Course guide
280647 - 280647 - Naval Electronics

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 710 - EEL - Department of Electronic Engineering.
Degree: BACHELOR'S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Compulsory subject).
BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).
Academic year: 2023  ECTS Credits: 6.0  Languages: Catalan

LEcTUrER

Coordinating lecturer: JOSEP MARIA TORRENTS DOLZ
Segon quadrimestre: JOSEP MARIA TORRENTS DOLZ
Others: Segon quadrimestre: ROMÀ MACARIO CHIB
MAHTAB MOHAMMADPOOR FASKHODI
JUAN DE DIOS CASTILLO MACHICADO
JOSEP MARIA TORRENTS DOLZ

PRIOR SKILLS

Concepts of electric current, electrical voltage, power and energy, their relation in electrical circuits and the use of their units in the SI. Basic circuit analysis (Kirchoff and Ohm laws). Concept of numbering bases (binary, octal and hexadecimal).

REQUIREMENTS

Pass 280641.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
GTM.CE8. Knowledge of electronics applied to the ship and offshore installations and their application to board.
GESTN.CE11. Knowledge of the characteristics of electronic components and systems and its application on board.

STCW:
ME.1. A-III/1-2. Function: Electrical, electronic and control engineering at the operational level
ME.2. A-III/1-2.1 Operate electrical, electronic and control systems
ME.3. A-III/1-KUP 2.1.1.2 Basic configuration and operation principles of the following electrical, electronic and control equipment: .2 electronic equipment: .a) characteristics of basic electronic circuit elements, .b) flowchart for automatic and control systems, .c) functions, characteristics and features of control systems for machinery items, including main propulsion plant operation control and steam boiler automatic controls
ME.4. A-III/1-2.2 Maintenance and repair of electrical and electronic equipment
ME.5. A-III/1-KUP 2.2.6 The interpretation of electrical and simple electronic diagrams
ETO.1. A-III/6-1. Function: Electrical, electronic and control engineering at the operational level
ETO.2. A-III/6-1.1 Monitor the operation of electrical, electronic and control systems
ETO.3. A-III/6-KUP 1.1.4 Knowledge of Fundamentals of electronics and power electronics
TEACHING METHODOLOGY

Various methodologies are combined: Lecture, participatory class of problems, flipped classroom, electronic lab practical duties.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course the student will be able to:
- Analyze electronic circuits
- Use the most common instruments in an electronics laboratory (DMM, GF, FA and Oscilloscope)
- Assemble circuits with devices (such as diodes and transistors) and measure electrical variables

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
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<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Topic 1. Introduction to electronics. Basic instrumentation and measurements**

**Description:**

**Full-or-part-time:** 28h
- Theory classes: 6h
- Practical classes: 2h
- Laboratory classes: 4h
- Guided activities: 2h
- Self study : 14h

**Topic 2. Semiconductors, the PN junction**

**Description:**

**Full-or-part-time:** 24h
- Theory classes: 6h
- Practical classes: 2h
- Laboratory classes: 2h
- Guided activities: 2h
- Self study : 12h
### Topic 3. Union transistors (BJT) and thyristors (SCR)

**Description:**

**Full-or-part-time:** 24h  
Theory classes: 6h  
Practical classes: 2h  
Laboratory classes: 2h  
Guided activities: 2h  
Self study: 12h

### Topic 4. Field effect transistors (JFET and MOSFET)

**Description:**
Principles of operation of a FET, enrichment and deplexion, N channel and P channel (low and high side transistors). Interpretation of the data sheets of the FET. Circuits with switching transistors (cut-off and saturation); transients, introduction to switched sources. Introduction to digital circuits from transients (LS and CMOS logic families), examples.

**Full-or-part-time:** 22h  
Theory classes: 6h  
Practical classes: 2h  
Guided activities: 4h  
Self study: 10h

### Topic 5. Operational amplifiers (OpAmp)

**Description:**

**Full-or-part-time:** 20h  
Theory classes: 6h  
Practical classes: 2h  
Guided activities: 4h  
Self study: 8h

### Topic 6. Special applications

**Description:**

**Full-or-part-time:** 12h  
Theory classes: 3h  
Practical classes: 1h  
Guided activities: 4h  
Self study: 4h
Topic 7. Introduction to power electronics

Description:

Full-or-part-time: 20h
Theory classes: 4h
Practical classes: 2h
Laboratory classes: 2h
Guided activities: 4h
Self study: 8h

ACTIVITIES

Access to the laboratory on the first day

Description:
Regulations for the use of the Electronics Laboratory

Sign the risk prevention sheet before entering the laboratory on the first day. Read and prepare practice and previous study and / or material before entering the laboratory. The assistant, always present during the lab session, assigns desk to each student enrolled in the group that performs the lab session. Coats and bags are not naughty or dangerous (e.g. tripped). No smoking or eating or drinking in the laboratory. Not on the balcony either. When finished, we clean and tidy the place. Tools and instruments are used only for the purpose of the lab session. It is forbidden to disarm them, if any damage is detected, please inform to the assistant.

Working in the laboratory presents health risks. Before starting, it is necessary to understand the General Standards of Safety and Hygiene in Laboratories prepared by the Occupational Risk Prevention Service of the UPC:
In addition, it is necessary to understand additional risks when working with electricity or welding. Working with electricity:
Solder with tin wire:

Final comment: Reverse-polarized capacitors (electrolytic, or polarized) tend to explode within minutes. Always double-check their polarity before connecting them.

Delivery:
Signed document.

Full-or-part-time: 0h 20m
Laboratory classes: 0h 20m
Laboratories

Description:
The laboratory practices are two hours every two weeks in the electronics and electricity laboratory of the FNB. In them, the use of the most common instruments in an electronics laboratory (DMM, GF, FA and Oscilloscope) will be learned and then circuits will be assembled with devices (such as diodes and transistors) and the electrical variables will be measured with the instruments. Students can supplement circuit assembly sessions in the lab with simulations with EasyEDA software.

Specific objectives:
Learn to work in a basic electronics lab.

Material:
Instruments, connection cables, protoboard, passive and active components.

Delivery:
Previous study and report of each practice.

Related competencies:
A36-1.1.4. A-III/6-KUP 1.1.4 Knowledge of Fundamentals of electronics and power electronics
A31-2.1.1b. A-III/1-KUP 2.1.1.2 Basic configuration and operation principles of the following electrical, electronic and control equipment: .2 electronic equipment: .a) characteristics of basic electronic circuit elements, .b) flowchart for automatic and control systems, .c) functions, characteristics and features of control systems for machinery items, including main propulsion plant operation control and steam boiler automatic controls
A31-2.2.6. A-III/1-KUP 2.2.6 The interpretation of electrical and simple electronic diagrams

Full-or-part-time: 14h 40m
Laboratory classes: 14h 40m

GRADING SYSTEM
Continuous evaluation of class/Atenea or a partial test. Continuous evaluation of the laboratory. A final exam. The final grade is the weighted average with 40% laboratory + 30% class or test + 30% final exam. To pass the subject it is necessary to attend all the laboratory sessions.

The criterion for demonstrating STCW competence is approved training with the laboratory equipment

EXAMINATION RULES.
The tests are individual. Only pen (blue or black, non-red, non-pencil) and scientific calculator (non-programmable) are allowed. The mobile phone must be switched off completely.
BIBLIOGRAPHY

Basic:

Complementary:

RESOURCES

Hyperlink:
Other resources:
It would be interesting to have access to a simple DMM.