

Course guide

230928 - TEL - Electronic Technology

Last modified: 13/06/2024

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: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: VICENTE JIMENEZ SERRES

Others: Segon quadrimestre:
MARC ARAGÓN HOMAR - 11, 12, 13
MIQUEL ANGEL GARCIA GONZALEZ - 12, 13
VICENTE JIMENEZ SERRES - 11, 12, 13

PRIOR SKILLS

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

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

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: Printed Circuit Boards Design (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: 29h

Theory classes: 9h

Self study : 20h

Topic 2: PCB Assembly

Description:

Component integration. Automatic assembly. Design implications.

Full-or-part-time: 10h

Theory classes: 3h

Self study : 7h

Tema 3: Introduction to Electromagnetic Compatibility

Description:

Introduction to EMC through real cases and examples. The EMC margin. Regulations.

Full-or-part-time: 6h

Theory classes: 2h

Self study : 4h

Topic 4: Coupling and current return paths

Description:

Conductors in radio frequency. Inductive and capacitive coupling. Types of twisted and shielded cables. Strategies for power distribution. Strategies for referencing circuit ground.

Full-or-part-time: 12h

Theory classes: 5h

Self study : 7h

Topic 5: Radiated interferences

Description:

Definitions and tests of radiated emissions and immunity. Basic concepts in electronic design for: Shielding of electronic products. Signal integrity. Decoupling capacitor. Differential systems. Ferromagnetic devices. Basic isolation techniques.

Full-or-part-time: 13h

Theory classes: 6h

Self study : 7h

Topic 6: Conducted interferences

Description:

Definitions and tests of conducted emissions and immunity. Basic concepts in the design of RF filters. Mains or power line filters.

Full-or-part-time: 10h

Theory classes: 4h

Self study : 6h

Topic 7: Transient interference

Description:

Definitions and tests of transient interference. Definitions and tests of electrostatic discharge (ESD). Protection circuits against transients from various origins.

Full-or-part-time: 10h

Theory classes: 4h

Self study : 6h

Topic 8: Safety in electronic equipment

Description:

Principles of safety for equipment and people. Risk analysis. Protection strategies and 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: 48h

Laboratory classes: 24h

Self study : 24h

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:

- Wilson, P. The circuit designer's companion. 4th ed. Oxford: Newnes, 2017. ISBN 9780081017647.
- 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.

Complementary:

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