

## Course guide

### 230928 - TEL - Electronic Technology

Last modified: 25/05/2023

**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

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**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

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Circuit analysis. Knowledge of materials in the electronics industry and passive components. Concepts of high frequency circuits and impedance adaptation. Electronic devices and operational amplifiers. Concepts of accumulation and transfer of heat. Basic concepts of magnetic circuits. Basic concepts of electromagnetic radiation.

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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##### 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'analitzar i solucionar els problemes d'interferències i compatibilitat electromagnètica. (Mòdul de tecnologia específica- Sistemes electrònics).

##### Generical:

CG2. (ENG) GEELEC: coneixment, 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 compliment.

##### Transversal:

CT5. (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

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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

Type	Hours	Percentage
Hours large group	39,0	26.00
Hours small group	26,0	17.33
Self study	85,0	56.67

**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



#### Topic 4: Power subsystem

**Description:**

Power regulation options. Inductive components. Distributed power. Decoupling.

**Full-or-part-time:** 7h

Theory classes: 3h

Self study : 4h

#### Topic 5: Cables and connectors

**Description:**

Types of cables. Electrical shielding and susceptibility to magnetic fields. Dielectric effects Connectors. Impedance matching.

**Full-or-part-time:** 7h

Theory classes: 3h

Self study : 4h

#### Topic 6: Integration and assembly of electronic equipment

**Description:**

Integration of components. Automatic assembly. Implications in the design.

**Full-or-part-time:** 7h

Theory classes: 3h

Self study : 4h

#### Topic 7: Electromagnetic compatibility concepts

**Description:**

Generation and susceptibility to electromagnetic radiation. Techniques to reduce emission and susceptibility. Compatibility regulations.

**Full-or-part-time:** 14h

Theory classes: 6h

Self study : 8h

#### Topic 8: Security in electronic equipments

**Description:**

Security of equipment and people. Security elements. Associated regulations.

**Full-or-part-time:** 7h

Theory classes: 3h

Self study : 4h



#### 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

#### 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

## 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

## BIBLIOGRAPHY

**Basic:**

- Bogatin, E. Signal and power integrity: simplified. 3rd ed. Boston: Prentice Hall, 2018. ISBN 9780134513416.
- Montrose, M.I. Printed circuit board design techniques for EMC compliance. 2nd ed. New York: IEEE Press, 2000. ISBN 0780353765.
- Wilson, P. The circuit designer's companion. 4th ed. Oxford: Newnes, 2017. ISBN 9780081017647.

**Complementary:**

- Joffe, E.B.; Lock, K.-S. Grounds for grounding: a circuit-to-system handbook. Oxford: John Wiley & Sons, 2010. ISBN 9780471660088.