

280813 - Disseny de Plataformes y Artefactes Oceànics

Unitat responsable: 280 - FNB - Facultat de Nàutica de Barcelona
Unitat que imparteix: 742 - CEN - Departament de Ciència i Enginyeria Nàutiques
Curs: 2019
Titulació: MÀSTER UNIVERSITARI EN ENGINYERIA NAVAL I OCEÀNICA (Pla 2017). (Unitat docent Obligatòria)
Crèdits ECTS: 5 Idiomes docència: Anglès

Professorat

Responsable: ALEIX CUBELLS BARCELÓ

Competències de la titulació a les quals contribueix l'assignatura

Bàsiques:

CB6. Posseir i comprendre coneixements que aportin una base o oportunitat de ser originals en el desenvolupament i / o aplicació d'idees, sovint en un context d'investigació.

CB7. Que els estudiants sàpiguen aplicar els coneixements adquirits i la seva capacitat de resolució de problemes en entorns nous o poc coneguts dins de contextos més amplis (o multidisciplinaris) relacionats amb la seva àrea d'estudi.

CB8. Que els estudiants siguin capaços d'integrar coneixements i enfrontar-se a la complexitat de formular judicis a partir d'una informació que, sent incompleta o limitada, inclogui reflexions sobre les responsabilitats socials i ètiques vinculades a l'aplicació dels seus coneixements i judicis.

CB9. Que els estudiants sàpiguen comunicar les seves conclusions i els coneixements i raons últimes que les sustenten a públics especialitzats i no especialitzats d'una manera clara i sense ambigüitats.

CB10. Que els estudiants tinguin les habilitats d'aprenentatge que els permetin continuar estudiant d'una manera que haurà de ser en gran mesura autodirigit o autònom.

Específiques:

CE9. Capacidad para organizar y dirigir la construcción de plataformas y artefactos oceánicos.

CE7. Capacidad para proyectar plataformas y artefactos oceánicos.

CE1. Capacidad para proyectar buques adecuados a las necesidades del transporte marítimo de personas y mercancías, y a las de la defensa y seguridad marítimas.

CTFM. Capacidad para la realización, presentación y defensa de un ejercicio original realizado individualmente ante un tribunal universitario, consistente en un proyecto integral de Ingeniería Naval y Oceánica de naturaleza profesional en el que se sinteticen las competencias adquiridas en las enseñanzas.

CEE2-8. Capacidad de proyecto de distintos sistemas de fondeo de estructuras offshore.

CEE2-1. Capacidad de análisis hidrodinámico, estabilidad y comportamiento en la mar de plataformas y otras estructuras offshore.

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Metodologies docents

The lecture will be structured in three parts. Each part will have a specific goal and will be presented and evaluated independently. Students will have different roles on each part depending on the content and the expected learnings.

During the three parts of the lecture, there will be presentations, exercises in class and home-tasks. In addition, there will be workshops related with specific software that is of common use in the offshore industry.

1. Offshore Industry Overview: In this first part of the lecture, there will be a presentation of what is the offshore industry, the history of how it started and how it has transformed to date. What have been the challenges, either technical, economical, and other aspects that have impacted the feasibility of the offshore projects. Types of project (EPCI vs Reimbursable). Cycle of life of a structure (FEED, Detail Design, Procurement, Fabrication, Transport, Installation, Operation, Decommissioning)

2. Basics of structural design: In the second part, students will learn the basics of the structural design. Types of structural elements that form a structure. How they are calculated as individual items or as a complex configuration. The standards and codes that apply for the offshore structures. The typical standards that major operators include in the project specifications. Design approach WSD vs LRFD. Design for Elastic and Plastic limits of material. General calculations that are to be included in design (CoG, Lift, Transport, Corrosion, etc). Common software that is used in industry for the solution of the complex calculations (FEA).

3. Development of a Project – Study Case: In the third part, students will be asked to carry out a complete offshore project. This will cover the whole part of Engineering, Procurement, Construction and Installation (EPCI). The project will run along a study case of a subsea structure project, the SLOR design for a ultra deep water project in the Atlantic Ocean. Students will carry out the project in groups. In each class, there will be a theory presentation based on the study case, and it will serve as a base to progress with the project that students will develop.

Activities will be carried out so that the students know how to apply their knowledge to their work or vocation in a professional way and possess the necessary skills through the elaboration and defense of arguments and problem solving within their area of study, aiming at acquiring the following capabilities:

1. Being responsible for self-learning, and being able to learn independently and continuously, being self-demanding and knowing how to define achievable goals.
2. Be able to analyze the current state of a discipline.
3. Develop critical and self-critical skills.
4. Acquire habits and skills to work responsibly in a team, possess negotiation and leadership skills, and be able to propose constructive solutions to potential conflicts.
5. Be able to weigh and manage information effectively, and know how to apply information and communication technologies to your management and analysis.
6. To be fluent in oral and written communication.

Objectius d'aprenentatge de l'assignatura

The main learning objectives of the course are:

1. Understanding the functions of each type of offshore structures
2. Understanding and application of basic principles for the design of offshore structures
3. Becoming familiar with the standards and codes of common use in the industry
4. Understanding the design spiral for offshore structures
5. Becoming familiar with the use of key design tools offshore engineering
6. Understanding the key issues and trade-off principles

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7. Understanding issues for detail design, considering fabrication, transportation and installation
8. Becoming familiar with general procedures and issues in fabrication, manufacture, and installation
9. Developing effective communication and presentation skills for the final report

Hores totals de dedicació de l'estudiantat

Dedicació total: 45h	Hores grup gran:	45h	100.00%
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Continguts

<p>Part 1. Offshore Industry Overview</p>	<p>Dedicació: 5h</p> <p>Grup gran/Teoria: 5h Grup mitjà/Pràctiques: 0h Grup petit/Laboratori: 0h Activitats dirigides: 0h</p>
<p>Descripció:</p> <p>Lecture will cover the following topics: Offshore industry overview – upstream vs downstream. Cycle of Exploration, Appraisal, Development, Production, and abandonment. History of the offshore, Technical and economical challenges. Offshore industry outlook – future prospects. Types of structure depending function and configuration. Types of project (EPCI vs Reimbursable). Cycle of life of a structure (FEED, Detail Design - Engineering, Procurement, Fabrication, Transport, Installation, Operation, Decommissioning). Supply chain in the industry – Economic ecosystem map. Professional career for offshore engineers, depending on knowledge, skills and capacities. Offshore projects on Shallow water vs ultradeepwater.</p>	
<p>Part 2. Basics of Design</p>	<p>Dedicació: 10h</p> <p>Grup gran/Teoria: 5h Grup mitjà/Pràctiques: 0h Grup petit/Laboratori: 0h Activitats dirigides: 5h</p>
<p>Descripció:</p> <p>Lecture will cover the following topics: General concepts for structural Design. Calculation of tubular and plate capacity. Approach of Allowable Stresses based on WSD and LRFD. Review on API, AISC, ASME, DNV for design in offshore environment, welding design, special design considerations, Lift loads, padeye design, rigging design, transportation forces, barge and seastate, stability of barges, grillage and seafastening. Tubular Joint Connections. Elastic design vs Plastic Design. Codes for Plastic Design. Review on FEA packages used for design Offshore. Review of Pipeline Design.</p>	

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<p>Part 3. Development of Detail Design Project</p>	<p>Dedicació: 30h</p> <p>Grup gran/Teoria: 5h Grup mitjà/Pràctiques: 20h Grup petit/Laboratori: 0h Activitats dirigides: 5h</p>
<p>Descripció:</p> <p>Students will carry out the design of a subsea structure. For this project, a framework will be provided with regards to functional requirements from the "client", the standards and codes that apply to the project, the requirements for construction, the functional limitations for transport and installation, and the restrains of cost and time from the "project manager". Study case will be presented alongside with the development of the project, and challenges will be posed to students while the design is being progressed.</p> <p>Design Premise, Pressure Piping, T&I, Strength, Weight calculation, Cathodic protection, Drawings, Fabrication, Flexible Jumper Connection, Miscellaneous Items, Structural Frame, Bend Stiffener, Subsea Connector, Top Assembly, Bottom Assembly</p>	

Sistema de qualificació

Final mark will be the summation of the following parts:

$$N_{\text{final}} = 0.0 \cdot N_{\text{Part 1}} + 0.3 \cdot N_{\text{Part 2}} + 0.4 \cdot N_{\text{Part 3_GR}} + 0.3 \cdot N_{\text{Part 3_IN}}$$

N_Part 1: Do not account for final mark

N_Part 2: Mark from Examn on Part 2

N_Part 3_GR: Mark from Project part 3 as group (continuous evaluation)

N_Part 3_IN: Mark from Project part 3 as individual (continuous evaluation)

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Normes de realització de les activitats

Theory classes

These classes will cover an overview and outlook of the offshore industry, and the theoretical concepts on the design of offshore structures. The main objective of these classes is to provide a general understanding of the industry, and to understand the structural concepts and will be necessary for the students to deal with the development of the project in groups.

Directed Activities

During the classes there will be resolution of typical engineering problems related with the design of offshore structures. Students will have to learn them so to be able to resolve as practical exercises during the exam.

FEA tools workshop

Industry software provider will give a session about FEA tools used in the industry for the design of offshore structures. Software provider will hand out attendance certificates to the attendees. This session will be necessary for the students to be able to progress with the development of the project of the third part of the structure.

Development of a Detail Design Project

Students will be asked to carry out the detail design of an offshore structure. For that, they will be working in groups. The project will have to be developed based on specific functional requirements from the "client", the standards and codes that apply to the project, the requirements for construction, the functional limitations for transport and installation, and the restrains of cost and time from the "project manager". For the project, students will be asked to do hand calculations, as well as use software tools such as spreadsheets and FEA packages.

Tutorials

The tutorial action will be carried out offering availability through e-mail.

Exams

There will be an exam, in the middle of the quartermaster, that will cover the second part of the course (Basics of Structural Design). Students that don't pass the exam will have the opportunity to repeat the exam during the exam period at the end of the quartermaster. Those who do not attend any of the two exams, will be classified as not presented

Bibliografia

Bàsica:

Gerwick, Ben C. Construction of marine and offshore structures. 3rd. Boca Raton: CRC Press, 2007. ISBN 9780849330520.

Chakrabarti, Subrata K. Handbook of offshore engineering [en línia]. Amsterdam [etc.]: Elsevier, cop. 2005 [Consulta: 21/09/2018]. Disponible a: <<https://www.sciencedirect.com/science/book/9780080443812>>. ISBN 0080443818.

API. Recommended practice 2A-WSD : planning, designing and constructing fixed offshore platforms : working stress design. 22nd. Washington: American Petroleum Institute, 2014.

Cobb, Fiona. Structural engineer's pocket book. 2nd. Oxford: Elsevier/Butterworth-Heinemann, 2009. ISBN 9780750686860.

Altres recursos:

American National Standard. Specification for Structural Steel Buildings AISC 360-10, 2010.

American National Standard. Specification for Structural Steel Buildings ANSI/AISC 360-10, 2010.