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| **Country****RO** | **Institution****RNA** | **Course title****Naval Architecture** | **ECTS****3** |

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| Service**Navy** | **Minimum Qualification for Lecturers*** Bachelor/ master degree in Nautical Sciences or Naval Electromechanics;
* Certified instructor in hydrodynamics or PhD degree holder;
* English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 1.
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| Languages**English** |
| **Prerequisites for international participants:*** English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 1.
* Basic knowledge of IMO.
 | **Goals of the Module:*** Understanding the ship as a complex and unitary system;
* Knowledge and understanding of the concepts, models and methods underlying the assessment of the fundamental nautical qualities of the ship - buoyancy and transverse stability, as well as the parameters that influence these nautical qualities;
* Understanding the actions to be taken in case of partial loss of buoyancy of the ship, by flooding (partial or total) of a compartment or a group of compartments;
* Knowledge of the main structural elements of the ship's hull as well as the nomenclature specific to shipbuilding
* Typical hull structures, construction and operating features of merchant ships;
* Understanding the fundamentals of the integrity and tightness of the hull.
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| Learning outcomes | Knowledge | * Knowledge of geometry, static and dynamics law of the ship, necessary to face and solve the problems connected with the buoyancy, the stability, the resistance to advancement and the behaviour of the ship.
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| **Skills** | * Apply correctly the studied topics about ship geometry, ship forms, ship buoyancy, intact and damaged ship stability.
* Recognise and describe shipbuilding elements and the main ship building methods.
* Describe special ship features of shipbuilding and operation.
* Understand and analyse the ship’s hull longitudinal strength.
* Operate safely the transport vessels while loading or unloading cargo.
* Use ship’s documents and diagrams referring to hydrodynamics and ship stability.
* Understand and correctly apply seakeeping concept and principles.
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| **Competence** | * Ability to evaluate variation of stability caused by changing boarding cargo or flooding.
* Ability to analyse effect of the trim about the ship’s stability.
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| **Verification of learning outcomes*** **Observation**:
	+ The theoretical part will be discussed and included in solving stability problems conducted during the practical activities using the calculus and dedicated software (during the seminar and laboratory classes).
* **Tests**:
	+ The final test will comprise problem solving exercises, to evaluate the course participants’ knowledge and ability to solve buoyancyand transverse stability problems using the calculus and dedicated software.
* **Evaluation**:
	+ The exam will consist in buoyancyand transverse stability exercises conducted on written test by using the calculus and dedicated software. The course participants will be asked to issue justified decisions based on provided scenario.
	+ Qualified individual feedback will be provided to each participant.
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| **Module details** |
| **Main Topic** | **Recom-mended** **WH** | **Details** |
| **Introductory concepts** | 4 | Short history of shipbuilding evolution, ship constructions rules and regulations, nautical features. |
| **Ship geometry** | 2 | Shipbuilding terminology, system of axis, main planes, main dimensions, ratios between dimensions, fineness ratio. |
| **Buoyancy** | 4 | Floating parameters, forces acting on the ship, equilibrium conditions, weight of the ship, coordinates of the center of gravity, groups of masses that make up the ship's displacement, calculation of hydrostatic elements of the hull and their variation curves with draft, straight hull diagram, calculation of inclined hulls, Bonjean diagram, trim chart, influence of embarkation and mass landing on board on the buoyancy of the ship, unit displacement (TPC), buoyancy reserve)Exercises for these topics. |
| **Initial stability of the ship intact** | 4 | Mechanism of creation of the moment of stability, disturbing forces, metacentric height, metacentric formula of stability, unit moment of transverse tilt and unit moment of trim (MCTC), influences on the position and stability of the ship in cases: mass movement on board, embarkation and disembarkation of masses, suspended masses, liquid-free surfaces, stability test, standardization of initial stability)Applied exercises. |
| **Stability at high tilt angles of the ship intact** | 6 |  Metacentric radius, hull centre and metacentre coordinates during tilt, static ship stability, static stability arm, ship dynamic stability, dynamic stability arm, stability charts, properties, practical problems that arise during ship operation and are solved using stability diagrams, influences on stability diagrams, hull diagram, stability standardization, global ship safety concept, stability documentation for intact ship). |
| **Buoyancy and stability of the damaged ship** | 4 | General, classification of flooded compartments, extent and location of damage, fundamental effects of damage, methods of calculating the buoyancy and stability of the damaged ship). |
| **Nomenclature and hull structure** | 2 | Basics, classification of civilian ships, draft ladders, classification societies, main parts of the hull structure, framing systems, superstructures and rudders, special tanks and fuel tanks, parapet, railings, straw, tree line tunnel, openings in decks and in the outer shell, bow and stern). |
| **Final evaluation** | 4 | The final assessment consists in solving buoyancyand transverse stability exercises. |
| **Total lecture WH** | **30** |  |
| **Additional hours (WH) to increase the learning outcomes** |
| Self-Study | 30 | **References:**1. Pricop M., Chiţac V., Oncica V., Shipbuilding Theory – Theoretical and aspects and problems, Naval Academy Publishing House, Constanta, 2009. 2. Maier V. , Ship Mecanics and Shipbuilding, Technical Publishing House, Romania, Bucharest, 1985. 3. AUTOSHIP Users Guide 9.1, 2011 4. AUTOHYDRO User’s Manual 6.5, 2011 5. AUTOPOWER User’s Guide 3.1, 2007  |
| **Total WH** | **60** | 30 residential hrs (16 teaching hrs + 8 exercises + 4 final assessment);30 hrs of self-study. |

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| **List of Abbreviations:** |
| RO………………………………………………………………………………………RomaniaRNA……………..…………………………..…Romanian Naval Academy “Mircea cel Bătrân”ECTS……………………………………...European Credit Transfer and Accumulation SystemSTANAG………………………………………………………….... Standardization AgreementIMO…………………………………………………….….. International Maritime Organization |