



**Escola Superior Náutica Infante D. Henrique**  
**Department of Transport and Logistics**

# **Bachelor of Science in Deck and Bridge Operations**

**(Syllabus)**

# Bachelor of Science in Deck and Bridge Operations

## 1<sup>st</sup> Year

|                                    | CH | ECTS |                     | CH | ECTS |
|------------------------------------|----|------|---------------------|----|------|
| Seamanship I                       | 3  | 4    | Seamanship II       | 4  | 5    |
| Navigation I                       | 5  | 6    | Navigation II       | 5  | 6    |
| English                            | 3  | 4    | Nautical English I  | 2  | 3,5  |
| Ship's Electricity and Electronics | 2  | 3,5  | Marine Machinery    | 2  | 3,5  |
| Mathematics Analysis               | 5  | 6    | Linear Algebra      | 4  | 5    |
| Applied Mechanics                  | 4  | 4    | Materials Mechanics | 3  | 3,5  |
|                                    |    |      | Applied Chemistry   | 4  | 6    |
| Totals                             | 24 | 27,5 | Totals              | 24 | 32,5 |

## 2<sup>nd</sup> Year

|                           | CH | ECTS |                               | CH | ECTS |
|---------------------------|----|------|-------------------------------|----|------|
| Nautical Astronomy        | 2  | 3    | Navigation IV                 | 4  | 4,5  |
| Ship' Stability           | 4  | 4,5  | Ship' Structural Resistance   | 5  | 5,5  |
| Navigation III            | 3  | 4    | Safety Reg. and Safety By-law | 3  | 4    |
| Maritime Safety I         | 4  | 5    | Nautical English III          | 3  | 3,5  |
| Nautical English II       | 3  | 3,5  | Probabilities and Statistics  | 4  | 5    |
| Computers and Programming | 4  | 5    | Maritime Law                  | 3  | 3,5  |
| Chemistry and Physics     | 4  | 5    | Psycho sociology              | 2  | 4    |
| Totals                    | 24 | 30   | Totals                        | 24 | 30   |

## 3<sup>rd</sup> Year

|                                | CH | ECTS |                                 | CH | ECTS |
|--------------------------------|----|------|---------------------------------|----|------|
| Navigation V                   | 4  | 4,5  | Navigation VI                   | 3  | 4    |
| Maritime Communications I      | 3  | 4    | Maritime Communications II      | 5  | 5    |
| Radar and Arpa Operations      | 6  | 6    | Carriage and Transp. Systems II | 4  | 4,5  |
| Fisheries                      | 2  | 3    | Voyage Planning                 | 2  | 3,5  |
| Loading and Carriage Systems I | 3  | 3,5  | Maritime Safety II              | 4  | 5    |
| The Law of the Sea             | 3  | 4    | Health Care I                   | 4  | 4    |
| Oceanography and Meteorology   | 4  | 5    | Navigation VII                  | 3  | 4    |
| Totals                         | 25 | 30   | Totals                          | 25 | 30   |

### NOTES:

CH – Contact Hours

ECTS – European Credit Transfer System

## **MARITIME CERTIFICATION**

Successful completion of first cycle of studies in Deck Operations and Navigation Course, meets the mandatory requirements for certification of deck officers as provided in paragraph 2.3 of regulation II / 1 of the 1978 STCW Convention amended in 1995, thus allowing to obtain the relevant certificates of competence, since are fulfilled the other requirements for certification.

**1<sup>st</sup> year of studies**

**1<sup>st</sup> Semester**

| Bachelor of Science in Deck and Bridge Operations  |              |  |           |
|--|--------------|--|-----------|
| Description of individual course unit  |              |  |           |
| Course title:  | Seamanship I |  |           |
| Field:   | Safety       |  |           |
| Course code:   | 3000         | Type of course:  | Mandatory |
| From:  | 2011/2012    |  |           |
| Year of study:   | 1st          | Semester:  | 1st       |
| ECTS:  | 4            | Hours/week:  | 3T + 1 P  |
| Name of lecturer:  |              |  |           |
| Prerequisites:   |              |  |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |              |  |           |
| To provide the students with the knowledge about the ship and its equipment, purpose and types of ships, navigation, and its boundaries, maneuver, and use of evolutive elements and in accordance with IMO recommendations. |              |  |           |
| Course contents:   |              |  |           |
| STCW   | Item         | Program  | Hours     |
|  |              | THEORETICAL SEAMANSHIP   |           |
|  | 1            | GENERAL DESCRIPTION OF THE SHIP                                      | 20        |
|  | 1.1          | Generalities. Nomenclature.  | 8         |
|  | 1.2          | Characteristics of Ships and Boats                                   | 3         |
|  | 1.3          | Ship's Structure   | 6         |
|  | 1.4          | Compartmentalization of Ships  | 1.5       |
|  | 1.5          | Contruction types  | 1         |
|  | 1.6          | Classification Societies: main Societies                             | 0.5       |
|  | 2            | SHIPTYPES  | 8         |
| Tabelas  | 2.1          | Classification of Ships (intended purposes)                          | 1         |
|  | 2.2          | Classification of Ships (áreas where sailing)                        | 1         |
| A II/1   | 2.3          | Families: general cargo, bulk carriers and container ships           | 2         |
| A II/2   | 2.4          | Ro/Ro's, heavy cargoes, tankers (oil, chemical and gas), passengers  | 2         |
|  | 2.5          | Supply vessels and coasters  | 2         |
|  | 3            | DIMENSIONS OF SHIPS (Linear, volumetric and signal)                  | 8         |
|  | 4            | MASTS (types, constitution, pau de surriola, carangueja)             | 1         |
|  | 5            | NAVIGATION EQUIPMENTS AND SYSTEMS                                    | 8         |
|  | 5.1          | Compass and Gyrocompass  | 2         |
|  | 5.2          | Odometer and Sound   | .25       |
|  | 5.3          | Propulsion, Loading and Unloading                                    | .5        |
|  | 5.4          | Mooring: type of mooring lines                                       | .25       |
|  | 5.5          | Anchoring: (anchors and chains)                                      | 2         |
|  | 5.6          | Pipes  | .5        |
|  | 5.7          | Ventilation, climatisation, refrigeration and watertight subdivision | .5        |
|  | 5.8          | Radar: purpose, care and interpretation                              | 1         |
|  | 5.9          | Steering gear and its composition                                    | 1         |
| Transport  |              |  | 45        |

|                                 |       |   |    |
|---------------------------------|-------|---|----|
|                                 |       | Transported   | 45 |
|                                 | 6     | PRATICAL SEAMANSHIP   | 15 |
| Tabelas                         | 6.1   | Small boats and its classification                                      | 1  |
|                                 | 6.2   | Types of hull construction and their nomenclature                       | 1  |
| A II/1                          | 6.3   | Boats equipment   | 1  |
| A II/2                          | 6.4   | Rowing and Sailing Boats  | 2  |
|                                 | 6.4.1 | Rowing techniques   | .5 |
|                                 | 6.4.2 | Rowing orders   | .5 |
|                                 | 6.4.3 | Mast and appliance. Sail types  | .5 |
|                                 | 6.4.4 | Principles of government and maneuver of sailing vessels                | .5 |
|                                 | 6.5   | Fibre ropes: definition and nomenclature                                | 1  |
|                                 | 6.6   | Wire ropes: definition. Plating, lubrication, use, storage and handling | 1  |
|                                 | 6.7   | Practical work (knots)  | 6  |
|                                 |       |   |    |
|                                 |       |   | 60 |
| <b>Teaching methods:</b>        |       |   |    |
|                                 |       |   |    |
| <b>Assessment methods:</b>      |       |   |    |
|                                 |       |   |    |
| <b>Language of instruction:</b> |       | Portuguese / English  |    |

| Bachelor of Science in Deck and Bridge Operations  |                               |   |                      |    |
|--|-------------------------------|---|----------------------|----|
| Description of individual course unit  |                               |   |                      |    |
| Course title:  | Navigation I                  |   |                      |    |
| Field:   | Navigation                    |   |                      |    |
| Course code:   | 3001                          | Type of course:   | Mandatory            |    |
| From:  | 2011 / 2012                   |   |                      |    |
| Year of study:   | 1st                           | Semester:   | 1st                  |    |
| ECTS:  | 6                             | Hours/week:   | 5 hours (2 T + 3 P)  |    |
| Name of lecturer:  | Carlos Alberto Sousa Coutinho |   |                      |    |
| Prerequisites:   | No                            |   |                      |    |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                               |   |                      |    |
| This syllabus aims at covering the required by STCW as Navigation is regarded, namely: Terrestrial Navigation; navigational charts, compasses, lines of position and positions, courses, practice on charts, information on charts and nautical publications, tides and ship's logs. |                               |   |                      |    |
| Course contents:   |                               |   |                      |    |
| STCW   | Item                          | Program   | Hours                |    |
| Tab. A - II/1  | 1.                            | Introduction to Navigation                              | 10                   |    |
|  | 1.1.                          | Conception, types, methodes and navigation systems.     | 1                    |    |
|  | 1.2.                          | Earth landscape. Elipsoide e geóid.                     | 3                    |    |
|  | 1.3.                          | Astronomic and geodesic cordinales. Vertical deviation. | 3                    |    |
|  | 1.4.                          | Coast survey. levelingsN. Datum                         | 2                    |    |
|  | 1.5.                          | World geodesic system.                                  | 1                    |    |
|  | 2.                            | Spherical Geometry                                      | 12                   |    |
|  | 2.1.                          | The circle in the sphere.                               | 2                    |    |
|  | 2.2.                          | Geographic coordinates.                                 | 4                    |    |
|  | 2.3.                          | Spherical distances.                                    | 4                    |    |
|  | 2.4.                          | Nautical miles.   | 2                    |    |
|  | 3.                            | Direcção, Distância e Velocidade no Mar                 | 20                   |    |
|  | 3.1.                          | Terrestrial magnetism.                                  | 4                    |    |
|  | 3.2.                          | Magnetic compass.                                       | 6                    |    |
|  | 3.3.                          | Gyro compass.   | 6                    |    |
|  | 3.4.                          | Revolutions table.                                      | 4                    |    |
|  | Tab. A II/I                   | 4.  | Courses              | 16 |
|  |                               | 4.1.  | Rhumb line.          | 10 |
|  |                               | 4.2.  | Great circle.        | 6  |
|  |                               | 5.  | Coastwise navigation | 15 |

|  |      |  |    |
|--|------|--|----|
|  | 5.1. | Position line.   | 4  |
|  | 5.2. | direction, angle, distance and bathymetrics. Drawing on the chart. | 6  |
|  | 5.3. | To fix the position.   | 5  |
|  |      | Total  | 75 |

#### Recommended reading:

Teacher's notes.

Manual de Navegação, 4ª edição, Instituto Hidrográfico;

Admiralty Manual of Navigation, vol. 1, The Stationery Office;

Navigation Advanced for Mates/Masters, Seamanship International;

Navegação: A Ciência e a Arte, Altineu Pires Miguens;

Bridge Procedures Guide, 4ª Edition 2007, International Chamber of Shipping;

Curso de Compensador de Agujas Nauticas, COMME;

Compensación de la Aguja Náutica, Ricardo Leicea;

Derrotas, Escola Naval;

Astronomia y Navegacion 3ª Edición, Tomo I, Tomo II, Tomo III, Moreu Curbera;

Problemas de Navegacion, Moreu Curbera;

Astronomia Nautica Y Navegacion, Moreu Curbera.

#### Teaching methods:

#### Assessment methods:

1 – Elements of assessment

1.1 - The evaluation of these components is done by holding a written test or final examination through written test. Whether the test frequency or the final exams are structurally composed of theoretical and practical questions and will last 2.5 to 3 hours.

1.2 - Works. Students will do individual work, and always considered a good contribution to teaching, other minor works corresponding to the specific matter. The work, follows specific rules, will be distributed at the beginning of the semester and will deliver the closing date of the last day of classes or other resulting agreement between the teacher and each of the working groups.

2 – Final exam will be exempt from the students meet all the following conditions:

- There have been rated less than 8 (eight) in the test frequency.
- Have submitted work within the established deadlines.
- Have positive information on the job.
- Have an average frequency equal to or greater than 10 (ten).

3 – Final standings

The final grade is the weighted average of the ratings of the elements of evaluation, considering, evaluating test 60%. Work and continuous assessment 40%.

#### Language of instruction:

Portuguese / English



| Bachelor of Science in Deck and Bridge Operations   |                                    |                 |           |
|---|------------------------------------|-----------------|-----------|
| Description of individual course unit   |                                    |                 |           |
| Course title:   | English                            |                 |           |
| Field:  | Language/communication             |                 |           |
| Course code:  | 3002                               | Type of course: | Mandatory |
| From:   | 2011/2012                          |                 |           |
| Year of study:  | 1st                                | Semester:       | 1st       |
| ECTS:   | 4                                  | Hours/week:     | 3         |
| Name of lecturer:   | Melany Ruth Alves Martins Saramago |                 |           |
| Prerequisites:  | Basic English language             |                 |           |
| Objective of the course (expected learning outcomes and competences to be acquired):  |                                    |                 |           |
| The objective of this course is to prepare students for developing the full knowledge, understanding and proficiency in English required by the STCW Code. To give students wide-ranging opportunities to practise communicating in English both written and oral for both maritime and general purposes at elementary to lower intermediate language level.  |                                    |                 |           |
| Course contents:  |                                    |                 |           |
| While getting acquainted with a number of technical/maritime vocabulary areas (dealing with the subjects listed below), it is also the purpose of this first Course to review the most important Grammar structures of the English language, namely:  |                                    |                 |           |
| <ul style="list-style-type: none"><li>• Nouns, verbs, adjectives, adverbs, pronouns, propositions and conjunctions.</li><li>• Verb Tenses; negatives and questions;</li><li>• Non-regular and modal verbs;</li><li>• Reported speech,</li><li>• Prepositions and phrasal verbs;</li><li>• Comparative, superlative and idiomatic comparisons;</li><li>• Passive Voice.</li><li>• Reading comprehension</li><li>• Speaking – role playing professional and personal settings</li><li>• Listening – different types if English accents</li><li>• Writing – report writing, translation and interpretation</li></ul> |                                    |                 |           |
| The technical maritime vocabulary areas to be learnt are the following:   |                                    |                 |           |
| <ul style="list-style-type: none"><li>• Different activities in the maritime sector;</li><li>• The types of ships - types of cargoes, stevedoring, unloading and loading; operations, and terminology of the different parts of the ship;</li><li>• Organisation and responsibilities on board a ship;</li><li>• Maritime terminology and vocabulary;</li><li>• Dimensions of the ship, GRT, NRT, GT, etc;</li><li>• Navigation concepts;</li></ul>   |                                    |                 |           |
| Regulations and conventions on security and the safety of life at sea.  |                                    |                 |           |
| Recommended reading:  |                                    |                 |           |
| Improve Your Written English- Fifth Edition, Maion Field  |                                    |                 |           |
| Basic English Grammar – Third Edition, Betty Schramper Azar and Stacy A. Hagen  |                                    |                 |           |
| Fundamental of English Grammar – Third Edition, Betty Schramper Azar  |                                    |                 |           |
| Improve your written English – Fifth Edition, Marion Field  |                                    |                 |           |
| Elements of Shipping – Eighth Edition, Alan E. Branch   |                                    |                 |           |
| English for Maritime Studies – Second Edition, T N Blakey   |                                    |                 |           |
| Notes and exercises, Melany Martins 2010, Escola Superior Náutica Infante D. Henrique   |                                    |                 |           |
| Teaching methods:   |                                    |                 |           |
| The teaching methodology includes theoretical-practical lectures. In the lectures the students will be given detailed explanations about the topics which will then be applied in practical examples and exercises. It is also expected and important that the students prepare themselves by self-studying and doing required assignments.   |                                    |                 |           |
| Assessment methods:   |                                    |                 |           |
| Assessments consists of the following:  |                                    |                 |           |
| Three tests – one in the beginning of the semester, one at mid-semester and one at the end of the   |                                    |                 |           |

|   |         |
|---|---------|
| semester. Minimum score: 8 with an average 10 or >.   |         |
| Students can opt for only taking the final exam at the end of the semester. Minimum score 10. |         |
| Language of instruction:  | English |

| Bachelor of Science in Deck and Bridge Operations                                    |   |   |                    |
|--|---|---|--------------------|
| Description of individual course unit  |   |   |                    |
| Course title:  | Ship Electricity and Electronics        |   |                    |
| Field:   | Technologies and Marine Loading Systems |   |                    |
| Course code:   | 3003                                    | Type of course:   | Mandatory          |
| From:  | 2011/2012                               |   |                    |
| Year of study:   | 1st                                     | Semester:   | 1st                |
| ECTS:  | 3.5                                     | Hours/week:   | 30 Hours - 2h/Week |
| Name of lecturer:  | Abel Simões                             |   |                    |
| Prerequisites:   |   |   |                    |
| Objective of the course (expected learning outcomes and competences to be acquired): |   |   |                    |
|  |   |   |                    |
| Course contents:   |   |   |                    |
| STCW   | Item                                    | Program   | Hours              |
|  | 1                                       | Basic concepts of electricity   | 2                  |
|  |   | Production of electric<br>Electricity accumulators<br>Static Electricity<br>Dynamic electricity   |                    |
|  | 2                                       | Conductors and insulators   | 2                  |
|  |   | Resistivity and resistance<br>Conductors and insulators   |                    |
|  | 3                                       | Electrical devices, measurements and associations   | 2                  |
|  |   | Coils / Inductors. Parallel and series combination<br>Resistances - series and parallel combination<br>Condensers - parallel and series combination |                    |
|  | 4                                       | Electric current characterization   | 2                  |
|  |   | Direct current<br>AC single phase<br>AC polyphase   |                    |
|  | 5                                       | Fundamental electrical laws and applications  | 2                  |
|  |   | Ohm's Law<br>Power and energy<br>Joule effect and its applications  |                    |
|  | 6                                       | Electric circuits analysis  | 4                  |
|  |   | Electric current,<br>Voltage and<br>Electrical power  |                    |
|  | 7                                       | Magnetism and Electromagnetism  | 2                  |
|  |   | Magnet, magnetism and its applications<br>Magnetic Laws and circuits<br>Electromagnetism Laws and applications                                      |                    |
|  | 8                                       | Electric transformers and inverters   | 1                  |
|  |   | Characteristics of transformers<br>Features of the inverters  |                    |
|  | 9                                       | Control devices and protection  | 2                  |
|  |   | Control devices<br>Measuring devices<br>Protective Devices  |                    |
|  | 10                                      | Electric Motors and Generators  | 2                  |
|  |   | DC motors and generators<br>AC motors and generators  |                    |

|   |    |  |    |
|---|----|--|----|
|   | 11 | Introduction to electronics  | 2  |
|   |    | Diodes and Rectifiers<br>Power Supply<br>Other components and electronic devices                         |    |
|   | 12 | Wiring schematics Diagrams   | 3  |
|   |    | Symbols and fixtures<br>Reading and interpreting wiring schematics diagrams                              |    |
|   | 13 | Ship's electrical and electronic   | 2  |
|   |    | Electric power systems<br>Lighting systems and safety<br>Automated systems and control<br>Energy balance |    |
|   | 14 | Maintenance of electric equipment  | 2  |
|   |    | Types of equipment maintenance<br>Fault detection and basic repair                                       |    |
| Total   |    |  | 30 |
| <b>Recommended reading:</b>   |    |  |    |
| <p>Electronic components and technology, Stephen Sangwine<br/> Basic Engineering Circuit Analysis, J. D. Irwin, Wiley Ed., 2002<br/> Microelectrónica, 1992]", McGraw-Hill, 2ª ed, 1987<br/> Syed A. Nasar, "Electric Energy systems", Editora Prentice-Hall.<br/> Regras Técnicas das Instalações de Baixa Tensão, Imprensa Nacional- Casa da Moeda.<br/> Instalações Elétricas de Embarcações, DL 379/80.<br/> Normas IEC, Lloyds, Veritas, Atex aplicáveis.<br/> Notes of lectures and presentations</p> |    |  |    |
| <b>Teaching methods:</b>  |    |  |    |
| <p>The teaching will be done through theory and practical. The theoretical component is intended to introduce the fundamental concepts, the theoretical basis of the materials and work motivation of the pupils. The practical component is intended to solve problems and review of typical practical situations. Students are encouraged to read several technical publications on topics of the program and comment on the matters set out in the classroom.</p>  |    |  |    |
| <b>Assessment methods:</b>  |    |  |    |
| <p>Continuous assessment<br/> Practical work (25%) and a test at the end of the semester (75%)<br/> Minimum grade - 10 points<br/> Evaluation by exam (unlimited access)<br/> Minimum grade - 10 points</p>   |    |  |    |
| <b>Language of instruction:</b>   |    | Portuguese / English   |    |

| Bachelor of Science in Deck and Bridge Operations  |   |                       |                 |
|--|---|-----------------------|-----------------|
| Description of individual course unit  |   |                       |                 |
| Course title:  | Mathematical Analysis I                           |                       |                 |
| Field:   | Basic Science                                     |                       |                 |
| Course code:   | 3004  | Type of course:       | Mandatory       |
| From:  | 2011/2012   |                       |                 |
| Year of study:   | 1 <sup>st</sup>                                   | Semester:             | 1 <sup>st</sup> |
| ECTS:  | 6,0   | Hours/ Type (T/P/TP): | 5h / TP         |
| Name of lecturer:  | Luís António de Lemos Ramalho de Azevedo Coutinho |                       |                 |
| Prerequisites:   |   |                       |                 |
| Objective of the course (expected learning outcomes and competences to be acquired):   |   |                       |                 |
| To give the students the concepts, the techniques and the suitable reasoning in the Mathematical Analysis area, with special incidence in the differential and integral calculus in R, to prepare them to develop the necessary capabilities to construct mathematical models with one variable to simulate real case studies in the management area and so that they can evolve for the differential and integral calculus in R <sup>2</sup> .  |   |                       |                 |
| Course contents:   |   |                       |                 |
| <div>1. Sequences and series (15 hours)<div>1.1. Sequences. General notions. Limits and convergence.</div>1.2. Numerical series. Examples. Convergence criteria of a series. Power and function series. Convergence radius</div> <div>2. Functions of real variable (25 hours)<div>2.1. Domain of a function. Limit and Continuity definitions</div>2.2. Differential Calculus in R. Derivatives and their applications. Determination of minima and maxima. Graphic representation of functions<div>2.3 Theorems of Rolle, Lagrange and Cauchy. Rule Cauchy</div>2.4 Fórmula de Taylor e de Mc-Laurin. Aproximações de valores de funções por polinómios de Taylor. Fórmula de resto, série de Taylor e de Mc-Laurin e funções analíticas</div> <div>3. Integral calculus (35 hours)<div>3.1. Primitives</div>3.2. Integral calculus and applications<div>3.3. Improper integrals</div></div>   |   |                       |                 |
| Recommended reading:   |   |                       |                 |
| <div><div>· Cunha, Maria Elisa. "Apontamentos Análise Matemática I". Associação Estudantes ENIDH</div><div>· Cruz-Filipe, Luís; Engrácia, Patrícia. "Análise Matemática I"</div><div>· Anton, Howard; Bivens, Irl; Davis, Stephen. "Calculus", 8<sup>th</sup> Edition. John Wiley &amp; Sons, Inc. ISBN 0-471-48273-0.</div><div>· Larson, Ron; Hostler, Robert P.; Edwards, Bruce H.. "Cálculo", Vol. I, 8.<sup>a</sup> Edição. Hill Interamericana do Brasil, Lda. ISBN: 85-86804-56-8</div><div>· Stewart, James. "Cálculo", Vol. I, 5<sup>a</sup> Edição. Tradução de António Carlos Moretti e António Carlos Gilli Martins. Austrália: Cengage Learning. ISBN 85-221-0479-4</div><div>· Spivak, Michael. "Calculus", 3<sup>rd</sup> Edition. Cambridge University Press. ISBN:978-0-521-86744-3</div><div>· Harshbarger, Ronald; Reynolds, James. "Matemática Aplicada: Administração, Economia e Ciências Sociais e Biológicas", 7<sup>a</sup> Edição. Tradução de Ariovaldo Griesi e Oscar Kenjiro Asakura. McGraw-Hill: São Paulo. ISBN 85-86804-84-3.</div></div> |   |                       |                 |
| Teaching methods:  |   |                       |                 |

The teaching methodology includes theoretical-practical lectures. It is also expected that the student prepare themselves by reading each topic in the recommended readings. In the lectures the students will be given brief exposition about the topics, followed by examples and exercises. The students are also given weekly exercises to solve at home.

**Assessment methods:**

The student can choose between two tests during the semester or a final exam. The final score (FS) results from:  $FS = 0.5(ST1 + ST2)$  or  $FS = ES$

**Language of instruction:**

Portuguese / English

| Bachelor of Science in Deck and Bridge Operations  |                       |                 |           |
|--|-----------------------|-----------------|-----------|
| Description of individual course unit  |                       |                 |           |
| Course title:  | Applied Mechanics     |                 |           |
| Field:   | Basic Sciences        |                 |           |
| Course code:   | 3005                  | Type of course: | Mandatory |
| From:  | 2011-2012             |                 |           |
| Year of study:   | 1st                   | Semester:       | 1st       |
| ECTS:  | 4 ECTS                | Hours/week:     | 4 h / TP  |
| Name of lecturer:  | Victor Franco Correia |                 |           |
| Prerequisites:   | Physics               |                 |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                       |                 |           |
| <p>Provide to students the basic concepts of the statics of particles and statics of rigid bodies, as well as fluid hydrostatics.</p> <p>Capacity to understand the involved phenomena and to apply the equilibrium equations of statics in general structures, as a ship or a crane for example.</p> <p>To understand the dynamic equilibrium equations and the corresponding application to the mechanical behavior of engineering systems.</p>  |                       |                 |           |
| Course contents:   |                       |                 |           |
| <b>Vectors</b> <p>Properties of vectors. Norm and unit vector. Direction cosines of a vector. Operations with vectors. Vector product and scalar product of two vectors.</p>   |                       |                 |           |
| <b>Systems of units</b> <p>Standards of fundamental units. Dimensional equations. Conversion of units.</p>   |                       |                 |           |
| <b>Statics of particles</b> <p>Resultant of forces. Action and Reaction. Equilibrium of a particle. Free-body diagrams. Forces in space. Static equilibrium in 3D.</p>   |                       |                 |           |
| <b>Equilibrium of rigid bodies</b> <p>Equivalent forces. Moment of a force about a point. Moment of a couple. Equivalent systems of forces. Free-body diagram. Reactions at supports and connections. Static equilibrium of rigid bodies in two and three dimensions.</p>  |                       |                 |           |
| <b>Centroids and centers of gravity</b> <p>Center of gravity of a two-dimensional body. Centroids of areas. Application to distributed loads. Center of gravity of a three-dimensional body.</p>   |                       |                 |           |
| <b>Friction</b> <p>The Coulomb law of dry friction. Coefficients of friction. Equilibrium of rigid bodies in friction problems.</p>  |                       |                 |           |
| <b>Statics of fluids</b> <p>Pressure in homogeneous incompressible fluids. Absolute and relative pressure. Forces exerted by fluids in submerged bodies. Buoyant forces and the Archimedes principle. Applications to ship stability.</p>  |                       |                 |           |
| <b>Dynamics</b> <p>Kinematics of particles. Rectilinear motion: position, velocity, acceleration. Relative motion. Curvilinear motion: position, velocity, acceleration. Tangential and normal components of acceleration. Kinematics of rigid bodies: translation and rotation about a fixed axis. Introduction to general plane motion.</p> <p>Kinetics of particles: Newton's Second Law. Linear momentum of a particle. Dynamic equilibrium of particles. Principle of impulse and linear momentum. Impulsive forces.</p> <p>Kinetic energy. Conservation of mechanical energy. Angular momentum. Conservation of angular momentum. Gyroscopic movement. Simplified analysis of the gyroscope and main applications.</p> |                       |                 |           |

| Recommended reading:  |                      |
|---|----------------------|
| <p>Vector Mechanics for Engineers – Vol. I – Statics, Vol. II - Dynamics, F. P. Beer, E. R. Johnston Jr. e E. Eisenberg, McGraw-Hill Co.</p> <p>Engineering Mechanics – Statics &amp; Dynamics, J. Meriam, L.G. Kraig, SI version, J. Wiley &amp; Sons.</p> <p>Texts by Prof. Humberto Mateus – ENIDH (<a href="http://www.sites.google.site/hmateus100/">http://www.sites.google.site/hmateus100/</a>).</p> <p>Texts and classroom presentations by Prof. Victor Franco – ENIDH, 2011 (<a href="http://www.enautica.pt/publico/professores/vfranco/indice.html">http://www.enautica.pt/publico/professores/vfranco/indice.html</a>).</p> |                      |
| Teaching methods:   |                      |
| Theoretical and theoretical-practical lectures. Presentations on each topic, followed by numerical and practical examples. Some of these lectures involve experimental demonstration of topics.   |                      |
| Assessment methods:   |                      |
| <p>Two tests during the semester or a Final Exam (NE). Two problems to be solved during the semester (NP).</p> <p>Minimum classification on each test: 7.</p> <p>Final classification (NF) is calculated by <math>NF = 0.85 \times NE + 0.15 \times NP</math> and must be greater or equal than 9.5.</p>  |                      |
| Language of instruction:  | Portuguese / English |



**1<sup>st</sup> year of studies**  
**2<sup>nd</sup> semester**

| Bachelor of Science in Deck and Bridge Operations   |               |   |           |
|---|---------------|---|-----------|
| Description of individual course unit   |               |   |           |
| Course title:   | Seamanship II |   |           |
| Field:  | Safety        |   |           |
| Course code:  | 3006          | Type of course:   | Mandatory |
| From:   |               |   |           |
| Year of study:  | 1st           | Semester:   | 2nd       |
| ECTS:   | 5             | Hours/week:   | 3T + 1P   |
| Name of lecturer:   |               |   |           |
| Prerequisites:  |               |   |           |
| Objective of the course (expected learning outcomes and competences to be acquired):  |               |   |           |
| To provide students with the knowledge level about the ship and its maneuvers, entering into account the elements of evolution and its importance for navigation, without forgetting the Regulations for Preventing Collisions at Sea in accordance with IMO recommendations. |               |   |           |
| Course contents:  |               |   |           |
| STCW  | Item          | Program   | Hours     |
|   | 1             | Ship handling in port, in restricted waters and in open seas  | 20        |
|   | 1.1           | Evolutive elements  |           |
|   | 1.2           | To turn the ship in restricted areas  |           |
|   | 1.3           | Navigation in channels and rivers   |           |
|   | 1.4           | Anchor down and anchor up   |           |
|   | 1.5           | Mooring to buoys  |           |
|   | 1.6           | Mooring and Unmooring   |           |
|   | 1.7           | Towing  |           |
|   | 1.8           | Navigation in bad weather   |           |
| Tabela  | 1.9           | Man-over-board  |           |
| A II/1  | 1.10          | Tropical hurricanes and how to avoid them   |           |
|   | 1.11          | Hull structural failure. Damage control   |           |
|   | 1.12          | Bringing off a stranded vessel. Ship's salvage  |           |
|   | 1.13          | Castaway assistance   |           |
|   | 2.            | International Regulations for Preventing Collisions at Sea  | 15        |
|   | 2.1           | Knowledge of the content, application and meaning of the Regulations, including the Annexes relating to safety of navigation. |           |
|   | 2.2           | Knowledge and content of the IMO recommendations on the principles relating to maritime surveillance, including Appendices    |           |
|   | 3             | International Maritime Buoyage System   | 5         |
|   | 4             | International Code of Signals   | 5         |
|   |               | Transport   | 45        |
|   |               | Practical Seamanship  | 15        |
|   | 1             | Poleame   | 4         |
|   | 1.1           | Designation   |           |
|   | 1.2           | Dead blocks, dead-eyes, stirrups  |           |
|   | 1.3           | Blocks (single, double, treble),snatch blocks   |           |
|   | 1.3.1         | Designation   |           |
|   | 1.3.2         | Shackles, hooks, thimbles, bull's eyes and eyes (rings)   |           |
|   | 2             | Tackle  | 4         |
| Tables  | 2.1           | Designation   |           |

|   |       |  |    |
|---|-------|--|----|
| A II/1  | 2.2   | Nomenclature   |    |
|   | 2.3   | Tackle classification<br>Tackle with single blocks<br>Tackle with double blocks<br>Tackle with treble blocks |    |
|   | 2.4   | Expressions used in the tackle manoeuvre   |    |
|   | 2.5   | Use of the tackles   |    |
|   | 2.5.1 | Designation  |    |
|   | 3     | Cargo Booms  | 4  |
|   | 3.1   | Designation  |    |
|   | 3.2   | Derricks   |    |
|   | 3.2.1 | Contitution and nomenclature   |    |
|   | 3.3   | Capstan bar  |    |
|   | 3.3.1 | Use of straps  |    |
|   | 4.    | Ropes manoeuvre  | 2  |
|   | 5.    | Sea-terms  | 1  |
|   |       |  | 60 |
| <b>Recommended reading:</b>   |       |  |    |
| - Arte Naval Moderna<br>R. Castro e Silva<br>- Arte de Marinheiro<br>Escola de Marinharia da Armada<br>(Navio Escola "SAGRES" – 1964<br>- Marinharia – Volume I<br>Escola Naval<br>José Fernando Ferreira da Costa<br>- The Ashley Book Of Knots<br>Clifford W. Ashle |       |  |    |
| <b>Teaching methods:</b>  |       |  |    |
|   |       |  |    |
| <b>Assessment methods:</b>  |       |  |    |
|   |       |  |    |
| <b>Language of instruction:</b>   |       | Portuguese / English   |    |

| Bachelor of Science in Deck and Bridge Operations  |                               |   |                     |
|--|-------------------------------|---|---------------------|
| Description of individual course unit  |                               |   |                     |
| Course title:  | Navegation II                 |   |                     |
| Field:   | Navigation                    |   |                     |
| Course code:   | 3007                          | Type of course:   | Mandatory           |
| From:  | 2011/2012                     |   |                     |
| Year of study:   | 1st                           | Semester:   | 2nd                 |
| ECTS:  | 6                             | Hours/week:   | 5 hours (2 T + 3 P) |
| Name of lecturer:  | Carlos Alberto Sousa Coutinho |   |                     |
| Prerequisites:   | No                            |   |                     |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                               |   |                     |
| This silabus aims at covering the required by STCW as Navigation is regarded, namely: Terrestrial Navigation; navigational charts, compasses, lines of position and positions, courses, practice on charts, information on charts and nautical publications, rhumb line and great circles and bridge procedures for officers of the watch. |                               |   |                     |
| Course contents:   |                               |   |                     |
| STCW   | Item                          | Program   | Hours               |
| Tab. A - II/1  | 1.                            | Spherical trigonometry  | 8                   |
|  | 2.                            | Map drawing Projections   | 15                  |
|  | 2.1.                          | Projections classification  | 2                   |
|  | 2.2.                          | Mercator projection   | 7                   |
|  | 2.3.                          | Gnómonic projection   | 4                   |
|  | 2.4.                          | other projections for the quick nautical use                      | 2                   |
|  | 3.                            | Courses   | 8                   |
|  | 3.1.                          | Great-circle course   | 6                   |
|  | 3.2.                          | Composit-sailing  | 2                   |
|  | 4.                            | Charts and Nautical Publications                                  | 16                  |
|  | 4.1.                          | Simbols and cartografpic abreviatures                             | 4                   |
|  | 4.2                           | Charts Datum  | 2                   |
|  | 4.3                           | Warnings to mariners  | 4                   |
|  | 4.4                           | Charts Caalogue   | 2                   |
|  | 4.5                           | Roteiros  | 2                   |
|  | 4.6                           | Outras publicações  | 2                   |
|  | 5.                            | Coastwise Navigation  | 15                  |
|  | 5.1.                          | Direction, angle, distance and batimetrics. Plotting on the chart | 10                  |
|  | 5.2.                          | Fixing determination  | 5                   |
|  | 6.                            | Procedures Guide for the Officer of the watch on the bridge       | 5                   |
|  | 6.1                           | Bridge Organisation   | 1                   |
|  | 6.2                           | Officer of the watch duties                                       | 2                   |
|  | 6.3                           | Functioning and maintenace of the Navigation Equipment            | 2                   |
|  | 7.                            | Routine and Bridge Emergency Survey                               | 2                   |
|  | 7.1                           | Routine   | 1                   |
|  | 7.2                           | Emergency   | 1                   |
|  |                               | Total   | 75                  |

|  |                      |
|--|----------------------|
| <b>Recommended reading:</b>  |                      |
| <p>Teacher's notes.</p> <p>Manual de Navegação, 4ª edição, Instituto Hidrográfico;</p> <p>Admiralty Manual of Navigation, vol. 1, The Stationery Office;</p> <p>Navigation Advanced for Mates/Masters, Seamanship International;</p> <p>Navegação: A Ciência e a Arte, Altineu Pires Miguens;</p> <p>Bridge Procedures Guide, 4ª Edition 2007, International Chamber of Shipping;</p> <p>Curso de Compensador de Agujas Nauticas, COMME;</p> <p>Compesación de la Aguja Náutica, Ricardo Leicea;</p> <p>Derrotas, Escola Naval;</p> <p>Astronomia y Navegacion 3ª Edición, Tomo I, Tomo II, Tomo III, Moreu Curbera;</p> <p>Problemas de Navegacion, Moreu Curbera;</p> <p>Astronomia Nautica Y Navegacion, Moreu Curbera.</p>   |                      |
| <b>Teaching methods:</b>   |                      |
|  |                      |
| <b>Assessment methods:</b>   |                      |
| <p>1 – Elements of assessment</p> <p>1.1 - The evaluation of these components is done by holding a written test or final examination through written test. Whether the test frequency or the final exams are structurally composed of theoretical and practical questions and will last 2.5 to 3 hours.</p> <p>1.2 - Works. Students will do individual work, and always considered a good contribution to teaching, other minor works corresponding to the specific matter. The work, follows specific rules, will be distributed at the beginning of the semester and will deliver the closing date of the last day of classes or other resulting agreement between the teacher and each of the working groups.</p> <p>2 – Final exam will be exempt from the students meet all the following conditions:</p> <ul style="list-style-type: none"> <li>- There have been rated less than 8 (eight) in the test frequency.</li> <li>- Have submitted work within the established deadlines.</li> <li>- Have positive information on the job.</li> <li>- Have an average frequency equal to or greater than 10 (ten).</li> </ul> <p>3 – Final standings</p> <p>The final grade is the weighted average of the ratings of the elements of evaluation, considering, evaluating test 60%. Work and continuous assessment 40%.</p> |                      |
| <b>Language of instruction:</b>  | Portuguese / English |

| Bachelor of Science in Deck and Bridge Operations   |                             |                                       |           |
|---|-----------------------------|---------------------------------------|-----------|
| Description of individual course unit   |                             |                                       |           |
| Course title:   | Nautical English I          |                                       |           |
| Field:  |                             |                                       |           |
| Course code:  | 3008                        | Type of course:                       | Mandatory |
| From:   | 2011/2012                   |                                       |           |
| Year of study:  | 1st                         | Semester:                             | 2nd       |
| ECTS:   | 3,5                         | Hours/week:                           | 3         |
| Name of lecturer:   | Elisa Semedo de Sá Bandeira |                                       |           |
| Prerequisites:  |                             |                                       |           |
| Objective of the course (expected learning outcomes and competences to be acquired):  |                             |                                       |           |
| <p>The student should develop the necessary skills to perform professional tasks in English namely as a Merchan Marine Deck Officer, in an independent way , with no difficulties and according to the following definitions.</p> <p>The present Course Unit is part of complete learning of approximately 195 hours, comprising the course units English, Maitime English I, Maritime English II and Maritime English III. Globally, this learning must be according to what is stipulated in STCW Convention, Table A-II/1, concerning the minimum standards for an Officer of the Watch on the Bridge of ships of 500 GT and above.</p> <p>It is also necessary to define the level of ESL (English as a Second Language) within the international framework , by following what is defined in the CEFML. For the present unit, Maritime English I, the student should be able to develop written and oral skills equivalent to the level B1 (Independent Speaker - Pre-Intermediate), established by the CEFML (Council of Europe Framework for Modern Languagesl) and through the foreign language learning model integrated in a specific context ((CLIL- Content Language Integrated Learning)).</p> |                             |                                       |           |
| Course contents:  |                             |                                       |           |
| STCW  | Item                        | Program                               | Hours     |
| Table A-II/1  | 1.                          | Merchant Marine industry              | 6         |
|   | 1.1.                        | Players in shipping market            |           |
|   | 1.2.                        | Ship operation .liners and tramping   |           |
|   | 1.3.                        | Charter-parties                       |           |
|   | 1.4.                        | Ports and port operations             |           |
|   | 2.                          | Types of ships and cargoes            | 9         |
|   | 2.1.                        | Cargo ships                           |           |
|   | 2.2.                        | Passenger ships                       |           |
|   | 2.3.                        | Special duty vessels                  |           |
|   | 3.                          | Shipbuilding                          | 9         |
|   | 3.1.                        | Naval architecture and ship's project |           |
|   | 3.2.                        | Shiyards                              |           |
|   | 3.3.                        | The diferente phases of construction  |           |
|   | 4.                          | The ship                              | 9         |
|   | 4.1.                        | Ship's characteristics                |           |
|   | 4.2.                        | The diferente parts of the ship       |           |
|   | 4.3.                        | Ship's dimensions; tonnage            |           |
|   | 4.4.                        | Positions on board a ship             |           |
|   | 4.5.                        | Positions in relation to the ship     |           |
|   | 4.6.                        | Shipborne systems                     |           |
|   | 5.                          | Organization on board a ship          | 6         |
|   | 5.1.                        | Ship's departments and their role     |           |
|   | 5.2.                        | Ranking and responsibilities          |           |
|   | 6.                          | Assessment (written and oral)         | 6         |

|  |         |    |
|--|---------|----|
| TOTAL  |         | 45 |
| <b>Recommended reading:</b>  |         |    |
| <b>Recommended reading:</b><br>Handbook provided by the lecturer<br>Apontamentos, Prof. Magano e Silva<br>"English for Maritime Studies", T.N. Blakey<br>Supplementary reading:<br>"International Maritime Language Programme", Van Kluijven |         |    |
| <b>Teaching methods:</b>   |         |    |
| Expository method<br>Practical work<br>Role-playing  |         |    |
| <b>Assessment methods:</b>   |         |    |
| Theoretical and practical  |         |    |
| <b>Language of instruction:</b>  | English |    |

| Bachelor of Science in Deck and Bridge Operations  |                                       |                 |           |
|--|---------------------------------------|-----------------|-----------|
| Description of individual course unit  |                                       |                 |           |
| Course title:  | Marine Machinery                      |                 |           |
| Field:   | Marine Technology and Loading Systems |                 |           |
| Course code:   | 3009                                  | Type of course: | Mandatory |
| From:  | 2011/2012                             |                 |           |
| Year of study:   | 1st                                   | Semester:       | 2nd       |
| ECTS:  | 3,5                                   | Hours/week:     | 2/TP      |
| Name of lecturer:  | João Parente                          |                 |           |
| Prerequisites:   | none                                  |                 |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                                       |                 |           |
| Provide students with the theoretical concepts to understand the operating principles of common machinery on board ships. This should promote the correct use of equipments as well as knowledge of their capabilities and limitations.  |                                       |                 |           |
| Course contents:   |                                       |                 |           |
| <b>1. Propulsion systems</b><br>Introduction to thermal engines. Concepts of energy, work, heat and power.<br>Gas turbine propulsion: operating principle and typical applications.<br>Steam turbine propulsion: steam cycle and its components; types of boilers and turbines.<br>Internal combustion engines propulsion: 2 and 4 stroke cycles; diesel engine main components and auxiliary equipment.<br>Diesel-electric propulsion: main components, architecture and applications.<br>Couplings, reduction gears, shafting, bearings. Their functions, requirements and typical applications. |                                       |                 |           |
| <b>2. Pumps and pumping systems</b><br>Dynamic pumps: radial, axial and mixed- flow types. Typical applications.<br>Positive displacement pumps: constant and variable flow. Typical applications.<br>Flow rate and pressure drop of a pump. Flow speed and delivery head.<br>Pump efficiency. Driving power required.   |                                       |                 |           |
| <b>3. Ship's auxiliary machinery and systems. Deck machinery.</b><br>Emergency systems.<br>Air compressors.<br>Hold covers, watertight doors and ramps. Mooring and anchoring winches.   |                                       |                 |           |
| <b>4. Fuel and lubricating oils.</b><br>Safety boarding. Effects on the environment.   |                                       |                 |           |
| <b>5. Ship's maneuvering system. Steering gear.</b><br>Electrical and hydraulic driving. Mechanical, hydraulic and electric components.<br>Control, protection and safety systems.   |                                       |                 |           |
| <b>6. Refrigeration. Ventilation.</b><br>Refrigeration plants operating principle. Main components and its functions. Compressors: types and applications. Refrigerants. Control and safety systems.<br>Ventilation systems.   |                                       |                 |           |
| Recommended reading:   |                                       |                 |           |
| Máquinas Marítimas, suport notes, Jorge Martins.<br>Documentation used by teachers in the classes.   |                                       |                 |           |
| Teaching methods:  |                                       |                 |           |
| The teaching will be conducted through lectures. The classes will work with brief presentations on each theme, accompanied by practical examples that allow students to consolidate the concepts learned. Where applicable, components will be shown to students using the ENIDH equipment.  |                                       |                 |           |
| Assessment methods:  |                                       |                 |           |
| Continuous assessment: continuous assessment approval in the discipline will be achieved by two tests according to the expression: $0.5 T1 + 0.5 T2 \geq 10$ ; $T1 \geq 7$ and $T2 \geq 7$ .<br>Examination: approval if $E \geq 10$ .   |                                       |                 |           |
| Language of instruction:   | Portuquese / English.                 |                 |           |



| Bachelor of Science in Deck and Bridge Operations  |                      |                 |           |
|--|----------------------|-----------------|-----------|
| Description of individual course unit  |                      |                 |           |
| Course title:  | Linear Algebra       |                 |           |
| Field:   | Basic Science        |                 |           |
| Course code:   | 3010                 | Type of course: | Mandatory |
| From:  | 2011/2012            |                 |           |
| Year of study:   | 1st                  | Semester:       | 2nd       |
| ECTS:  | 5                    | Hours/week:     | 4         |
| Name of lecturer:  | Luís Cruz-Filipe     |                 |           |
| Prerequisites:   |                      |                 |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                      |                 |           |
| Understanding and applying basic concepts of Linear Algebra necessary to other courses. Solving systems of linear equations by means of Gauss's Elimination Method, as well as problems leading to such systems. Mastering algebraic operations on matrices and calculus of determinants. Working with linear spaces and linear transformations and applying the lerned techniques to problem solving in Engineering. Solving optimization and aproximation problems by means of computing orthogonal projections.   |                      |                 |           |
| Course contents:   |                      |                 |           |
| Systems of linear equations: Gauss's method, solving and classification of systems and their geometrical interpretation. Matrix calculus: algebraic operations and applications to the resolution of systems. Inversion, determinants and properties.<br>Linear spaces: vector spaces as generalizations of $\mathbb{R}^n$ . Examples: matrix spaces and function spaces. Algebraic properties. Linear subspaces. Linear dependence and independence, linear space generated by a set of vectors, base, dimension, coordinates and choice of base. Spaces related to a matrix: lines, columns, kernel. Relationship to the resolution of systems of linear equations. Euclidean spaces: inner product, norm, orthogonality, Gram—Schmidt method and applications.<br>Linear transformations: definition, properties, examples, algebraic operations and composition. Matrix representation. Properties of a transformation vs properties of its representations. Choice of base. Eigenvalues, eigenvectors and diagonalization.  |                      |                 |           |
| Recommended reading:   |                      |                 |           |
| Apontamentos de Álgebra Linear. Luís Cruz-Filipe & Patrícia Engrácia. Escola Superior Náutica Infante D. Henrique, September 2010.<br>Elementary Linear Algebra. H. Anton & C. Rorres, John Wiley, 2000.<br>Algebra Linear. Luis T. Magalhães. Texto Editora, 1996.  |                      |                 |           |
| Teaching methods:  |                      |                 |           |
| Classes include a brief theoretical exposition of each topic, practical examples of applicability and exercises. Students are given weekly exercise lists for home practice.   |                      |                 |           |
| Assessment methods:  |                      |                 |           |
| 1. Continuous assessment, including:<br>(a) 12 assessment assignments, to be delivered weekly, allotted 10 minutes each, graded on a scale of 0 to 20, of which the arithmetic average of the 10 best is computed (ST). Each undelivered assignment is graded as 0 (zero).<br>(b) Final global test, allotted two hours, consisting of three question groups of which the student must choose two to answer, graded on a scale of 0 to 20 (FT).<br>(c) The student will pass the course whenever $FT \geq 8.0$ and $0.3 \cdot ST + 0.7 \cdot FT \geq 9.5$ simultaneously, the final grade being then computed as $(0.3 \cdot ST + 0.7 \cdot FT)$ and rounded to the nearest integer.<br>(d) Students that deliver three assignments are considered to have chosen the continuous assessment method, and will not be allowed to change their choice before the semester's end.<br>2. Final exam, allotted three hours, containing three question groups and graded on a scale of 0 to 20 (E). The student will pass the course whenever $E \geq 9.5$ , the final grade being then computed as E rounded to the nearest integer. |                      |                 |           |
| Language of instruction:   | Portuquese / English |                 |           |

| Bachelor of Science in Deck and Bridge Operations  |                        |                       |                 |
|--|------------------------|-----------------------|-----------------|
| Description of individual course unit  |                        |                       |                 |
| Course title:  | Mechanics of Materials |                       |                 |
| Field:   | Basic Science          |                       |                 |
| Course code:   | 3011                   | Type of course:       | Mandatory       |
| From:  |                        |                       |                 |
| Year of study:   | 1 <sup>st</sup>        | Semester:             | 2 <sup>nd</sup> |
| ECTS:  | 3,5                    | Hours/ Type (T/P/TP): | 3               |
| Name of lecturer:  | Pedro Silveira         |                       |                 |
| Prerequisites:   |                        |                       |                 |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                        |                       |                 |
| The student shall be able to describe the processes of deformation of structural members subjected to tension, compression, shearing, bending and torsion. The student shall also be able to design simple structures subjected to different types of loads.   |                        |                       |                 |
| Course contents:   |                        |                       |                 |
| Geometrical characteristics of sections: <ul style="list-style-type: none"><li>Centroids.</li><li>Area moment of inertia, product of inertia. Polar moment of inertia.</li><li>Translation and rotation of axes.</li><li>Principal axes.</li><li>Composite bodies.</li></ul> Strength of materials: <ul style="list-style-type: none"><li>Isotropic materials.</li><li>Types of loads.</li><li>Method of sections.</li><li>Stress and strain.</li><li>Tensile test.</li></ul> Tension, compression, shearing: <ul style="list-style-type: none"><li>Normal and shear stresses.</li><li>Deformation of members subjected to axial loading or temperature changes.</li><li>Poisson's ratio.</li><li>Generalized Hooke's law.</li><li>Axial forces diagram. Nodal displacement.</li><li>Shear stress. Shear modulus.</li><li>Bearing stresses.</li><li>Hyperstatic systems.</li><li>Plane stress. Thin-walled pressure vessels.</li></ul> Torsion of shafts: <ul style="list-style-type: none"><li>Solid and hollow circular shafts.</li><li>Torsional moments diagram. Stresses. Angle of twist.</li><li>Shaft design criteria.</li></ul> Plane bending of beams: <ul style="list-style-type: none"><li>Shear and bending moments.</li><li>Equations and diagrams. Method of sums and method of integrals.</li><li>Bending induced stresses.</li></ul> |                        |                       |                 |

|  |                       |
|--|-----------------------|
| <ul style="list-style-type: none"> <li>• Deflection and slope. Deformation of beams.</li> <li>• Equation of the elastic curve.</li> <li>• Maximum deflection.</li> </ul> <p>Stability of structures:</p> <ul style="list-style-type: none"> <li>• Critical compressive load.</li> <li>• Influence of end conditions.</li> <li>• Euler's formula.</li> </ul>  |                       |
| <b>Recommended reading:</b>  |                       |
| <ul style="list-style-type: none"> <li>• Mecânica Vetorial para Engenheiros – Estática, 5ª edição. Ferdinand P. Beer, E. Russell Johnston, Jr.. McGraw Hill.</li> <li>• Mechanics of Materials, Fifth Edition. Ferdinand P. Beer, E. Russell Johnston, Jr., John T. DeWolf, David F. Mazurek. McGraw Hill.</li> <li>• Strength of Materials, Second Edition. S. Timoshenko. D. Van Nostrand Company, Inc.</li> <li>• Mechanics of Materials, Second Edition. Msdhukar Vable, Michigan Technological University. Available at <a href="http://www.me.mtu.edu/~mavable/MoM2nd">http://www.me.mtu.edu/~mavable/MoM2nd</a>.</li> </ul> |                       |
| <b>Teaching methods:</b>   |                       |
| Lectures.  |                       |
| Problem solving classes.   |                       |
| <b>Assessment methods:</b>   |                       |
| <ul style="list-style-type: none"> <li>• 4 assignments.</li> <li>• 2 tests.</li> </ul>   |                       |
| <b>Language of instruction:</b>  | Portuguese / English. |

| Bachelor of Science in Deck and Bridge Operations |                   |  |           |
|---|-------------------|--|-----------|
| Description of individual course unit             |                   |  |           |
| Course title:                                     | Applied Chemistry |  |           |
| Field:  | Maritime Safety   |  |           |
| Course code:                                      | 3012              | Type of course:  | Mandatory |
| From:   | 2011/2012         |  |           |
| Year of study:                                    | 1 <sup>st</sup>   | Semester:  | 2nd       |
| ECTS:   | 6                 | Hours/ Type (T/P/TP):  | 4         |
| Name of lecturer:                                 | Manuela Batista   |  |           |
| Prerequisites:                                    | None              |  |           |
| STCW-2010   | Item              | Program  | Hours     |
| Table   | 06                | Lubrication  |           |
| A II/1  | 07                | Chemical Equilibrium   |           |
|   | 1                 | Revisions: Concepts. Formulas. Stoichiometry. Atom electronic structure.   |           |
|   | 01                | Atom electronic structure.   |           |
|   | 1.0               | General chemistry  |           |
|   | 2.0               | Chemical connections<br>Maritime transport   |           |
|   | 3.0               | Intermolecular Forces  |           |
|   | 3.1               | Electrochemistry and corrosion.  |           |
|   | 4.0               | Organic chemistry. Hydrocarbons. Mineral, vegetable and animal oils.   |           |
|   | 4.1               | Organic chemistry. Hydrocarbons  |           |
|   | 4.2               | Marine pollution   |           |
|   | 5                 | Chemical equilibrium   |           |
|   | 5.1               | Lubricants   |           |
|   | 5.2               | Waters   |           |
|   | 6.0               | Corrosion and Catodic protection.  |           |
|   | 7.0               | Marine Pollution<br>Some parameters of water control; types of marine polluters;<br>Pollution by hydrocarbons<br>Equipments for spilling fight |           |
|   | 8.0               | Corrosion:<br>Energetic inevitability of corrosion effects<br>Corrosion centres and rate of corrosion.<br>Grounds of cathode protection        |           |
|   | 9.0               | Marine Pollution   |           |
|   | 9.2               | Introduction, IMO Concept of pollution. Concepts: ecosystem, food chain, biodegradability, bioaccumulation, eutrofization,etc                  |           |
|   | 9.1               | Alguns parâmetros controlo de uma água. Polluting types, etc   |           |
|   |                   |  | 60        |
| Recommended reading:                              |                   |  |           |
| Teaching methods:                                 |                   |  |           |
| Assessment methods:                               |                   |  |           |
| Language of instruction:                          |                   |  |           |
| Portuguese / English.                             |                   |  |           |

**2<sup>nd</sup> year of studies**

**1<sup>st</sup> semester**

| Bachelor of Science in Deck and Bridge Operations  |                               |   |                |
|--|-------------------------------|---|----------------|
| Description of individual course unit  |                               |   |                |
| Course title:  | Nautical Astronomy            |   |                |
| Field:   | Navigation                    |   |                |
| Course code:   | 3013                          | Type of course:                                   | Mandatory      |
| From:  | 2011/2012                     |   |                |
| Year of study:   | 2nd                           | Semester:   | 1st            |
| ECTS:  | 6                             | Hours/week:                                       | 2 hours (2 TP) |
| Name of lecturer:  | Carlos Alberto Sousa Coutinho |   |                |
| Prerequisites:   | No                            |   |                |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                               |   |                |
| Provide students with knowledge necessary to develop competences for ship positioning determination at sea by the use stars as per sections A-II/1 and A-II/2 of STCW. |                               |   |                |
| Course contents:   |                               |   |                |
| STCW   | Item                          | Program   | Hours          |
| Tab. A - II/1<br>and<br>Tab. A - II/2  |                               |   |                |
|  | 1                             | Reference systems                                 | 12             |
|  | 1.1                           | Fundamental systems of reference                  |                |
|  | 1.2                           | The different systems of astronomical coordinates |                |
|  | 1.3                           | Transformation of Coordinates                     |                |
|  | 2                             | Earth’s movements                                 | 2              |
|  | 2.1                           | Rotation movement                                 |                |
|  | 2.2                           | Translation movement                              |                |
|  | 2.3                           | Precession and notation of the Earth              |                |
|  | 3                             | Basic principles of celestial mechanics           | 4              |
|  | 3.1                           | The problem of two bodies                         |                |
|  | 3.2                           | Laws of Kepler                                    |                |
|  | 3.3                           | Movement equation – problem of 2 bodies           |                |
|  | 4                             | Solar system                                      | 4              |
|  | 4.1                           | Constitution of the solar system                  |                |
|  | 4.2                           | Movements of planets and their orbits             |                |
|  | 4.3                           | Movement of Earth’s translation                   |                |
|  | 4.4                           | Terrestrial orbit. Stations of the year           |                |
|  | 5                             | Relative particularities to some asters           | 2              |
|  | 5.1                           | Sun .   |                |
|  | 5.2                           | Moon.   |                |
|  | 5.3                           | The planets – Venus, Mart, Jupiter and Saturn     |                |
|  | 5.4                           | Stars   |                |
|  | 6                             | The time  | 6              |
|  | 6.1                           | Basic conceits                                    |                |
|  | 6.2                           | Systems of time measurement                       |                |
|  | 6.3                           | Systems of rotational time                        |                |
|  | 6.4                           | Systems of dynamic time                           |                |
|  | 6.5                           | Systems of atomic time                            |                |
|  | 6.6                           | Universal Time Coordinated                        |                |

|                                 |     |  |  |
|---------------------------------|-----|--|--|
|                                 | 6.7 | GPS Time                                   |  |
|                                 | 6.8 | Practical utilization of time - Legal time |  |
| <b>Recommended reading:</b>     |     |  |  |
|                                 |     |  |  |
| <b>Teaching methods:</b>        |     |  |  |
|                                 |     |  |  |
| <b>Assessment methods:</b>      |     |  |  |
|                                 |     |  |  |
| <b>Language of instruction:</b> |     | Portuguese / English                       |  |

| Bachelor of Science in Deck and Bridge Operations                                    |                       |  |           |
|--|-----------------------|--|-----------|
| Description of individual course unit  |                       |  |           |
| Course title:  | Navigation III        |  |           |
| Field:   | Navigation            |  |           |
| Course code:   | 3015                  | Type of course:  | Mandatory |
| From:  | 2011/2012             |  |           |
| Year of study:   | 2nd                   | Semester:  | 1st       |
| ECTS:  | 4                     | Hours/week:  | 3         |
| Name of lecturer:  | Jaime Lima dos Santos |  |           |
| Prerequisites:   | No                    |  |           |
| Objective of the course (expected learning outcomes and competences to be acquired): |                       |  |           |
|  |                       |  |           |
| Course contents:   |                       |  |           |
| STCW   | Item                  | Program  | Hours     |
| Tabela   | 1                     | Electromagnetic propagation waves                                | 3         |
| A – II/1   | 1.1                   | Introduction   |           |
| A – II/2   | 1.2                   | Characteristics of electromagnetic waves                         |           |
|  | 1.3                   | Propagation of electromagnetic waves                             |           |
|  | 1.4                   | Ionosphere   |           |
|  | 1.5                   | Characteristics of propagation regarding the path and frequency. |           |
|  | 1.6                   | Perturbations in the propagation                                 |           |
|  | 2                     | Radar theory   | 12        |
|  | 2.1                   | Radar fundamental principles                                     |           |
|  | 2.2                   | Radar system   |           |
|  | 2.2.1                 | System Fundamental components and its summary functions          |           |
|  | 2.2.2                 | Transmission characteristics of the radar energy                 |           |
|  | 2.2.3                 | Transmission frequencies of radar energy                         |           |
|  | 2.2.4                 | PRF, Impulse duration, distances scale                           |           |
|  | 2.2.5                 | Aerials  |           |
|  | 2.2.6                 | Indicator  |           |
|  | 2.2.7                 | Radar components location on board ships                         |           |
| Tabela   | 2.3                   | Targets detection  |           |
| A – II/1   | 2.3.1                 | Influence general factors  |           |
| A – II/2   | 2.3.2                 | Influence of radar characteristics                               |           |
|  | 2.3.3                 | Influence of targets characteristics                             |           |
|  | 2.3.4                 | Radar aids   |           |
|  | 2.3.5                 | Influence of undulation phenomena                                |           |
|  | 2.3.6                 | Influence of rain phenomena                                      |           |
|  | 2.3.7                 | Radar horizon  |           |
|  | 2.3.8                 | False targets  |           |
|  | 2.4                   | The radar system – operating controls                            |           |
|  | 2.4.1                 | Switch on / off. “stand-by” position                             |           |
|  | 2.4.2                 | Scale selector   |           |
|  | 2.4.3                 | Impulse duration (SP/LP)   |           |
|  | 2.4.4                 | Image presentation   |           |
|  | 2.4.5                 | Controls for measurements of distances and bearings              |           |



|                                 |       |  |    |
|---------------------------------|-------|--|----|
|                                 | 2.4.6 | Controls to suppress undesired effects   |    |
|                                 | 2.5   | The use of radar for navigation  |    |
|                                 | 2.5.1 | General considerations   |    |
|                                 | 2.5.2 | Targets identification, conspicuous points on the coast line through the radar image                                 |    |
|                                 | 2.5.3 | Ship's position determination and navigation   |    |
|                                 | 2.5.4 | Navigation with reduced or no visibility   |    |
| Tabela                          | 2.6   | "Shore-based" radar  |    |
| A – II/1                        | 3     | Practice on fix radar and simulator  | 30 |
| A – II/2                        | 3.1   | Awareness with the equipment   |    |
|                                 | 3.2   | Handling and adjusting of operating controls   |    |
|                                 | 3.3   | Exercises for conspicuous points and coast lines identification resorting to the diverse means of image presentation |    |
|                                 | 3.4   | Navigational exercises with radar  |    |
|                                 |       |  |    |
|                                 |       |  |    |
|                                 |       | TOTAL  | 45 |
| <b>Recommended reading:</b>     |       |  |    |
|                                 |       |  |    |
| <b>Teaching methods:</b>        |       |  |    |
|                                 |       |  |    |
| <b>Assessment methods:</b>      |       |  |    |
|                                 |       |  |    |
| <b>Language of instruction:</b> |       | Portuguese / English   |    |

| Bachelor of Science in Deck and Bridge Operations  |                           |  |           |
|--|---------------------------|--|-----------|
| Description of individual course unit  |                           |  |           |
| Course title:  | Maritime Safety I         |  |           |
| Field:   | Maritime Safety           |  |           |
| Course code:   | 3016                      | Type of course:  | Mandatory |
| From:  | 2011/2012                 |  |           |
| Year of study:   | 2nd                       | Semester:  | 1st       |
| ECTS:  | 5                         | Hours/week:  | 4 (3T/1P) |
| Name of lecturer:  | Fernando Ferreira Esteves |  |           |
| Prerequisites:   |                           |  |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                           |  |           |
| <div>-Prevention and Response to Emergencies.<br/>-Preparation of Contingency Plans.<br/>-Organization of Fire Fighting and Abandon Drills<br/>-Personal Survival Techniques.<br/>-Search and Rescue; International Aeronautical and Maritime Search and Rescue Manual (IAMSAR).<br/>- Theoretical Proficiency for Certificates in Survival Craft and Rescue Boats<br/>- Theoretical Proficiency for Certificates in Fast Rescue Boats.<br/>-Provide competencies for the Advanced Certificate in Fire-Fighting Operations ao Certificado de Comando de Operações de Combate a Incêndios.<br/>-Knowledge of IMO Conventions and Documents and of the National Legislation.</div> |                           |  |           |
| Course contents:   |                           |  |           |
| STCW   | Item                      | Program  | Hours     |
| Table  | 1                         | LEGAL REQUIREMENTS   | 2         |
| A-II/1   | 1.1                       | International Maritime Organization (IMO):<br>What is IMO, its Organization and Purpose.   |           |
|  | 1.2                       | International Convention of the Safety of Life at Sea (SOLAS).   |           |
|  | 1.3                       | International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978  |           |
|  | 1.4                       | Regulamento de Inscrição Marítima - rim  |           |
|  | 2                         | FIRE PREVENTION, DETECTION AND FIGHTING  | 18        |
|  | 2.1                       | Fire Theory; Fire Triangle   |           |
|  | 2.1.1                     | Flammable Limits   |           |
|  | 2.1.2                     | Flash Point, Fire Point and Ignition Point   |           |
|  | 2.1.2                     | Fire Evolution. Burning Rate   |           |
|  | 2.1.3                     | Comburent (oxygen)   |           |
|  | 2.1.4                     | Chain Reaction. Fire Tetrahedron   |           |
|  | 2.1.5                     | Heat Sources   |           |
|  |                           | Hot Work<br>Open Flames and Naked Lights<br>Electric Arcs and Sparks<br>Static Electricity<br>Hot Surfaces<br>Friction and Mechanical Sparcs<br>Pyrophor Sustances<br>Hydrogen<br>Sudden Decompression<br>Spontaneous Combustion |           |
|  | 2.1.6                     | Heat Flow  |           |
|  | 2.1.7                     | Methods of Fire Propagation  |           |
|  | 2.1.8                     | Fire Classes   |           |

|      |        |   |  |
|------|--------|---|--|
|      | 2.1.9  | Types of extinguishing agents   |  |
|      |        | Water<br>Foam<br>Carbon Dioxide (CO2)<br>Dry Chemical<br>Special Dry Powder<br>Halon<br>Trifluoromethane (FE-13)  |  |
|      | 2.1.10 | Fire Hazards  |  |
|      | 2.1.11 | Safe Practices  |  |
|      | 2.1.12 | Fire Detection  |  |
|      | 2.1.13 | Fire Fighting Appliances  |  |
|      |        | Portable Fire Extinguishers<br>Fire Main System; International Shore Fire Connection<br>Sprinkler System<br>Water Mist System (Water Fog)<br>Foam Fixed System<br>Carbon Dioxide Flooding System<br>Chemical Powder Fixed System<br>Local Protection System |  |
|      | 2.1.14 | Fire Fighting Equipment   |  |
|      |        | Fire Hoses<br>Fire Hydrants<br>Fire Nozzles<br>Fire Axe<br>Safety Lamp<br>Fire Blanket<br>Fireman's Outfit  |  |
|      | 2.1.15 | Breathing Apparatus   |  |
|      |        | Self-contained Breathing Apparatus (SCBA)<br>Air Line Breathing Apparatus<br>Emergency Escape Breathing Device (EEBD)   |  |
|      | 2.2    | SHIPBOARD SAFETY ORGANIZATION   |  |
|      | 2.2.1  | Introduction: Shipboard Safety Organization and ISM Code  |  |
|      | 2.2.2  | Shipboard Organization for Emergency Response   |  |
|      |        | Alarm Signals<br>Muster Points<br>Emergency Response Teams<br>Muster List   |  |
|      | 2.3    | CONSTRUCTION ARRANGEMENTS   |  |
|      |        | Class A, B and C Divisions<br>Inert Gas System<br>Means for tanks gas freeing<br>Emergency Escape Routes  |  |
|      | 2.4    | GAS MEASUREMENT   |  |
|      |        | Explosimeter<br>Tankscope<br>Oxygen Analyser<br>Toxic Gases Detector<br>Multi-Gas Detectors<br>Personal Gas Monitors<br>Fixed Gas Detection Installations   |  |
|      | 2.5    | ENCLOSED OR CONFINED SPACES   |  |
|      |        | Enclosed Spaces<br>Oxygen Deficiency<br>Oxygen above 21% by volume<br>Toxic Gases<br>Other Hazards<br>Physical Hazards<br>Claustrophobia<br>Gases Detection and Venting<br>Entry into Enclosed Spaces<br>Rescue from Enclosed Spaces                        |  |
|      | 2.6    | PROCEDURES IN CASE OF FIRE  |  |
| Tab. | 2.7    | FIRE FIGHTING DRILLS  |  |

|        |       |   |    |
|--------|-------|---|----|
| A-VI/3 |       | NOTE: These drills are carried out at Army facilities. These drills comply with nr 3 of Annex 1 of IMO Res.A.437(XI). Only the students with approval perform these drills.   |    |
|        | 3     | EMERGENCY SITUATIONS  |    |
|        | 3.1   | Emergencies   |    |
|        | 3.1.1 | Types of Emergencies  |    |
|        | 3.1.2 | Emergency Signal Alarms   |    |
|        | 4     | ABANDON AND SURVIVAL  | 18 |
|        | 4.1   | Life-saving Appliances  |    |
|        | 4.1.1 | Personal Life-saving Appliances   |    |
|        |       | Lifejackets<br>Lifebuoys<br>Immersion Suits<br>Thermal Protective Aids  |    |
|        | 4.1.2 | Survival Craft  |    |
|        |       | Lifeboats<br>Cooling System; battery charger<br>Water sprinkler (tanker lifeboats)<br>Self-contained air support system (tanker lifeboats)<br>Rescue Boat<br>Fast Rescue Boat<br>Liferafts<br>Marine Evacuation Systems (MES)<br>Means of Rescue (MOR) (Ro-ro Passenger ship) |    |
|        | 4.2   | Distress Flares   |    |
|        |       | Handflares<br>Parachute Rockets<br>Smoke Signals  |    |
|        | 4.3   | Line-Throwing Appliance   |    |
|        | 4.4   | Aparelho de Vai-Vém e Bóia Calção   |    |
|        | 4.5   | Emergency Radio Equipment   |    |
|        |       | Emergency Position Emergência (EPIRB)<br>Radar transponder (SART)<br>Two-way VHF Radiotelephone Apparatus   |    |
|        | 4.6   | Survival Craft Equipment  |    |
|        | 4.7   | Abandon   |    |
|        | 4.7.1 | Procedures for summoning passengers and crew in the muster points.  |    |
|        | 4.7.2 | Procedures when the abandon order is given  |    |
|        | 4.7.3 | Crew Functions in the Passenger Ship  |    |
|        | 4.7.4 | Lowering manoeuvres of the Survival Craft   |    |
|        | 4.7.5 | Procedures with survival craft: lowering, cast off and move away  |    |
|        |       | Liferafts reunion;  |    |
|        |       | To rescue personnel from the water.   |    |
|        |       | Procedures when off the ship:   |    |
|        |       | -How to keep together all the survival craft;   |    |
|        |       | -Use of the sea anchor;   |    |
|        |       | -Immediate actions: EPIRB, SART, canopy, anti-seasickness pills, etc.   |    |
|        |       | To drain the water and keep dry the survival craft  |    |
|        |       | Take care of the wounded;   |    |
|        |       | To fill with air the liferaft bottom with cold temperatures;  |    |
|        |       | Assignment of external lookouts;  |    |
|        |       | - Liferaft air ventilation  |    |
|        | 4.7.6 | Survival Craft with Engine. Procedures to start the engine. Use of the accessories.   |    |
|        |       | Lowering the survival craft with good weather and bad weather   |    |

|                                 |        |   |     |
|---------------------------------|--------|---|-----|
|                                 | 4.7.7  | Use of the distress flares  |     |
|                                 | 4.7.8  | Procedures on board of the Survival Craft   |     |
|                                 | 4.7.9  | Survival Routines; use of the equipment and distribution of water and rations                   |     |
|                                 |        | Rations<br>Water  |     |
|                                 | 4.7.10 | Hazards when drinking sea water;  |     |
|                                 | 4.7.11 | How to catch and keep rain water;   |     |
|                                 | 4.7.12 | Hazards when eating fish, birds or other food instead of rations (increase of the dehydration); |     |
|                                 | 4.7.13 | How to minimize dehydration in hot climates;  |     |
|                                 | 4.7.14 | Hypothermia: causes, symptoms, care with hypothermics   |     |
|                                 | 5      | INTERNATIONAL AERONAUTICAL AND MARITIME SEARCH AND RESCUE MANUAL (IAMSAR)                       | 1,5 |
|                                 | 6      | WATCHKEEPING PRINCIPLE  | 1,5 |
|                                 | 7      | ASSESSMENT  | 2   |
| <b>Recommended reading:</b>     |        |   |     |
|                                 |        |   |     |
| <b>Teaching methods:</b>        |        |   |     |
|                                 |        |   |     |
| <b>Assessment methods:</b>      |        |   |     |
|                                 |        |   |     |
| <b>Language of instruction:</b> |        | Portuguese / English  |     |

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|---|-----------------------------|---|-----------|
| Description of individual course unit   |                             |   |           |
| Course title:   | Nautical English II         |   |           |
| Field:  |                             |   |           |
| Course code:  | 3017                        | Type of course:   | Mandatory |
| From:   | 2011/2012                   |   |           |
| Year of study:  | 2nd                         | Semester:   | 1 st      |
| ECTS:   | 3,5                         | Hours/week:   | 3         |
| Name of lecturer:   | Elisa Semedo de Sá Bandeira |   |           |
| Prerequisites:  |                             |   |           |
| Objective of the course (expected learning outcomes and competences to be acquired):  |                             |   |           |
| <p>The student should develop the necessary skills to perform professional tasks in English namely as a Merchan Marine Deck Officer, in an independent way , with no difficulties and according to the definitions that follow.</p> <p>The present Course Unit is part of complete learning of approximately 195 hours, comprising the course units English, Maitime English I, Maritime English II and Maritime English III. Globally, this learning must be according to what is stipulated in STCW Convention, Table A-II/1, concerning the minimum standards for an Officer of the Watch on the Bridge of ships of 500 GT and above.</p> <p>It is also necessary to define the level of ESL (English as a Second Language) within the international framework , by following what is defined in the CEFML. For the present unit, Maritime English I, the student should be able to develop written and oral skills equivalent to the level B2 (Independent Speaker – Vantage or Intermediate), established by the CEFML (Council of Europe Framework for Modern Languagesl) and through the foreign language learning model integrated in a specific context ((CLIL- Content Language Integrated Learning).</p> |                             |   |           |
| Course contents:  |                             |   |           |
| STCW  | Item                        | Program   | Hours     |
| Table A-II/1  | 1.                          | Shipborne systems   | 6         |
|   | 1.1.                        | Systems installed on the bridge                                 |           |
|   | 1.2.                        | Fire detection and fire fighting systems                        |           |
|   | 1.3.                        | Salvage means   |           |
|   | 2.                          | Navigation  | 9         |
|   | 2.1.                        | Navigational charts; ECDIS                                      |           |
|   | 2.2.                        | Types of navigation   |           |
|   | 2.3.                        | Aids to navigation  |           |
|   | 2.4.                        | Buoyage   |           |
|   | 2.5.                        | Descrption of a voyage  |           |
|   | 3.                          | Seamanship  | 9         |
|   | 3.1.                        | Cables  |           |
|   | 3.2.                        | Arrival at a port, anchoring, berthing, leaving berth, underway |           |
|   | 3.3.                        | Stowage   |           |
|   | 3.4.                        | To load and unload; Plimsol marks                               |           |
|   | 3.5.                        | To ballast and unballast  |           |
|   | 4.                          | Engine room and bunkering                                       | 6         |
|   | 4.1.                        | Propulsion plant  |           |
|   | 4.2.                        | Auxiliary machinery   |           |
|   | 4.3.                        | Types of fuels  |           |
|   | 4.4.                        | Bunkering   |           |
|   | 5.                          | Ship’s documents  | 9         |

|                                 |        |                                 |    |
|---------------------------------|--------|---------------------------------|----|
|                                 | 5.1.   | Charter Party                   |    |
|                                 | 5.2.   | Bill of Lading                  |    |
|                                 | 5.3.   | Voyage instructions             |    |
|                                 | 5.4.   | Cargo Manifest                  |    |
|                                 | 5.5.   | NOR (Notice of Readiness)       |    |
|                                 | 5.6.   | Letter of Protest               |    |
|                                 | 5.7.   | Certificates                    |    |
|                                 | 6.     | Assessment                      | 6  |
|                                 | 6.1.   | Theoretical (written and oral ) |    |
|                                 | 6.1.1. | Practical (oral)                |    |
| TOTAL                           |        |                                 | 45 |
| <b>Recommended reading:</b>     |        |                                 |    |
|                                 |        |                                 |    |
| <b>Teaching methods:</b>        |        |                                 |    |
|                                 |        |                                 |    |
| <b>Assessment methods:</b>      |        |                                 |    |
|                                 |        |                                 |    |
| <b>Language of instruction:</b> |        | English                         |    |

| Bachelor of Science in Deck and Bridge Operations   |                                      |                 |                 |
|---|--------------------------------------|-----------------|-----------------|
| Description of individual course unit   |                                      |                 |                 |
| Course title:   | Probabilities and Statistics         |                 |                 |
| Field:  | Basic Science                        |                 |                 |
| Course code:  | 3018                                 | Type of course: | Mandatory       |
| From:   | 2011/2012                            |                 |                 |
| Year of study:  | 2 <sup>nd</sup>                      | Semester:       | 1 <sup>st</sup> |
| ECTS:   | 5,0                                  | Hours/week:     | 4h / TP         |
| Name of lecturer:   | Maria Elisa Pissarra do Amaral Cunha |                 |                 |
| Prerequisites:  |                                      |                 |                 |
| Objective of the course (expected learning outcomes and competences to be acquired):  |                                      |                 |                 |
| Knowing and applying the basic techniques of Statistics, Statistical Inference and Correlation Theory. Understanding the theoretical grounding of these areas on Probability Theory. Getting acquainted with and applying some of the main probabilistic models and estimating and testing the parameters needed to their application. Applying these concepts and methodologies to problem solving in Engineering.   |                                      |                 |                 |
| Course contents:  |                                      |                 |                 |
| <div>1. Statistics Descriptive. Data representation in charts and tables, statistical measures for central tendency, dispersion, asymmetry and moments. Counting techniques.</div> <div>2. Probability Theory. Basic concepts: random experiment, outcome space and event. Axioms. Independence, conditional probability and Bayes’ Theorem.</div> <div>3. Random variables and distributions. Definition, discrete, continuous and mixed random variables. Distribution function and probability density function. Some theoretical distributions for discrete and continuous random variables. Discrete uniform, Bernoulli, binomial, geometric, hyper-geometric, Poisson, continuous discrete, Gaussian, exponential and chi-square. Central Limit Theorem and applications.</div> <div>4. Statistical Inference. Goals, population, sample and random sample. Sampling distributions. Parameter estimation: maximum likelihood method. Confidence intervals and hypothesis testing: methodology and examples (intervals/tests for expected value, difference between expected values, variance).</div> <div>5. Correlation and regression: general notions of Multivariate Statistics. Correlation measures. Linear regression and method of least squares.</div> |                                      |                 |                 |
| Recommended reading:  |                                      |                 |                 |
| <div>· Maria Elisa Cunha. “Textos de apoio às aulas teórico-práticas”</div> <div>· Mendenhall, W.; Beaver, R.; Beaver, B.” Introduction to probability and statistics”. 1999. Duxbury Press.</div> <div>· Guimarães, R. C.; Cabral, J. S.. “Estatística”. 1997. McGrawill.</div> <div>· Fonseca, Jaime; Torres, Daniel. “Exercícios de Estatística”, Vol I e II. 2000. Edições Sílabo.</div>  |                                      |                 |                 |
| Teaching methods:   |                                      |                 |                 |
| Classes include a brief theoretical exposition of each topic, practical examples of applicability and exercises. Students are given weekly exercise lists for home practice.  |                                      |                 |                 |
| Assessment methods:   |                                      |                 |                 |
| Three tests (T1, T2 and T3) throughout the semester graded on a scale from 0 to 20. The student will pass the course when two of (T1 >= 8.0, T2>=8.0 and T3>=8.0) are met, and also (0.2*T1+0.4*T2+0.4*T3>=9.5). The final graded is computed as (0.2*T1+0.4*T2+0.4*T3) rounded to the nearest integer.   |                                      |                 |                 |
| A student who does not pass the course may repeat the second test on the day of the regular exam.   |                                      |                 |                 |
| Language of instruction:  | Portuguese / English                 |                 |                 |



| Bachelor of Science in Deck and Bridge Operations  |                           |                       |                 |
|--|---------------------------|-----------------------|-----------------|
| Description of individual course unit  |                           |                       |                 |
| Course title:  | Computers and Programming |                       |                 |
| Field:   | Basic Science             |                       |                 |
| Course code:   | 3019                      | Type of course:       | Mandatory       |
| From:  |                           |                       |                 |
| Year of study:   | 2 <sup>nd</sup>           | Semester:             | 1 <sup>st</sup> |
| ECTS:  | 5                         | Hours/ Type (T/P/TP): | 4               |
| Name of lecturer:  | Pedro Silveira            |                       |                 |
| Prerequisites:   |                           |                       |                 |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                           |                       |                 |
| The student shall be able to use numerical methods to determine roots of equations with one variable, solve differential equations, perform numerical integration and differentiation, and to fit curves to data using interpolation and least-squares regression. The student shall be able to understand the effects of numerical errors and their propagation. The student shall also be able to perform conversions between different numeral systems and to solve a programming problem by creating a flowchart of an algorithm and designing/writing a program in Visual Basic programming language. |                           |                       |                 |
| Course contents:   |                           |                       |                 |
| Numeral systems: <ul style="list-style-type: none"><li>• Introduction.</li><li>• Representing real numbers. Numeral systems.</li><li>• Binary numeral system.</li><li>• Conversion between different numeral systems.</li></ul>  |                           |                       |                 |
| Numerical errors: <ul style="list-style-type: none"><li>• Introduction.</li><li>• Representing numbers on computers: Integer and real numbers.</li><li>• Floating point arithmetics.</li><li>• Types of errors. Propagation.</li><li>• Stability of errors.</li></ul>  |                           |                       |                 |
| Roots of equations with one variable: <ul style="list-style-type: none"><li>• Introduction.</li><li>• Bisection method.</li><li>• Fixed-point iteration.</li><li>• Newton-Raphson method.</li></ul>  |                           |                       |                 |
| Curve fitting, interpolation: <ul style="list-style-type: none"><li>• Introduction.</li><li>• Least squares method.</li><li>• Lagrange polynomial.</li></ul>   |                           |                       |                 |
| Numerical differentiation: <ul style="list-style-type: none"><li>• Introduction.</li><li>• Numerical differentiation with two and three points.</li></ul>  |                           |                       |                 |
| Numerical integration: <ul style="list-style-type: none"><li>• Introduction.</li><li>• Trapezoidal rule.</li><li>• Simpson’s rule.</li><li>• 3/8 rule.</li></ul>   |                           |                       |                 |

|  |                      |
|--|----------------------|
| Differential equations: <ul style="list-style-type: none"> <li>• Introduction.</li> <li>• Euler method.</li> <li>• Runga-Kutta methods.</li> </ul> Symbolic computation: <ul style="list-style-type: none"> <li>• Main concepts.</li> <li>• Symbolic computation systems.</li> <li>• Analytical, numerical and graphic computation.</li> <li>• Exercises using Maple.</li> </ul> High-level programming language: <ul style="list-style-type: none"> <li>• Structured programming. Introduction.</li> <li>• Main programming structures.</li> <li>• Practical exercises using Visual Basic.</li> </ul> |                      |
| <b>Recommended reading:</b>  |                      |
| <ul style="list-style-type: none"> <li>• Numerical Methods for Engineers, 5<sup>th</sup> edition. Steven C. Chapra. McGraw-Hill Education.</li> <li>• Métodos Numéricos - Introdução, Aplicação e Programação. José Alberto Rodrigues. Edições Sílabo.</li> <li>• Beginning Visual Basic 2010. Thearon Willis, Bryan Newsome. Wiley/Wrox.</li> <li>• Programming in Visual Basic 2010. Julia Case Bradley, Anita C. Millspaugh. McGraw-Hill.</li> </ul>  |                      |
| <b>Teaching methods:</b>   |                      |
| Lectures.<br>Problem solving classes.<br>Practical exercises using Visual Basic IDE.   |                      |
| <b>Assessment methods:</b>   |                      |
| <ul style="list-style-type: none"> <li>• 2 tests.</li> <li>• 1 group assignment that requires the students to develop a program using Visual Basic as a programming language.</li> </ul>   |                      |
| <b>Language of instruction:</b>  | Portuguese / English |

**2<sup>nd</sup> year of studies**

**2<sup>nd</sup> semester**

| Bachelor of Science in Deck and Bridge Operations  |                               |   |                |
|--|-------------------------------|---|----------------|
| Description of individual course unit  |                               |   |                |
| Course title:  | Nautical Astronomy            |   |                |
| Field:   | Navigation                    |   |                |
| Course code:   | 3020                          | Type of course:   | Mandatory      |
| From:  | 2011 / 2012                   |   |                |
| Year of study:   | 2nd                           | Semester:   | 2nd            |
| ECTS:  | 6                             | Hours/week:   | 2 hours (2 TP) |
| Name of lecturer:  | Carlos Alberto Sousa Coutinho |   |                |
| Prerequisites:   | No                            |   |                |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                               |   |                |
| Provide students with knowledge necessary to develop competences for ship positioning determination at sea by the use stars as per sections A-II/1 and A-II/2 of STCW. |                               |   |                |
| Course contents:   |                               |   |                |
| STCW   | Item                          | Program   | Hours          |
| Tab. A - II/1<br>Tab. A-II/2   |                               |   |                |
|  | 1                             | Astronomical ephemerides                                    | 12             |
|  | 1.1                           | The Nautical Almanac  |                |
|  | 1.2                           | Rise and set of the Sun and Moon                            |                |
|  | 1.3                           | Twilights. Hours favourable for astronomical observations   |                |
|  | 1.4                           | Identification of heavenly bodies: Star Finder & Identifier |                |
|  | 2                             | Correction of heights                                       | 5              |
|  | 2.1                           | Refraction, Dip and Mirage                                  |                |
|  | 3                             | Sextant   | 5              |
|  | 3.1                           | Operating Principle   |                |
|  | 4                             | Astronomical Position Lines                                 | 10             |
|  | 4.1                           | Sight reduction procedures and methods                      |                |
|  |                               |   |                |
|  | 5                             | Errors in Astronomical Position Lines                       | 3              |
|  | 6                             | Isolated position lines                                     | 6              |
|  | 6.1                           | Meridian passage of the Sun                                 |                |
|  | 6.2                           | Polaris   |                |
|  | 7                             | Observed position and Sight Reduction Procedures            | 19             |
|  | 7.1                           | Calculating altitude and azimuth                            |                |
|  |                               | Total   | 60             |
| Recommended reading:   |                               |   |                |
|  |                               |   |                |
| Teaching methods:  |                               |   |                |
|  |                               |   |                |
| Assessment methods:  |                               |   |                |
|  |                               |   |                |
| Language of instruction:   |                               | Portuguese / English  |                |

| Bachelor of Science in Deck and Bridge Operations  |                              |  |           |
|--|------------------------------|--|-----------|
| Description of individual course unit  |                              |  |           |
| Course title:  | Regulations and Safety Rules |  |           |
| Field:   | Maritime Safety              |  |           |
| Course code:   | 3022                         | Type of course:  | Mandatory |
| From:  | 2011/2012                    |  |           |
| Year of study:   | 2nd                          | Semester:  | 2nd       |
| ECTS:  | 5                            | Hours/week:  | 3         |
| Name of lecturer:  |                              |  |           |
| Prerequisites:   |                              |  |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                              |  |           |
| Provide the students with the necessary knowledge for the Prevention and Response of Marine Pollution. Knowledge of the legislation for the Prevention and Response of the Marine Pollution.<br>-Response to Marine Pollution by Oil (hydrocarbons).<br>-To enable students with the International Certificate for Familiarization in Oil, Chemical and Gas Tankers.<br>-Ship Safety Management. |                              |  |           |
| Course contents:   |                              |  |           |
| STCW   | Item                         | Program  | Hours     |
| Tabs.  | 1                            | MARINE POLLUTION   | 12        |
| A-II/1   | 1.1                          | Definition of Marine Pollution (adopted by United NationsUnidas)   |           |
| A-II/2   | 1.2                          | Types of Marine Pollution  |           |
|  | 1.3                          | Some Pollutants and their effects  |           |
|  | 1.4                          | Origin of Discharge in Coastal Zones   | 2         |
|  | 1.5                          | Origin of the Discharge of Pollutants beyond the Continental Shelf   |           |
|  | 1.6                          | Effects of Marine Pollution in the Food Chain  |           |
|  | 1.7                          | Sources and Means of the Seas Pollution  |           |
| Tabs.  | 1.8                          | International Convention for the Prevention of Pollution from Ships - MARPOL 1973 / 78                           | 10        |
| A-II/1   | 1.8.1                        | What is MARPOL?  |           |
| A-II-2   | 1.8.2                        | MARPOL Constitution: Articles, Protocols and Annexes   |           |
|  | 1.8.2.4                      | Annexes I, II, III, IV, V, VI  |           |
|  | 1.8.3                        | Scope of the Annexes   |           |
|  | 1.8.4                        | Surveys and Certification:   |           |
|  | 1.8.4.1                      | Annexes I, II and IV.  |           |
|  | 1.8.5                        | Criteria for the Application of Annexes I, II, IV e V  |           |
| Secção A-V/1   | 2                            | REGULATIONS FOR GAS AND CHEMICAL TANKERS   |           |
|  | 2.1                          | International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk – IGC Code;      |           |
|  | 2.1.1                        | Abstract of the 19 chapters;   |           |
|  | 2.2                          | International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk – IBC Code – |           |
|  | 2.2.1                        | Abstract of the 19 chapters.   |           |
| Tabs.  | 3                            | CARGOES CARACTERISTICS   | 18        |
| A-II/1   | 3.1                          | Nature   |           |
| A-II/2   | 3.2                          | Basic Properties;  |           |
| A-V/1(2-7)   | 3.3                          | Hydrocarbon Gases and its Dispersion;  |           |
| A-V/1(9, 13, 16,23,25,32)  | 3.4                          | Toxicity;  |           |
|  | 3.5                          | Entry and Works into Enclosed Spaces and Others;   |           |
|  | 3.6                          | Safety Precautions and Measures;   |           |

|                                 |       |   |    |
|---------------------------------|-------|---|----|
|                                 | 3.7   | Safety Equipments and Personnel Protection Equipment (PPE);     |    |
|                                 | 3.8   | Emergency Operations;   |    |
|                                 | 3.9   | Fire-fighting in Gas Tankers and Chemical Tankers.              |    |
|                                 | 4     | NEW PROJECTS OF OIL TANKERS                                     | 2  |
|                                 | 5     | RESPONSE TO MARINE POLLUTION BY HYDROCARBON                     | 5  |
|                                 | 5.1   | Prevention;   |    |
|                                 | 5.1.1 | Prevention Measures;  |    |
|                                 | 5.1.2 | International Legislation;                                      |    |
|                                 | 5.1.3 | National legislation;   |    |
|                                 | 5.1.4 | Surveys with vessel in port:                                    |    |
|                                 | 5.2   | Contingency Plans. National Emergency Plan                      |    |
|                                 | 5.2.1 | Geographic Coverage;  |    |
|                                 | 5.2.2 | Types of Hydrocarbons;  |    |
|                                 | 5.3   | Instructions to act:  |    |
|                                 | 5.3.1 | Ways of acting;   |    |
|                                 | 5.3.2 | Elements to be obtained;  |    |
|                                 | 5.3.3 | Immediate actions.  |    |
|                                 | 5.4   | Action in case of Oil Spills                                    |    |
|                                 | 5.4.1 | Oil spills;   |    |
|                                 | 5.4.2 | Air surveillance and monitoring;                                |    |
|                                 | 5.4.3 | Determination of the amount of oil spilled;                     |    |
|                                 | 5.4.4 | Assessment of the pollution threat;                             |    |
|                                 | 5.4.5 | Containment and recovery of the hydrocarbons;                   |    |
|                                 | 5.4.6 | Use of dispersants;   |    |
|                                 | 5.4.7 | Cleanliness of the coast;                                       |    |
|                                 | 5.4.8 | Storage, Transport and Disposal of the Contaminated Oil Debris. |    |
| Tabs.                           | 6     | TOTAL SAFETY  | 2  |
| A-II/1                          | 6.1   | International Safety management Code (ISM Code)                 | 2  |
| A-II/2                          | 6.1.1 | Purpose;  |    |
|                                 | 6.1.2 | Operation;  |    |
|                                 | 6.1.3 | IMO Resolution A741(18)   |    |
|                                 | 7     | FINAL ASSESSMENT  | 2  |
|                                 |       | TOTAL   | 45 |
| <b>Recommended reading:</b>     |       |   |    |
|                                 |       |   |    |
| <b>Teaching methods:</b>        |       |   |    |
|                                 |       |   |    |
| <b>Assessment methods:</b>      |       |   |    |
|                                 |       |   |    |
| <b>Language of instruction:</b> |       | Portuguese / English  |    |

| Bachelor of Science in Deck and Bridge Operations  |                             |  |           |
|--|-----------------------------|--|-----------|
| Description of individual course unit  |                             |  |           |
| Course title:  | Nautical English III        |  |           |
| Field:   |                             |  |           |
| Course code:   | 3023                        | Type of course:  | Mandatory |
| From:  | 2011/2012                   |  |           |
| Year of study:   | 2 nd                        | Semester:  | 2 nd      |
| ECTS:  | 3,5                         | Hours/week:  | 3         |
| Name of lecturer:  | Elisa Semedo de Sá Bandeira |  |           |
| Prerequisites:   |                             |  |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                             |  |           |
| <p>The student should develop the necessary skills to perform professional tasks in English namely as a Merchan Marine Deck Officer, in an independent way , with no difficulties and according to the following definitions.</p> <p>The present Course Unit is part of complete learning of approximately 195 hours, comprising the course units English, Maitime English I, Maritime English II and Maritime English III. Globally, this learning must be according to what is stipulated in STCW Convention, Table A-II/1 concerning the minimum standards for an Officer of the Watch on the Bridge of ships of 500 GT and above.</p> <p>It is also necessary to define the level of ESL (English as a Second Language) within the international framework , by following what is defined in the CEFML. For the present unit, Maritime English I, the student should be able to develop written and oral skills equivalent to the level C1 (Profient Speaker – Effective operational proficiency or Upper-intermediate) established by the CEFML (Council of Europe Framework for Modern Languagesl) and through the foreign language learning model integrated in a specific context ((CLIL- Content Language Integrated Learning).</p> |                             |  |           |
| Course contents:   |                             |  |           |
| STCW   | Item                        | Program  | Hours     |
| Table A-II/1   | 1.                          | Safety   | 10        |
|  | 1.1.                        | Ship’s diferente motions                                 |           |
|  | 1.2.                        | Meteorology  |           |
|  | 1.2.1.                      | Winds: Beaufort wind scale                               |           |
|  | 1.2.2.                      | Swell  |           |
|  | 1.2.3.                      | Tides and currents                                       |           |
|  | 1.2.4.                      | Weather forecast   |           |
|  | 1.2.5.                      | Rules to avoid collisions at sea                         |           |
|  | 2.                          | SOLAS e MARPOL conventions                               | 6         |
|  | 2.1.                        | SOLAS  |           |
|  | 2.2.                        | MARPOL   |           |
|  | 3.                          | IMO standard vocabulary                                  | 12        |
|  | 3.1.                        | Standard Marine Communication Phrases                    |           |
|  | 4.                          | GMDSS communications                                     | 24        |
|  | 4.1.                        | System concept   |           |
|  | 4.2.                        | Terrestrial communications and equipment – VHF and MF/HF |           |
|  | 4.3.                        | Satellite communications and equipment - INMARSAT        |           |
|  | 4.4.                        | Distress, Urgency and Safety communications              |           |
|  | 4.5.                        | Routine communications                                   |           |
|  | 4.6.                        | Port operations communications                           |           |
|  | 4.6.1.                      | Ship VTS   |           |
|  | 4.6.2.                      | Ship - pilots  |           |
|  | 4.6.3.                      | Other communications                                     |           |

|  |        |                                   |    |
|--|--------|-----------------------------------|----|
|  | 4.7.   | Onboard communications            |    |
|  | 4.7.1. | On the bridge – helm orders       |    |
|  | 4.7.2. | Communications during Manouvering |    |
|  | 4.8.   | Search and Rescue communications  |    |
|  | 4.8.1. | IAMSAR                            |    |
|  | 5.     | Assessment                        | 8  |
|  | 5.1.   | Theoretical                       |    |
|  | 5.2.   | Practical                         |    |
|  |        |                                   |    |
| TOTAL  |        |                                   | 60 |
| <b>Recommended reading:</b>  |        |                                   |    |
| Recommended reading:<br>Handbook provided by the lecturer<br>Apontamentos , Prof. Magano e Silva<br>"International Maritime Language Programme", Van Kluijven<br>Supplementary reading:<br>"English for Maritime Studies", T.N. Blakey |        |                                   |    |
| <b>Teaching methods:</b>   |        |                                   |    |
| Expository method<br>Practical work<br>Role-playing  |        |                                   |    |
| <b>Assessment methods:</b>   |        |                                   |    |
| Theoretical and practical  |        |                                   |    |
| <b>Language of instruction:</b>  |        | English                           |    |



| Bachelor of Science in Deck and Bridge Operations   |   |   |           |
|---|---|---|-----------|
| Description of individual course unit   |   |   |           |
| Course title:   | Physics - Chemistry                               |   |           |
| Field:  | Basic Science                                     |   |           |
| Course code:  | 3024  | Type of course:   | Mandatory |
| From:   | 2011/2012   |   |           |
| Year of study:  | 2nd   | Semestre curricular:  | 2nd       |
| ECTS:   | 3   | Carga horária/Tipo de ensino:   | 4/TP      |
| Name of lecturer:   | Luís António de Lemos Ramalho de Azevedo Coutinho |   |           |
| Prerequisites:  |   |   |           |
| Objective of the course (expected learning outcomes and competences to be acquired):  |   |   |           |
| <p>To study the fluids (gases and liquids) so as to ensure that the curriculum corresponds to the content of the courses familiarization tankers (tankers, chemical and liquefied gas).</p> <p>-Provide the fundamentals and basic knowledge of thermodynamics in order to understand the workings of the mechanical parts in a system of cold.</p> <p>- Realising the knowledge in view of practical application to cold cycles (refrigerators and heat pumps), and the use of refrigeration cycles as a way to optimize operating income re-liquefaction systems in different types of vessels - Gas Tanks - Liquefied according to cycle type and nature of the refrigerant</p> <p>- Learn the fundamentals of thermodynamics of fluid flow, to ensure the knowledge, own transport operations (loading and unloading), which occur in tankers (oil tankers, chemical and liquefied gas).</p> <p>-To comply with international norms and conventions in relation to mandatory training (STCW - 95) on transport of hazardous chemicals in your shed ("IMDG CODE"). Adapt training to acquire skills either as to the query of the International Maritime Dangerous or on the establishment of frameworks for product segregation simultaneously transported by sea in different forms of packaging and transport ships.</p> <p>-Give the basics related to security systems transverse vessels tanks - GI system</p> <p>-Ensuring the acquisition of competence for some operations that cut across all the tankers, such as, calculation of maximum filling of tanks, the operating times of calculations and degassing tank blanketing, the calculation of new volumes of liquid and gas phases after a temperature increase within the tanks.</p> |   |   |           |
| Course contents:  |   |   |           |
| STCW  | Item  | Program   | Hours     |
| Section   | 1.  | Gases   | 8         |
| A-V/1   | 1.1   | Properties of the gases   |           |
|   | 1.2   | Equations of state of gases   | (1,5)     |
|   | 1.2.1   | Boyle's Law. Graphical representation. Isothermal   |           |
|   | 1.2.2   | Charles-Laws. Graphical representation. Isobaric and isochoric. Absolute temperature  |           |
|   | 1.2.3   | PVT behavior of ideal gases. Ideal gas equation. The ideal gas constant (R); power units  |           |
|   | 1.3   | Some properties of mixtures of gases  | (0,5)     |
|   | 1.3.1   | Dalton and Amagat 's laws   |           |
|   | 1.4   | Liquefaction gases. The critical point.   | (0,5)     |
|   | 1.5   | The kinetic-molecular theory of gases   | (1,5)     |
|   | 1.5.1   | The molecular-kinetic model of gases. The pressure of a gas. Kinetic energy and temperature   | (1)       |
|   | 1.5.2   | Molecular energies and molecular velocities. Distribution of the Maxwell-Boltzmann speed. Average speed, mean square and most probable velocity |           |
|   | 1.5.3   | Diffusion and effusion of gases. An effusion rate of gas. Graham's law  |           |
|   | 1.6   | The actual behavior of gases. Gas compressibility factor (Z)  | (1)       |

|         |        |   |       |
|---------|--------|---|-------|
|         | 1.6.1  | Theory of non-ideal behavior. Equation Van der Waals forces. The equation of Van der Waals and the critical point .. The equation of Van der Waals and virial equation. |       |
|         | 1.7    | Applications to calculations tankers (oil tankers and liquefied gas )   | (2)   |
| Section | 2      | Thermodynamics  | 12    |
| A-V/1   | 2.1    | Concepts: systems (isolated, closed, open, neighborhood), state   | (0,5) |
|         | 2.2    | Labor. Heat. The mechanical equivalent of heat  | (0,5) |
|         | 2.3    | The 1st law of thermodynamics.  | (1,5) |
|         | 2.3.1  | Internal energy (U). Reversible and irreversible processes  |       |
|         | 2.3.2  | Work expanding (or compression) to the shaft and electrical   |       |
|         | 2.3.3  | Equations of state  |       |
|         |        | Some properties of state functions  |       |
|         |        | Thermodynamic coefficients, $C_v$ , $C_p$   |       |
|         | 2.3.4  | The enthalpy condition function (H)   |       |
|         |        | Dependence of U and H of a perfect gas with P and V   |       |
|         | 2.3.5  | Adiabatic expansion of ideal gases  |       |
|         | 2.4    | General statements of 2nd law of thermodynamics   | (2)   |
|         | 2.4.1  | Entropy (S). Second statement of Prigogine entropy  |       |
|         | 2.4.2  | Carnot cycle.   |       |
|         |        | The transformation efficiency of heat into work   |       |
|         |        | Yield-cycle   |       |
|         | 2.5    | The entropy and the 3rd law of thermodynamics   | (1)   |
|         | 2.5.1  | Entropy the probability of a system of molecules  |       |
|         |        | Chaos and disorder-   |       |
|         | 2.6    | Applications in thermal cycles  | (1,5) |
|         | 2.6.1  | Cycles: Joule, Otto, Diesel, Seilinger, Ericsson, Graphical representation of a cycle diagram (PV) and (TS)   |       |
|         | 2.6.2  | Calculation of income of a cycle  |       |
|         | 2.7    | Refrigerators (refrigerators and heat pumps)  | (5)   |
|         | 2.7.1  | Organs constituting a refrigeration system. Its functions   |       |
|         | 2.7.2  | Carnot cycle around: refrigerator and heat pump   |       |
|         |        | Efficiencies. cooling effect  |       |
|         |        | Carnot-cycle refrigeration unit for a condensable fluid   |       |
|         |        | -Vapor compression cycle. Mollier diagram (P ,H)  |       |
|         | 2.7.3  | refrigerants  |       |
|         |        | -Tables of thermodynamic properties of fluids refrigerants. Properties of refrigerants  |       |
| Section | 3      | Thermodynamics of fluid flow processes  | 6     |
| A-V/1   | 3.1    | General considerations. Fundamental equations   | (1)   |
|         | 3.1.1  | Conservation of mass. Equation of continuity  |       |
|         |        | Volume-control concept. Flows permanent   |       |
|         | 3.1.2. | Conservation of energy. Continuous flow process   |       |
|         | 3.1.3  | Conservation of mechanical energy. Bernoulli's equation. Friction   | (0,5) |
|         |        | -Applications for incompressible fluids   |       |
|         | 3.1.4  | Relationship between energy conservation and mechanical energy  |       |
|         |        | -For the isothermal, adiabatic and reversible's flows   |       |

|        |       |   |       |
|--------|-------|---|-------|
|        | 3.2   | Flow in pipes   | (1,5) |
|        | 3.2.1 | Regimes of laminar and turbulent flow   |       |
|        | 3.2.2 | Concept of boundary layer. Fanning equation   |       |
|        | 3.2.3 | Criteria for the type of flow. Reynolds number  |       |
|        |       | Friction coefficient. Application to cases of ships   |       |
|        | 3.3   | Flows through an orifice. Pitot tube.   | (1,5) |
|        | 3.3.1 | Maximum speed of flow   |       |
|        |       | -nozzle   |       |
|        | 3.3.2 | Thermodynamic analysis of nozzles: convergent, divergent and convergent--divergent ( Venturi tube )   | (1)   |
|        | 3.4.3 | Motion of a body fluid through a solid initially at rest. Stokes law  | (0,5) |
| A-V/1  | 4     | Líquids and solutions   | 6     |
|        | 4.1   | Structure of the liquid   | (1)   |
|        | 4.2   | Properties of liquids, including liquid and vapor densities   |       |
|        | 4.2.1 | Variation of density with temperature   |       |
|        | 4.3   | Solutions   | (3)   |
|        | 4.3.1 | Type of liquid solutions  |       |
|        | 4.3.2 | Concentration of the solute. Chemical equivalent. Concentration units ( Molarity, molality and normality)   |       |
|        | 4.3.3 | Factors affecting the solubility of the solutions   |       |
|        | 4.3.4 | Colligative properties of solutions.  |       |
|        |       | -Pressure Steam   |       |
|        |       | -Elevation of boiling point (ebuliometria)  |       |
|        |       | Lowering the melting point (freezing point)   |       |
|        | 4.3.5 | Colloidal solution  |       |
|        |       | -Properties of the colloids. Tyndall effect. Adsorption. dialysis   |       |
|        | 4.3.6 | Features loads of liquid chemicals  | (2)   |
| A-II/2 | 5     | The International Maritime Transport of Dangerous Substances ( IMDG CODE )  | 18    |
|        | 5.1   | Introduction. General considerations  | (0,5) |
|        | 5.2   | Classes of danger   | (1)   |
|        | 5.3   | Identification systems of dangerous substances pictorial  |       |
|        | 5.4   | Converting the code number UN (United Nations) to a number of IMDG Code   | (0,5) |
|        | 5.5   | Perspective chemical transportation problem   |       |
|        | 5.5.1 | Tables segregation:<br>Dangerous substances carried in packings<br>Dangerous substances transported in containers<br>Dangerous substances carried in bulk and other in containers | (1)   |
|        | 5.6   | Methodology of a transportation problem by sea  | (1)   |
|        | 5.7   | Classification of substances by danger class  |       |
|        | 5.7.1 | Class 1. Explosive Substances   | (2)   |
|        | 5.7.2 | Class 2 Gases   | (2)   |
|        | 5.7.3 | Class 3 Flammable Liquids   | (2)   |
|        | 5.7.4 | Class 4 flammable solids  | (2)   |
|        | 5.7.5 | Class 5 Oxidizing Substances and Organic Peroxides  | (2)   |
|        | 5.7.6 | Class 6 Poisonous (toxic) and infectious's substances   | (1)   |
|        | 5.7.7 | Class 7 Radioactive Substances  | (1,5) |

|         |       |   |         |
|---------|-------|---|---------|
|         | 5.7.8 | Class 8 Corrosive Substances  | (1)     |
|         | 5.7.9 | Class 9 Miscellaneous dangerous substances  | (0,5)   |
|         | 5.8   | Generic each Class  |         |
|         | 5.8.1 | Class definition. Concepts  |         |
|         | 5.8.2 | Main chemical – physical characteristics  |         |
|         | 5.8.3 | chemical incompatibilities  |         |
|         | 5.8.4 | Chemical reactions: combustion, self - reaction, polymerization, with air, water, impurities role of agents such as catalysts   |         |
|         | 5.8.5 | Examples of the major dangerous compounds   |         |
|         | 5.9   | Practical examples and utilization of volumes IMO   |         |
| A – V/I | 6     | Liquid-vapor equilibrium. Liquefied Gases   | 10      |
|         | 6.1   | State changes and equilibrium between phases  | ( 1,5 ) |
|         | 6.1.1 | Definition of phase of a system. Rule Gibbs phase   |         |
|         | 6.1.2 | Water as abnormal substance   |         |
|         | 6.1.3 | Latent heat (melting and boiling)   |         |
|         | 6.2   | Determination of properties in the area of two phases   | (1.5)   |
|         | 6.2.1 | Title vapor   |         |
|         | 6.2.2 | Equilibrium liquid - vapor. Clapeyron equation and Clausius equation  |         |
|         | 6.3   | IMO definition of liquefied petroleum gas ( according "Gas Carrier Code"  | (1)     |
|         | 6.3.1 | Liquefied petroleum gas (LPG). Natural gas (LNG). Chemical properties - physical  |         |
|         | 6.4   | Inert Gas (GI)  | (2)     |
|         | 6.4.1 | Chemical composition . Limits of the O2 content in GI. Sources for the production of GI   |         |
|         | 6.4.2 | Description of a system of GI equipment : scrubbing (washing tower, filters, demister), fans, gas deck seals (seal and water valves non-return). Distribution. Functions pipes, performance |         |
|         | 6.5   | Methods and devices for changing the atmosphere in the tank. Displacement method. Dilution method.  | (3,5)   |
|         | 6.5.1 | Operations where the GI intervenes. degassing. Re-blanketing  |         |
|         | 6.5.2 | Definition of tank degassed. Calculation of time to degas a tank.   |         |
|         | 6.5.3 | Other operations: Dry tank (purge). Calculation time inerting operational with either GI or with N2   |         |
|         | 6.6   | Measuring equipment: explosimeter (% O2), apparatus for measuring the concentration of hydrocarbons. Detectors toxicity (Draeger tubes)   | (0,5)   |
|         | 7     | Report  |         |
|         |       | Is the development and discussion of a report made by a group of two students, dealing with various themes, it is stated below, the way of example, some of the possible topics:            |         |
|         |       | Corrosion :   |         |
|         |       | Corrosion in the hull of a vessel   |         |
|         |       | Corrosion in the tanks of oil tankers   |         |
|         |       | Corrosion in the tanks of chemical tankers  |         |
|         |       | Corrosion in reefer ships   |         |
|         |       | Impressed current cathodic protection   |         |
|         |       | Anti-corrosive coatings by  |         |
|         |       | Corrosion in inert gas system   |         |
|         |       | Marine Pollution:   |         |
|         |       | Ways to combat spills of "crude-oil" (estuary, coastal and deep - sea)  |         |

|  |  |  |    |
|--|--|--|----|
|  |  | Detection and control of marine pollution                          |    |
|  |  | New projects for oil tankers                                       |    |
|  |  | General Discussion:  |    |
|  |  | Cleaning tanks in chemical tankers                                 |    |
|  |  | Static electricity as a source causing explosions in tanks of ship |    |
|  |  | The transport  | 60 |

#### Recommended reading:

**Physical Chemistry, P.W. Atkins, 6<sup>a</sup> ed. Oxford University Press**

Handbook of Chemical Physics, Gerd Wedler, 4th ed. Edition of the Calouste Gulbenkian Foundation  
Fundamentals of Classical Thermodynamics. Gordon V. Wylen e Richard E. Sonntag, John Wiley & Sons, Inc.

Thermodynamic, M. M. Abbot e H. Van Ness. Ed. McGraw-Hill

IMDG CODE ,ed. 2010. publication IMO

OIL Tanker Familiarization, IMO

Advanced Training Programme on OIL TANKER OPERATIONS ( Cap. : Inert Gas Plants )

Liquefied Gas Handling. Principles on Ship and in Terminal, McGuire and White, 3<sup>a</sup> ed. , SIGTTO.

Published

by Witherby & Company Limited

Advanced Training Programme on Liquefied Gas Tanker Operations. Model Course 1. 06 ( Norwegian programme ), ( Cap. : 1 , 2- Chemistry and Physics 3 - Hazard )

TANKER SAFETY GUIDE ( CHEMICALS). Edição International Chamber of Shipping

Tank Cleaning Guide , 6<sup>a</sup> ed. , compiled and published by Dr. Verwey's, Chemical Laboratories & Super-Intendence Company

#### Teaching methods:

The teaching will be done through practical classes. It is intended that through the reading of library spelling, the student is introduced to deal with each topic. Classes will initially theoretical components with brief presentations on each topic followed by practical examples, where it is intended that the student can see the theory to the reality of implementation. Classes will be that after a theoretical exposition followed up

will be a practical component, which will make the resolution of exercises where students apply the acquired knowledge.

Some areas ("IMDG CODE") will simulate real problems of transport, in order to solve practice of these situations.

#### Assessment methods:

I-Continuous Assessment

1 - Three tests to the exclusion of a matter and Working (Report) tests:

A-Chapters: Gases. Thermodynamics. Cold cycles. Re-liquefaction. Thermodynamics of flow

Minimum grade: 10.00 values, coefficient: 25%

B-Chapter : Dangerous Goods ("IMDG CODE")

Minimum grade: 10.00 values, coefficient: 20%

C-Chapters: Liquids. Solutions. Tanker Liquefied Gas. Inerting systems (GI and N2)

Minimum grade: 10.00 values, coefficient: 20%

D- Report under discussion

Minimum grade: 10.00 values, coefficient: 30%

2-For exemption from the final exam the student must meet all the following conditions:

a) Weighted average - 10 points - according to the following equation:

$0.25 (\text{note A}) + 0.20 (\text{note B}) + 0.20 (\text{grade C}) + 0.30 (\text{note D})$

b) No grades below their minimum grades

\* The students will have, optionally, a bonus in the classification for the following test:

. Test A - Bonus: values up to 2.0 - Solving a Thermal Cycle (Otto, Diesel, Joule, etc..) own form as

NOTES: 1 - testing (evaluation elements: A, B and C) function as independent modules, by any classification> values 10.00, which was assessed and is considered by therefore waived for purposes of examination.

2 - Failure to submit the report and / or invalidate the assessment are discussed in the

discipline.

(The report is required even for II-Final Exam)

- . For the Continuous Assessment: - date - limit 1/06/20(12)
- . For Regular Season: - date - limit 22/06/20(12)
- . Exam Resource: - date - limit 6/07/20(12)
- . For the Period of September: - deadline 16/07/20 (12)

#### II-Final Exam

The students who can not obtain approval of assessment, will have to undergo a Examination with the following components:

- (A) Written test (a maximum of 3 hours including tolerance and also the proof Dangerous Goods of a maximum of 1 h 15 min)
- (B) Oral test (mandatory for students to obtain notes from the written test (9) and values and 12. maximum duration of 40 min)

Note: For testing - in continuous assessment - and the various Seasons Examination, will only allow calculators very elementary.

|                                 |                      |
|---------------------------------|----------------------|
| <b>Language of instruction:</b> | Portuguese / English |
|---------------------------------|----------------------|

| Bachelor of Science in Deck and Bridge Operations  |                  |  |           |
|--|------------------|--|-----------|
| Description of individual course unit  |                  |  |           |
| Course title:  | Psycho-sociology |  |           |
| Field:   | Maritime Safety  |  |           |
| Course code:   | 3026             | Type of course:  | Mandatory |
| From:  | 2011/2012        |  |           |
| Year of study:   | 2nd              | Semester:  | 2nd       |
| ECTS:  | 4,0              | Hours/week:  | 2         |
| Name of lecturer:  | Antonio Fera     |  |           |
| Prerequisites:   |                  |  |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                  |  |           |
| Provide students with knowledge necessary to the functioning of organisations and human behaviour in order to contribute, as per Table A-II/1, Sections A-V/2 of STCW 2010, for an effective personnel management capacity and response to emergency situations and crises on board passenger ships and ro-ro passenger ships. |                  |  |           |
| Course contents:   |                  |  |           |
| STCW   | Item             | Program  | Hours     |
|  | 1                | Familiarization training   | 4         |
|  | 1.1              | General design of passengers ships   | 1         |
|  | 1.2              | Operational function of corridors, ladders and emergency exists                            | 0,5       |
|  | 1.3              | Familiarizations with safety equipment in passengers ships                                 | 1         |
|  | 1.4              | Procedures for opening, closing and securing hull opening                                  | 0,5       |
|  | 1.5              | Legislation, codes and agreements affecting ro ro passengers ships                         | 1         |
|  |                  |  |           |
| Tab.   | 2                | Crowd management   | 18        |
| A II/1   | 2.1              | Formation and development of human resources   | 1         |
|  | 2.2              | Factors influencing the seafarer’s behaviour   | 0,5       |
|  | 2.3              | Basic instincts  | 1         |
| Sections   | 2.4              | Crowd characteristics  | 3.0       |
| A-V/2  | 2.5              | Personality features and individual fitness’s  | 1,5       |
|  | 2.6              | Attitude   | 1.0       |
|  | 2.7              | Instructions to hand to passengers   | 1.0       |
|  | 2.8              | Emergency situations assessment  | 1.0       |
|  | 2.9              | Orientation and assistance to passengers   | 1.0       |
|  | 2.10             | Crew tasks committed to stairs and corridors to accompany passengers                       | 1.0       |
|  | 2.11             | Staff functions in muster places   | 1.0       |
|  | 2.12             | Knowledge and procedures to be execute by crewmembers in dangerous or emergency situations | 2.0       |
|  | 2.13             | Preparation of evacuating possibilities  | 1,0       |
|  | 2.14             | Stress situations and panic control in passengers ships                                    | 2.0       |
|  | 3.0              | Safety training for personnel providing direct service to passengers in passenger spaces   | 8         |
| Tab.   | 3.1              | Communication general characteristics  | 1,0       |
| A II/1   | 3.2              | Factors influencing communication  | 1.0       |
|  | 3.3              | Barriers for a correct communication between crewmembers                                   | 0,5       |
|  | 3.4              | Communication processes and information on board ships                                     | 1         |
|  | 3.5              | Non verbal language on board passenger ships   | 1,0       |

|                                 |     |  |     |
|---------------------------------|-----|--|-----|
| Sections                        | 3.6 | Communication with passengers in English | 2,5 |
| A-V/2                           | 3.7 | Self-control in emergency situations     | 1.0 |
|                                 |     | Total                                    | 30  |
| <b>Recommended reading:</b>     |     |  |     |
|                                 |     |  |     |
| <b>Teaching methods:</b>        |     |  |     |
|                                 |     |  |     |
| <b>Assessment methods:</b>      |     |  |     |
| Theoretical and practical       |     |  |     |
| <b>Language of instruction:</b> |     | Portuguese / English                     |     |



**3<sup>rd</sup> year of studies**

**1<sup>st</sup> semester**

| Bachelor of Science in Deck and Bridge Operations   |                               |  |               |
|---|-------------------------------|--|---------------|
| Description of individual course unit   |                               |  |               |
| Course title:   | Navigation V                  |  |               |
| Field:  | Navigation                    |  |               |
| Course code:  | 3027                          | Type of course:  | Mandatory     |
| From:   | 2011 / 2012                   |  |               |
| Year of study:  | 3nd                           | Semester:  | 1st           |
| ECTS:   | 5                             | Carga horária/Tipo de ensino:                              | 4 (1 T + 3 P) |
| Name of lecturer:   | Carlos Alberto Sousa Coutinho |  |               |
| Prerequisites:  | Não                           |  |               |
| Objective of the course (expected learning outcomes and competences to be acquired):  |                               |  |               |
| This discipline program contains complementary matters to the navigational area aiming to develop capacities leading to demonstration of competencies in planning the voyage and the safety of the voyage conduction as per sections A-II/1 e A-II/2 of STCW. |                               |  |               |
| Course contents:  |                               |  |               |
| STCW  | Item                          | Program  | Hours         |
| Tabs.   | 1                             | DEEP SEA ROUTE WITH NO RESTRICTIONS                        | 12            |
| A-II/1  | 1.1                           | Route calculation in the sphere and ellipsoid              |               |
| A-II/2  | 1.1.1                         | Distance and course calculation                            |               |
|   | 1.1.2                         | Transit minimum distance to a point exterior to the route  |               |
|   | 1.1.3                         | Practical conduction of great circle. Intermediate points. |               |
|   | 1.2                           | Automatic calculation applications                         |               |
|   | 2                             | TIDES AND TIDAL CURRENTS                                   | 14            |
|   | 2.1                           | Tidal theory   |               |
|   | 2.2                           | Real tide  |               |
|   | 2.3                           | Levels and datum's associated to tides                     |               |
|   | 2.4                           | Prediction of the tide                                     |               |
|   | 2.4.1                         | IH tides table   |               |
|   | 2.4.2                         | Admiralty tides table                                      |               |
|   | 2.4.3                         | "Co-Tidal" and "Co-Range" charts                           |               |
|   | 2.5                           | Tide currents prediction                                   |               |
|   | 2.5.1                         | Admiralty tide tables                                      |               |
|   | 2.5.2                         | Navigational charts  |               |
|   | 2.5.3                         | Tide currents Atlas  |               |
|   | 3                             | DEEP-SEA ROUTEING  | 6             |
|   | 3.1                           | General considerations                                     |               |
|   | 3.2                           | Climatological course. Routeing charts.                    |               |
|   | 3.3                           | Meteorological routeing                                    |               |
|   | 3.4                           | Ocean currents   |               |
|   | 3.5                           | Specific factors of influence upon routeing in each ocean  |               |
| Tabs.   | 3.6                           | Optimum course   |               |
| A-II/1  | 4                             | HIGH LATITUDES NAVIGATION                                  | 4             |
| A-II/2  | 4.1                           | General considerations                                     |               |
|   | 4.2                           | Polar cartography  |               |
|   | 4.3                           | Particular Aspects associated to areas of high latitudes   |               |
|   | 4.3.1                         | Coastwise navigation                                       |               |
|   | 4.3.2                         | Astronomical navigation                                    |               |

|                                 |       |  |    |
|---------------------------------|-------|--|----|
|                                 | 4.3.3 | Electronic Navigation  |    |
|                                 | 5     | NAVIGATION WITH ICE  | 4  |
|                                 | 5.1   | General considerations on icing formation and drift                                    |    |
|                                 | 5.2   | Oceans ice distribution  |    |
|                                 | 5.3   | Navigation with ice – Prevision, detection, operation                                  |    |
|                                 | 5.4   | Informative services   |    |
|                                 | 6     | SAFETY OF THE NAVIGATION   | 6  |
|                                 | 6.1   | The IMO and the safety of the navigation   |    |
|                                 | 6.2   | Bridge procedures  |    |
|                                 | 6.2.1 | BRM – Bridge Resource Management   |    |
|                                 | 6.2.2 | Voyage planning  |    |
|                                 | 6.2.3 | Voyage preparation   |    |
|                                 | 6.2.4 | Navigational routines at sea   |    |
|                                 | 7     | MAGNETIC AND GYRO COMPASSES  | 14 |
|                                 | 7.1   | Magnetic compasses   |    |
|                                 | 7.1.1 | Terrestrial and ship's magnetic fields   |    |
|                                 | 7.1.2 | Deviations studies. Accurate and approximate deviation calculation of directive force. |    |
|                                 | 7.1.3 | Band deviation   |    |
|                                 | 7.1.4 | Provisional and definitive compensation.   |    |
|                                 | 7.1.5 | Compensation practice in simulator   |    |
|                                 | 7.2   | Gyro compasses   |    |
|                                 | 7.2.1 | Free gyro compass  |    |
|                                 | 7.2.2 | Gyro compass transformed into compass  |    |
|                                 | 7.2.3 | Gyro errors  |    |
|                                 | 7.2.4 | Principal characteristics of common equipment's on board.                              |    |
| <b>Recommended reading:</b>     |       |  |    |
|                                 |       |  |    |
| <b>Teaching methods:</b>        |       |  |    |
|                                 |       |  |    |
| <b>Assessment methods:</b>      |       |  |    |
| Theoretical and practical       |       |  |    |
| <b>Language of instruction:</b> |       | Portuguese / English   |    |

| Bachelor of Science in Deck and Bridge Operations   |                             |   |              |
|---|-----------------------------|---|--------------|
| Description of individual course unit   |                             |   |              |
| Course title:   | Maritime Communications I   |   |              |
| Field:  |                             |   |              |
| Course code:  | 3028                        | Type of course:   | Mandatory    |
| From:   | 2011/2012                   |   |              |
| Year of study:  | 3 rd                        | Semester:   | 1st          |
| ECTS:   | 4,0                         | Hours/week:   | 3 ( T/1 P/2) |
| Name of lecturer:   | Elisa Semedo de Sá Bandeira |   |              |
| Prerequisites:  | n/a                         |   |              |
| Objective of the course (expected learning outcomes and competences to be acquired):  |                             |   |              |
| Provide students the necessary skills for understanding and operating Global Maritime, Distress and Safety System and general radiocommunicatins as well as the correct operation of shipborne equipment. |                             |   |              |
| Provide students the necessary and mandatory skills according to STCW Convention in order to obtain the GMDSS General Operator’s Certificate  |                             |   |              |
| Course contents:  |                             |   |              |
| STCW  | Item                        | Program   | Hours        |
| Table A-II/1  | 1.                          | International Code of Signals   | 3            |
|   | 1.1.                        | Use of the international phonetic alphabet and morse code                         |              |
|   | 1.2.                        | Standard abreviations and service codes   |              |
|   | 1.3.                        | Communication methods   |              |
|   | 1.5.                        | Luminous morse procedures   |              |
|   | 1.6.                        | Procedures with flags   |              |
|   | 2.                          | General Principles and fundamental characteristics of the Maritime Mobile Service | 5            |
|   | 2.1                         | Types of communications in the MMS  |              |
|   | 2.2                         | Types of stations   |              |
|   | 2.3.                        | Propagation and classes of emission   |              |
|   | 2.4.                        | Frequencies allocated to MMS  |              |
| Section A-IV/2  | 3.                          | General communications procedures   | 4            |
|   | 3.1.                        | Selection of communication methods in different situations                        |              |
|   | 3.2.                        | Procedures for radiotelephone calls in VHF and MF/HF                              |              |
|   | 3.3.                        | National and international use of different channels in VHF                       |              |
|   | 4.                          | Radiotelegrams  | 1            |
|   | 5.                          | General principles of Narrow Band Direct Printing (NBDP)                          | 2            |
| Table A-II/1  | 6.                          | Luminous morse practice   | 15           |
| A-IV/2  | 7.                          | VHF and MF/HF equipment practice  | 15           |
| TOTAL   |                             |   | 45           |
| Bibliography :  |                             |   |              |
| International Code of Signals   |                             |   |              |
| IMO Model Course 1.25   |                             |   |              |
| Teaching methods:   |                             |   |              |
| Expository method   |                             |   |              |
| Research work and practical work  |                             |   |              |
| Assessment methods:   |                             |   |              |

|                           |                      |
|---------------------------|----------------------|
| Theoretical and practical |                      |
| Language of instruction:  | Portuguese / English |

| Bachelor of Science in Deck and Bridge Operations  |                           |  |           |
|--|---------------------------|--|-----------|
| Description of individual course unit  |                           |  |           |
| Course title:  | Radar and Arpa Operations |  |           |
| Field:   | Navigation                |  |           |
| Course code:   | 3029                      | Type of course:  | Mandatory |
| From:  | 2011/2012                 |  |           |
| Year of study:   | 3nd                       | Semester:  | 1st       |
| ECTS:  | 6                         | Hours/week:  | 3TP+3P    |
| Name of lecturer:  | Jaime Lima dos Santos     |  |           |
| Prerequisites:   | No                        |  |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                           |  |           |
| Competence development for the use of radar and arpa systems under the perspective of the conduction of navigation and of the anti-collision as per International Regulation to Avoid Collisions at Sea, and complying with Tables A-II.1 and A-II.2 STCW95 Code |                           |  |           |
| Course contents:   |                           |  |           |
| STCW   | Item                      | Program  | Hours     |
| Tabela   | 1                         | Naval Kinematics   | 9         |
| A-II/1   | 1.1                       | Kinematics principles  |           |
|  | 1.2                       | The speed triangle   |           |
|  | 1.3                       | Course calculation, speed and aspect of the other ships  |           |
|  | 1.4                       | Calculation of CPA and TCPA  |           |
|  | 1.5                       | Effects on course and speed alteration of OS (Own-ship)  |           |
|  | 1.6                       | Effects of change in course and speed of the echoes  |           |
|  | 1.7                       | Exercises on the manoeuvring rose  |           |
|  | 2                         | Anti-collision kinematics  | 40        |
|  | 2.1                       | Kinematics principles and anti-collision   |           |
|  | 2.2                       | Re-interpretation and application of COLREG 72 regulations and their amendments, namely the Regulations of Part B and D. |           |
|  | 2.3                       | The IM and IFM   |           |
|  | 2.4                       | Anti-collision Kinematics exercises on the manoeuvring rose with 1,2 and more echoes                                     |           |
|  | 2.5                       | Radar simulator anti-collision practices.  |           |
|  | 3                         | The A.R.P.A. System  | 6         |
|  | 3.1                       | System general description   |           |
|  | 3.2                       | Characteristics of ARPA monitor  |           |
|  | 3.3                       | Standard characteristics of a ARPA system set up by IMO (Resolution IMO A.422(XI) ).                                     |           |
|  | 3.4                       | Acquiring of echoes  |           |
|  | 3.5                       | Capacities and limitations to follow echoes tracks directions  |           |
|  | 3.6                       | Processing delays .  |           |
|  | 4                         | Exercises of anti-collision:   | 20        |
|  | 4.1                       | - 2 and 3 echoes at open sea   |           |
|  | 5                         | Anti-collision practice by arpa in simulator   |           |
|  | 5.1                       | Identification of equipment and respective commands.   |           |
|  | 5.2                       | - 2 and 3 echoes at open sea   |           |
|  |                           | - several echoes at open sea   |           |
|  |                           | - several echoes at TSS` s and zones of heavy traffic intensity  |           |
|  | 6                         | International Regulation to Avoid Collisions at Sea  | 15        |
|  |                           | Total  | 90        |

|                                 |                      |
|---------------------------------|----------------------|
| <b>Bibliography :</b>           |                      |
|                                 |                      |
| <b>Teaching methods:</b>        |                      |
|                                 |                      |
| <b>Assessment methods:</b>      |                      |
| Theoretical and practical       |                      |
| <b>Language of instruction:</b> | Portuguese / English |

| Bachelor of Science in Deck and Bridge Operations   |                 |  |           |
|---|-----------------|--|-----------|
| Description of individual course unit   |                 |  |           |
| Course title:   | Fisheries       |  |           |
| Field:  |                 |  |           |
| Course code:  | 3030            | Type of course:  | Mandatory |
| From:   | 2011/2012       |  |           |
| Year of study:  | 3nd             | Semester:  | 1st       |
| ECTS:   | 3,0             | Hours/week:  | 2         |
| Name of lecturer:   | Fortunato Costa |  |           |
| Prerequisites:  |                 |  |           |
| Objective of the course (expected learning outcomes and competences to be acquired):  |                 |  |           |
| Provide students with basic theoretical knowledge on Oceanography, fishing vessels and arts which are more in use in order to prepare them for the professional activity. |                 |  |           |
| Course contents:  |                 |  |           |
| STCW  | Item            | Program  | Hours     |
| Tabela  | 3               | Introduction to fishery arts   | 3         |
| A – II/2  | 3.1             | Different types of fishery   |           |
|   | 3.2             | Maritime areas   |           |
|   | 3.3             | Large fishery areas  |           |
|   | 4               | Division of fishing apparatus according Portuguese law   | 3         |
|   | 9               | UE fishing zones (Total amounts, prohibited catches, target species, pemited meshsize and composition by catch). Statistical data. | 3         |
|   | 5               | Materials used in the building of fishing apparatus  | 3         |
|   | 5.1             | Natural fibres   |           |
|   | 5.2             | Artificial fibres  |           |
|   | 5.3             | Twine for nets   |           |
|   | 5.4             | Ropes for nets   |           |
|   | 5.5             | Choice of a material   |           |
|   | 5.6             | Lettering systems  |           |
|   | 6               | Notions on fishing nets  | 6         |
|   | 6.1             | The net cloth  |           |
|   | 6.2             | The direction of the mesh  |           |
|   | 6.3             | Net cloth dimensions   |           |
|   | 6.4             | Meshing and mesh size  |           |
|   | 6.5             | Net cloth cutting  |           |
|   | 6.5.1           | Straight cut   |           |
|   | 6.5.2           | Slant cut  |           |
|   | 6.5.3           | Calculation of the theoretic cut type  |           |
|   | 6.5             | Net cloth cutting  |           |
|   | 6.5.1           | Straight cut   |           |
|   | 6.5.2           | Slant cut  |           |
|   | 6.5.3           | Calculation of the theoretic cut type  |           |
|   | 6.5.4           | Types of practical cut   |           |
|   | 6.6             | Characterization of a net cloth  |           |
|   | 7               | Assembly Coefficient   | 1/2       |
|   | 8               | Slack  | 1/2       |



|                                 |       |   |    |
|---------------------------------|-------|---|----|
|                                 | 9     | Fish hook apparatus                                     | 1  |
|                                 | 9.1   | Simple lines  |    |
|                                 | 9.2   | The palangres   |    |
|                                 | 9.2.1 | automatic palangres                                     |    |
|                                 | 9.3   | Troll fishing lines                                     |    |
|                                 | 10    | Traps   | 1  |
|                                 | 11    | Tenon nets  | 3  |
|                                 | 12    | Dragging nets   | 9  |
|                                 | 13    | Siege nets  | 3  |
|                                 | 14    | Handling and preservation of fish aboard                | 3  |
|                                 | 15    | Presentation of most used electronic equipment on board | 2  |
|                                 |       | Assessment  | 4  |
|                                 |       | Total   | 45 |
| <b>Bibliography :</b>           |       |   |    |
|                                 |       |   |    |
| <b>Teaching methods:</b>        |       |   |    |
|                                 |       |   |    |
| <b>Assessment methods:</b>      |       |   |    |
| Theoretical and practical       |       |   |    |
| <b>Language of instruction:</b> |       | Portuguese / English                                    |    |

| Bachelor of Science in Deck and Bridge Operations  |                                |   |           |
|--|--------------------------------|---|-----------|
| Description of individual course unit  |                                |   |           |
| Course title:  | Loading and carriage systems I |   |           |
| Field:   | Loading and Carriage Systems   |   |           |
| Course code:   | 3031                           | Type of course:   | Mandatory |
| From:  | 2011/2012                      |   |           |
| Year of study:   | 3rd                            | Semester:   | 1st       |
| ECTS:  | 4                              | Hours/week:   | 4         |
| Name of lecturer:  | AntónioFera                    |   |           |
| Prerequisites:   |                                |   |           |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                                |   |           |
| Provide students with knowledge and skills necessary to effectuate the stowage and carriage of sea-waterborne commodities on board the different existing ships, this as per a Table A II/1 of STCW 2010: Control of cargo, stowage, lashing and discharge operations as well as precautions during the transit. |                                |   |           |
| Course contents:   |                                |   |           |
| STCW   | Item                           | Program   | Hours     |
| Tables   | 1                              | Maritime carriage   | 1         |
| A II/1   | 1.1                            | Ships’ Classification   | 0,5       |
|  | 1.2                            | Nomenclature related to stowage   | 0,5       |
|  | 2                              | Port Entities / Regulation  | 2         |
|  | 3                              | Loading Documentation<br>-Bill of lading, note of loading, tallying sheet, cargo manifest, note of cargo, cargo plan, cargo tracer. | 4         |
|  |                                |   |           |
|  | 4                              | - Cargo Minute<br>capacity plan, stability book. Hydrostatic Curves , stability curves  | 3         |
|  | 5                              | Break cargo   | 10        |
|  | 5.1                            | Cargo characteristics   | 0,5       |
|  | 5.2                            | Goods packages  | 0,5       |
|  | 5.3                            | Ships’ characteristics  | 0,5       |
|  | 5.4                            | Equipments used in goods stowage  | 0,5       |
|  | 5.5                            | Stowage factor  | 0,5       |
|  | 5.6                            | Goods stowage on board ships  | 0,5       |
|  | 5.7                            | Holds readiness and cleanness   | 0,5       |
|  | 5.8                            | Cargoes segregation   | 0,5       |
|  | 5.9                            | Securing of cargo   | 1         |
|  | 5.10                           | Holds ventilation   | 1         |
|  | 5.11                           | Heavy Volumes   | 0,5       |
|  | 5.12                           | Stowage of cargo on deck (timber)   | 1         |
|  | 5.13                           | Cargo Stowage Safety Code on board (CSP/CSS)  | 1         |
|  | 6                              | Dangerous Cargos  | 8         |
|  | 6.1                            | Cargoes characteristics   | 3         |
|  | 6.2                            | IMDGC Code  | 2         |
|  | 6.3                            | Cargoes stowage on board ships and their securing   | 3         |
| Tables   | 7                              | Unitised cargoes. Containerisation.   | 10        |
| A II/1   | 7.1                            | Containers building characteristics   | 0,5       |
|  | 7.2                            | Containers types  | 0,5       |
|  | 7.3                            | Container ships – holds – hatches – cargo gear  | 1         |

|                                 |      |  |     |
|---------------------------------|------|--|-----|
|                                 | 7.4  | Equipments used in the stowage   | 1   |
|                                 | 7.5  | Goods stowage in containers  | 1   |
|                                 | 7.6  | Containers stowage on board ships  | 1   |
|                                 | 7.7  | The securing of the containers   | 1   |
|                                 | 7.8  | Regulation (International Convention on the safety of containers 1972 and amendments )                       | 1   |
|                                 | 7.9  | Stowage plane  | 3   |
| Tables                          | 8    | Roll-On-Roll-Off (Ro-Ro) ships   | 10  |
| A V/2                           | 8.1  | Ro-Ro system and International Regulation  | 1,5 |
|                                 | 8.2  | Characterization of ships types  | 1   |
|                                 | 8.3  | Definitions and terminology  | 0,5 |
|                                 | 8.4  | Handling and manoeuvre and maintenance of equipments: watertight doors; Ramps; lifting and transporting gear | 1,5 |
|                                 | 8.5  | Cargo spaces ventilation   | 1   |
|                                 | 8.6  | Ballast, unballasting and draining systems   | 0,5 |
|                                 | 8.7  | Cargo stowage and securing   | 3   |
|                                 | 8.8  | Cargo carriage safety  | 1   |
| Tables                          |      |  |     |
| A II/1                          | 9    | Bulk carrier   | 1,5 |
|                                 | 9,1  | Bulk carrier ships   | 0,5 |
|                                 | 9.2  | Bulk carrier cargo   | 0,5 |
|                                 | 9.3  | Stowage equipment  | 0,5 |
|                                 | 10   | Cargo and spaces damages and surveyors   | 3   |
|                                 | 10.1 | Cargoes damages and surveyors  | 1   |
|                                 | 10.2 | Ship structure, cargo spaces, ballast tanks damages  | 1   |
|                                 | 10.3 | Procedures to surveys the cargo and ship damages   | 1   |
|                                 | 11   | Loading and comunication   | 6   |
|                                 | 11.1 | Stowage communication inside the ship  | 3   |
|                                 | 11.2 | Stowage communication ship/shore   | 3   |
|                                 |      | Total  | 60  |
| <b>Bibliography :</b>           |      |  |     |
|                                 |      |  |     |
| <b>Teaching methods:</b>        |      |  |     |
|                                 |      |  |     |
| <b>Assessment methods:</b>      |      |  |     |
| Theoretical and practical       |      |  |     |
| <b>Language of instruction:</b> |      | Portuguese / English   |     |

**3<sup>rd</sup> year of studies**  
**2<sup>nd</sup> semester**

| Bachelor of Science in Deck and Bridge Operations   |  |  |           |
|---|--|--|-----------|
| Description of individual course unit   |  |  |           |
| Course title:   | Navigation VI                          |  |           |
| Field:  | Navigation                             |  |           |
| Course code:  | 3034                                   | Type of course:  | Mandatory |
| From:   | 2011/2012                              |  |           |
| Year of study:  | 3nd                                    | Semester:  | 2nd       |
| ECTS:   | 4,0                                    | Hours/week:  | 3         |
| Name of lecturer:   | Helena Maria Rodrigues da Costa Julião |  |           |
| Prerequisites:  |  |  |           |
| Objective of the course (expected learning outcomes and competences to be acquired):  |  |  |           |
| To provide the students with knowledge on electronic navigation systems and equipments, in order to enable them to perform their tasks on board, in accordance with STCW95 Code Tables A-II/1 and A-II/2. |  |  |           |
| Program:  |  |  |           |
| STCW  | Item                                   | Program  | Hours     |
| Tables  | 1                                      | ELECTROMAGNETIC WAVE PROPAGATION                                       | 3.0       |
| A II/1<br>A II/2  | 1.1                                    | Introduction.  | 0.5       |
|   | 1.2                                    | Electromagnetic waves characteristics.                                 | 0.5       |
|   | 1.2.1                                  | Frequency and wavelength.  | 0.1       |
|   | 1.2.2                                  | Radiation distribution.  | 0.1       |
|   | 1.2.3                                  | Polarizing plan.   | 0.1       |
|   | 1.2.4                                  | Electromagnetic wave spectrum.   | 0.2       |
|   | 1.3                                    | Electromagnetic waves propagation.                                     | 0.5       |
|   | 1.3.1                                  | Vertical structure of atmosphere.                                      | 0.2       |
|   | 1.3.2                                  | Kinds of propagation.  | 0.3       |
|   | 1.4                                    | Ionosphere.  | 0.5       |
|   | 1.4.1                                  | Nature of ionosphere.  | 0.1       |
|   | 1.4.2                                  | Layers of ionosphere.  | 0.2       |
|   | 1.4.3                                  | Changes and anomalies of ionosphere.                                   | 0.2       |
|   | 1.5                                    | Wave propagation characteristics concerning path and frequency.        | 0.6       |
|   | 1.5.1                                  | Surface wave.  | 0.1       |
|   | 1.5.2                                  | Direct wave.   | 0.1       |
|   | 1.5.3                                  | Reflected wave.  | 0.1       |
|   | 1.5.4                                  | Ionosphere wave.   | 0.3       |
|   | 1.6                                    | Meteorological conditions effects on electromagnetic wave propagation. | 0.4       |
|   | 1.6.1                                  | Rain effect.   | 0.2       |
|   | 1.6.2                                  | Temperature effect.  | 0.2       |
| Transport   |  |  | 3.0       |
| A II/1 ; A II/2   | 2                                      | RADAR THEORY   | 9.0       |
|   | 2.1                                    | Marine radar basic concept.  | 0.5       |
|   | 2.2                                    | Marine radar system and operation.                                     | 4.0       |
|   | 2.2.1                                  | Basic system components and functions.                                 | 0.5       |
|   | 2.2.2                                  | Characteristics of radar energy transmission.                          | 0.5       |
|   | 2.2.3                                  | Radar transmission frequencies.  | 0.5       |
|   | 2.2.4                                  | Radar constants: PL, PI, PRR, PRF.                                     | 0.5       |
|   | 2.2.5                                  | Antennas.  | 0.5       |

|                  |         |   |      |
|------------------|---------|---|------|
|                  | 2.2.6   | Plain Position Indicator.   | 0.6  |
|                  | 2.2.6.1 | Operation.  | 0.1  |
|                  | 2.2.6.2 | Measuring distance and bearing in PPI.  | 0.1  |
|                  | 2.2.6.3 | Commands and circuits: on/stand-by/off, gain, lin/log amplification, tuning, anti clutter rain, focus, brilliance, distance scale, short/long pulse length, bearing mark, base-time, pulse brilliance, anti clutter sea, fixed and mobile distance rings, linearity, bow mark and synchronizing system. | 0.4  |
|                  | 2.3     | Image presentation in the PPI.  | 0.3  |
|                  | 2.3.1   | Non stabilized relative motion.   | 0.1  |
|                  | 2.3.2   | Stabilized relative motion.   | 0.1  |
|                  | 2.3.3   | True motion.  | 0.1  |
|                  | 2.4     | Device characteristics.   | 0.6  |
|                  | 2.4.1   | Radar horizon.  | 0.1  |
|                  | 2.4.2   | Maximum and minimum ranges.   | 0.1  |
|                  | 2.4.3   | Refraction.   | 0.1  |
|                  | 2.4.4   | Bearing and distance measurements accuracy.   | 0.1  |
|                  | 2.4.5   | Image definition.   | 0.1  |
|                  | 2.4.6   | Distance and bearing discrimination.  | 0.1  |
| A II/1<br>A II/2 | 4       | LORAN C   | 6.0  |
|                  | 4.1     | Navigation hyperbolic systems development.  | 0.5  |
|                  | 4.2     | Hyperbole geometry.   | 0.5  |
|                  | 4.3     | System description and fundamentals.  | 1.0  |
|                  | 4.4     | LORAN C signal architecture and characteristics.  | 0.5  |
|                  | 4.5     | LORAN C system errors and precision.  | 1.0  |
|                  | 4.6     | Covering diagrams.  | 0.5  |
|                  | 4.7     | Simultaneous use of several LORAN C chains.   | 0.5  |
|                  | 4.8     | LORAN C receivers.  | 0.5  |
|                  | 4.9     | Tables, charts and publications.  | 1.0  |
|                  | 5       | SATELLITE NAVIGATION  | 16.0 |
|                  | 5.1     | Satellite systems development.  | 0.5  |
|                  | 5.2     | Kepler's laws and orbit. Ephemerides.   | 1.0  |
|                  | 5.3     | GPS system description and fundamentals.  | 1.0  |
|                  | 5.4     | GPS signal architecture, characteristics and services.  | 1.0  |
|                  | 5.5     | Types of messages and contents.   | 0.5  |
|                  | 5.6     | Types of GPS receivers.   | 0.5  |
|                  | 5.7     | Types of GPS measurements.  | 1.0  |
|                  | 5.7.1   | Pseudo-distance. Algorithms used to perform a navigational solution.  | 0.5  |
|                  | 5.7.2   | Wave phase measurement.   | 0.5  |
|                  | 5.8     | Atmospheric phenomena effecting satellites.   | 0.5  |
|                  | 5.9     | Relativistic phenomena effecting satellites.  | 2.5  |
|                  | 5.9.1   | Basic concepts on theory of relativity.   | 1.5  |
|                  | 5.9.2   | Relativistic effects associated to satellite orbit, signal and watch.   | 0.5  |
|                  | 5.9.3   | Relativistic effects associated to receiver watch.  | 0.5  |
| A II/1<br>A II/2 | 5       | SATELLITE NAVIGATION  | 16.0 |
|                  | 5.10    | Satellite geodetic reference systems.   | 0.5  |
|                  | 5.11    | GPS system errors and precision.  | 1.0  |
|                  | 5.11.1  | Errors associated to satellite, signal propagation and receiver that affect GPS observations.   | 0.5  |

|       |        |   |      |
|-------|--------|---|------|
|       | 5.11.2 | Dilution of precision in positioning and geometry of satellite constellation.         | 0.5  |
|       | 5.12   | GLONASS, EGNOS and GALILEU satellite systems.   | 2.0  |
|       | 5.13   | Differential GPS.   | 2.0  |
|       | 5.13.1 | Concept and system components.  | 0.5  |
|       | 5.13.2 | Types of differential corrections and errors compensation.                            | 0.5  |
|       | 5.13.3 | RTCM-SC104 message format.  | 0.5  |
|       | 5.13.4 | Performance and integrity control of DGPS.  | 0.5  |
|       | 5.14   | DGPS Portuguese net.  | 2.0  |
|       | 5.15   | EUROFIX system.   | 0.5  |
|       | 6      | DOPPLER NAVIGATION  | 2.0  |
|       | 6.1    | Doppler effect.   | 1.0  |
|       | 6.2    | Speed measuring systems. Doppler odometer.  | 1.0  |
|       | 7      | ACCOUSTIC SOUNDERS  | 6.0  |
|       | 7.1    | Measuring the depth. Single beam and multi beam acoustical sounders basic concepts.   | 2.0  |
|       | 7.2    | Calibration and resolution of an acoustic sounder.                                    | 1.0  |
|       | 7.3    | Position and depth values correction with tide, movements and ship condition effects. | 1.0  |
|       | 7.4    | Equipment internal noise, sea and ship noise and reverberation.                       | 1.0  |
|       | 7.5    | Sonar equation.   | 1.0  |
|       |        |   |      |
| Total |        |   | 45.0 |

#### Recommended reading:

A DÉCADA DO GPS – TEN. NUNO SARDINHA MONTEIRO – ANAIS DO CLUBE MILITAR NAVAL, VOL.CXXX, JANEIRO- MARÇO 2000

A REDE DGPS PORTUGUESA – TEN. NUNO SARDINHA MONTEIRO – REVISTA DA ARMADA, DEZEMBRO 2002

ACOUSTICAL OCEANOGRAPHY – CLARENCE S. CLAY & HERMAN MEDWIN – JONH WILEY & SONS

COORDINATE SYSTEMS OVERVIEW – PETER H. DANA – UNIVERSITY OF TEXAS, 1995

DA MILHA AO METRO - INSTALAÇÃO DA REDE DGPS PORTUGUESA – TEN. NUNO SARDINHA MONTEIRO – REVISTA DA ARMADA, NOVEMBRO 2002

DUTTON’S NAVIGATION & PILOTING – ELBERT S. MALONEY – NAVAL INSTITUTE PRESS, ANNAPOLIS, MARYLAND, USA 1978

EQUIPAMENTO DE RADAR E ARPA – ABEL SIMÕES –ENIDH

EUROFIX: LORAN-C AS A GPS AUGMENTATION SYSTEM: WHAT DOES THE FUTURE HOLD? – D. VAN WILLINGEN, G.W.A. OFFERMANS & A.W.S. HELWIG – DELFT UNIVERSITY OF TECHNOLOGY, 1997 NETHERLANDS

EUROPEAN GEOSTATIONARY NAVIGATION OVERLAY SERVICE (EGNOS) – NUNO SARDINHA MONTEIRO – REVISTA DE MARINHA, DEZEMBRO 2003 / JANEIRO 2004

GEODETIC DATUM OVERVIEW – PETER H. DANA – UNIVERSITY OF TEXAS, 1995

GLOBAL AND EUROPEAN REFERENCE SYSTEMS: THEORY AND PRACTICE – ROYAL OBSERVATORY OF BELGIUM, 2004

GLOBAL POSITIONING SYSTEM OVERVIEW – PETER H. DANA – UNIVERSITY OF TEXAS, 1994

GPS INSTANT NAVIGATION FROM BASIC TECHIQUES TO ELECTRONIC CHARTING – KEVIN MONAHAN & DON DOUGLASS – FINE EDGE.COM, CANADA

INTRODUCTION TO HF RADIO PROPAGATION – IPS RADIO & SERVICE SPACES

L5 – THE NEW GPS SIGNAL – STEFAN ERKER, STEFFEN THÖLERT, JOHANN FURTHNER, MICHAEL MEURER

LORAN-C USER HANDBOOK – COMMANDANT PUBLICATION P16562.5 – WASHINGTON DC

MANUAL DE NAVEGAÇÃO – INSTITUTO HIDROGRÁFICO (4ª ED. 1989)

MARINE ELECTRONIC NAVIGATION (SECOND ENLARGED EDITION) – S. F. APPLEYARD, R. S. LINFORD

|   |                      |
|---|----------------------|
| AND P. J. YARWOOD – ROUTLEDGE & KEGAN PAUL – LONDON AND NEW YORK  |                      |
| MARITIME REQUIREMENTS FOR A FUTURE GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) – IMO RESOLUTION A.860(20) – ANNEX, NOVEMBER 27, 1997  |                      |
| NAVIGATION AFLOAT – A MANUAL FOR THE SEAMAN – ALTON B. MOODY – HOLLIS & CARTER, TORONTO 1980  |                      |
| O RADAR E A SUA UTILIZAÇÃO NA NAVEGAÇÃO – NV905 – ESCOLA NAVAL  |                      |
| PERFORMANCE OF GPS, GLONAS AND GALILEO – BERND EISSFELLER, GERALD AMERES, VICTORIA KROPP, DANIEL SANROMA – MÜNCHEN  |                      |
| PRINCIPLES AND PRACTICE OF GPS SURVEYING – CHRIS RIZOS – AUSTRALIAN NATIONAL UNIVERSITY, 1999   |                      |
| PROPAGAÇÃO DAS ONDAS ELECTROMAGNÉTICAS – NV900 – ESCOLA NAVAL   |                      |
| RADAR AND ARPA MANUAL – ALAN BOLE, BILL DINELEY, ALAN WALL – ELSEVIER (2ND ED. 2005)  |                      |
| RADAR AND ELECTRONIC NAVIGATION – G. J. SONNENBERG  |                      |
| RADAR NAVIGATION AND MANEUVERING BOARD MANUAL – NATIONAL IMAGERY AND MAPPING AGENCY PUB 1310 (7ª ED. 2001)  |                      |
| RADAR OBSERVER'S HANDBOOK – W. BURGER   |                      |
| REDE DGPS (DIFFERENTIAL GPS) PORTUGUESA: MELHOR SEGURANÇA DA NAVEGAÇÃO EM ÁGUAS NACUIONAIS – TEN. NUNO SARDINHA MONTEIRO – ANAIS DO CLUBE MILITAR NAVAL, VOL.CXXXI, JULHO-SETEMBRO 2001   |                      |
| RELATÓRIO DE ESTAGIO PARA INGRESSO NA CARREIRA TÉCNICA (PARTE IV – APLICAÇÕES INFORMÁTICAS) – HELENA MARIA RODRIGUES DA COSTA JULIÃO – INSTITUTO HIDROGRÁFICO, 1996   |                      |
| SIDE SCAN VERSUS MULTIBEAM ECHOSOUNDER OBJECT DETECTION: A COMPARATIVE ANALYSIS – MIKE B. BRISSETTE AND DR JOHN E. HUGHES CLARKE – ACOUSTIC DATA ANALYSIS CENTRE PACIFIC & OCEAN MAPPING GROUP, UNIVERSITY OF NEW BRUNSWICKFREDERICTON, NEW BRUNSWICK, CANADA |                      |
| SOUND PROPAGATION IN THE SEA – R. J. URICK – DEFENSE ADVANCED RESEARCH PROJECT AGENCY, 1979   |                      |
| SOUND UNDERWATER IMAGES – JOHN P. FISH & H. ARNOLD CARR – EG&G MARINE INSTRUMENTS, MASSACHUSETTS, USA 1990  |                      |
| SPECIFICATION ON THE TRANSMITTED LORAN-C SIGNAL – COMDTINST M16562.4A, 1994 – U.S. DEPARTMENT OF TRANSPORTATION – UNITED STATES COAST GUARD   |                      |
| THE AMERICAN PRATICAL NAVIGATOR - BOWDITCH (ED. 1995, 2002)   |                      |
| THE CASE FOR eLORAN – RESEARCH AND RADIONAVIGATION – GENERAL LIGHTHOUSE AUTHORITIES OF THE UNITED KINGDOM AND IRELAND   |                      |
| THE GPS TUTOR – US DEPARTMENT OF DEFENSE  |                      |
| THE NEW L2 CIVIL SIGNAL – RICHARD D. FONTANA, WAI CHEUNG, PAUL M. NOVAK, THOMAS A. STANSELL   |                      |
| WORLD-WIDE RADIONAVIGATION SYSTEM – IMO RESOLUTION A.815(19), NOVEMBER 23, 1995   |                      |
| <b>Teaching methods:</b>  |                      |
| Lectures under recommended reading and digital presentations.   |                      |
| Practical handling to apply Radar commands and functions of electronic components.  |                      |
| Interactive dialog with pupils.   |                      |
| <b>Assessment methods:</b>  |                      |
| Two (2) theoretical tests.  |                      |
| <b>Language of instruction:</b>   | Portuguese / English |



| Bachelor of Science in Deck and Bridge Operations  |                             |   |                      |
|--|-----------------------------|---|----------------------|
| Description of individual course unit  |                             |   |                      |
| Course title:  | Communications II           |   |                      |
| Field:   |                             |   |                      |
| Course code:   | 3035                        | Type of course:   | Mandatory            |
| From:  | 2011/2012                   |   |                      |
| Year of study:   | 3rd                         | Semester:   | 2nd                  |
| ECTS:  | 5,0                         | Hours/week:   | 5 (T/2 – TP/1 – P/2) |
| Name of lecturer:  | Elisa Semedo de Sá Bandeira |   |                      |
| Prerequisites:   | Communications I            |   |                      |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                             |   |                      |
| Acquisition of the necessary skills for the correct operation of radiocommunications systems within the GMDSS, namely in what refers to situations of distress, urgency and safety situations, according to what is stipulated in the STCW Convention, section A-IV/2 and B-IV/2, SOLAS/74 and Radio Regulations from UIT. |                             |   |                      |
| Course contents:   |                             |   |                      |
| STCW   | Item                        | Program   | Hours                |
| Section  | 1.                          | Global Maritime Distress and Safety System (GMDSS)  | 6                    |
| A-IV/2   | 1.1.                        | Sea areas and Master plan   |                      |
|  | 1.2.                        | GMDSS functions   |                      |
|  | 1.3.                        | Functional requirements for stations within the GMDSS o âmbito do GMDSS and means of communications     |                      |
|  | 1.4.                        | Certificates  |                      |
| Secção   | 2.                          | Mandatory procedures from the Radio Regulations   | 6                    |
| A-IV/2   | 2.1.                        | Station documents and use of publications   |                      |
|  | 2.2.                        | Station Logbook   |                      |
|  | 2.3.                        | Knowledge of Radio Regulations for the Maritime Mobile Service and Maritime Mobile Service by Satellite |                      |
|  | 3.                          | Digital Selective Calling (DSC)   | 16                   |
|  | 3.1.                        | General principles, characteristics and format  |                      |
|  | 3.2.                        | Maritime Mobile Slective Identification (MMSI)  |                      |
|  | 3.3.                        | Use and facilities of Digital Selective Calling   |                      |
|  | 3.4.                        | Categories of calls and priorities  |                      |
| Section  | 4.                          | Maritime Mobile Service by Satellite  | 18                   |
| A-IV/2   | 4.1.                        | Functions of satallite communications   |                      |
|  | 4.2.                        | Space and earth segments and mobile stations  |                      |
|  | 4.3.                        | Modes of communications   |                      |
|  | 4.4.                        | Distress, urgency and safety communications   |                      |
|  | 4.5.                        | Inmarsat B, C e F77 systems   |                      |
|  | 4.6.                        | Enhaced Group Call (EGC)  |                      |
|  | 5.                          | GMDSS sub-systems   | 8                    |
|  | 5.1.                        | Emergemcy Positioning Radio Beacons (EPIRB)   |                      |
|  | 5.1.1.                      | EPIRB COSPAS-SARSAT system, INMARSAT system and VHF DSC   |                      |
|  | 5.1.2.                      | Precautions to avoid false alerts   |                      |
|  | 5.2.                        | Search and Rescue Transponder (SART)  |                      |
|  | 5.3.                        | Maritme Safety Information (MSI)  |                      |
|  | 5.3.1.                      | General concept, services and facilities  |                      |
|  | 5.3.2.                      | NAVTEX and SafetyNet (EGC) services   |                      |
| Section  | 6.                          | Distress alerts   | 22                   |

|                                  |        |  |    |
|----------------------------------|--------|--|----|
| A-IV/2                           | 6.1.   | Procedures in case of Distress, Urgency and Safety situations in GMDSS       |    |
|                                  | 6.1.1. | Procedures for DSC terrestrial communications                                |    |
|                                  | 6.1.2. | Procedures for Inmarsat satellite communications                             |    |
|                                  | 6.2.   | Search and rescue operations   |    |
|                                  | 6.2.1. | The role of the Rescue Coordination Centres (RCC)                            |    |
|                                  | 6.2.2. | International Aeronautical and Maritime Search and Rescue Handbook (IAMSAR)  |    |
|                                  | 6.2.3. | Information and ship reporting systems (AMVER, JASREP, AUSREP, SITREP, etc.) |    |
|                                  | 6.2.4. | Search and Rescue operations in Portugal                                     |    |
|                                  | 6.3.   | Additional requirements for passenger ships                                  |    |
|                                  | 6.4.   | False alerts: prevention and cancelling                                      |    |
| Section                          | 7.     | Traffic charges  | 2  |
| B-IV/2                           | 8.     | Emergency energy sources   | 2  |
|                                  | 9.     | Basic Maintenance  | 1  |
| TOTAL                            |        |  | 75 |
| <b>Recommended reading:</b>      |        |  |    |
| IMO Model Course 1.25            |        |  |    |
| Radio Regulations, UIT           |        |  |    |
| <b>Teaching methods:</b>         |        |  |    |
| Expository method                |        |  |    |
| Research work and practical work |        |  |    |
| <b>Assessment methods:</b>       |        |  |    |
| Theoretical and practical        |        |  |    |
| <b>Language of instruction:</b>  |        | Portuguese / English   |    |

| Bachelor of Science in Deck and Bridge Operations                                    |                                  |  |          |
|--|----------------------------------|--|----------|
| Description of individual course unit  |                                  |  |          |
| Course title:  | Loading and Transport Systems II |  |          |
| Field:   |                                  |  |          |
| Course code:   | 3036                             | Type of course:  | Optional |
| From:  | 2011/2012                        |  |          |
| Year of study:   | 3nd                              | Semester:  | 2nd      |
| ECTS:  | 5                                | Hours/week:  | 4 h      |
| Name of lecturer:  | Lázaro Delgado                   |  |          |
| Prerequisites:   |                                  |  |          |
| Objective of the course (expected learning outcomes and competences to be acquired): |                                  |  |          |
|  |                                  |  |          |
| Course contents:   |                                  |  |          |
| STCW   | I tem                            | Program  | Hours    |
| Tables<br>A II/1   | 01.                              | Liquid bulk cargoes and Chemicals                              | 28       |
|  | 01.01.                           | Ship’s characterization  | 2        |
|  | 01.01.01.                        | Oil tankers  | 1        |
|  | 01.01.02.                        | Chemical tankers   | 1        |
|  | 01.02.                           | Characteristics of cargoes - Hydrocarbons, chemicals           | 4        |
|  | 01.02.01.                        | Structure of the Cargoes                                       | 2        |
|  | 01.02.02.                        | Properties of petroleum  | 1        |
|  | 01.02.03.                        | Properties of Chemicals  | 1        |
|  | 01.03.                           | Cargoes hazards  | 2        |
|  | 01.03.03.                        | Hazards associated with the handling and carriage of petroleum | 1        |
|  | 01.03.04.                        | Hazards associated with the handling and carriage of chemicals | 1        |
|  | 01.04.                           | Pumping, piping and discharge arrangements                     | 6        |
|  | 01.04.01.                        | Tank arrangements in oil tankers                               | 1        |
|  | 01.04.02.                        | Tank arrangements in chemical tankers                          | 1        |
|  | 01.04.04.                        | Pumping and piping arrangements                                | 1        |
|  | 01.04.05.                        | Draining and stripping   | 1        |
|  | 01.04.06.                        | Measurement of the Cargo Quantity                              | 1        |
|  | 01.04.07.                        | Heating, Cooling, Venting and Vaporization Systems             | 1        |
|  | 01.05.                           | Operations   | 9.5      |
|  | 01.05.01.                        | Loading and Unloading Operations in Oil Tankers                | 1        |
|  | 01.05.02.                        | Loading and Unloading Operations in Chemical Tankers           | 1        |
|  | 01.05.03.                        | Transfer Operations  | 0.5      |
|  | 01.05.04.                        | Storage and Transport Systems                                  | 0.5      |
|  | 01.05.05.                        | Ballast and Deballast Operations                               | 0,5      |
|  | 01.05.06.                        | Gas-freeing and Purging Operations                             | 0,5      |
|  | 01.05.07.                        | Tank Cleaning  | 0,5      |
|  | 01.05.08.                        | Crude Oil Washing (COW) System                                 | 2.5      |
|  | 01.05.09.                        | Gas-freeing and Purging Operations                             | 0,5      |
|  | 01.05.10.                        | Inert Gas System (IGS)   | 2        |
|  | 01.06.                           | Marine Pollution   | 4.5      |
|  | 01.06.01.                        | Causes of Marine Pollution                                     | 1        |

|  |           |  |     |
|--|-----------|--|-----|
|  | 01.06.02. | Prevention of Marine Pollution                                       | 1   |
|  | 01.06.03. | MARPOL 73/78   | 1,5 |
|  | 01.06.04. | Requirements for the Discharge of Oil into the Sea                   | 0,5 |
|  | 01.06.05. | National and International Codes                                     | 0,5 |
|  | 02.       | Liquefied Gases  | 15  |
|  | 02.01.    | Liquefied Gas Tankers  | 2   |
|  | 02.01.01. | Introduction   | 0,5 |
|  | 02.01.02. | Type and Characterization of Gas Tankers                             | 1,0 |
|  | 02.01.03. | Definitions and  | 0,5 |
|  | 02.02.    | Liquefied Gases Characteristics and Hazards                          | 4   |
|  | 02.02.01. | Cargo types  | 1   |
|  | 02.02.02. | Basic Physics and Chemistry of the Liquefied Gases                   | 1   |
|  | 02.02.03. | Methods of Gases Reliquefaction                                      | 1   |
|  | 02.02.04. | Hazards associated with the handling and carriage of liquefied gases | 1   |
|  | 02.03.    | Cargo-handling Equipment and Instrumentation                         | 5   |
|  | 02.03.01. | Tank Arrangements in Gas   | 0,5 |
|  | 02.03.02. | Pumping and piping arrangements                                      | 1   |
|  | 02.03.03. | Pressure System  | 0,5 |
|  | 02.03.04. | Measurement of the Cargo Quantity                                    | 1   |
|  | 02.03.05. | Cargo Heaters and Cargo vaporizers                                   | 1   |
|  | 02.03.06. | Reliquefaction Systems   | 1   |
|  | 02.04.    | Tanks and Control Systems  | 4   |
|  | 2.04.01.  | Control Methods  | 1   |
|  | 2.04.02.  | Inert Gas System (IGS)   | 1   |
|  | 02.04.03. | Gas-freeing  | 1   |
|  | 02.04.04. | Purging  | 0,5 |
|  | 02.04.05. | Instrumentation  | 0,5 |
|  | 03.       | Ship/Shore Liaison   | 0,5 |
|  | 04.       | Emergency Operations   | 1,5 |
|  | 04.01.    | Organizational Structure   | 0,5 |
|  | 04.02.    | Alarms   | 0,5 |
|  | 04.03.    | Emergency Procedures   | 0,5 |
|  | 05.       | Practical Lessons in the Liquefied Cargo Handling Simulator          | 15  |
| <b>Recommended reading:</b>  |           |  |     |
| Teacher's handouts<br>Marpol, Solas, IGC, IBC/BCH, Cursos IMO, Directivas da UE, OPA 90<br>Tanker Safety Guide, International Chamber of Shipping, 1978<br>International Safety Guide for Oil Tankers and Terminals, 2005<br>Operation of Liquid Gas Carriers, LGE Liquid Gas Equipment Ltd.<br>Tanker Handbook for Deck Officers, by Captain C. Baptist, 1980 |           |  |     |
| <b>Teaching methods:</b>   |           |  |     |
|  |           |  |     |
| <b>Assessment methods:</b>   |           |  |     |
| Theoretical and practical  |           |  |     |
| <b>Language of instruction:</b>  |           | Portuguese / English   |     |

| Bachelor of Science in Deck and Bridge Operations  |                               |  |                |
|--|-------------------------------|--|----------------|
| Description of individual course unit  |                               |  |                |
| Course title:  | Passage Planning              |  |                |
| Field:   | Navigation                    |  |                |
| Course code:   | 3037                          | Type of course:  | Mandatory      |
| From:  | 2011/2012                     |  |                |
| Year of study:   | 3nd                           | Semester:  | 2nd            |
| ECTS:  | 4                             | Hours/week:  | 2 hours (2 TP) |
| Name of lecturer:  | Carlos Alberto Sousa Coutinho |  |                |
| Prerequisites:   | No                            |  |                |
| Objective of the course (expected learning outcomes and competences to be acquired):   |                               |  |                |
| Develop skills towards the implementation of passage planning, with navigation in ocean, coastal, restricted waters and piloting in accordance with the STCW Convention. |                               |  |                |
| Course contents:   |                               |  |                |
| STCW   | Item                          | Program  | Hours          |
| Tab. A - II/1 and Tab. A – II/2  | 1                             | PASSAGE PLANNING   | 6              |
|  | 1.1                           | Objectives and advantages of the planning                  | 0,5            |
|  | 1.2                           | IMO RESOLUTION A.893 (21) – Guidelines For Voyage Planning | 0,5            |
|  | 1.2.1                         | Voyage planning components                                 | 1              |
|  | 1.3                           | Types of passage planning                                  | 1              |
|  | 1.4                           | Overall assessment and collection of voyage information    | 1              |
|  | 1.5                           | Preparation of the voyage planning                         | 1              |
|  | 1.6                           | Contingency plans  | 1              |
|  | 2                             | SHIP ‘S ROUTEING   | 2              |
|  | 2.1                           | Objectives and definitions                                 | 0,3            |
|  | 2.2                           | Procedures and responsibilities                            | 0,3            |
|  | 2.3                           | Methods used   | 0,3            |
|  | 2.4                           | Planning and design criteria for systems                   | 0,3            |
|  | 2.5                           | Use of routing systems                                     | 0,3            |
|  | 2.6                           | Representation on the charts                               | 0,3            |
|  | 2.7                           | Legislation and publications                               | 0,2            |
|  | 3                             | VESSEL TRAFFIC SYSTEMS – VTS                               | 2              |
|  | 3.1                           | Evolution of VTS stations                                  | 0,2            |
|  | 3.2                           | Legislation and publications                               | 0,2            |
|  | 3.3                           | Objectives and definitions                                 | 0,3            |
|  | 3.4                           | Types of VTS   | 0,3            |
|  | 3.5                           | VTS services   | 0,3            |
|  | 3.6                           | Communications systems and ship reporting                  | 0,3            |
|  | 3.7                           | Organization and technical configuration                   | 0,2            |
|  | 3.8                           | Participation of ships                                     | 0,2            |
|  | 4                             | SHIP REPORTING SYSTEMS                                     | 1              |
|  | 4.1                           | Introduction and development of reporting systems          | 0,20           |
|  | 4.2                           | Applicable Law   | 0,20           |
|  | 4.3                           | General principles for ship reporting systems              | 0,20           |
|  | 4.4                           | Notification Types   | 0,20           |

|                                 |     |  |      |
|---------------------------------|-----|--|------|
|                                 | 4.5 | Standard format and procedures                               | 0,20 |
|                                 | 5   | AMVER - ATLANTIC MERCHANT VESSEL EMERGENCY REPORTING SYSTEMS | 1    |
|                                 | 5.1 | Evolution of the system AMVER                                | 0,25 |
|                                 | 5.2 | Participation in the system                                  | 0,25 |
|                                 | 5.3 | Notification types AMVER                                     | 0,25 |
|                                 | 5.4 | Sending notifications AMVER                                  | 0,25 |
|                                 | 6   | PASSAGE PLANNING PRACTICE                                    | 18   |
|                                 | 6.1 | Coastal voyage   | 9    |
|                                 | 6.2 | Ocean voyage   | 9    |
|                                 |     | TOTAL  | 30   |
| <b>Recommended reading:</b>     |     |  |      |
|                                 |     |  |      |
| <b>Teaching methods:</b>        |     |  |      |
|                                 |     |  |      |
| <b>Assessment methods:</b>      |     |  |      |
|                                 |     |  |      |
| <b>Language of instruction:</b> |     | Portuguese / English   |      |

| Bachelor of Science in Deck and Bridge Operations  |                                 |  |           |
|--|---------------------------------|--|-----------|
| Description of individual course unit  |                                 |  |           |
| Nome:  | Maritime Safety II              |  |           |
| Área Científica:   | Safety                          |  |           |
| Código:  | 3038                            | Tipo de unidade:   | Mandatory |
| Início de vigência:  | 2011/2012                       |  |           |
| Ano curricular:  | 3rd                             | Semestre curricular:   | 2nd       |
| ECTS:  | 4                               | Carga horária/Tipo de ensino:  | 4TP       |
| Prof. Resp.:   | Fortunato Carlos Alves da Costa |  |           |
| Precedências:  | Não                             |  |           |
| Objectivos da unidade curricular (resultados esperados de aprendizagem e competências a adquirir):   |                                 |  |           |
| Learning and training the following techniques :<br>-personal survival at sea;<br>-Conduction of survival and rescue crafts ;<br>-Conduction of quick rescue crafts.<br>-provide students the respective certificates. |                                 |  |           |
| Course contents:   |                                 |  |           |
| STCW   | Item                            | Program  | Hours     |
| Tabela   | 1                               | PERSONAL SURVIVAL TECHNIQUES AT SEA  | 21        |
| A-II/1   | 1.1                             | Utilisation of survival equipment  |           |
| A-VI/1-1   | 1.1.1                           | Rigid life jackets:  |           |
|  |                                 | -don properly the life jacket within a length of 1 minute  |           |
|  |                                 | -jump into water with life-jacket donned from a 4 meter drop   |           |
|  |                                 | -swim with life-jacket donned in a 50 metre distance   |           |
|  |                                 | -Utilise the life-jacket whistle;  |           |
|  |                                 | -behaviour in water to reduce the loss of body heat  |           |
|  | 1.1.2                           | Inflatable life-jacket:  |           |
|  |                                 | -don properly life-jacket in a 1 minute time;  |           |
|  |                                 | -jump into the water with life-jacket from a 4 meter drop  |           |
|  |                                 | -swim with life-jacket at a distance of 50 meters;   |           |
|  |                                 | -Utilise the life-jacket whistle;  |           |
|  |                                 | -Utilise the non automatic method of insufflations   |           |
|  | 1.1.3                           | Life-buoys   |           |
|  |                                 | -launch a life-buoy with line towards a person in water  |           |
|  |                                 | -Utilise a support buoy ;  |           |
|  | 1.1.4                           | Immersion suits  |           |
|  |                                 | -take from a package an immersion suit with no help in a space of 2 minutes.                         |           |
|  |                                 | -with the immersion suit and life-jacket donned  |           |
|  |                                 | -climb up and down a upright ladder with, at least, a 5 meter length;                                |           |
|  |                                 | Jump into the water from a 4.5 meter drop  |           |
|  | 2.3.5                           | Influence of undulation phenomena  |           |
|  | 1.1.5                           | Thermal protection aids.   |           |
|  |                                 | -take from a package and don a thermal aid with no help when on board a survival craft or life boat; |           |
|  |                                 | -undress in less than 2 minutes a thermal protection aid which impairs swimming;                     |           |
|  |                                 | -don a thermal protection aid (simulating non-conscious) Maritime safety                             |           |
| Tabela.  | 1.2                             | Survival with proper equipment   | 3         |

|                    |       |  |    |
|--------------------|-------|--|----|
| A-II/1             | 1.2.1 | Maintain buoyancy with no support means  |    |
| A-VI/1-1           | 1.2.2 | Maintain buoyancy wearing clothing as support.   |    |
|                    | 1.2.3 | Techniques to jump into the water and swimming to survive in case of hydrocarbons in water.                              |    |
| Tabela.            | 1.3   | Embarkation and survival crafts  | 6  |
| A-II/1             | 1.3.1 | Jump onto a raft from a drop of 3 meters;  |    |
| A-VI/1-1           | 1.3.2 | Embark in survival crafts:   |    |
| A-VI/2-1           |       | -from the ship's side and from water with and no survival equipments;  |    |
|                    |       | -pay attention to a stowaway who is exhausted or unconscious bringing him to a survival craft;                           |    |
|                    |       | -rescue from water to a raft or life-boat a stowaway who is exhausted or unconscious                                     |    |
|                    |       | -cast rescue loop with hand-line to a stowaway in water;   |    |
|                    |       | -upright a life raft which is capsized :   |    |
|                    |       | -without survival equipment;   |    |
|                    |       | -with immersion suit and life-jacket.  |    |
|                    |       | -on board survival crafts initial actions in order to improve survival conditions;                                       |    |
|                    |       | -cast off drogue or floating anchor.   |    |
|                    |       | -Demonstrate the use of survival equipment;  |    |
|                    |       | -Demonstrate the use of detection from others, including radio sets;   |    |
|                    |       | -Abandon a capsized life-raft.   |    |
|                    | 1.4   | Survival behaviour of stowaways in water:  | 3  |
|                    | 1.4.1 | To avoid dispersing;   |    |
|                    | 1.4.2 | For, together, minimise loss of heat;  |    |
|                    | 1.4.3 | Survival actions in waters infested with sharks  |    |
|                    | 1.5   | Rescue by helicopter   | 3  |
|                    | 1.5.1 | Utilisation of salvage loop:   |    |
|                    |       | -correct way to use it;  |    |
|                    |       | -signal to heave it up;  |    |
|                    |       | -safe position during lifting him.   |    |
| Table              | 2     | COMPETÊNCIA EM EMBARCAÇÕES DE SOBREVIVÊNCIA E DE SALVAMENTO  | 24 |
| A-II/1<br>A-VI/2-1 |       | (during the exercises must be used inflatable rafts and life-boats with open deck or totally enclosed ones, with engine) |    |
|                    | 2.1   | Engine of life boats and spares  | 9  |
|                    | 2.1.1 | Start engine:  |    |
|                    |       | -check fuel and lub. levels;   |    |
|                    |       | -check the engine lever is in a neutron position;  |    |
|                    |       | -follow constructor's instructions and identify the commands,  |    |
|                    |       | -lash the fuel system if necessary;  |    |
|                    |       | -start engine and box acceleration ;   |    |
|                    |       | -check oil and cooling water pressure if applicable;   |    |
|                    |       | -move engine ahead and astern;   |    |
|                    |       | -stop engine and close fuel admittance;  |    |
|                    |       | -explain how to clean fuel tank and substitute oil filters   |    |
|                    |       | -find out fuel necessary for the craft;  |    |
|                    |       | -Explain how to start an out board engine when it is cold;   |    |
|                    | 2.2   | Commando, conduction and handling  |    |
|                    | 2.2.1 | Act as competent element for the launching and rescue tasks  |    |
|                    | 2.2.2 | Assume the conduction and allocate functions for launching and rescue jobs;  |    |



|                                 |       |   |    |
|---------------------------------|-------|---|----|
|                                 | 2.2.3 | Give correct orders for people embarkation, launching and get away from the ship's side;                      |    |
|                                 | 2.2.4 | Acting as person in charge of life-boat conduction be it provided with oars or engine, and using the compass; |    |
|                                 | 2.2.5 | Oaring;   |    |
|                                 | 2.2.6 | Utilise stoppers and the drogue or floating anchor;   |    |
|                                 | 2.2.7 | Utilise survival equipment;   |    |
|                                 | 2.2.8 | Interpret the survival craft's inscriptions as to the number of people they can carry;                        |    |
|                                 | 2.2.9 | Manoeuvre the craft to muster other ones;   |    |
|                                 |       | -Manoeuvre to rescue stowaways in water;  |    |
|                                 |       | -Procedures to ease the detection of other ones;  |    |
|                                 |       | -rig the craft's cover (with recourse to two persons))  |    |
|                                 |       | -stowaway positioning in a life-boat with the drogue launched for capsized prevention cause by sea stroke;    |    |
|                                 |       | -Organisation of life-boat staying (watch moral, physical condition)  |    |
|                                 |       | -Organisation and procedures for helicopter rescue:   |    |
|                                 |       | -of rafts; -of life- boats;   |    |
|                                 |       | -beaching manoeuvre; -beaching to shelving beach;   |    |
|                                 |       | -steep beach.   |    |
|                                 |       | -up-right capsized survival crafts;   |    |
| Tabela                          | 2.3   | Quick survival crafts.  |    |
| A-VI/2-2                        | 2.3.1 | Conduct the launching and rescuing in safety;   |    |
|                                 | 2.3.2 | Up-right a capsized rescue craft;   |    |
|                                 | 2.3.3 | Conduct a quick rescue craft with the present weather conditions;   |    |
|                                 | 2.3.4 | Swim with the special equipment;  |    |
|                                 | 2.3.5 | Utilise communications and signalling equipment between quick boats and the helicopter and the ship:          |    |
|                                 | 2.3.6 | Utilise the emergency equipment carried by the life-boat  |    |
|                                 | 2.3.7 | Rescue from water a person simulating be dead or wounded, carrying her for a helio, ship or other safe place; |    |
|                                 | 2.3.8 | Execute processes of search and rescue taking into account the environment factors;                           |    |
|                                 | 2.3.9 | Demonstrate skills to start and conduct a quick rescue boat engin.  |    |
|                                 |       | Total:  | 60 |
| <b>Recommended reading:</b>     |       |   |    |
|                                 |       |   |    |
| <b>Teaching methods:</b>        |       |   |    |
|                                 |       |   |    |
| <b>Assessment methods:</b>      |       |   |    |
|                                 |       |   |    |
| <b>Language of instruction:</b> |       | Portuguese / English  |    |

| Bachelor of Science in Deck and Bridge Operations   |                            |                 |                 |
|---|----------------------------|-----------------|-----------------|
| Description of individual course unit   |                            |                 |                 |
| Course title:   | Basic Health Care on Board |                 |                 |
| Field:  |                            |                 |                 |
| Course code:  | 3039                       | Type of course: | Mandatory       |
| From:   | 2011/2012                  |                 |                 |
| Year of study:  | 3 <sup>rd</sup>            | Semester:       | 2 <sup>nd</sup> |
| ECTS:   | 3                          | Hours/week:     | 30 h / TP+PL    |
| Name of lecturer:   | Teresa Cardoso Pinto       |                 |                 |
| Prerequisites:  |                            |                 |                 |
| Objective of the course (expected learning outcomes and competences to be acquired):  |                            |                 |                 |
| Provide officials with theoretical and practical knowledge, so they can be able to deal with basic emergencies on board, according with IMO-STCW Convention.  |                            |                 |                 |
| Course contents:  |                            |                 |                 |
| <b>1. TELEMEDICINE</b><br>1.1 CODU-MAR: Medical Advice Centre<br>1.2 Radio-medical contact - call simulation<br>1.3 The chain of survival<br>1.4 Organization of the Medical Emergency System<br>1.5 On board pharmacies<br>1.6 National and International Legislation on Health Care On board<br>1.7 Support Manuals |                            |                 |                 |
| <b>2. HUMAN ANATOMY AND PHYSIOLOGY</b><br>2.1 Cardio-circulatory System<br>2.2 Respiratory System<br>2.3 Locomotive System<br>2.4 Nervous System  |                            |                 |                 |
| <b>3. CARDIO-PULMONARY RESUSCITATION</b><br>3.1 European algorithm of Basic Life Support<br>3.2 Practice of Basic Life Support - Ventilation and Chest Compressions<br>3.3 Airway obstruction   |                            |                 |                 |
| <b>4. BLEEDING</b><br>4.1 Internal bleeding<br>4.2 External Bleeding<br>4.3 Techniques of bleeding control<br>4.4 Hypovolemic shock   |                            |                 |                 |
| <b>5. TRAUMATOLOGIA</b><br>5.1 Trauma<br>5.2 Injuries: Types and treatment<br>5.3 Wounds: Classification and treatment<br>5.4 Joint injuries<br>5.4.1 Types and symptoms<br>5.4.2 Complications and treatment<br>5.5 Fractures<br>5.5.1 Classification, complication and treatment<br>5.6 Bandages                    |                            |                 |                 |
| <b>6. HEAT AND COLD INJURIES</b><br>6.1 Burns – types, symptoms and treatment   |                            |                 |                 |
| <b>7. SUBMERSION ACCIDENTS</b><br>7.1 Drowning<br>7.2 Physiopathology, symptoms and immediate care  |                            |                 |                 |
| <b>8. TOXICOLOGY</b><br>8.1 Poison Classification<br>8.2 Contamination routes   |                            |                 |                 |

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| 8.3 Symptoms and treatment<br>8.4 Frequently poisoning<br>8.5 Portuguese Poison Centre<br>8.6 Addictions<br><br><b>9. SEXUALLY TRANSMITED DISEASES</b><br>9.1 Hepatitis and AIDS<br>9.2 Treatment<br>9.3 Prevention<br><br><b>10. MEDICAL EMERGENCIES</b><br>10.1 Heart diseases – angor pectoris and myocardial infarction<br>10.2 Stroke |                      |
| <b>Recommended reading:</b>  |                      |
| International Medical Guide for Boats (WHO)<br>Emergency Medical Technician Manual - Basic   |                      |
| <b>Teaching methods:</b>   |                      |
| Lectures, practical simulations.   |                      |
| <b>Assessment methods:</b>   |                      |
| Continuous assessment or final examination   |                      |
| <b>Language of instruction:</b>  | Portuguese / English |