Course guide
230928 - TEL - Electronic Technology

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.
Degree: BACHELOR'S DEGREE IN ELECTRONIC ENGINEERING AND TELECOMMUNICATION (Syllabus 2018).
(Compulsory subject).
Academic year: 2023  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: Consultar aquí / See here:
https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura
Others: Consultar aquí / See here:
https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

PRIOR SKILLS

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE8. (ENG) GREELEC: Capacitat per utilitzar eines informàtiques de cerca de recursos bibliogràfics o d'informació relacionada amb les telecomunicacions i l'electrònica. (Mòdul comú a la branca de telecomunicació).
CE29. (ENG) GREELEC: Capacitat d'anàlitzar i solucionar els problemes d'interferències i compatibilitat electromagnètica. (Mòdul de tecnologia específica- Sistemes electrònics).

General:
CG2. (ENG) GEELEC: coneixement, comprensió i capacitat per explicar la legislació necessària durant el desenvolupament de la professió d'enginyer tècnic de telecomunicació i facilitat per al maneig d' especificacions, reglaments i normes d'obligat compliment.
CG6. (ENG) GREELEC: Facilitat per al maneig d’especificacions, reglaments i normes d'obligat cumpliment.

Transversal:
CTS. (ENG) GREELEC: ÚS SOLVENT DELS RECURSOS DE LA INFORMACIÓ. Gestionar l'adquisició, l'estructuració, l'anàlisi i la visualització de dades i informació en l'àmbit de l'especialitat i valorar de forma crítica els resultats d'aquesta gestió.

TEACHING METHODOLOGY
Lectures
Laboratory sessions
Team assignments (at home)
Individual work
Continuous assessment evaluation
Final assessment evaluation
LEARNING OBJECTIVES OF THE SUBJECT

Understand the task of the engineer in the development of an electronic product from the specifications to the final product including the design of PCB circuits and the obligatory regulations.
Understand the problems associated systems compatibility, both from the standardization and interference point of view.
Understand the problems associated with the design of Printed Circuit Boards (PCBs) both at the level of its manufacturability and the problems associated with heat management or the integrity of the signals.
Know the problems related to the safety of people and electronic equipment.
Understand the current electronic equipment manufacturing process.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>39,0</td>
<td>26.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>26,0</td>
<td>17.33</td>
</tr>
<tr>
<td>Self study</td>
<td>85,0</td>
<td>56.67</td>
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</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Topic 1: Introduction to the manufacture of electronic equipments**

**Description:**
Typical elements within an electronic device: Analog and digital circuits, power supplies, cables, connectors, presentation elements and interaction, shielding, enclosure.
Phases of the design of an electronic equipment.

**Full-or-part-time:** 5h
Theory classes: 2h
Self study: 3h

**Topic 2: Printed Circuit Boards (PCB)**

**Description:**
Elements of printed circuit boards. CAD tools for the design of PCBs. Stack-Up options. Phases of the design of a PCB. Management of the current return and grounding. Differential and controlled impedance lines. Thermal considerations. Standards and regulations.

**Full-or-part-time:** 22h
Theory classes: 10h
Self study: 12h

**Topic 3: Electronic components technology.**

**Description:**
Technological aspects of passive components, active devices and analog and digital integrated circuits. Limitations of components and non-idealities.

**Full-or-part-time:** 19h
Theory classes: 9h
Self study: 10h
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Full-or-part-time:</th>
<th>Theory classes:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Topic 4: Power subsystem</strong></td>
<td>Power regulation options. Inductive components. Distributed power. Decoupling.</td>
<td>7h</td>
<td>3h</td>
<td>4h</td>
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<tr>
<td><strong>Topic 5: Cables and connectors</strong></td>
<td>Types of cables. Electrical shielding and susceptibility to magnetic fields. Dielectric effects Connectors. Impedance matching.</td>
<td>7h</td>
<td>3h</td>
<td>4h</td>
</tr>
<tr>
<td><strong>Topic 6: Integration and assembly of electronic equipment</strong></td>
<td>Integration of components. Automatic assembly. Implications in the design.</td>
<td>7h</td>
<td>3h</td>
<td>4h</td>
</tr>
<tr>
<td><strong>Topic 7: Electromagnetic compatibility concepts</strong></td>
<td>Generation and susceptibility to electromagnetic radiation. Techniques to reduce emission and susceptibility. Compatibility regulations.</td>
<td>14h</td>
<td>6h</td>
<td>8h</td>
</tr>
<tr>
<td><strong>Topic 8: Security in electronic equipments</strong></td>
<td>Security of equipment and people. Security elements. Associated regulations.</td>
<td>7h</td>
<td>3h</td>
<td>4h</td>
</tr>
</tbody>
</table>
Laboratory: Design of a PCB

**Description:**
Designing a PCB from a schematic. Schematic capture. Generation of BOM and netlist. Editing footprints Placement Routing Post processed

**Full-or-part-time:** 34h
Theory classes: 20h
Laboratory classes: 14h

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Laboratory: Circuit measurements

**Description:**
Integrity tests for analog and digital signals. Noise, interference and crosstalk. Differential lines and single ended. Power integrity tests. Comparison with linear and commutated supplies. Effects of decoupling and PSRR.

**Full-or-part-time:** 28h
Theory classes: 16h
Laboratory classes: 12h

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**GRADING SYSTEM**

40% Final exam
35% Laboratory sessions
25% Continuous assessment evaluation

In the reassessment exam, only the theory contents are reassessed, so the resulting grade from the reassessment will be:

65% Reassessment Exam
35% Previous laboratory work

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**BIBLIOGRAPHY**

**Basic:**

**Complementary:**