Design and simulation of communication systems

Academic Year: (2023 / 2024) **Review date: 27-04-2023**

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: GARCIA ARMADA, ANA

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

No requirements.

OBJECTIVES

The student should aquire the following habilities:
- Have acquired and understand the knowledge to have a basis or opportunity to be original in the design or application of ideas, often in a research context.
- Capability to mathematically model, compute and simulate in tecnolgy centers and enterprise engineering, particularly in research tasks, development and innovation in all fields related to teleccomunication engineering and afine disciplines.
- Capability to develop radiocommunication systems: design of antennas, subsystems and equipment, channel modeling, link budget and planning.
- Capability to implement cable, fiber optics, radio and fixed and mobile service satellite systems.
- Capability to design and dimension transport networks, broadcasting and distribution of multimedia signals.
- Capability to design radionavigatio, positioning and radar systems.

At the end of the course the student will be able to:
- analize, simulate and design radiocommunication systems using channel modeling techniques, link budget and planning.
- take design decisions to implement cable, fiber optics, radio and satellite systems, the latter both in fixd and mobile environments, including radionavigation and multimedia broadcasting.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Basic concepts for the design of communication systems.
1.1 Traffic concepts
1-2 Quality of service and availability
1.3 Multiplexing
1.4 Elements of a communication system: atenuation, noise and link budget
2. Channel modeling.
2.1 Large and small scale models
2.2 Examples for cable and radio channels
3. Simulation of communication systems.
3.1 Basic concepts
3.2 Simulation of communication channels and systems
3.3 Parameter estimation
4. Wireline communication systems.
4.1 Optical fiber
4.2 ADSL
4.3 PLC
5. Wireless communication systems.
5.1 WPAN, WLAN and WMAN
5.2 Cellular systems
6. Satelite communication systems.
6.1 Fixed service
6.2 Mobile service
6.3 Positioning
7. Multimedia broadcast systems.
7.1 DVB standards
7.2 Interactivity

8. Examples of communication systems design.
8.1 Examples of complex systems joining the concepts learnt in the course

LEARNING ACTIVITIES AND METHODOLOGY

Three types of activities:
- Theoretical lectures with examples
- Problem solving
- Laboratory practical work with simulations.

ASSESSMENT SYSTEM

Final exam - 57%
Continuous evaluation of student progress - 43%

The assessment of the extraordinary evaluation is based on a final exam.

% end-of-term-examination:	57
% of continuous assessment (assigments, laboratory, practicals…):	43

BASIC BIBLIOGRAPHY

- Jeruchim et al Simulation of Communication Systems, Plenum, Plenum, 1984
- R L Freeman Telecommunication System Engineering, John Wiley & Sons, 1989
- R L Freeman Telecommunication Transmision Handbook, John Wiley & Sons, 1991
- T S Rappaport Wireless Communications, Prentice Hall, 1996

ADDITIONAL BIBLIOGRAPHY

- Lee, B. G Broadband telecommunications technology, Artech House, 1996
- Saadawi, T. N Fundamentals of telecommunication networks, John Wiley & Sons, 1994