Global Navigation Satellite Systems and Telecommunication Systems

Academic Year: (2021 / 2022) **Review date: 10-06-2021**

Department assigned to the subject: Department of Signal and Communications Theory

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.

Link to document

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:

Global Navigation Satellite Systems and Telecommunication Systems. The program of the subject includes:

1 Introduction to Satellite Navigation: history, typology
2 GNSS: General Overview and Systems in Use
3 Time and Reference Frameworks
4 Measurements and Error Sources
5 Position, Velocity and Time Computation
6 Augmentation Systems (EGNOS, WAAS, MSAS, etc.)
7 Market and Applications of GNSS (SAR, LBS, Aeronautics, etc.)
8 Case of Study: GALILEO (Architecture, Signals, Receivers, etc.)
9 SatComms in the telecommunications world and SatComm services
10 Markets of Satellite Communication Systems and services
11 Satellite Communication systems architecture, characteristics, orbits, frequency bands and performance
12 Satellite Communication Payload technology and On-Board processing
13 Satellite Communication ground segment
14 Satellite Communication operations, users and receivers
15 Satellite communications international coordination groups
16 New trends and Global SatComm constellations
17 European Data Relay System
18 SatComm and 5G

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
AF6	3	1	33
AF7	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

EVALUATION SYSTEMS:

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%	100%
SE3	0%	60%

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- Gleason GNSS, applications and methods, Artech House, 2009
- Kaplan Understanding GPS: Principals and Applications, Artech House, 2006
- Maral and Bousquet Satellite Communications, Wiley, 2004
- Misra and Enge GPS: signals, measurements and performance, www.gpstextbook.com, 2001
- Parkinson, Spilker et al GPS: Theory and Applications, Parkinson.