Communications Systems Design 2015/2016

Code: 42837
ECTS Credits: 6

Degree	Type	Year	Semester
4313797 Telecommunication Engineering	OB	1	1

Contact

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Use of languages

Principal working language: english (eng)

External teachers

david fernandez piñas

Prerequisites

Digital communications and communication systems.

Objectives and Contextualisation

Systems engineering design is an interdisciplinary field towards the conceptualization, optimization and realization of successful engineering systems.

Requirements and functionalities are customer-driven and can become highly interdisciplinary and complex. Design alternatives and system validation are part of the design process, which requires interdisciplnary team efforts.

Differently to what an undergraduate engineering student learns, the general objective of this subject is about how to think rather than about what to think.

A taxonomic view of the communications systems within systems engineering will be given to contextualize communications system design.

Real examples of large and very large communications systems design will be lectured by system design engineers so that students get inspiration for their own design to be developed in the practical work.

Skills

- Capacity for applying theory of information methods, adaptative modulation and channel coding as well as advanced techniques for digital signal processing in telecommunications and audiovisual systems.
- Capacity for designing and dimensioning transport, diffusion and distribution networks for multimedia signals.
- Capacity for implementing systems using cable, lines, satellite in fixed and mobile communications environments.
- Capacity for modelling, designing, introducing, managing, operating, administrating and maintaining networks, services and content.
- Capacity for planning, decision-making and packaging of networks, services and applications considering the quality of service, direct and operating costs, the implementation plan, supervision,

security procedures, scaling and maintenance and for managing and ensuring quality in the development process.
- Demonstrate an entrepreneurial, creative and innovative spirit
- Student should possess the learning skills that enable them to continue studying in a way that is largely student led or independent
- Students should know how to apply the knowledge they have acquired and their capacity for problem solving in new or little known fields within wider (or multidisciplinary) contexts related to the area of study
- Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously

Learning outcomes

1. Carry out measurements to obtain different antenna parameters
2. Demonstrate an entrepreneurial, creative and innovative spirit
3. Design and obtain coding and modulation techniques in communications systems.
4. Design communications systems considering quality requirements and the services offered.
5. Identify and classify multimedia diffusion and distribution mechanisms in radio access networks.
6. Recognise design strategies for mechanisms to assign resources in radio access networks.
7. Student should possess the learning skills that enable them to continue studying in a way that is largely student led or independent
8. Students should know how to apply the knowledge they have acquired and their capacity for problem solving in new or little known fields within wider (or multidisciplinary) contexts related to the area of study
9. Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously

Content

Part I - Conceptual introduction

1. System Design.

- What is a System?.

- What is Systems Design?.

2. Engineering System Design.

- What is Engineering System Design?.

- Innovation: how to think (instead of what to think).

3. System Design Architectural Frameworks.

- Functional Block diagrams.

- Open architecture design frameworks.

- Unified Modeling Language (UML).

- NATO Architectural Framework (NAF).

- European Cooperation for Space Standardization (ECSS).

Part II - Practical System Design

3. Design examples

- Enterprise communications system (Hospital Case Study).

- Large scale communications system (SATCOM for Air Traffic Management).

- Communications System Testbed(e.g. in UML).

4. Laboratory: system design by students teams.

Session 1. Problem statement and Requirements Gathering.

Session 2. Preliminary System Design:Use cases, Functions and Architecture.

Session 3. Detailed System Design: Physical Architecture and Implementation.

Session 4. System verification and validation.

Methodology

The methodology will consist of lectures and study cases.

The students will be given two examples of requirements-driven full design study cases after which, teams of students will work on their own (interdisciplinary) design cases.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Supervised	45	1.8	3, 4, 5, 8, 7, 1, 6
Type: Supervised			
Student's work	15	0.6	2, 3, 4, 5, 8, 9, 7, 1, 6
Type: Autonomous			
Lectures	86	3.44	2, 3, 4, 5, 8, 9, 7, 1, 6

Evaluation

EVALUATION:
25% MID-TERM + 75% STUDENT'S DESIGN (25% LAB + 50% FINAL REPORT)
For each evaluated activity, the aspects to be specifically evaluated are:
•Creativity: 25%
•Technical applied knowledge: 25%
•Communication skills: 25%
•Multidisciplinary level: 25%
Students will have the option to improve the obtained qualifications.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Final Report	Final Report	2	0.08	2, 3, 4, 5, 8, 9, 7, 1, 6
Mid-term presentation	Mid-term presentation	2	0.08	2, 3, 4, 5, 8, 9, 7, 1, 6

Bibliography

1. Dennis M. Buede, "The Engineering Design of Systems: Models and Methods", Wiley 2009.

2. Jeffrey Wheat et All, "Designing a Wireless Network", Syngress; 1st edition 2001.