FACULTY OF **ENGINEERING**

DEGREE COURSE: **COMPUTER AND CONTROL ENGINEERING**

MASTER DEGREE: **COMPUTER AND CONTROL ENGINEERING**

SUBJECT: TELECOMMUNICATIONS AND REMOTE SENSING

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OBJECTIVES

This course aims at providing the student with recent transmission and signal processing techniques, as well as the corresponding applications in the realm of multi-user networking. Wireless communication systems will be analyzed, with particular focus, among the remote sensing and monitoring applications, on wireless sensor networks.

CONTENTS

1. **INTRODUCTION**
   Introduction to telecommunications and remote sensing
   Summary of probability and random variables
   Summary of signals and systems

2. **INFORMATION THEORY AND PERFORMANCE LIMITES**
   Entropy and mutual information
   Channel capacity
   The Gaussian channel

3. **CHANNEL CODING**
   Linear block codes
   Convolutional codes
   Advance techniques: turbo and LDPC codes

4. **THE WIRELESS CHANNEL**
   Deterministic and stochastic models of the wireless channel
   Capacity of the wireless channel
   Error probability in faded channels

5. **ADVANCED TRANSMISSION TECHNIQUES**
   Passband numerical modulations
   Multi-user communication systems
   Network coding

6. **WIRELESS NETWORKS FOR COMMUNICATIONS AND REMOTE SENSING**
   Wireless network evolution

Sensor networks
IEEE 802.15.4 standard
Models for analysis of wireless sensor networks

LEARNING OUTCOMES

The student will be familiar with basic concepts about the characterization of a wireless communication systems, both from the channel and the system performance point of view. Moreover, the student will be provided with the basic principles of the design of a remote monitoring system, based on wireless sensor networks.

ASSESSMENT

Written exam: multiple-choice tests and open-ended questions

RECOMMENDED TEXTBOOKS

Lectures notes given by the instructor