

DEA-TEL-513 Communications Systems I

SEMESTER: Fall

CREDITS: 6 ECTS (4 hrs. per week: 3 Theory + 2 Lab, on average)

LANGUAGE: Spanish

DEGREES: MIT

Course overview

The main goal of this course is to provide the students with knowledge about the main blocks existing in commercial communication systems both wired and wireless. These concept will be studied from an analytical perspective on theoretical classes and from a practical point of view on the laboratory sessions. Main topics will be OFDM, source coding, digital modulations and channel modelling.

Prerequisites

Knowledge of complex variable and differential calculus. Knowledge of digital signal processing and electronics. Medium knowledge of Matlab programming.

Course contents

Theory:

1. Introduction: Signal's theory
2. Analysis of Communication's Channels
3. Band-pass and Base-band Digital Transmission Techniques.
4. Multi-carrier Modulations.
5. Channel Coding.
6. Beam Forming
7. System design.

Laboratory:

There will be nine 2-hour sessions throughout the course.

- P1. Introduction to the lab.
- P2. Base-band digital transmission.
- P3. Noise source modelling.
- P4. Inter-symbol interference.
- P5. Digital Modulations
- P6. Orthogonal Frequency Division Multiplexing (OFDM)

P7. Channel coding

P8. Modeling of a commercial communication system.

P9. Beamforming.

Textbook

- Slides on Moodle.
- Proakis, J. G., & Salehi, M. (2008). Digital Communications. McGraw-Hill Higher Education.
- Haykin, S. S. (2013). Digital Communication Systems. Wiley.
- Concepts in Systems and Signals, J. D. Sherrick. Prentice-Hall 2001.
- Discrete-Time Signal Processing (2nd Edition). Oppenheim, Schafer, Buck. Prentice-Hall.
- Digital Signal Processing Handbook. Vijay K. Madisetti, Douglas B. Williams. Chapman & Hall.
- Advanced Signal Processing Handbook. Editor Stergios Stergiopoulos. CRC Press.

Grading

The following conditions must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.

The overall grade is obtained as follows:

- Final exam 40%.
- Other exams 10%. Typically there is 1 mid-term exam (2-hour long), although, depending on the schedule, other might be programmed. Students will be told at least a week in advance.
- Lab reports 20%.
- Modeling of commercial system (group project) 30%.