280629 - Nautical Meteorology and Oceanography

**Coordinating unit:** 280 - FNB - Barcelona School of Nautical Studies  
**Teaching unit:** 742 - CEN - Department of Nautical Sciences and Engineering  
**Academic year:** 2019  
**Degree:** BACHELOR'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT (Syllabus 2010). (Teaching unit Compulsory)  
**ECTS credits:** 7,5  
**Teaching languages:** Catalan, Spanish, English  

**Teaching staff**

**Coordinator:** FRANCESC XAVIER MARTINEZ DE OSÉS  
**Others:** Primer quadrimestre: FRANCESC XAVIER MARTINEZ DE OSÉS - 1

**Opening hours**

**Timetable:** To be noticed in the FNB web site

**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.


**Transversal:**

1. EFFECTIVE USE OF INFORMATION 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 interpretation of the meteorological data, to obtain a safer and more comfortable track.
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To understand the meteorological information 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 Barcelona Ketch, the second and third also through the evaluation of activities in class with real weather 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 characteristics of the various weather systems, reporting procedures and recording systems and the ability to apply the meteorological 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

<table>
<thead>
<tr>
<th>Total learning time: 187h 30m</th>
<th>Hours large group:</th>
<th>41h</th>
<th>21.87%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group:</td>
<td>34h</td>
<td>18.13%</td>
<td></td>
</tr>
<tr>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>Self study:</td>
<td>112h 30m</td>
<td>60.00%</td>
<td></td>
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</tbody>
</table>
## Content

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

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

**Related activities:**
Theory classes

**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.

**Learning 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.

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

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

**Learning 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.

**Related activities:**
Brief explanation of thermodynamic diagrams.

**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.

**Learning time:** 3h

- Theory classes: 3h
<table>
<thead>
<tr>
<th>(ENG) 4: Clouds, precipitations and fog</th>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Related activities:</strong></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td>Observation practical activities from the class and on board.</td>
<td></td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(ENG) 5: The wind. Description and effects on navigation</th>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Related activities:</strong></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td>Classroom activities and real measure on board the sailing boat.</td>
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</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td></td>
</tr>
<tr>
<td>To understand the wind generating forces and their effect on the marine surface.</td>
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</tbody>
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<table>
<thead>
<tr>
<th>(ENG) 6: Front dynamics</th>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>Air mass concept definition, thermal border among them and frontal systems development in mid latitudes.</td>
<td></td>
</tr>
<tr>
<td><strong>Related activities:</strong></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td>Surface charts will be analyzed.</td>
<td></td>
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<tr>
<td><strong>Specific objectives:</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>
### (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.

**Learning time:** 4h
- Theory classes: 4h

### (ENG) 8: Weather interpretation and forecasting

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

**Related activities:**
Surface and upper level charts interpretation activity.

**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.

**Learning 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:**
Physical and chemical properties of sea water, will be explained.
The instruments used to get information from sea will be described.

**Learning time:** 4h
- Theory classes: 4h
### (ENG) 10: Currents, classification and distribution around the world. Tides.

**Learning time:** 2h  
Theory classes: 2h

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

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

**Specific objectives:**
To mention and know, the main currents that affect navigation 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.

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

**Learning time:** 3h  
Theory classes: 3h

**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.

**Related activities:**
Scheduled optimal track activity.

**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 software.

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

**Learning time:** 2h 30m  
Theory classes: 2h 30m

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

**Related activities:**
Upper level interpretation charts activities.

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

<table>
<thead>
<tr>
<th>Learning time: 1h</th>
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<tbody>
<tr>
<td>Theory classes: 1h</td>
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</table>

**Description:**
Tides energy description.

**Specific objectives:**
Energetic capacity of tides will be described and calculation methods will be provided.
## Planning of activities

| **(ENG) METEOROLOGICAL INSTRUMENTS READING** | **Hours:** 4h  
Laboratory classes: 4h |
<table>
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<tr>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Reading and understanding of meteorological information will be done on the available devices.</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Automatic observation station and different meteorological devices.</td>
</tr>
<tr>
<td><strong>Descriptions of the assignments due and their relation to the assessment:</strong></td>
<td>Observation report delivery</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>To understand the meaning of meteorological data</td>
</tr>
</tbody>
</table>

| **(ENG) SURFACE CHARTS INTERPRETATION**    | **Hours:** 3h  
Laboratory classes: 3h |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Surface charts interpretation will be done from different sources of information.</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Downloaded charts from web site</td>
</tr>
<tr>
<td><strong>Descriptions of the assignments due and their relation to the assessment:</strong></td>
<td>Proposed exercises delivery</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>To practice with charts to understand the contained meteorological information.</td>
</tr>
</tbody>
</table>

| **(ENG) UPPER LEVEL CHARTS INTERPRETATION** | **Hours:** 2h  
Laboratory classes: 2h |
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Different upper level charts will be interpreted. The obtained information will be used to forecast the evolution of weather.</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Upper level charts and relative topographies, obtained in web site.</td>
</tr>
<tr>
<td><strong>Descriptions of the assignments due and their relation to the assessment:</strong></td>
<td>Interpretation report</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>To understand the role of upper circulation in the future weather evolution.</td>
</tr>
</tbody>
</table>

| **(ENG) OPTIMUM TRACK DESIGN**             | **Hours:** 1h  
Theory classes: 1h |
|--------------------------------------------|-----------------|
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**Description:**
Some basic concepts will be given to elaborate the optimum track from the safety and track time saving point of views.

**Support materials:**
Class material provided by teacher, theoretical examples and commercial software.

**Descriptions of the assignments due and their relation to the assessment:**
Solved activities delivery

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

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**SAILING ACTIVITY**

<table>
<thead>
<tr>
<th>Hours: 20h</th>
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<tbody>
<tr>
<td>Guided activities: 20h</td>
</tr>
</tbody>
</table>

**Description:**
Weather information will be obtained during the navigation.

**Support materials:**
Ketch "Barcelona"

**Descriptions of the assignments due and their relation to the assessment:**
Report on the observations and charts data.

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

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**Qualification system**

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

**Regulations for carrying out activities**

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

Basic:


