



## IDENTIFYING DATA

### Satellite communication systems, positioning, remote sensing and radionavigation

Subject	Satellite communication systems, positioning, remote sensing and radionavigation			
Code	P52M182V01204			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Nocelo López, Rubén			
Lecturers	Nocelo López, Rubén Núñez Ortuño, José María			
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General description	The course of Satellite Communications Systems, Positioning, Remote Sensing and Radionavigation aims to provide students with an overview of the main satellite communications systems. Radionavigation Systems aims to provide students with an overview of the main remote positioning and communication systems. communication and remote positioning systems. The course details the technologies involved, regulatory and safety aspects of this type of systems. regulatory and safety aspects of this type of systems.			

## Training and Learning Results

Code	
A6	CB6 - 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.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B5	CG5 - Critically evaluate the structure and validity of reasoning, analyzing, interpreting, and questioning the foundations of ideas, actions, and judgments of oneself or others, before accepting them as valid.
C12	CISTT1 - Deepen the knowledge of telecommunications systems based on different technologies applicable to the tactical, operational and strategic fields; to fixed and mobile environments; with different types and volumes of data.
C13	CISTT2 - Analyze and optimize the deployment of communication systems in military operating environments.
D4	CT4 - Oral and written communication skills.
D5	CT5 - Autonomous learning and work.

## Expected results from this subject

Expected results from this subject	Training and Learning Results
LO1: Understand the mechanisms of satellite propagation and communications.	A6 A7 B1 B2 C12 C13 D4 D5
LO2: To know the basic operation of the different radionavigation systems existing today.	A8 B1 B2 B5 C12 D4 D5
LO3: To know the basic operation of the different positioning systems currently existing.	A9 B1 B2 C12 D4 D5
LO4: To know the basic operation of the different remote sensing systems.	A10 B1 B2 C12 D4 D5
LO5: To know the different existing systems in the military field, as well as their most remarkable characteristics their most outstanding characteristics.	A9 A10 B1 B2 B5 C12 C13 D4 D5

## Contents

### Topic

Subject 1: Satellite communications	<ul style="list-style-type: none"> <li>- Historical evolution and generalities</li> <li>- Structure of a satellite communication system</li> <li>- Coverage</li> <li>- Access methods</li> <li>- Link budget</li> <li>- SECOMSAT</li> <li>- Other systems: IRIDIUM, THURAYA, INMARSAT, GLOBALSTAR</li> </ul>
Subject 2: Positioning systems	<ul style="list-style-type: none"> <li>- Global positioning systems (GNSS)</li> <li>- Augmentation systems</li> <li>- Location services based on GSM networks</li> <li>- Indoor positioning systems (IPS)</li> <li>- NAVWAR</li> </ul>
Subject 2: Radionavigation systems	<ul style="list-style-type: none"> <li>- Radiogoniometry</li> <li>- Directional and no directional radiobeacons</li> <li>- ILS/MLS system</li> <li>- Augmented GNSS systems: WAAS, EGNOS and MSAS</li> <li>- Other systems</li> </ul>
Subject 4: Teledetection systems	<ul style="list-style-type: none"> <li>- Components</li> <li>- Classification</li> <li>- Sensors types</li> <li>- Main characteristics</li> <li>- Satellite teledetection systems: radar, SAR and optoelectronics</li> </ul>

## Planning

	Class hours	Hours outside the classroom	Total hours

Lecturing	8	8	16
Problem solving	2	2	4
Previous studies	0	29	29
Practices through ICT	2	0	2
Autonomous problem solving	0	6	6
Seminars	2	0	2
Self-assessment	0	2	2
Presentation	2	1	3
Problem and/or exercise solving	0	7	7
Laboratory practice	4	0	4

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

## Methodologies

	Description
Lecturing	Presentation by a lecturer of the contents of the subject of study, theoretical bases and/or guidelines for a work or exercise that the student has to develop.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop the appropriate and correct solutions through the exercise of routines, application of formulas or algorithms, application of transformation procedures of the available information and interpretation of the results.
Previous studies	Search, reading, documentation work and/or autonomous performance of any other activity that the student considers necessary to enable the acquisition of knowledge and skills related to the subject. It is usually carried out prior to classes, laboratory practices and/or evaluation tests. This includes the reading and analysis of documents, and the viewing of multimedia resources.
Practices through ICT	Activities for the application of knowledge in a given context and the acquisition of basic and procedural skills related to the subject matter, through the use of ICTs.
Autonomous problem solving	Activity in which students analyze and solve problems and/or exercises related to the subject in an autonomous way.
Seminars	Activity focused on working on a specific topic, which allows to deepen or complement the contents of the subject.

## Personalized assistance

Methodologies	Description
Lecturing	Personalized answers to the doubts related to the exposition by the lecturer of the contents of the subject matter, theoretical bases and/or guidelines of a work or exercise that the student has to develop. exercise that the student has to develop
Problem solving	Attention in the distance phase: It will be carried out through the use of telematic resources. Students who wish to do so may ask questions to the lecturer in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer , which will be developed by videoconference. Personalized comments to the resolution of problems and/or exercises related to the subject.
Seminars	Personalized comments on the work on a specific topic, which allows to deepen or complement the contents of the subject.
Practices through ICT	Personalized attention will be given individually and in person to the activities of application of knowledge in a given context and acquisition of basic and procedural skills in relation to the subject, through the use of ICT.
Tests	Description
Laboratory practice	Guidance in the realization of the different laboratory practices related to the syllabus of the course.
Problem and/or exercise solving	Personalized comments and guidance on the work proposed in class, which allow to deepen or complement the contents of the subject.

## Assessment

Description	Qualification	Training and Learning Results
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Self-assessment	Mechanism in which, by means of a series of questions or activities, the learner is activities, it is possible for the student to evaluate autonomously his or her autonomously their degree of acquisition of knowledge and skills about the the subject, allowing a self-regulation of the personal learning process. personal learning process. There will be two intermediate tests (PE1 and PE2), one hour long, to control the follow-up of the subject. Each test of control has a weight of 20%. The first test that covers topics 1 and 2 will be carried out in the distance phase, while the second test that will cover topics 3 and 4 will be carried out in the face-to-face phase.	40	A6 A7 A8 A9	B1 B2 B5	C12 C13	D4
Presentation	Presentation by the students, individually or in groups, of a work (T1 and T2) related to the contents of the topic 1 and 2 of the subject . Each task has a weight of 10% and will be evaluated in the distance phase.	20	A6 A7 A8 A9 A10	B1 B2 B5	C12 C13	D4 D5
Problem and/or exercise solving	Resolution of different exercises (E1 and E2) proposed in class on assumptions applicable to each of the topics 3 and 4 of the syllabus. Each exercise has a weight of 10% and will be carried out in the distance phase.	20	A6 A7 A8 A9 A10	B1 B2 B5	C12 C13	D4 D5
Laboratory practice	Evaluation of two laboratory practices (PL1 and PL2) related to the course syllabus by means of deliverable reports that will be carried out in the face-to-face phase. Each practice has a weight of 10%.	20	A6 A7 A8 A9 A10	B1 B2 B5	C12 C13	D4 D5

#### Other comments on the Evaluation

If the average grade of continuous assessment, called MED\_CON, is calculated as:

$$\text{MED\_CON} = 0.4 * (\text{PE1} + \text{PE2}) / 2 + 0.2 * (\text{T1} + \text{T2}) / 2 + 0.2 * (\text{E1} + \text{E2}) / 2 + 0.2 * (\text{PL1} + \text{PL2}) / 2$$

it will be necessary to obtain at least 50% of the grade to pass the course.

In case of not passing the course in the ordinary call, there would be a second opportunity to pass it in the extraordinary call, which would be carried out in distance mode on the dates established for this purpose by the Academic Committee of the Master. The evaluation of the second call will be carried out in distance mode, through the evaluation of a deliverable (work) which will account for 60% of the grade and the completion of a written test (with development questions and / or test type) using telematic means, which will account for the remaining 40%. It will be necessary to obtain at least 50% of the grade to pass the course. The evaluation process in this second call would be carried out as indicated in the following table

Assessment systems		
Denomination	Qualification(%)	Competences
Evaluation of deliverables (work)	60%	CB6, CB7, CB8, CB9, CB10 CG1,CG2, CG5 CE12,CE13 CT4, CT5
Written test	40%	CB6, CB7, CB8, CB9, CB10 CG1,CG2, CG5 CE12,CE13 CT4, CT5

#### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo*, **any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity**, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the event that there is any difference between the Galician/Spanish/English guides related to evaluation the Spanish guide will always prevail.

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**Sources of information**

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**Basic Bibliography**

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**Complementary Bibliography**

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Richard Curry, **Radar Essentials**, Scitech Publishing Inc., 2012

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M. L. Skolnik, **Radar Handbook**, McGraw Hill, 2008

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**Recommendations**

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**Subjects that it is recommended to have taken before**

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Networks and telecommunication systems/P52M182V01104

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