

Academic Year: ( 2020 / 2021 )

Review date: 12-07-2020

Department assigned to the subject:

Coordinating teacher: SEGOVIA VARGAS, DANIEL

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Have passed the course on Complements on Telecommunications Technologies and Telecommunication Systems and Signal Processing (or equivalent courses in their previous bachelors)

## OBJECTIVES

### Basic competences

CB6 To possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context

CB7 Students must know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study

CB8 Students must be able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments

CB9 Students must know how to communicate their conclusions and the knowledge and ultimate reasons that sustain them to specialized and non-specialized audiences in a clear and unambiguous way

CB10 Students must have the learning skills allowing them to continue studying in a way that will be largely self-directed or autonomous.

### General competences

CG3 Ability to analyze and correct the environmental and social impact of the technical solutions of any space system

CG4 Ability to work in multidisciplinary teams in a cooperative way to complete work tasks

CG5 Ability to handle the English, technical and colloquial language.

CG6 Ability to know adequately the business context of the professional sector, as well as to know and understand the applicable legislation in the exercise of the profession

### Specific competences

CE3 Ability to develop a complete system that meets the design specifications and the expectations of the interested parties. This includes the production of products; acquire, reuse or code products; integrate products in top-level assemblies; verify products against design specifications; validate the products against the expectations of the interested parties; and the transition of products to the next level of the system.

CE12 Ability to understand and apply the knowledge, methods and tools of space engineering to the analysis and design of sensors and instruments used in space missions.

CE14 Ability to understand and apply the knowledge, methods and tools of space engineering to space surveillance and clean space.

## DESCRIPTION OF CONTENTS: PROGRAMME

Common topics to all the subjects, as indicated in the learning outcomes, are related to the social and business context of space engineering.

Specific topics of each subject:

Remote Sensing, and Scientific Missions. The program of the subject includes:

- 1 Introduction to Satellite Remote Sensing: definition, history, advantages, legal aspects
- 2 Remote Sensing Fundamentals: electromagnetic spectrum, atmospheric interactions, acquisition geometry, spatial, temporal and spectral resolution
- 3 Concept of Operations (from mission requirements to final implementation)
- 4 Types of instruments
- 5 Payload Data Ground Segment (PDGS) components
- 6 Geographic Information Systems (GIS)
- 7 Programmatics: Market and Applications of Remote Sensing, Earth Observation Programmes (Copernicus, GMES, GEOSS, etc.)
- 8 Introduction to Scientific Missions: definition, architecture, advantages of space observatories
- 9 Space Astronomy Instrumentation: telescopes, spectrometers, particle detectors, plasma diagnostic, gravitational waves,  $\gamma$

## LEARNING ACTIVITIES AND METHODOLOGY

Formative activities included in the curriculum

- AF1 Theoretical class
- AF4 Laboratory practices
- AF5 Office hours
- AF6 Teamwork
- AF7 Individual work of the student
- AF8 Midterm and final exams

Activity code	Total hours	Classroom hours	% classroom hours
AF1	18	18	100
AF4	3	3	100
AF5	3	1	33
AF6	48	0	0
AF8	3	3	100
TOTAL	75	25	33%

Methodology

- MD1 Master class supported by computing and audiovisual media, where the main topics are exposed, and bibliography is provided to complement the learning by the students.
- MD2 Critical reading of recommended texts: press articles, reports, textbooks and/or academic papers, both to be later discussed in class, or to complement and consolidate the knowledge of the topic.
- MD3 Resolution of practical cases, problems, etc., proposed by the teacher, individually or in groups.
- MD4 Exposition and discussion in class of topics related to the course and practical cases, under teacher moderation.
- MD5 Elaboration of assignments and reports individually or in groups.

## ASSESSMENT SYSTEM

ASSESSMENT SYSTEMS OF THE STUDY PLAN REFERRED TO SUBJECTS

- SE2 Individual or group work carried out during the course
- SE3 Final exam

System of Evaluation

Minimum weight (%)	Maximum weight (%)
SE2	40%
SE3	0%

<b>% end-of-term-examination:</b>	30
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	70

## BASIC BIBLIOGRAPHY

- Charles Elachi Jakob Van Zyl Introduction to the physics and techniques of remote sensing, Wiley-Interscience , 2006
- Christopher Legg, Remote sensing and geographic information systems : geological mapping,

mineral exploration and mining, John Wiley & Sons, 1994

- D.A. Landgrebe Signal theory methods in multispectral remote sensing, John Wiley & Sons , 2003
- Alfred Stein Spatial statistics for remote sensing , Kluwer Academic , 2002.

#### BASIC ELECTRONIC RESOURCES

- . Copernicus (ESA): : [https://www.esa.int/Our\\_Activities/Observing\\_the\\_Earth/Copernicus/Overview3](https://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Overview3)
- . - GMES (ESA): : [http://https://www.esa.int/About\\_Us/Ministerial\\_Council\\_2012/Global\\_Monitoring\\_for\\_Environment\\_and\\_Security\\_GMES](http://https://www.esa.int/About_Us/Ministerial_Council_2012/Global_Monitoring_for_Environment_and_Security_GMES)
- . - GEOSS (Consortium): : <https://www.earthobservations.org/geoss.php>
- . - Earth Observation Programmes (ESA) : [https://www.esa.int/About\\_Us/Business\\_with\\_ESA/Business\\_Opportunities/Earth\\_Observation\\_Programmes](https://www.esa.int/About_Us/Business_with_ESA/Business_Opportunities/Earth_Observation_Programmes)
- . NASA's Earth Observing System (NASA): : <https://eospsa.nasa.gov/content/nasas-earth-observing-system-project-science-office>
- . Committee on Earth Observation Satellites (CEO): : <http://ceos.org>
- . - National Oceanic and Atmospheric Administration (NOAA, USA): : <https://www.noaa.gov>
- . - EUMETSAT: : <https://www.eumetsat.int/website/home/index.html>
- . - ESA Science and Technology Missions (ESA, EU): : <http://sci.esa.int/home/51459-missions/>
- . - NASA Science Missions (NASA, USA): : <https://science.nasa.gov/missions-page>
- . - JAXA Projects (JAXA, Japan): : <http://global.jaxa.jp/projects/>
- . - ROSCOSMOS (Russia): : [http:// http://en.roscosmos.ru](http://en.roscosmos.ru)
- . - China National Space Administration (China) : <http://www.cnsa.gov.cn/english/>
- . ISRO (India): : <https://www.isro.gov.in>