Course guides
13963 - ORSA - Optical Remote Sensing I: Active

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.

Degree: ERASMUS MUNDUS MASTER'S DEGREE IN RESEARCH ON INFORMATION AND COMMUNICATION TECHNOLOGIES (Syllabus 2009). (Optional subject).
MASTER'S DEGREE IN PHOTONICS (Syllabus 2009). (Optional subject).
ERASMUS MUNDUS MASTER'S DEGREE IN PHOTONICS ENGINEERING, NANOPHOTONICS AND BIOPHOTONICS (Syllabus 2010). (Optional subject).
MASTER'S DEGREE IN RESEARCH ON INFORMATION AND COMMUNICATION TECHNOLOGIES (Syllabus 2009). (Optional subject).

Academic year: 2015  ECTS Credits: 3.0  Languages: English

LECTURER

Coordinating lecturer:

Others:

PRIOR SKILLS


REQUIREMENTS


TEACHING METHODOLOGY

Oral-exposition classes combined with problems and/or computer-based classes. Review of journal papers or others.

LEARNING OBJECTIVES OF THE SUBJECT

To introduce the main techniques, systems and subsystems on laser-radar (LIDAR) remote sensing. The course presents the grounds of the technological, physical, and signal-processing keys involved as well as the applications of these remote sensing systems. Present-day fields of application comprise the detection and monitoring of chemical species, atmospheric observation, pollution concentration and physical variables, and others, in the industrial field.

CONTENTS

1. Introduction to LIDAR, electro-optical and technological considerations

Description:

Full-or-part-time: 1 h
Theory classes: 1h
## 2. Elastic LIDAR Systems

**Description:**
1. Architecture and receiver chain [(optical and electro-optical sub-systems (lasers, detectors), signal acquisition sub-systems (analog and photon counting)]. 2. Examples of real systems 3. Applications and satellite/space missions. 4. Pseudo-random systems.

**Full-or-part-time:** 3 h  
Theory classes: 3h

## 3. LIDAR Link-Budget / Project coaching I

**Description:**
1. Receiving chain. 2. Assessment of power levels in the chain. 3. Generalised signal-to-noise ratio. 4. Lidar range estimation and simulation. 5. Problem discussion I

**Full-or-part-time:** 3 h  
Theory classes: 1h 30m  
Practical classes: 2h 30m

## 4. LIDAR Inversion Algorithms

**Description:**
1. Inversion of opto-atmospheric parameters. 2. Examples

**Full-or-part-time:** 2 h  
Theory classes: 1h  
Practical classes: 1h

## 5. Raman LIDAR Systems / Project coaching II

**Description:**
1. Raman lidar (temperature and gas detection). 2. Elastic-Raman lidar systems. 3. Problem discussion II

**Full-or-part-time:** 5 h  
Theory classes: 4h 30m  
Practical classes: 1h 30m

## 6. Wind LIDAR Systems

**Description:**

**Full-or-part-time:** 3 h  
Theory classes: 3h 30m  
Practical classes: 0h 30m
7. Other Laser-Radar Systems

Description:
1. DIAL (Differential Absorption Lidar, trace gas detection). 2. Other systems (fluorescence, active vision, etc.)

**Full-or-part-time:** 1 h
Theory classes: 1h 30m
Practical classes: 0h 30m

8. Exam

**Full-or-part-time:** 2 h
Theory classes: 2h

9. Project exposition

**Full-or-part-time:** 2 h
Theory classes: 2h

**GRADING SYSTEM**

50 % final exam (multiple answer test), 50 % Guided research work (computer based).

**EXAMINATION RULES.**

A minimum attendance of 80% is required. Exam duration: 2h. Guided research work: Oral exposition or interview (depending on the number of students).