Course guide
280626 - 280626 - Routes & Compasses

Last modified: 27/05/2025

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering.

Degree: BACHELOR'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT (Syllabus 2010). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 4.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JORGE MONCUNILL MARIMÓN

Others: Segon quadrimestre:
UYÀ JUNCADELLA, ÀFRICA
MONCUNILL MARIMÓN, JORGE

PRIOR SKILLS

Coastal Navigation and spherical trigonometry.

REQUIREMENTS

Having passed the subject 280610: Coastal navigation.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge of navigation techniques based on the determination of the position, heading, time, speed and distance. Ability to perform calculations: navigation co Ster kinematics of the ship, reckoning, plane sailing, navigation, great circle, celestial navigation, electronic navigation and inertial navigation. Lift charts.
CE4MENTM. Develop a travel plan, including the ship's track and the management and correction of charts and publications.
CE19.GEN. Ability to carry out the installation, repair and optimize elements of navigation and marine safety.

TEACHING METHODOLOGY

MD2. Participating expositive class.
MD5. Learning based on problems/projects.

LEARNING OBJECTIVES OF THE SUBJECT

Knowledge and application of the rhumb line, great circle and composite tracks. For each one of them: generalities; obtaining the course and distance between two points on earth, and accurately plotting, on a nautical chart, the track that the ship must follow to go from one point to the other.
Knowledge of the main factors to take into account when planning and carrying out a route: traffic separation schemes and other predetermined route systems; reports to vessel traffic services (VTS); winds, sea and currents.
Knowledge and implementation of the basic structure of a voyage plan: courses, navigated distances and ETA (estimated time of arrival).
Knowledge of the principles of operation of the different types of compasses: magnetic, mechanical gyroscopic, optical gyroscopic and satellite ones.
Compass adjustment: magnetism (general, terrestrial, permanent of the ship and induced of the ship); equation and correctors of the deviations, and exercises.
On the other hand, one of the objectives of this subject is to provide knowledge, understanding and aptitude of the following competencies of the STCW convention: those corresponding to table A-II/1 "Plan and conduct a passage and determine position - Compass magnetic and gyro" in its section "Knowledge of the principles of magnetic and gyro compasses" and "Maintain a safe navigational watch - Watchkeepig" in its section "The use of routeing in accordance with the General Provisions on Ships' Routeing", and the corresponding to table A-II/2 "Determine and allow for compass errors".

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	40.00
Self study	67,5	60.00

Total learning time: 112.5 h

CONTENTS

Topic 1.1. Rhumb line track

Description:
Review of the dead reckoning.
Objective, definition and properties of rhumb line track.
Rhumb line equation and meridional parts.
Direct course and rhumb line distance.
Drawing a rhumb line track along several charts: cutting longitude.

Full-or-part-time: 15h
Theory classes: 6h
Self study : 9h

Topic 1.2. Great circle track

Description:
Objective, definition and properties of the great circle track.
Great circle distance and courses.
Comparison with the rhumb line track.
Vertices, nodes and coefficients of a great circle.
Drawing a great circle track: on a gnomonic chart and on a Mercator chart by points.

Full-or-part-time: 18h 45m
Theory classes: 7h 30m
Self study : 11h 15m

Topic 1.3. Composite great circle track

Description:
Objective, definition and properties of the composite great circle track.
Distance, courses and vertices of the composite great circle track.
Drawing the composite great circle track.

Full-or-part-time: 18h 45m
Theory classes: 7h 30m
Self study : 11h 15m

Topic 1.4. Passage plan

Description:
Ships' routeing.
Pilot charts.
Incidence of waves and current on ship speed and ETA.
Basic structure of the voyage plan.

Specific objectives:
knowledge, understanding and aptitude of the competence from table A-II/1 of the STCW convention "Maintain a safe navigational watch - Watchkeepig" in its section "The use of routeing in accordance with the General Provisions on Ships' Routeing".

Full-or-part-time: 15h
Theory classes: 6h
Self study : 9h

Topic 2.1. Types of compasses

Description:
Knowledge of the principles of operation of the different types of compasses: magnetic, mechanical gyroscopic, optical gyroscopic and satellite ones.

Specific objectives:
knowledge, understanding and aptitude of the competence from table A-II/1 of the STCW convention "Plan and conduct a passage and determine position - Compass magnetic and gyro" in its section "Knowledge of the principles of magnetic and gyro compasses".

Full-or-part-time: 7h 30m
Theory classes: 3h
Self study : 4h 30m

Topic 2.2. Magnetic compass adjustment

Description:
Magnetic compass: description, magnetic moment and properties.
Magnetism: magnetic field, material properties and types of iron according to their magnetic behavior.
Magnetic fields that affect the compass: terrestrial, permanent of the ship and induced of the ship.
Equation and correctors of the deviation.
Compass adjustment methods.

Specific objectives:
knowledge, understanding and aptitude of the competence from table A-II/2 of the STCW convention "Determine and allow for compass errors".

Related activities:
Visit to magnetic compass company

Full-or-part-time: 37h 30m
Theory classes: 15h
Self study : 22h 30m

GRADING SYSTEM

Examen of Routes (partial exam): 60 %.
Examen of Compasses (final exam): 40 %.
To pass the subject, it is necessary to pass both exams.
Between 0 and 20% of the note for each exam may correspond to objective criteria for monitoring the course, such as attendance and participation in classes and activities, and/or completion of exercises.
Students who fail the partial exam may re-examine the Routes syllabus in the final exam (together with the Compasses syllabus) but, in this case, the Routes exam will be pass (5) or not pass.

EXAMINATION RULES.

In the performance of the tests, the students will only be able to have non-programable calculator, pen, pencil and eraser.

BIBLIOGRAPHY

Basic:
- Moreu Curbera, José María. Problemas de navegación. [Madrid]: [l'autor], 1977. ISBN 8440037414.
- Moreu Curbera, José María; Martínez Jiménez, Enrique. Astronomía y navegación. Vol. 1 i Vol. 2. 3a ed. Vigo: [s.n.], DL 1987-. ISBN 8485645014.
- Moreu Curbera, José María; Martínez Jiménez, Enrique. Astronomía y navegación. Vol. 3. 3a ed.. Vigo: [s.n.], 1972.
- Ships' routeing. London: IMO, 2019. ISBN 9789280100495.

Complementary:
- Gaztelu-Iturri Leicea, Ricardo. Compensación de la aguja náutica: curso de compensador. Vitoria: Servicio Central de Publicaciones del Gobierno Vasco, 1999. ISBN 8445715070.
- Defense Mapping Agency Hydrographic/Topographic Centerd. Handbook of magnetic compass adjustment [on line]. 4th ed. Bethesda (Maryland, E.U.A.): Washington, 1980 [Consultation: 19/07/2024]. Available on: https://msi.nga.mil/api/publications/download?key=16920950/SFH00000/HoMCA.pdf&type=view.
- Vila Mitjà, Antoni. Elementos de trigonometría esférica. 2a ed. Barcelona: Edicions UPC, 1994. ISBN 8476534205.
- Anwar, Nadeem. Navigation advanced: mates/masters. Lanarkshire: Seamanship International Ltd., 2006. ISBN 1905331150.
- Martínez-Lozares, A. et al.. La Aguja magnética y su compensación: comportamiento de la aguja náutica. [s.l.]: Editorial Académica Española, 2012. ISBN 9783846565605.

RESOURCES

Other resources:
Binnacle, deviascope and pilot charts.