COURSE DATA

DATA SUBJECT

Code: 34280
Name: Remote sensing
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1105 - Degree in Physics	Facultat de Física	4	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1105 - Degree in Physics	Complements of Physics	ELECTIVES

COORDINATION

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SUMMARY

The subject is taught, optionally, in the second quarter of the fourth course in the degree in physics.

Remote Sensing develops a basic block of issues that are of great help in planning, understanding and resolving problems that may explain a wide range of natural phenomena that shape and affect the environment. Among the subjects taught in the degree is related to various subjects specific subjects such as Physics and Meteorology and Climatology, among others.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

In this subject, the previous knowledge acquired in the basic subjects of the Physics degree is sufficient.

COMPETENCES / LEARNING OUTCOMES

1105 - Degree in Physics

Ability to collect and interpret relevant data in order to make judgements.

Basic & applied Research: acquire an understanding of the nature and ways of physics research and of how physics research is applicable to many fields other than physics, e.g. engineering; be able to design experimental and/or theoretical procedures for: (i) solving current problems in academic or industrial research; (ii) improving the existing results.

Communication Skills (written and oral): Being able to communicate information, ideas, problems and solutions through argumentation and reasoning which are characteristic of the scientific activity, using basic concepts and tools of physics.

Foreign Language skills: Have improved command of English (or other foreign languages of interest) through: use of the basic literature, written and oral communication (scientific and technical English), participation in courses, study abroad via exchange programmes, and recognition of credits at foreign universities or research centres.

Knowledge and understanding of the fundamentals of physics in theoretical and experimental aspects, and the mathematical background needed for its formulation.

Learning ability: be able to enter new fields through independent study, in physics and science and technology in general.

Literature Search: be able to search for and use physical and other technical literature, as well as any other sources of information relevant to research work and technical project development.

Modelling & Problem solving skills: be able to identify the essentials of a process / situation and to set up a working model of the same; be able to perform the required approximations so as to reduce a problem to an approachable one. Critical thinking to construct physical models.

Physics general culture: Be familiar with the most important areas of physics and with those approaches which span many areas in physics, or connections of physics with other sciences.

Problem solving: be able to evaluate clearly the orders of magnitude in situations which are physically different, but show analogies, thus allowing the use of known solutions in new problems .

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

To know how to apply the knowledge acquired to professional activity, to know how to solve problems and develop and defend arguments, relying on this knowledge.

DESCRIPTION OF CONTENTS

1. Introduction

1.1. Remote sensing concept, definitions
1.2. Historical evolution and main remote sensing systems
1.3. Orbits and observation platforms

2. Physical foundations

2.1. Basic radiometric quantities and fundamental laws
2.2. Interaction of radiation with natural surfaces: reflection, transmission, absorption and emission.
2.3. Propagation of radiation in natural environments: radiative transfer equation

3. Remote sensing systems

3.1. Optical systems: active and passive
3.2. Thermal systems
3.3. Microwave systems: active and passive

4. Data processing

4.1. Data pre-processing and corrections
4.2. Methods of analysis and extraction of information
4.3. Processing of large volumes of data, time series analysis

5. Applications

5.1. Atmospheric, meteorological, climatological and environmental applications
5.2. Cartographic applications and in the management of terrestrial and aquatic natural resources
5.3. Integration of data into physical models of the phenomena

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	15,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	49,00
Preparation of lessons	0,00
Preparation for assessment activities	3,50
Resolution of case studies	0,00
Total hours	**67,50**

TEACHING METHODOLOGY

The course consists of several parts, with a distinct methodology:

- Theory (blackboard classes)
- Seminars
- Tutoring
- Laboratory.

For each one of them is a different development methodology.

Theory:
Two classes of slate a week. In class the teacher teaches content based on materials (slides, notes, figures and diagrams) to be provided to students in advance.

Tutorials:
In the compulsory tutorials (small subgroups of less than 16 students), the teacher monitors the work and progress of students, in addition to resolve the questions raised.

Seminars:
The course also includes two additional sessions of attendance at seminars where students will learn some current issues in remote sensing.

Laboratory:
Three laboratory sessions (one session each week). These are taught in small subgroups, with one teacher

assigned to each subgroup. In the sessions the students will be grouped in pairs, and perform 3 practices: Introduction to digital imaging satellite, Digital processing of satellite images of high and low resolution, and field radiometry. For each practice, the couple must file a report for the collection and treatment data (errors, graphic settings), and the conclusions reached. With emphasis on the use of computer programs for data processing, which can be done during the practice sessions with the computers available in the laboratory.

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EVALUATION

The evaluation of the course is done taking into account the following differentiated parts:

a) Theory
b) Laboratory
c) Seminars

The evaluation is done separately, with the following criteria:

a) Theory evaluation: The evaluation of this part of the subject will be based on a written exam.
b) Laboratory evaluation: The laboratory work is evaluated based on the reports made by the students for each of the practices planned during the course.
c) Seminars: The students will have to do a short work or a summary of some of the external seminars taught in the course, or of any remote sensing application or activity that is proposed.

The grading of the course will be done with the following criteria:

a) 40% a written exam. This exam will consist of applied and theory questions.
b) 30% practical reports and work done in the laboratory.
c) 30% a written work of any remote sensing application or summary of any external seminar or proposed activity.

The final grade will be obtained from the weighted sum of the grades in sections (a), (b) and (c), considering that it is required a minimum of 4/10 points both in section (a) and in section (b). The total grade necessary to pass the course will be 5 points out of 10.

These evaluation criteria are common to the first and second calls.

REFERENCES

- Chuvieco, E. (1997). Fundamentos de teledetección espacial. Madrid, Rialp.
- Elachi, C. (1987). Introduction to the Physics and techniques of remote sensing. Ed. John Wiley &

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- Pinilla, C. (1995). Elementos de Teledetección. Ra-Ma.

- Sobrino, J. A. et al., (2000). Teledetección. Ed. J. A. Sobrino. Servicio de Publicaciones. Universitat de València.

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- Ulaby, F. T., Moore, R. K. Y Fung, A. K. (1982). Microwave remote sensing: active and passive, vol. I y II. Addison-Wesley, London.