legislación ambiental aplicable.

RA534 - Conocimiento de los conceptos básicos de ingeniería de costas; perfil de playa, profundidad activa del perfil, dinámica sedimentaria, y aplicación de los conceptos de transporte longitudinal y transversal de sedimentos, así como de la formulación del CERC

RA540 - Conocimiento del Programa ROM de Puertos del Estado y su aplicación a los proyectos de ingeniería marítima.

RA286 - Conocer el funcionamiento del mar, sus movimientos en su propagación hacia la costa; refracción, peraltamiento, reflexión y difracción, así como las acciones que éste genera en su desarrollo sobre las infraestructuras marítimas.

RA541 - Diseño y configuración de las obras de abrigo; diques en talud, diques verticales, rebasables y sumergidos, así como el rebase del oleaje y la estabilidad del espaldón.

RA348 - Aplicar las técnicas de análisis espectral del oleaje: tipos de espectros e interpretación y análisis estadístico de oleaje

RA83 - Organizar, controlar y dirigir la construcción y conservación de obras marítimas.

RA542 - Conocimiento de las diferentes tipologías de obras de atraque, su uso adecuado en función de la mercancía y su diseño en planta y sección.

RA539 - Conocimiento del concepto de puerto y las diferentes tipologías de obras de abrigo, sus formulaciones para el cálculo y el diseño, condiciones óptimas de uso y modos de fallo asociados, así como procedimientos constructivos.

RA537 - Diseño de regeneraciones de playa y solución de problemas asociados al transporte sedimentario.

RA287 - Conocer y comprender la teoría lineal del oleaje, los conceptos asociados a esta, así como los diferentes movimientos del mar y de la dinámica de la partícula.

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

6. Brief description of the subject and syllabus

6.1. Brief description of the subject

This is the subject of initiation to Maritime Engineering. The main objective is to introduce the student to the knowledge of this part of civil engineering, by studying the behavior of the sea and its actions in the maritime works, as well as the design of these and their construction methods.

We analyze the factors that determine the character of the swell as the main action to be considered in the design of any maritime work, and their behavior is studied through linear wave theory and statistical theory of swell. It also analyzes the phenomena that occur during the movement of the sea towards the coast and its variation of the average level.

The different actions and the behavior before the swell are analyzed to know and dominate the design of breakwaters and quay walls. It also analyzes the behavior of the coast before erosion and the action of man, evaluating and defining solutions to problems of tilting, regression and local erosion on beaches, etc.

Finally, we learn to design breakwaters and vertical sea wall based on the "*Recomendaciones Para Obras Marítimas (ROM)*" using the Iribarren, Hudson, Van der Meer and Goda-Takahashi formulations.

In addition, we dedicate some time to dredging as a key phase in the maritime works, knowing the types of dredges, and their characteristics and use.

6.2. Syllabus

1. Introduction to Maritime Engineering
2. Overview of the coastal zone and the coast
3. Linear Wave Theory
4. Wavelength, kinematics and particle dynamics
5. Wave Propagation
6. Statistical theory of swell. Statistical analysis and spectral swell analysis
7. Sea Level Variations
8. Sedimentary characterization of beaches. Beach profile and balance profiles
9. Longitudinal stream and longitudinal sediment transport
10. Beach nourishment
11. Spanish Legislation: Law of Spanish Coasts and Integral Management of the Coast. Environmental Legislation applied to maritime works and coastal areas
12. Definition of Port. Typology of Port Works.
13. Recomendaciones Generales para el Diseño de Obras Portuarias (Programa ROM).
14. Seawalls. General characteristics: definition and functions of the seawalls
15. Breakwaters.
16. Diques verticales. Fault modes. Design Parameters.
17. Crest Design: Calculation of overtopping and stability of the crest
18. Mooring works. Quays. Typology of quays. Design Conditions. Design of the Maritime Port Configuration.
19. Dredging. Operations in dredging, methods. Types of dredgers.

7. Schedule

7.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Other face-to-face activities	Assessment activities
1	Introducción Duration: 01:00 Lecture Overview of the coastal zone and the coast Duration: 02:00 Lecture Linear Wave Theory; Previous topics Duration: 02:00 Lecture			Control Other assessment Continuous assessment Duration: 01:00
2	Linear Wave Theory; Previous topics Duration: 02:00 Lecture Wavelength and discussion. Undefined, intermediate and shallow depths Duration: 03:00 Lecture			
3	Wave propagation Duration: 04:00 Lecture Statistical and spectral description of swell Duration: 01:00 Lecture			
4	Statistical and spectral description of swell Duration: 03:00 Lecture Sea Level Variations Duration: 02:00 Lecture			
5	Sea Level Variations Duration: 02:00 Lecture Characterization of sedimentary beaches Duration: 03:00 Lecture			

6	Characterization of sedimentary beaches Duration: 01:00 Lecture Longitudinal stream and longitudinal sediment transport Duration: 03:00 Lecture Beach nourishment Duration: 01:00 Lecture			
7	Beach nourishment Duration: 02:00 Lecture The Spanish Port System: Spanish Coastal Law and Coastal Integral Management Duration: 02:00 Lecture Introduction to Ports. (Typology and classification) Duration: 01:00 Lecture			
8	Introduction to Ports. (Typology and classification) Duration: 01:00 Lecture Recomendaciones Generales para el Diseño de Obras Portuarias Duration: 04:00 Lecture			
9	Seawalls. General characteristics Duration: 04:00 Lecture Breakwaters Duration: 01:00 Lecture			
10	Breakwaters Duration: 05:00 Lecture			
11	Breakwaters Duration: 05:00 Lecture			
12	Breakwaters Duration: 03:00 Lecture Rebase del oleaje. Espaldones Duration: 02:00 Lecture			

13	Overtopping. Crest of the seawall Duration: 01:00 Lecture Vertical seawalls Duration: 04:00 Lecture			
14	Vertical seawalls Duration: 05:00 Lecture			
15	Vertical seawalls Duration: 03:00 Lecture Dredged Duration: 02:00 Lecture			Examen final Written test Final examination Duration: 03:00
16				
17				

The independent study hours are training activities during which students should spend time on individual study or individual assignments.

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The subject schedule is based on a previous theoretical planning of the subject plan and might go through experience some unexpected changes along throughout the academic year.

8. Activities and assessment criteria

8.1. Assessment activities

8.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Control	Other assessment	Face-to-face	01:00	10%	3 / 10	CG03 CG04 CG08 CG09 CG10 CG15 CG12

8.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
15	Examen final	Written test	Face-to-face	03:00	100%	3 / 10	CG03 CG04 CG08 CG09 CG10 CG15 CG12

8.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

8.2. Assessment criteria

A theoretical-practical test with two blocks; theoretical (70% grade) and practical (30% grade). To be done at the end of the semester with a minimum score to compensate for each part of 3 points.

The passed course is obtained when the final grade is equal to or higher than 5 points and when at least 3 points are obtained in each of the two parts of the exam.

The review will be made on request within the period indicated together with the publication of the qualifications and exclusively by the interested party at the date and time indicated.

9. Teaching resources

9.1. Teaching resources for the subject

Name	Type	Notes
Rafael del Moral y J.M. Berenguer, (1980). Curso de Ingeniería de Puertos y Costas Tomo II Obras Marítimas.	Bibliography	
USACE. Coastal Engineering Manual. Vicksburg: Coastal Engineering Research Center	Bibliography	
Goda, Y. (2.000). Random seas and design of maritime structures. World Scientific Publishing.	Bibliography	
Dizy Menéndez, A., & Mey Almela, R. (2.009). Guía de buenas prácticas para la ejecución de obras marítimas. Madrid: Puertos del Estado	Bibliography	

PORT ENGINEERING. Planing, Construction, Maintenance, and Security. Gregory P. Tsinker. Edited by John Wiley and Sons, Inc.2044.	Bibliography	
PORT DESIGNERS'S HANDBOOK. Carl A. Thoresen. Second Edition. Ed. Thomas Telford. 2010.	Bibliography	
Grupo de Facebook Obras Marítimas-euitop	Web resource	
Biblioteca de la Escuela y de la Unidad Docente	Equipment	