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| FAME           | ENSEA                         |                       |
|                | <b>Communications Systems</b> |                       |
| US Credits : 3 | Lecture : 33h, Laboratory 12h | Language :<br>English |

### Summary

This course introduces analog and digital techniques for signal transmission. By the end of the course students should be able to analyze basic communication systems and specify their performances.

### Prerequisites

- Fourier analysis of signals and systems
- Probability and random variables

### Contents

#### Signals and Systems review

- Fourier series and transforms
- Linear systems theory, impulse response and transfer functions

#### Continuous waveform modulation systems

- Amplitude modulation: study of AM signal in time and frequency domains, AM modulator and demodulator circuits
- Angle modulation: study of FM signal in time and frequency domains, FM modulator and demodulator circuits
- Noise effects in analog modulations

#### Probability, random variables and stochastic processes

- Statistical averages, mean, correlation and covariance functions
- Transmission of a random process through a linear filter, power spectral density
- Gaussian process, white Gaussian noise

#### Digital communication systems

- Baseband transmission of digital signals: representation of digital information, M-ary symbols, intersymbol interference, matched filter detection, eye pattern, probability of error due to noise
- Band-pass transmission of digital signals: QAM, PSK and FSK modulations

### Organization

- Include 12h of laboratory (8h of measurements on real circuits with oscilloscope and spectrum analyzer, 4h of simulations of digital systems with Matlab Simulink)
- Computer projects using MATLAB software as homeworks

### Textbook

Simon Haykin & Michael Moher, Communication Systems, John Wiley, 5<sup>th</sup> Edition

### Similar to the following courses

- IIT Chicago
- University at Buffalo EE 483
- University of Pittsburgh ECE 1472
- University of Illinois at Urbana-Champaign
- Mississippi State University
- University of Michigan at AA EECS 400 level
- Michigan Tech EE 3250