COURSE MODULE – Remote Imaging and Sensing

COURSE CODE	
COURSE LEVEL	Master
ECTS CREDITS	5
COURSE INSTRUCTOR/S	Francisco José Olmo Reyes / Juan Luis Nieves
DURATION PERIOD	SEMESTER 2
EXPECTED PRIOR-KNOWLEDGE	Photonics and Optics Fundalmentals, Image Processing and Analysis, Basics and Fundamentals with Matlab
LANGUAGE OF INSTRUCTION	English

AIM

This course develops the fundamentals of remote sensing techniques. The course covers the basic principles of remote sensing, a revision of the electromagnetic radiation and its interaction with matter, some basics ideas about the atmosphere both as a transfer medium and as an observational object, advanced topics in surface and atmosphere remote sensing. Different platforms and sensors used in remote sensing will be presented including imaging systems. Pre-processing aspects of remotely sensed data will be addressed paying special attention to atmospheric and radiometric corrections. On completion of this course the students will be able to:
•Understand the bases of the remote sensing process.
•Approach to the remote sensing procedures applied to the surface and atmosphere.
•Distinguish the different kind of sensors and platforms used in remote sensing.
•Understand the need of atmospheric correction of surface remote sensing data.
•Apply atmospheric correction to real remote sensing data.
•Extract surface and atmospheric variables from remote sensing data.

TEACHING ACTIVITIES

This course is based on exchanges and discussions between students and instructors, lectures and practical session activities, as well as homework.

COURSE OUTLINE

(topic 1)	Remote sensing: basic principles
(topic 2)	Electromagnetic radiation and its interaction with matter.
(*topic 3*)	Basics principles of atmospheric remote sensing and radiative transfer.
(*topic 4*)	Remote sensing sensors: airborne and surface systems, optical, UV-VIS-IR and microwave sensors, imaging and non-imaging systems.
(*topic 5*	Pre-processing of remotely sensed-data: atmospheric correction, calibration.
(*topic 6*)	Extraction of surface and atmospheric variables from remote sensing data.
(*topic 8*)	Future applications

PRACTICAL ACTIVITIES

- Design of look up tables for atmospheric correction.
- Atmospheric correction of remote sensing images.
- Extraction of geophysical surface and atmospheric variables from remote sensing data.

LEARNING OUTCOMES[1]

• *Knowledge* and *Comprehension* of the fundamentals, principles, applications, limits, relationships, of all concepts and topics covered by this course;
• *Application, Analysis, Synthesis* and *Evaluation* skills of the main concepts and topics covered by this course;
• Ability to apply/implement concepts and principles introduced in the lectures on practical tasks and on industrial study cases;
• Ability to self-learn, to understand some problems and to suggest/find solutions to solve these problems.

[1] The meaning of *keywords* in italic used to define Learning Outcomes are detailed in Annex.

FORM/S OF ASSESSMENT

Written exam (50%), Practical works (50%)

ASSESSMENT CRITERION

Written exam and Practical works

Excellent - outstanding performance	A
Very Good - above the average standard but with some errors	B
Good - generally sound work with a number of notable errors	C
Satisfactory - fair but with significant shortcomings	D
Sufficient - performance meets the minimum criteria	E
Fail - some more work required before the credit can be awarded	FX
Fail - considerable further work is required	F

Detail of criteria used to assess acquired skills :
• Activities and questionnaires giving evidence of knowing (20%)
• Activities and questionnaires giving evidence of comprehension/understanding (20%)
• Activities and questionnaires giving evidence of analysis (20%)
• Activities and questionnaires giving evidence of synthesis (20%)
• Activities and questionnaires giving evidence of evaluation (20%)

Excellent	A
Very Good - above the average standard	B
Good - generally sound well	C
Satisfactory - but with significant shortcomings	D
Sufficient - performance meets the minimum criteria	E
Fail - some more work required	FX
Fail - considerable further work is required	F

The evaluation of informal learning outcomes will be based on questionnaires and laboratory notebook (self-evaluation, learning diary).

LITERATURE AND STUDY MATERIALS

- CAMPBELL, J.B., Introduction to remote sensing, The Guildford Press, New York, 1987.
- CURRAN, P., Principles of remote sensing. Longman Scientific & Technical, New York, 1985.
- ELACHI, C., Introduction to the physics and techniques of remote sensing. John Willey & Sons, New York, 1987.
- LENOBLE, J., Atmospheric radiative transfer. A. Deepak Publishing, Virginia, 1993.
- LIOU, K.N., An introduction to atmospheric radiation. Academic Press, New York, 2002.
- MATHER, P.M., Computer processing of remotely-sensed images. An introduction. John Willey & Sons, Chichester, England, 1999.
- SLATER, P.N., Remote sensing. Optics and optical systems. Addison-Wesley Publishing Company, Reading, Massachusetts, 1980.

CONTACT DETAILS

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