Course guide
280629 - 280629 - Nautical Meteorology and Oceanography

Last modified: 09/05/2023

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: 2023 **ECTS Credits:** 7.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: FRANCISCO JAVIER MARTINEZ DE OSÉS

Others: Primer quadrimestre:
FRANCISCO JAVIER MARTINEZ DE OSÉS - ERAS, GNTM

PRIOR SKILLS

Basic knowledge on physics and navigation

REQUIREMENTS

To have passed the subjects of Physics and Coastal navigation

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
2. Knowledge of the energy use of the tides, numeracy and disposal of equipment.
3. Knowledge of the fundamentals of sailing weather. Ability to analyze the factors and processes that control synoptic weather risk situations. Cap acidic interpretation of weather maps. Knowledge of techniques for predicting severe weather events. Ability to calculate the synoptic weather and navigation. Depressionary knowledge systems and tropical cyclones. Ice. Calculation of the tides. Knowledge of oceanography, currents and waves.

Transversal:
1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

TEACHING METHODOLOGY

The main concepts and topics, will be presented through Magistral classes, those will be supported by some practical activities and one session of sailing in the Barcelona ketch.
During the course will be proposed several activities to be delivered.

LEARNING OBJECTIVES OF THE SUBJECT

To understand the meaning, variation and interpretationof the meteorological data, to obtain a safer and more comfortable track.
To understand the meteorological infromation received on board.

On the other hand, one of the objectives of this subject is provide the knowledge, understanding and proficiency of the competencies:
- Capacity to understand the received information through the meteorological instruments on board.
- Knowledge of characteristics of the different meteorological systems, notification procedures and systems of registry.
- Capacity to apply the available meteorological information.

, competencies required and defined in Section A-II/1 and A-II/2 (Mandatory minimum requirements for certification of masters and chief mates on ships of 500 gross tonnage or more) of the Seafarers Training, Certification and Watchkeeping (STCW) International Code.

This competencies can be evaluated through the simulator of navigation, in accordance of STCW Code. Or by means in the case of the first one of a short sailing on board Barceklona Ketch, the second and third also through the evaluation of activities in class with real wetaher maps.

This subject will evaluate the following STCW competences: Within the plan and conduction a passage and determine the position, the meteorology section where the ability to use and interpret information obtained from shipborne meteorological instruments, the knowledge of the characteristcs of the various weather systems, reporting procedures and recording systems and the ability to apply the meterological information available.

Knowledge, understanding and proficiency of the competency" (this knowledge is necessary in accordance with STCW Code) in the chart A-II/2, "Forecast weather and oceanographic conditions". Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information received by weather fax Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants.

STUDY LOAD

Type	Hours	Percentage
Hours large group	41,0	21.87
Self study	112,5	60.00
Hours medium group	34,0	18.13

Total learning time: 187.5 h

CONTENTS

(ENG) 1: The atmosphere, classification and constitution. Main pollutant gases

Description:
Definition of the atmosphere, its composition and structural parts. Main pollutant gases.

Specific objectives:
To understand the main concepts and structure of the atmosphere. A mention is made on the jet stream and the main air pollutants

Related activities:
Theory classes

Related competencies :
06 URI N2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Full-or-part-time: 2h 30m
Theory classes: 2h 30m

(ENG) 2: The weather variables

Description:
The three main meteorological variables will be explained. Temperature, humidity and pressure. Used units to measure them, measurement devices and variation curves.

Specific objectives:
To know the three main variables ruling the weather, and understand the intercation among them. To comprehend the reasons of their variation and the consequences they have on teh evolution of meteorological weather.

Related activities:
Short numerical exercises, related to the interaction of mentioned variables. Reading of wether devices information.

Related competencies :
CE21.GEN. Knowledge of the fundamentals of sailing weather. Ability to analyze the factors and processes that control synoptic weather risk situations. Cap acidic interpretation of weather maps. Knowledge of techniques for predicting severe weather events. Ability to calculate the synoptic weather and navigation. Depressionary knowledge systems and tropical cyclones. Ice. Calculation of the tides. Knowledge of oceanography, currents and waves.

Full-or-part-time: 5h
Theory classes: 5h

(ENG) 3: Air stability

Description:
To understand the conditions conducting to situations of air stability or unstability and the related issues like the cloud formation.

Specific objectives:
Some basic concepts will be given to understand the stability mechanisms and the convection procedures. mostly to comprehend the humidity role in the air elevation processes.

Related activities:
Brief explanation of thermodynamic diagrams.

Full-or-part-time: 3h
Theory classes: 3h

(ENG) 4: Clouds, precipitations and fog

Description:
Description of different types of clouds depending on their heightness, shape and formation processes.
To know the different kind of fog depending on their generation processes.

Specific objectives:
Classification of clouds will be explained and their formation mechanisms. The clouds will be related with fronts.
Different type of precipitations will be defined and those related with the clouds.
The fog also will be explained and related to the safety of navigation.

Related activities:
Observation practical activities from the class and on board.

Full-or-part-time: 5h
Theory classes: 5h

(ENG) 5: The wind. Description and effects on navigation

Description:
The wind is defined as a vectorial unit.The measurement units are identified and the different parameters inside are showed coming from the real wind to the wind generated solely by pressure.

Specific objectives:
To understand the wind generating forces and their effect on the marine surface.

Related activities:
Classrooom activities and real measure on board the sailing boat.

Full-or-part-time: 5h
Theory classes: 3h
Guided activities: 2h

(ENG) 6: Front dynamics

Description:
Air mass concept defintiion, thermal border among them and frontal systems development in mid latitudes.

Specific objectives:
The mechanisms and origins of the frontal dynamics, will be explained. The frontogenesis and frontolisis will be dealt also and the phenomena affecting the sailing.

Related activities:
Surface charts will be analyzed.

Related competencies :
CE21.GEN. Knowledge of the fundamentals of sailing weather. Ability to analyze the factors and processes that control synoptic weather risk situations. Cap acidic interpretation of weather maps. Knowledge of techniques for predicting severe weather events. Ability to calculate the synoptic weather and navigation. Depressionary knowledge systems and tropical cyclones. Ice. Calculation of the tides. Knowledge of oceanography, currents and waves.

Full-or-part-time: 5h
Theory classes: 3h
Guided activities: 2h

(ENG) 7: Tropical and extra tropical lows

Description:
An explanation will be done on the borning, evolution and dissipation of extratropical depressions. Mention will be done also to frontal systems and their meteorological effects.

Specific objectives:
To know the ruling processes of the different depressions life together with the procedure of becoming gales, storms or even tropical revolving storms. These concepts are included in the STCW convention chart A-II/2, "Forecast weather and oceanographic conditions". 8.2 Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants.

Related competencies :
CE21.GEN. Knowledge of the fundamentals of sailing weather. Ability to analyze the factors and processes that control synoptic weather risk situations. Cap acidic interpretation of weather maps. Knowledge of techniques for predicting severe weather events. Ability to calculate the synoptic weather and navigation. Depressionary knowledge systems and tropical cyclones. Ice. Calculation of the tides. Knowledge of oceanography, currents and waves.

Full-or-part-time: 4h
Theory classes: 4h

(ENG) 8: Weather interpretation and forecasting

Description:
Weather interpretation and prediction basic rules will be provided.

Specific objectives:
The basics rules of interpretation of weather will be provided, keeping in mind the information available for the seamen. Some very brief ideas will be given on forecasting.
These concepts are included in the STCW convention chart A-II/2, "Forecast weather and oceanographic conditions". 8.1 Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information.
The concepts included in the STCW convention chart A-II/1, "Meteorology".
7.1 Ability to use and interpret information obtained from shipborne meteorological instruments. 7.2 Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems. 7.3 Ability to apply the meteorological information available.

Related activities:
Surface and upper level charts interpretation actitivity.

Full-or-part-time: 3h
Theory classes: 3h

(ENG) 9: Oceanography. Sea water properties

Description:
Oceanography concepts will be provided, measurement devices also. Sea water properties will also be defined.

Specific objectives:
Physycal and chemical properties of sea water, will be explained.
The instruments used to get information from sea will be described.

Related competencies :
06 URI N2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Full-or-part-time: 4h
Theory classes: 4h

(ENG) 10: Currents, classsification and distribution around the world. Tides.

Description:
Currents their classification and world distribution. Concepts on Tides.

Specific objectives:
To mention and know, the main currents that affect navifation over seas. An idea of tidal energy, will be provided. These concepts are included in the STCW convention chart A-II/2, "Forecast weather and oceanographic conditions". 8.3 Knowledge of ocean current systems, the ability to calculate tidal conditions. Use all appropriate nautical publications on tides and currents.

Related activities:
Theory classes with the support of short activities.

Full-or-part-time: 2h
Theory classes: 2h

(ENG) 11: Waves and marine ice. Optimal track

Description:
Waves will be described, different kinds and their effect on navigation together with optimal track. International classification of marine ice will also be explained.

Specific objectives:
Different type of waves spectra will be explained.
The international classification of ices, will be provided.
The optimal track procedures will be explained with commercial companies and sftware.

Related activities:
Scheduled optimal track activity.

Full-or-part-time: 3h
Theory classes: 3h

(ENG) 12: Upper level charts. Meaning and interpretation.

Description:
500 hPa charts interpretation theory,meaning and understanding will be provided.

Specific objectives:
An overview will be done to highness charts. Its meaning and influence on the current weather will be explained.

Related activities:
Upper level interpretation charts activities.

Related competencies :
CE21.GEN. Knowledge of the fundamentals of sailing weather. Ability to analyze the factors and processes that control synoptic weather risk situations. Cap acidic interpretation of weather maps. Knowledge of techniques for predicting severe weather events. Ability to calculate the synoptic weather and navigation. Depressionary knowledge systems and tropical cyclones. Ice. Calculation of the tides. Knowledge of oceanography, currents and waves.

Full-or-part-time: 2h 30m
Theory classes: 2h 30m

-Tides

Description:
Tides energy description.

Specific objectives:
Energetic capacity of tides will be described and calculation methods will be provided.

Related competencies :
CE22.GEN. Knowledge of the energy use of the tides, numeracy and disposal of equipment.

Full-or-part-time: 1h
Theory classes: 1h

ACTIVITIES

(ENG) METEOROLOGIAL INSTRUMENTS READING

Description:
Reading and understanding of meteorological information will be done on the available devices.

Specific objectives:
To understand the meaning of meteorological data

Material:
Automatic observation station and different meteorological devices.

Delivery:
Observation report dlivery

Related competencies :
06 URI N2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Full-or-part-time: 4h
Laboratory classes: 4h

(ENG) SURFACE CHARTS INTERPRETATION

Description:
Surface charts interpretation will be done from different sources of information.

Specific objectives:
To practice with charts to understand the contained meteorological information.

Material:
Downloaded charts from web site

Delivery:
Proposed exercises delivery

Related competencies :
CE21.GEN. Knowledge of the fundamentals of sailing weather. Ability to analyze the factors and processes that control synoptic weather risk situations. Cap acidic interpretation of weather maps. Knowledge of techniques for predicting severe weather events. Ability to calculate the synoptic weather and navigation. Depressionary knowledge systems and tropical cyclones. Ice. Calculation of the tides. Knowledge of oceanography, currents and waves.

Full-or-part-time: 3h
Laboratory classes: 3h

(ENG) UPPER LEVEL CHARTS INTERPRETATION

Description:
Different upper level charts will be interpreted. The obtained information will be used to forecast the evolution of weather.

Specific objectives:
To understand the role of upper circulation in the future weather evolution.

Material:
Upper level charts and relative topographies, obtained in web site.

Delivery:
Interpretation report

Related competencies :
CE21.GEN. Knowledge of the fundamentals of sailing weather. Ability to analyze the factors and processes that control synoptic weather risk situations. Cap acidic interpretation of weather maps. Knowledge of techniques for predicting severe weather events. Ability to calculate the synoptic weather and navigation. Depressionary knowledge systems and tropical cyclones. Ice. Calculation of the tides. Knowledge of oceanography, currents and waves.

Full-or-part-time: 2h
Laboratory classes: 2h

(ENG) OPTIMUM TRACK DESIGN

Description:
Some basic concepts will be given to ellaborate the optimum track from the safety and track time saving point of views.

Specific objectives:
To get knowledge on the optimum track principles.

Material:
Class material provided by teacher, theoretical examples and comercial software.

Delivery:
Solved activities delivery

Related competencies :
06 URI N2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Full-or-part-time: 1h
Theory classes: 1h

SAILING ACTIVITY

Description:
Weather information will be obtained during the navigation.

Specific objectives:
Acquired knowledge on weather observation and chart interpretation.

Material:
Ketch "Barcelona"

Delivery:
Report on the observations and charts data.

Related competencies :
CE21.GEN. Knowledge of the fundamentals of sailing weather. Ability to analyze the factors and processes that control synoptic weather risk situations. Cap acidic interpretation of weather maps. Knowledge of techniques for predicting severe weather events. Ability to calculate the synoptic weather and navigation. Depressionary knowledge systems and tropical cyclones. Ice. Calculation of the tides. Knowledge of oceanography, currents and waves.

Full-or-part-time: 20h
Guided activities: 20h

GRADING SYSTEM

Partial exam: 30%
Activities during the course and attendance: 12,5%
Sailing: 2,5%
Final exam: 55%
Re evaluation will mean to do the exam of the entire subject.

EXAMINATION RULES.

Copying and talking during the exam development, will suppose the removal of it.

BIBLIOGRAPHY

Basic:
- Zúñiga, Ignacio; Crespo del Arco, Emilia; Fernández Sánchez, Julio; Santos Burguete, Carlos. Problemas de meteorología y climatología [on line]. Madrid: Universidad Nacional de Educación a Distancia, 2017 [Consultation: 01/09/2022]. Available on: https://lectura-unebook-es.recursos.biblioteca.upc.edu/viewer/9788436271737. ISBN 9788436271737.
- Zúñiga, Ignacio; Crespo del Arco, Emilia. Meteorología y climatología [on line]. 2a. ed. Madrid: Universidad Nacional de Educación a Distancia, 2010 [Consultation: 01/09/2022]. Available on: https://lectura-unebook-es.recursos.biblioteca.upc.edu/viewer/9788436260076. ISBN 9788436260076.
- Hause, David J. The Ice navigation manual. Edinburgh: Witherby Seamanship International, 2010. ISBN 9789053315989.
- Cuadrat, José María; Pita, Maria Fernanda. Climatología. Madrid: Cátedra, 2011. ISBN 9788437615318.
- Martínez de Osés, Francesc Xavier. Meteorología aplicada a la navegación [on line]. 2a ed. Barcelona: Edicions UPC, 2006 [Consultation: 01/07/2019]. Available on: http://hdl.handle.net/2099.3/36716. ISBN 848301873X.
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- Stull, Roland. Practical meteorology : an algebra-based survey of atmospheric science. Vancouver: University of British Columbia, [2015]. ISBN 9780888651761.

Complementary:
- Viñas, José Miguel. Curiosidades meteorológicas. Madrid: Alianza, cop. 2012. ISBN 9788420665801.

- Viñas, José Miguel. Preguntas al aire. Madrid: Alianza, cop. 2014. ISBN 9788420687469.
- Melville, Herman. Moby Dick. 2a ed. Barcelona: Edicions 62, 1996. ISBN 8429720936.
- Alarcón, Marta. Canvi climàtic : evidències científiques i impactes [on line]. 1. Barcelona: Iniciativa Digital Politècnica, 2011 [Consultation: 30/05/2022]. Available on: https://upcommons.upc.edu/handle/2099.3/36572. ISBN 9788476539224.