Course guide
300039 - ESR - Radio Software Engineering

Last modified: 01/06/2023

Unit in charge: Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: Definit a la infoweb de l'assignatura.

Others: Definit a la infoweb de l'assignatura.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. CE 10 TELECOM. Capacidad para evaluar las ventajas e inconvenientes de diferentes alternativas tecnológicas de despliegue o implementación de sistemas de comunicaciones, desde el punto de vista del espacio de la señal, las perturbaciones y el ruido y los sistemas de modulación analógica y digital. (CIN/352/2009, BOE 20.2.2009.)
2. CE 12 TELECOM. Conocimiento y utilización de los fundamentos de la programación en redes, sistemas y servicios de telecomunicación. (CIN/352/2009, BOE 20.2.2009.)
3. CE 13 TELECOM. Capacidad para comprender los mecanismos de propagación y transmisión de ondas electromagnéticas y acústicas, y sus correspondientes dispositivos emisores y receptores. (CIN/352/2009, BOE 20.2.2009.)
4. CE 2 TELECOM. Students will acquire basic knowledge of the use and programming of computers, operating systems, databases and computer programs used in engineering. (CIN/352/2009, BOE 20.2.2009)
5. CE 26 SIS. Capacidad para analizar, codificar, procesar y transmitir información multimedia, empleando técnicas de procesado analógico y digital de señal. (CIN/352/2009, BOE 20.2.2009.)

Generical:
11. PROJECT MANAGEMENT - Level 1: To know project management tools carrying out the different phases of the project established by the professor

12. PROJECT MANAGEMENT - Level 2: Define the objectives of a well-defined, narrow scope, and plan development, identifying resources, tasks, shared responsibilities and integration. Use appropriate tools to support project management.
16. EFFICIENT USE OF EQUIPMENT AND INSTRUMENTS - Level 1: Using instruments, equipment and software from the laboratories of general or basic use. Realising experiments and proposed practices and analyzing obtained results.
17. EFFICIENT USE OF EQUIPMENT AND INSTRUMENTS - Level 2: Use the correct instruments, equipment and laboratory software for specific or specialized knowledge of their benefits. A critical analysis of the experiments and results. Correctly interpret manuals and catalogs. Working independently, individually or in groups, in the laboratory.

Transversal:
6. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
7. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
8. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
9. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
10. ENTREPRENEURSHIP AND INNOVATION - Level 1. Showing enterprise, acquiring basic knowledge about organizations and becoming familiar with the tools and techniques for generating ideas and managing organizations that make it possible to solve known problems and create opportunities.
13. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
14. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
15. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
18. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
19. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

Type	Hours	Percentage
Guided activities	7,5	5.00
Hours large group	26,0	17.33
Hours small group	32,5	21.67
Self study	84,0	56.00

Total learning time: 150 h

CONTENTS

(ENG) Concepte Software Radio

Full-or-part-time: 4h
Theory classes: 2h
Self study : 2h

(ENG) Metodologia de disseny i verificació de sistemes SDR

Full-or-part-time: 11h
Theory classes: 2h
Laboratory classes: 2h 30m
Guided activities: 0h 30m
Self study : 6h

(ENG) Front-end Software Radio

Full-or-part-time: 27h
Theory classes: 4h
Laboratory classes: 7h 30m
Guided activities: 1h 30m
Self study : 14h

(ENG) Moduladors, demoduladors, DDC i DUC

Full-or-part-time: 35h
Theory classes: 6h
Laboratory classes: 7h 30m
Guided activities: 1h 30m
Self study : 20h

(ENG) Sincronismes

Full-or-part-time: 35h
Theory classes: 6h
Laboratory classes: 7h 30m
Guided activities: 1h 30m
Self study : 20h

(ENG) Síntesi de freqüència digital

Full-or-part-time: 21h
Theory classes: 2h
Laboratory classes: 6h
Guided activities: 1h
Self study : 12h

(ENG) Estimació i Equalització de canal

Full-or-part-time: 17h
Theory classes: 4h
Laboratory classes: 2h 30m
Guided activities: 0h 30m
Self study : 10h

ACTIVITIES

(ENG) LAB_0. DESENVOLUPAMENT SISTEMES EN TEMPS REAL

Full-or-part-time: 4h 30m
Laboratory classes: 2h 30m
Self study: 2h

(ENG) PROJECTE 1. ANÀLISI DEL CANAL DE COMUNICACIONS

Full-or-part-time: 11h 30m
Laboratory classes: 5h
Guided activities: 1h 30m
Self study: 5h

(ENG) PROJECTE 2: MODULADORS/DEMODULADORS DIGITALS

Full-or-part-time: 14h
Laboratory classes: 5h
Guided activities: 1h
Self study: 8h

(ENG) PROJECTE 3: SINCRONISMES RECEPTOR

Full-or-part-time: 23h
Laboratory classes: 7h 30m
Guided activities: 1h 30m
Self study: 14h

(ENG) PROJECTE 4: SISTEMA DE COMUNICACIONS COMPLERT. INTEGRACIÓ

Full-or-part-time: 35h
Laboratory classes: 12h 30m
Guided activities: 2h 30m
Self study: 20h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:
- Reed, Jeffrey Hugh. Software radio : a modern approach to radio engineering. Upper Saddle River: Prentice Hall, 2002. ISBN 0130811580.

Complementary:
- Carlson, A. Bruce; Rutledge, Janet C.; Crilly, Paul B. Communication systems : an introduction to signals and noise in electrical communication. 4th ed. New York [etc.]: McGraw-Hill, 2002. ISBN 0070111278.
- Sklar, Bernard. Digital communications : fundamentals and applications. 2nd ed. Upper Saddle River: Prentice Hall, 2001. ISBN

0130847887.
- Bateman, Andrew; Yates, Warren. Digital signal processing design. New York: Computer Science Press, 1989. ISBN 0716781883.
- Dixon, Robert C. Radio receiver design. New York ; Basel ; Hong Kong: Marcel Dekker, 1998. ISBN 0824701615.
- Webb, William; Hanzo, Lajos. Modern quadrature amplitude modulation : principles and applications for fixed and wireless communications. London : New York: Pentech Press ; IEEE Press, 1994. ISBN 0727317016.
- Bateman, Andy. Digital communications : design for the real world. Harlow [etc.]: Addison-Wesley, 1998. ISBN 0201343010.
- Goldberg, Bar-Giora. Digital frequency synthesis demystified : DDS and fractional-N PLLs. Eagle Rock: LLH Technology, 1999. ISBN 1878707477.
- Stacey, Dale. Aeronautical radio communication systems and networks [Recurs electrònic] [on line]. Chichester, England ; Hoboken, NJ: Wiley, cop. 2008 [Consultation: 26/07/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=350916. ISBN 9780470035092.