UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2018/19
Subject (*)	Advanced naval hydrodynamic		Code	730496002
Study programme	Mestrado Universitario en Enxeñaría Naval e Oceánica (plan 2018)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Obligatory	4
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Naval e Industrial			
Coordinador	Fariñas Alvariño, Pablo	E-mail	pablo.farinas@udc.es	
Lecturers	Fariñas Alvariño, Pablo	E-mail	pablo.farinas@udc.es	
Web				
General description	Parametric design of ship propellers and forms. This subject will provide the necessary knowledge to develope the propeller design under a particular vessel wake. The hydrodynamic fundamentals are based on the potential field theory and are applicable to any kind of flow under neglectable viscous effects.			

Study programme competences	
Code	Study programme competences
A2	Coñecemento avanzado da hidrodinámica naval para a súa aplicación á optimización de carenas, propulsores e apéndices.
B1	CB06 Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación
B2	CB07 Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en ámbitos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo
B4	CB09 Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a públicos especializados e non especializados dun modo claro e sen ambigüidades.
B5	CB10 Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que haberá de ser en boa medida autodirixido ou autónomo.
B6	G01 Capacidade para resolver problemas complexos e para tomar decisións con responsabilidade sobre a base dos coñecementos científicos e tecnolóxicos adquiridos en materias básicas e tecnolóxicas aplicables na enxeñaría naval e oceánica, e en métodos de xestión.
B7	G02 Capacidade para concibir e desenvolver solucións técnica, económica e ambientalmente adecuadas a necesidades de transporte marítimo ou integral de persoas e mercadorías, de aproveitamento de recursos oceánicos e do subsolo mariño (pesqueiros, enerxéticos, minerais, etc.), uso adecuado do hábitat mariño e medios de defensa e seguridade marítimas.
C1	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.

Learning outcomes			
Learning outcomes	Study programme competences		
Understand the theoretical background of fundamentals about potential flow	AC2	BC1 BC2 BC4 BC5 BJ1	CC1

2D theory of thin hydrofoils. Linear theory.	AC2	BC1 BC2 BC4 BC5 BJ1	CC1
Applications of the potential flow solutions to a 3d design.	AC2	BC1 BC2 BC4 BC5 BJ1	CC1
Design tools based on lifting line theory	AC2	BC1 BC2 BC4 BC5 BJ1 BJ2	CC1
Background of lifting line theory adapted to the propeller design	AC2	BC1 BC2 BC4 BC5 BJ1	CC1
Como resultado das capacidades anteriores os alumnos adquiren a capacidade para deseñar e optimizar formas, apéndices e propulsores de xeito xenérico. Utilizan técnicas de simulación e modelado numérico e comprenden os fundamentos e o desenvolvemento desas técnicas.	AC2	BC1 BC2 BC4 BC5 BJ1 BJ2	CC1

Contents	
Topic	**Sub-topic**
Os bloques ou temas seguintes desarrollan os contidos establecidos na ficha da Memoria de Verificación	Definición paramétrica de carenas e apéndices. Optimización de carenas e apéndices. Aplicación ó deseño de carenas e appendices. Teoría da circulación en propulsores. Teoría dos perfiles sustentadores. Teoría da liña de sustentación. Teoría de impulsión. Aplicación ó deseño de propulsores.
Mathematics background	Singular integrals Trigonometric functions Glauert integrals Hilbert transform
2D potential flow theory. Fundamentals.	Complex potential Stream function Potential function Source Sink Vortex

Thin foils theory	Thickness effect Angle of attack effect Camber effect Zero lift angle Ideal angle of attack
Thin foil theory correction in the near leading edge region	Flux arround the apex of a parabola Velocity correction in high curvature regions Velocity prediction along the full foil wall
Cavitation	Pressure coefficient Cavitation number Pressure coefficient along the whole foil wall Bucket diagrams
Tridimensional effects. Application to appendices and forward body.	Tridimensional potential field Velocity field induced by a 3D differential vortex element Free vortex vorticity Bound and free vorticity relation
Lifting line. Control surfaces (rudders).	Induced velocities over a tridimensional foil Prandtl lifting line equation
Application to ship propellers	The open water case Prandtl lifting line theory adaptation to the ship propeller design case Induction coefficients
Optimum propeller performance	Goldstein factors Betz diagram

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Objective test	A2 B1 B2 B4 B5 B6 B7 C1	3	92	95
Personalized attention		5	0	5
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Objective test	Is the exam.

Personalized attention	
Methodologies	Description
	In order the students to develop the proposed homework and to fully understand the introduced concepts it is necessary the continuous professor support. The students presence is not required and is not scored. Therefore there will be no difference between the partial time and full time students. All of them will develop the same work/requirements in order to pass the subject.

Assessment			
Methodologies	Competencies	Description	Qualification
Objective test	A2 B1 B2 B4 B5 B6 B7 C1	Is the exam.	100

Assessment comments
In order to pass this subject it is compulsory to attain five points over ten in the exam qualification.This is an extinguishing subject, therefore the assessment will be attained through one single exam.

Sources of information	
Basic	- J. Kerwin (). Hydrofoils and propellers. MIT - SNAME (). Principles of naval arch. (Propulsion). SNAME - J.N. Newman (1977). Marine Hydrodynamics. MIT press - G. Pérez (). Detailed desighn of ships propellers. FEIN - Apuntes de clase (). .
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Propulsion Systems/730496016 Marine Internal Combustion Engines/730496017 Advanced Hydrostatic and Hydrodynamic /730496020 Numerical Methods fot continuous media/730496022
Subjects that continue the syllabus
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.