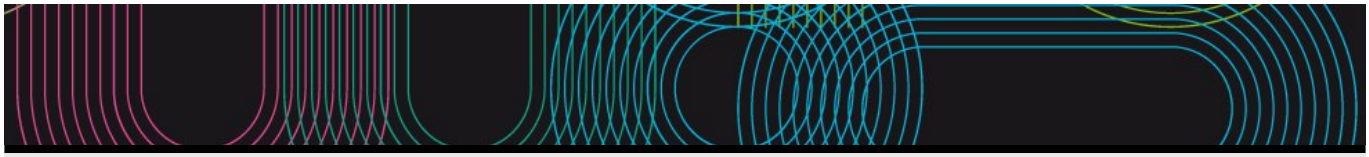

IDENTIFYING DATA				
Theory of the ship and shipbuilding				
Subject	Theory of the ship and shipbuilding			
Code	P52G381V01504			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	5th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	González-Cela Echevarría, Gerardo			
Lecturers	Carrasco Pena, Pedro Jesús González-Cela Echevarría, Gerardo			
E-mail	gerarcela@cud.uvigo.es			
Web	http://moovi.uvigo.gal			
General description	This subject is placed between the specific of the intensification in naval technology, offered exclusively to students of the General Body of the Armed, whose aim is to contribute skills or specific skills to exert the destination of Official of Inner Security (*S.I.). It understands by *S.I. The group of processes, disposals, technical and material means and humans, allocated to warn, reduce and correct the effects that, on a fuselage or his endowment, derive of accidents or actions enemies. The subject has like aim, in the first place, achieve that the students know and comprise all the related with the stability of the fuselage (hydrostatic and intact stability and in failures), as well as the basic concepts related with the hydrodynamic naval (resistance to the advance and his implications) and the behaviour of the fuselage in the sea by the interaction with external factors like waves, wind or currents. Second, the subject will allow that the students purchase sufficient knowledge on the appearances of the naval construction related with the structural elements of the fuselage, his purpose, behaviour, forms of failure and his implications when these produce . This knowledge will allow to the official futures assume functions related with the survival on board of fuselages of surface and submarines. Of this form, the students graduates will be able to have the smart units for the fight, sustain them in the same and make the temporary repairs, back to the fight, necessary to keep the fuselage to the highest operative level.			

Training and Learning Results	
Code	
B3	Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
B4	Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of Industrial Engineering in Mechanical specialty.
B6	Capacity for handling specifications, regulations and mandatory standards.
C38	CITN12/OPT8 To know the nomenclature, the basic principles of the procedures of construction and operation of ships, the basics of buoyancy and stability, the materials for its construction and structure.
C39	CITN13/OPT9 To acquire the ability to perform calculations of buoyancy and stability.
C40	CITN14/OPT10 To apply the principles of control breakdowns in order to reduce the risk of personal and material, and for decision-making in case of onboard emergencies.
D2	Problems resolution.
D8	Decision making.
D9	Apply knowledge.
D16	Critical thinking.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
To know the technological basis of ship construction and operation and the basic fundamentals of buoyancy and stability	B3 B6	C38	
To know the buoyancy and stability calculations of a vessel.	B4	C39	D2 D8 D9 D16
To know the principles of on-board damage control	B3 B6	C40	
LEARNING OUTCOMES ENAEE: KNOWLEDGE AND UNDERSTANDING: RA1.3.- Be aware of the multidisciplinary context of engineering (Developmental level: Adequate (2)).		C38 C39	
LEARNING OUTCOMES ENAEE: ANALYSIS IN ENGINEERING: RA2.2.- The ability to identify, formulate and solve engineering problems in their specialty; choose and apply analytical, computational and experimental methods already established; recognize the importance of social, health and safety, environmental, economic and industrial constraints (development level: Adequate (2)).	B4	C39	D2 D8 D9 D16
LEARNING OUTCOMES ENAEE: RESEARCH AND INNOVATION: RA4.2.- Ability to consult and apply codes of good practice and safety codes of their specialty (development level: Adequate (2)).	B6		
LEARNING OUTCOMES ENAEE: PRACTICAL APPLICATION OF ENGINEERING: RA5.3.- Knowledge of application of materials, equipment and tools, technology and engineering processes and their limitations in the field of their specialty (development level: Adequate (2)).		C38 C39 C40	D8 D9
LEARNING OUTCOMES ENAEE: PRACTICAL APPLICATION OF ENGINEERING: RA5.4.- Ability to apply standards of engineering practice in their specialty (development level: Adequate (2)).	B6	C40	D9

Contents	
Topic	
1. General considerations about ship theory:	1.1. Buoyancy. 1.2. Stability.
2. Hull geometry:	2.1. Shape plan. 2.2. Layout chart. 2.3. Principal coefficients. 2.4. Hydrostatic curves.
3. Transversal stability:	3.1. Initial stability. 3.2. Experiment of stability. 3.3. Accidental grounding.
4. Longitudinal stability:	4.1. Effect of the accidental grounding. 4.2. Stranded in dike. 4.3. Launching.
5. Stability in damage:	5.1. Floods. 5.2. Effects.
6. Tight subdivision:	6.1. Compartment. 6.2. Control of damages.
7. Regulation:	7.1. Classification. 7.2. IMO Rules. 7.3. Freeboard. 7.4 Tonnage.
8. CAD applications:	8.1. Naval design. 8.2. Naval construction.
9.Naval construction:	9.1. Definition. 9.2. The ship and his types. 9.3. Materials of construction.
10. General description of the hull:	10.1. Structural topology. 10.2. Structural elements. 10.3. Processes of union.
11. Structural tensions:	11.1. Calm waters.
12.Structural tensions:	12.1. Stormy waters.
13. Basic calculations of of naval structures.	13.1. Diagram of flow for calculations.
14. Peculiarities of the structures of the fuselages of war.	14.1. Special loads.
Practices:	P1: Buoyancy. P2: Transversal Stability. P3: Longitudinal Stability. P4: Breakdown practice. P5: Transverse Stability in spreadsheet. P6: Longitudinal Stability in spreadsheet. P7: Calculation of stability in damage in spreadsheet.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	28	42	70
Laboratory practical	14	28	42
Seminars	26	5	31
Problem solving	7	0	7

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
	Description
Lecturing	In these sessions, the basic theoretical contents of the program will be explained in detail, exposing explanatory examples with which to deepen the understanding of the subject. Presentations and the blackboard will be used in combination. As far as possible, a copy of the transparencies will be provided to the students prior to the presentation, focusing the effort of the teacher and the students on the presentation and understanding of the knowledge. In any case, paper reproductions of transparencies should never be considered as substitutes for texts or notes, but as complementary material.
Laboratory practical	Small participative lecture sessions. Sometimes, it will be necessary to explain certain practical concepts providing useful advice for the best use of the practical classes. Problem solving. The practices are aimed at reinforcing the theoretical concepts dealt with in the theory sessions. The didactic method to be followed in the practical classes consists of problem solving. The teacher solves a problem interacting with the students. Then the students solve problems in group and finally the students solve a problem individually that will be collected at the end of the session. Tutored laboratory practices. In practices 5 and 6 the teacher performs the practice and explains some steps and the student follows the process.
Seminars	These hours include the 15-hour intensive course that is scheduled as support for the student in their preparation for the extraordinary call. Assessment tasks
Problem solving	The teacher solves a problem by interacting with the students and solving the doubts that arise.

Personalized assistance	
Methodologies	**Description**
Problem solving	In the field of tutorial action, there are academic tutoring actions as well as personalized tutoring. In the first case, the students will have at their disposal hours of tutorials in which they can consult any doubt related to the contents, organization and of the subject, with the development of the project, etc. The tutorials can be individualized, but group tutorials will be encouraged for the resolution of problems related to the activities to be carried out in group, or simply to inform the teacher of the evolution of the collaborative work. In the personalized tutorials, each student, individually, will be able to discuss with the teacher any problem that is preventing him/her from following the course properly, in order to find some kind of solution between both of them. By combining both types of tutorial action, the aim is to compensate for the different learning rhythms through attention to diversity. The teachers of the subject will personally attend to the doubts and queries of the students, both in person, according to the schedule that will be published in the web page of the center, and through telematic means (e-mail, videoconference, Moovi forums, etc.) under the modality of previous appointment.

Assessment			
	Description	Qualification	Training and Learning Results
Lecturing	The knowledge of theory taught in the classroom is evaluated through written tests throughout the term. The intermediate tests are short tests (1 hour) (15% c.u.) and their purpose is to evaluate the assimilation of the contents by the students, to motivate autonomous study and to identify those students who require individualized tutoring. On the other hand, the final written test is a long test (4 hours) (40%) which aims to evaluate the learning of all the theoretical contents of the course.	70	B3 C38 D2 B4 C39 D8 B6 C40 D9 D16
Laboratory practical	The evaluation of the internships (NP) is carried out by averaging the scores obtained in each of the internships, all of them with the same weight.	20	C39 D2 D9 D16
Problem solving	Participation (date: it evaluates in the seminars and in the debates in class of theory)	10	D16

Other comments on the Evaluation

The final summative evaluation of the student will be based on the sum of the score given to each of the above mentioned parts, being the continuous evaluation grade (NEC):
NEC = 0.15 * PI1 + 0.15 * PI2 + 0.2 * NP + 0.4 * PF + 0.1 * CP
In order to pass the course by continuous evaluation, a NEC grade equal to or higher than 5 points is required. However, some requirements will be demanded, in some of the sections, that guarantee the balance between all types of competences. These requirements are:1. To have taken the two intermediate tests and at least 6 of the 7 practical sessions.2. To obtain a grade equal to or higher than 4 points out of 10 in the final continuous evaluation test (FP).
Those students with NEC lower than 5 points or who do not meet any of the above requirements, must take the regular exam in order to pass the course. In addition, for those who do not meet the requirements, their continuous evaluation grade will be calculated as: NEC FINAL = min (4, NEC). All those students who wish to improve their grade obtained by continuous evaluation may also take the regular exam.
Both the ordinary and the extraordinary exam will evaluate all the competences of the course. Therefore, these exams will include questions related to the tasks carried out in the practicals.
ACADEMIC INTEGRITY: Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo*, as well as point 6 of the fifth rule of *Order DEF/711/2022, of July 18th, which establishes the requirements for evaluation, progress, and ongoing enrolment in military educational training centres for incorporation into the ranks of the Armed Forces,* **any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity,** regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

Sources of information

Basic Bibliography

Armada Española, **I-CP-03 Estabilidad**, Armada,

Armada Española, **I-CP-02 Control de averías**, Armada,

Complementary Bibliography

A. Biran, **Ship hydrostatics and stability**, New Riders Publishing,

J. Olivella Puig, **Teoría del buque. Flotabilidad y estabilidad**, UPC,

J. Olivella Puig, **Teoría del buque. Flotabilidad y estabilidad (Problemas).**, UPC,

Lewis, E. V., **Principles of naval architecture second revision: stability and strength. Volume I.**, SNAME,

Lewis, E. V., **Principles of naval architecture second revision: stability and strength. Volume II.**, SNAME,

Bonilla de la Corte, A., **Teoría del buque.**, Librería San José,

Bonilla de la Corte, A., **Construcción naval y servicios.**, Librería San José,

de Juan García Aguado, J. M., **Estática del buque.**, UDC,

de Juan García Aguado, J. M., **Principios de teoría del buque: Dinámica.**, UDC,

Bureau of Naval Personel USN, **Principles of naval engineering**, NAVPERS,

Recommendations

Other comments

It is recommended a review of basic elements studied in other subjects such as:
-Gravitation, Center of gravity, composition of centers of masses, Pappus-Guldin and Steiner theorems.
-Density, Archimedes' theorem, fundamental principle of hydrostatics, viscosity, Bernoulli's equations, continuity and Venturi effect.
-Descriptive geometry, systems of representation in the plane, projections and cuts.
-Methods of approximate integration of areas and volumes, linear regressions, trapezoidal and Simpson's rules.