280624 - Radio Communications

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2020
Degree: BACHELOR'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT (Syllabus 2010).
(Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish, English

Degree competences to which the subject contributes

Specific:
1. Knowledge and expertise in the use and operation of radiocommunication systems. Global Maritime Distress and Safety System (GMDSS), safety procedures, equipment s and communication protocols.

Learning objectives of the subject

The main objective is to know the GMDSS devices onboard the ships and the correct utilization in routine operation and emergency situations.

Competencies
The specific CE.28 and additionally in the chart A-II/1 of the STCW convention: "Respond to a distress signal at sea".

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>31h</td>
<td>6h</td>
<td>23h</td>
<td>0h</td>
<td>90h</td>
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<td>20.67%</td>
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</table>
## GMDSS

**Description:**
- The GMDSS / GMDSS Bases
- Introduction
- The SOLAS Convention (SEVIMAR) of 1974
- The GMDSS / GMDSS
- The Maritime Areas
- Maintenance requirements
- Radio personnel on board
- Devices used in all the Maritime Areas
- Listening
- Radio Station License
- Manuals and publications that must be carried on board
- Radio Journal (Radio Log)
- Test and check of GMDSS equipment
  - Daily test
  - Weekly test
  - Monthly test
- Time zones (Husos)
  - UTC (GMT) or Z (ZULU)
  - Local Time (LT)
- The pricing system for maritime communications

**Learning time:** 1h
  - Theory classes: 1h
## Power Supply, UPS's, Fuses and Batteries

**Description:**
- Power supply of radiocommunication equipment
- UPS (Uninterruptible Power System)
  - UPS On Line
  - UPS Off Line
- Fuses
  - Types of fuses
  - Check fuses
- Batteries
  - Fundamentals of batteries
  - Characteristics of batteries
  - Batteries connected in series
  - Batteries connected in parallel
  - Batteries connected in Series / Parallel
  - Connecting batteries to the circuit
  - Types of batteries
    - Primary
    - Secondary
  - Care and maintenance of batteries
  - Replacing batteries

**Learning time:** 1h 30m
- Theory classes: 1h 30m

## Antennas

**Description:**
- Introduction
- The antennas
- Calculating the length of an antenna
- Reflected Power (Stationary Waves)
- VHF antennas
  - Types of cable
- Antennas of MF / HF (OM / OC)
  - ATU or Antenna Coupling Unit
- Maintenance of antennas
- Load antennas (Dummy load)
- Radar's antennae

**Learning time:** 1h 30m
- Theory classes: 1h 30m
### Modulación y Tipos de Emisión

**Description:**
- Modulation
  - Amplitude Modulation (AM)
  - Frequency Modulation (FM)
  - Phase Modulation
- Graphic images of amplitude modulation (AM)
- Graphic images of Frequency Modulation (FM)
- Meaning of the characters of the emission types (Table)
- Table of the main emission types

**Learning time:** 0h 40m
  - Theory classes: 0h 40m

### Radio Waves Propagation

**Description:**
- The Propagation of Radio Waves
  - Frequency
  - Wavelength
- Types of Propagation
  - Direct Wave or Line of Sight (Direct Wave / Line of Sight)
  - Ground Wave (Ground Wave)
  - Waves in the Ionosphere (Sky Wave)
  - Waves in Space (Space Wave)
- Direct beam
- Indirect beam
- Dead Zone or Zone of Silence
- Shadow Zone
- The Ionosphere
- Frequency Bands and their propagation
  - VLF (Very Low Frequency)
  - LF (Low Frequency)
  - MF (Medium Frequency)
  - VHF (Very High Frequency) and higher bands
  - Calculation of coverage in VHF

**Learning time:** 2h
  - Theory classes: 2h
## RT Procedures

**Description:**
The Procedures in Radiotelephony

Types of Calls
- DISTRESS (MAYDAY)
- URGENCY (PAN PAN)
- SAFETY (SECURITE)
- ROUTINE

International codes Numerical and Alphabetical

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

## Digital Selective Calling DSC

**Description:**
Digital Selective Call (DSC / LSD)

Types of Calls
- DISTRESS
- URGENCY
- SAFETY
- ROUTINE

Functions of the DSC
- MMSI
  - Types of MMSI: Ship, Coastal and Group

General call procedures in DSC

Table of approved words to specify a danger

Types of DSC VHF controllers. Class A and Class D

### Learning time:
- 2h
- Theory classes: 2h
## Radio VHF (VHF Transceiver)

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 1h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHF Radio (Very High Frequency)</td>
<td>Theory classes: 1h 30m</td>
</tr>
<tr>
<td>The Basics of VHF Radio</td>
<td></td>
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<tr>
<td>Installing the VHF radio</td>
<td></td>
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<tr>
<td>Location of the VHF antenna</td>
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<tr>
<td>Connected to navigation system</td>
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<tr>
<td>VHF portable vs fixed VHF</td>
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<tr>
<td>Requirements of the SOLAS Convention (SEVIMAR)</td>
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<tr>
<td>Basic functions of a VHF radio</td>
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<tr>
<td>The VHF channels</td>
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<tr>
<td>Simplex</td>
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<tr>
<td>Duplex</td>
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<tr>
<td>Full Duplex</td>
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<tr>
<td>Semi Duplex (Half Duplex)</td>
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<tr>
<td>Use of VHF channels</td>
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<tr>
<td>Table of VHF channels</td>
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<tr>
<td>VHF DF System (Direction Finder)</td>
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</table>

## Radio MF/ HF

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 1h 30m</th>
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<tbody>
<tr>
<td>Radio MF/HF</td>
<td>Theory classes: 1h 30m</td>
</tr>
<tr>
<td>The Basics of Radio MF/HF</td>
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<tr>
<td>Installing the MF/HF radio</td>
<td></td>
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<tr>
<td>Location of the MF/HF antenna</td>
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<tr>
<td>Connected to the navigation system</td>
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<tr>
<td>Requirements of the SOLAS Convention (SEVIMAR)</td>
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<tr>
<td>Basic functions of a MF/HF radio</td>
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<tr>
<td>Simplex</td>
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<tr>
<td>Full Duplex</td>
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<tr>
<td>Semi Duplex (Half Duplex)</td>
<td></td>
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<tr>
<td>Use of channels and frequencies in MF</td>
<td></td>
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<tr>
<td>Use of channels and frequencies in HF</td>
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<tr>
<td>Map of HF coastal stations in the world</td>
<td></td>
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<tr>
<td>Radiotèlex and Radiofacsimil</td>
<td>Learning time: 0h 40m</td>
</tr>
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<td>---------------------------------------------------------------</td>
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<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>The Radiotelex</td>
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<tr>
<td>Transmission systems in radiotelex</td>
<td></td>
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<tr>
<td>ARQ (Automatic Repeat on reQuest)</td>
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<td>FEC (Forward Error Correction)</td>
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<tr>
<td>SELFEC</td>
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<tr>
<td>Radiotelex. Manual and automatic connection</td>
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<tr>
<td>Procedure and call techniques</td>
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<tr>
<td>Radiofacsimile</td>
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</table>
## Inmarsat

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 2h</th>
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<tr>
<td></td>
<td>Theory classes: 2h</td>
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</table>

**The Inmarsat System**
- Inmarsat satellite network
- Satellite propagation
- The Space Segment
  - Ocean Regions
- The Earth Segment
  - Coordination of the Inmarsat Network
  - SES (Ship Earth Station)

**The current GMDSS satellite systems**
- Inmarsat C
- Operation of the Inmarsat C terminal
- Login and Logout
- Communications in Inmarsat C
  - EGC (Enhanced Group Call). SafetyNet. FleetNet
  - How to create a message
  - Types of messages
    - Telex
    - Fax
    - Data
    - E-mail
    - SMS
  - Calculating the cost of a message
  - Emergency calls
    - Distress button and software option
    - How to cancel a false call
  - Urgency and Security Calls
  - Routine checks on Inmarsat C
  - Fault code table
  - Table of special codes of two digits
- Inmarsat Fleet 77 or F77
- Phone calls in inmarsat F77
- End of Fleet services 33, 55 and 77

**The new satellite systems**
- Fleet One
- Fleet Broadband 250, 500
- Fleet Xpress

**Safety on vessels**
- Ship Security Systems (SSAS) (anti-piracy security)
- Long Range Identification and Tracking (LRIT) of ships
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## MSI Maritime Safety Information

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<tr>
<th>Description:</th>
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<tbody>
<tr>
<td>The MSI messages</td>
</tr>
<tr>
<td>Navareas</td>
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<tr>
<td>Types of MSI notifications</td>
</tr>
<tr>
<td>Navarea</td>
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<tr>
<td>Coastal</td>
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<tr>
<td>Local</td>
</tr>
<tr>
<td>Metareas</td>
</tr>
<tr>
<td>The NAVTEX system</td>
</tr>
<tr>
<td>Requirements of the SOLAS Convention (SEVIMAR)</td>
</tr>
<tr>
<td>NAVTEX messages</td>
</tr>
<tr>
<td>Type of messages</td>
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<tr>
<td>Examples of messages</td>
</tr>
<tr>
<td>EGC (Enhanced Group Call) services. SafetyNet. FleetNet</td>
</tr>
</tbody>
</table>

### Learning time:
- 1h 30m
- Theory classes: 1h 30m

## EPIRB (Emergency Position Indicating Radio Beacon)

<table>
<thead>
<tr>
<th>Description:</th>
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<tbody>
<tr>
<td>The Basics of radio beacons</td>
</tr>
<tr>
<td>Mandatory registration</td>
</tr>
<tr>
<td>Components of radio beacons</td>
</tr>
<tr>
<td>The radio beacons released and activated manually</td>
</tr>
<tr>
<td>The radio beacons released and activated automatically</td>
</tr>
<tr>
<td>What happens when a beacon is activated</td>
</tr>
<tr>
<td>Where the beacon is placed</td>
</tr>
<tr>
<td>The requirements of the SOLAS Convention (SEVIMAR)</td>
</tr>
<tr>
<td>The COSPAS-SARSAT satellite systems</td>
</tr>
<tr>
<td>The LEOSAR satellites</td>
</tr>
<tr>
<td>The GEOSAR satellites</td>
</tr>
<tr>
<td>The MEOSAR satellites</td>
</tr>
<tr>
<td>COSPAS-SARSAT Follow-up on land</td>
</tr>
<tr>
<td>LUT stations (Local Users Terminal)</td>
</tr>
<tr>
<td>MCC control stations (Mission Control Centers)</td>
</tr>
<tr>
<td>How to activate a radio beacon</td>
</tr>
<tr>
<td>How to cancel a false alarm</td>
</tr>
<tr>
<td>Other types of radio beacons</td>
</tr>
<tr>
<td>VHF radio beacon (VPIRB)</td>
</tr>
<tr>
<td>Personal Radio Beacons (PLB's) of 121.5 Mhz</td>
</tr>
<tr>
<td>Personal Radio Beacons (PLB's) of 406 Mhz</td>
</tr>
</tbody>
</table>

### Learning time:
- 2h
- Theory classes: 2h
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| **SART (Search and Rescue Radar Transponder) / AIS-SART** | **Learning time:** 1h  
Theory classes: 1h |
| --- | --- |
| **Description:**  
The Radar Transponder (SART)  
The basics of SART  
Operation of the device  
Correct installation of the SART  
Storage of the SART  
AIS-SART  
Identification of the AIS-Sart signal  
Requirements of the SOLAS Convention (SEVIMAR) |

| **VHF portátil GMDSS Marítimo y Aéreo** | **Learning time:** 0h 30m  
Theory classes: 0h 30m |
| --- | --- |
| **Description:**  
The maritime portable VHF (GMDSS)  
The emergency aerial band VHF |

| **AIS Automatic Identification System** | **Learning time:** 1h  
Theory classes: 1h |
| --- | --- |
| **Description:**  
AIS (Automatic Identification System)  
AIS system operation  
Types of AIS  
AIS Class A  
AIS Class B  
AIS Receiver Class B  
Advantages of AIS over RADAR |
## Annex

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>Theory classes: 0h 30m</th>
</tr>
</thead>
</table>

### Description:
- Annex1: Summary and translation of standard sentences in English for emergency radiocommunications.
- Annex2: INTERCO - International Code of Signals
- Annex3: Spanish Coastal Stations and Maritime Rescue for zones A1, A2 and A3 (source: web Ministry of Development 02/15/2016)
- Annex4: Table of frequencies for the maritime mobile service
- Annex5: Table of marine frequencies VHF USA
- Annex6: Table of marine frequencies VHF INTL
- Annex7: Table of maritime frequencies MF / HF
  - Distress frequencies MF/HF RT/DSC
  - Frequencies MF/HF RT USB Ship to Ship (boat-ship)
- Annex8: International List of MIDs by country

## Glossary of Abbreviations

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>Theory classes: 0h 30m</th>
</tr>
</thead>
</table>

### Description:
- Abbreviations Glossary
### Bibliography

**Basic:**


**Complementary:**

- Convenio internacional para la seguridad de la vida humana en el mar (SOLAS).
- Convenio Internacional sobre Normas de Formación, Titulación y Guardia para la Gente de Mar.

**Others resources:**

- Hyperlink: Convenio internacional para la seguridad de la vida humana en el mar (SOLAS).