Teaching Guide				
Identifying Data				2023/24
Subject (*)	Naval Construction and Ship Stability		Code	631G03018
Study programme	Grao en Máquinas Navais			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatory	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Ciencias da Navegación e Enxeñaría Mariña			
Coordinador	Orosa Garcia, Jose Antonio	E-mail	jose.antonio.orosa@udc.es	
Lecturers	Orosa Garcia, Jose Antonio Sánchez Girón, Javier Ramón	E-mail	jose.antonio.orosa@udc.es javier.sanchez5@udc.es	
Web				
General description	Introducción a la Construcción Naval y a la Teoría del Buque.			

Study programme competences	
Code	Study programme competences
A2	CE02 - Facer funcionar a maquinaria principal e auxiliar e os sistemas de control correspondentes.
A6	CE06 - Mantemento e reparación das máquinas e o equipo de a bordo.
A7	CE07 - Manter a navegabilidade do buque.
A9	CE09 - Emprego do inglés escrito e falado.
A10	CE10 - Utilizar os sistemas de comunicación interna.
A14	CE14 - Facer funcionar os dispositivos de salvamento.
A99	CE99 - Ter a capacidade para exercer como Oficial de Máquinas da Mariña Mercante, unha vez superados os requisitos esixidos pola Administración Marítima.
A100	CE100 - Ter a capacidade para exercer como oficial ETO da Mariña Mercante, unha vez superados os requisitos esixidos pola Administración Marítima.
B1	CB1 - Demostrar que posúen e comprenden coñecementos na área de estudo que parte da base da educación secundaria xeneral, e que inclúe coñecementos procedentes da vangarda do seu campo de estudo
B2	CB2 - Aplicar os coñecementos no seu traballo ou vocación dunha forma profesional e posuír competencias demostrables por medio da elaboración e defensa de argumentos e resolución de problemas dentro da área dos seus estudos
B3	CB3 - Ter a capacidade de reunir e interpretar datos relevantes para emitir xuicios que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética
B4	CB4 - Poder transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado.
B5	CB5 - Ter desenvolvido aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores con un alto grao de autonomía.
B6	CG01 - Capacidade para xestionar os propios coñecementos e utilizar de forma eficiente técnicas de traballo intelectual.
B7	CG02 - Resolver problemas de forma efectiva.
B8	CG03 - Comunicarse de maneira efectiva nunha contorna de traballo.
B9	CG04 - Traballar de forma autónoma con iniciativa.
B10	CG05 - Traballar de forma colaborativa.
B11	CG06 - Comportarse con ética e responsabilidade social como cidadán e como profesional.
B12	CG07 - Capacidade para interpretar, seleccionar e valorar conceptos adquiridos noutras disciplinas do ámbito mariño, mediante fundamentos físico-matemáticos.
B13	CG08 - Capacidade para a aprendizaxe de novos métodos e teorías, que lle doten dunha gran versatilidade para adaptarse a novas situacións.
B14	CG09 - Comunicar por escrito e oralmente os coñecementos procedentes da linguaxe científica.

B15	CG10 - Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e de comunicar e transmitir coñecementos habilidades e destrezas.
B16	CG11 - Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
B17	CG12 - Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.
B18	CG13 - Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.
C1	CT01 - Expresarse correctamente, tanto de forma oral como escrita, nas linguas oficiais da comunidade autónoma.
C4	CT04 - Desenvolverse para o exercicio dunha cidadanía respectuosa coa cultura democrática, os dereitos humanos e a perspectiva de xénero.
C9	CT09 - Ter a capacidade de xestionar tempos e recursos: desenvolver plans, priorizar actividades, identificar as críticas, establecer prazos e cumprilos.

Learning outcomes			
Learning outcomes	Study programme competences		
Será capaz de resolver problemas de forma efectiva.	A2 A6 A7 A10 A14 A99 A100	B2 B3 B9 B10 B13 B15 B16 B17 B18	C9
Ser capaz de comunicarse de manera efectiva en un entorno de trabajo. Trabajar de forma colaborativa.	A9	B1 B4 B5 B6 B7 B8 B11 B12 B14	C1
Comportarse con ética y responsabilidad social como ciudadano y como profesional.			C4

Contents	
Topic	Sub-topic
Introducción	Tipos de buques mercantes O buque: partes e nomenclatura Compartimentos dun buque Carga e descarga Amaraxe e fondeo Accesos dun buque

Elementos estruturais	Descrición xeral do buque Sistemas de construción Fondo e Dobre Fondo Proa Popa Mamparos Cubertas Superestruturas
Esforzos do buque	Tipos de esforzos En augas tranquilas. Entre olas.
Construción naval	Introdución á construción naval Normativa de construción: Sociedades de clasificación O estaleiro: descrición e equipos O proceso de adquisición de buques Contratos e especificacións
Sistemas de propulsión	Hélices Bocina Eixo de Cola Deseño de hélices Fabricación de hélices Waterjet Azimutal Voith
Sistema de goberno	Estrutura Tipos de lemes Efectos do leme Deseño do equipo de goberno servo-leme Fabricación de lemes
Deseño da cámara de máquinas e sistemas do buque	Equipamentos principais e auxiliares Sistema de auga salgada Sistema de combustible e aceites Sistema de aire Sistema de auga doce Sistema eléctrico Sistemas electrónicos de navegación
Deseño de estruturas na construción e reparación naval	Documentación técnica Planos de montaxe, despiece e detalle de elementos estruturais navais Materiais e documentación de trazado e corte en construcións navais
Deseño de manobras na construción e reparación naval	Cálculo de manobras de buques, elementos, bloques, maquinaria e equipos pesados Manobras de traslado e volteo de bloques, botadura e flotadura Manobras de fondeo, amaraxe, remolque e varada
Deseño de armamento na construción e reparación naval	Deseño de redes de tubaxes e ventilación naval Planos construtivos de redes de tubaxes e ventilación naval Planos construtivos para elaboración e ensamblaxe de equipos e maquinaria de armamento

Inspección de buques	Sociedades de clasificación Inspección estrutural Inspección de equipos Estado de Bandeira (Flag State Control) Control do Estado Rector (Port State Control) Sire Vetting Exemplos de inspeccións
Documentación técnica para construción e reparación naval	Xestión documental do produto de fabricación mecánica Representación gráfica na construción naval Deseño 2D e 3D na construción naval
Estabilidade	Introducción
Xeometría do Buque	Plano de formas Planos e liñas de referencia Dimensións Coeficientes de formas Cálculo aproximado de áreas, volumes, centros de gravidade e momentos
O buque como flotador	Curvas hidrostáticas. Volume de carena Desprazamento Centros de gravidade, carena e flotación
Estabilidade	Tipos de equilibrio Estabilidade estática transversal inicial Efectos do traslado, carga e descarga de pesos Radio metacéntrico transversal Altura metacéntrica
Estabilidade transversal para grandes inclinacións	Curva "C" Metacentros Curvas "GZ" Curvas "KN" Cálculo e trazado da curva de estabilidade estática transversal
Estabilidade dinámica	Concepto Cálculo da curva de estabilidade dinámica Efecto do par escorante Ángulo de equilibrio dinámico
Estabilidad estática lonxitudinal	Altura metacéntrica lonxitudinal Momento unitario Fórmula do Asento Fórmula da alteración Cálculo dos calados ao trasladar, cargar ou descargar pesos Variación dos calados por cambio de densidade Permiso de auga doce Puntos indiferentes
Experiencia de estabilidade	Finalidade Realización práctica Criterios de estabilidade
Francobordo	Concepto Definición Convenios internacionais de liñas de carga Zonas e períodos estacionais

Inundación	Xeneralidades Compartimentado Permeabilidade Eslora inundable Clases de inundación Efectos da inundación Cálculos de inundación

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Problem solving	A2 A6 A7 A99 A100 B1 B2 B3 B6 B7 B9 B10 B12 B13 B15 B16 C9	10	18	28
Objective test	A9 A10 A14 A99 A100 B3 B4 B5 B8 B11 B14 B17 B18 C1 C4	4	4	8
Collaborative learning	B10	6	5	11
Supervised projects	A7 A9 A99 A100 B3 B8 B9 B10 C1 C9	2	15	17
Workshop	B1 B5 B7 B12 B13	8	5	13
Oral presentation	B3 B4 B6 B8 B11 B15 B18 C1 C4	2	6	8
Guest lecture / keynote speech	B4 B12 C1	22	33	55
Personalized attention		10	0	10
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Problem solving	It allows the teacher to assess the level of learning and identify errors, deficiencies, and limitations in the use of work tools. Overall, it contributes to a weight percentage of 10% of the final grade. 5% of the grade will be based on the student's involvement throughout the course.
Objective test	It evaluates the knowledge and understanding of the basic content of the subject, taking into consideration the student's skills, strategies, and problem-solving approaches. Two tests will be conducted during the course, corresponding to the topics of Naval Construction and Ship Theory. Each test will contribute 35% to the overall grade. Students who do not participate in continuous assessment throughout the course will take an objective test to evaluate and verify the expected results regarding the overall content of the subject and the achievement of proposed objectives. The final comprehensive exam, as the sole evaluation, will consist of two parts with independent assessment. A minimum score of 5 out of 10 is required for each part: a) theoretical (50%); b) practical (50%). The practical part will involve solving multiple problems, while the theoretical part will include various multiple-choice questions and definition of concepts.
Collaborative learning	It involves solving tasks and problems through teamwork, including the development and presentation of group work.
Supervised projects	This methodology is designed to promote autonomous learning among students, under the guidance of the teacher and in diverse scenarios.
Workshop	It is a training modality focused on the application of learning, combining various methodologies and tests such as presentations, simulations, debates, problem-solving, guided practices, etc. Students engage in practical tasks related to a specific topic with the support and supervision of the faculty.
Oral presentation	It involves orally presenting the results of supervised work, supported by audiovisual resources.

Guest lecture / keynote speech	It refers to the classroom exposition of each topic of the subject.

Personalized attention	
Methodologies	**Description**
Supervised projects Problem solving	Each student will receive personalized attention for the resolution of calculations and problems, both in class and during tutoring sessions.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Oral presentation	B3 B4 B6 B8 B11 B15 B18 C1 C4	Oral presentation of the results of the supervised assignment supported by audiovisual resources. It will be evaluated based on a rubric. To calculate the average grade of the oral presentation along with the other evaluation tests, a minimum score of 5 out of 10 will be required.	10
Supervised projects	A7 A9 A99 A100 B3 B8 B9 B10 C1 C9	A report will be prepared and evaluated based on a rubric. To calculate the average grade of the supervised assignment along with the other evaluation tests, a minimum score of 5 out of 10 will be required.	5
Problem solving	A2 A6 A7 A99 A100 B1 B2 B3 B6 B7 B9 B10 B12 B13 B15 B16 C9	Together they will contribute a weight of 10% to the final grade. 5% will be based on the student's involvement throughout the course.	15
Objective test	A9 A10 A14 A99 A100 B3 B4 B5 B8 B11 B14 B17 B18 C1 C4	Each partial exam (P1 and P2) will contribute 35% to the overall grade, and the global objective exam (average score of both) will account for 70% of the total course evaluation. It will be necessary to obtain a minimum grade of 4/10 in each partial exam for them to be averaged.	70

Assessment comments
The students who attend and complete at least 80% of the activities proposed in the classroom as part of the workshop will be continuously evaluated according to the methodologies described in the course guide. In the opposite case, students will be evaluated solely through a final objective exam on the date of the regular examination period. The objective exam, which students evaluated through the continuous evaluation system are entitled to, will take place on the date of the regular examination period. However, if the result of the oral presentation is at least 5 out of 10, the student will not be evaluated on competencies B3, B8, B15, and B18, and their score in the corresponding mixed part of the assessment will be equivalent to the one obtained in the oral presentation. The final objective exam for the regular and extraordinary examination periods will consist of two distinct parts. Each part will carry equal weight (50%) in the final grade, but it will be necessary to obtain a minimum score of 4 out of 10 in each part for them to average out. The evaluation criteria set out in Table A-III / 2 of the STCW Code, and set out in the Quality Assurance System, will be taken into account when designing and conducting the evaluation. Students with recognition of part-time dedication and academic exemption from exemption from attendance, as established in the "RULE GOVERNING THE REGIME OF DEDICATION TO THE STUDY OF UNDERGRADUATE STUDENTS IN THE UDC (Arts. 2.3; 3.b; 4.3 and 7.5) (04/05/2017): - Attendance / participation in the activities of minimum class: 66%, being exempt the attendance to the master classes The fraudulent completion of exams or assessment activities, once confirmed, will result directly in a failing grade in the respective exam session: the student will be graded as "fail" (numerical grade of 0) in the corresponding academic year's exam session, whether the misconduct occurs in the first opportunity or the second. In this regard, their grade will be modified in the first opportunity's record, if necessary.

Sources of information

Basic	- Orosa García, J.A. (2022). Diseño y construcción de buques. Apuntes ETSNyM - Alvariño Castro, R; et al. (1997). El proyecto básico del buque mercante. Colegio Oficial de Ingenieros Navales - (1980). La obra viva del bque: su conservación y pintado. ANAVE - Bonilla, A. (1984). Construcción naval y servicios. Hijos de E. Vinuesa - White, G.W. (1979). Elementary beam theory and the ship girder. Stanford Maritime - Eyres, D.J. (2002). Ship construction. Butterworths Heinemann - (2002). Reglas de construcción de buques. Germanisher Lloyd - Kemp, J.F.; Young, P. (1990). Ship construction. Sketches and notes. Butterworths Heinemann - Lee Storch, R. et al. (1995). Ship production. Cornell Maritime Press - Pursey, H.J. (1977). Merchant ship stability. Brown, Son and Ferguson - Baxtewr, B. (1990). Architecture examples and theory. Griffin & Company - Gamboa Sánchez-Barcaiztegui, Marcial (1945). Nociones de arquitectura naval. Naval - Pursey, Edward V. lewis (1983). Merchant ship construction: specially written for the merchant navy. Brown, Son and ferguson - Derret, D.R. (1987). Ship stability for master and mates. Stanford Maritime - Bonilla de la Corte, A. (1972). Teoría del Buque. Librería San José
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Mechanical Draw/631G03047 Thermal Marine Machinery/631G03030 Mechanical Technology/631G03029 Mechanics and Strength of Materials/631G03013 Fluid Mechanics/631G03017 Science and Engineering of Materials/631G03009 Physics I/631G03003 Physics II/631G03008 Technical Draw/631G03007
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Simulator Training/631G03053 Ship Energy Efficiency/631G03040 Maintenance Management for Ships/631G03026 Maritime Safety and Pollution/631G03019 Auxiliary Equipment for Ships/631G03023 Electrotechnology and Ship Electrical Machines/631G03015
Other comments