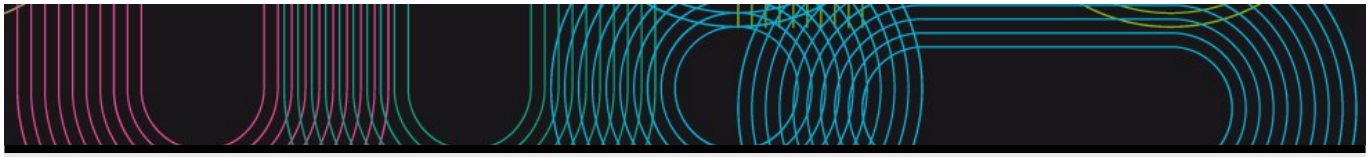

IDENTIFYING DATA				
Radio communication and navigation systems				
Subject	Radio communication and navigation systems			
Code	O07M174V01103			
Study programme	Máster Universitario en Operaciones e Ingeniería de Sistemas Aéreos no Tripulados			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	1st	1st
Teaching language	Spanish English			
Department				
Coordinator				
Lecturers				
E-mail				
Web	http://aero.uvigo.es			
General description	International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A3	That the students be able to integrate knowledge and face the complexity of formulating judgments from information, which being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments
A4	That the students know how to communicate their conclusions - and the latest knowledge and reasons that support them - to specialized and non-specialized audiences in a clear and unambiguous manner
A5	That students have the learning abilities that allow them to continue studying in a way that will have to be largely self-directed and autonomous
B3	That students acquire the capabilities to analyze the needs of a company in the field of unmanned aerial systems and determine the best technological solution for the same
B4	That the students acquire the knowledge to develop unmanned aerial systems or to plan specific operations, depending on the existing needs and to apply the existing technological tools
B5	That students know and be able to apply the principles and methodologies of research, such as bibliographical searches, data collection and analysis and interpretation thereof, as well as the presentation of conclusions, in a clear, concise and rigorous way
C2	Knowledge of the geomatic, photogrammetrical and cartographic principles of navigation, aerotriangulation, interpretation and digital processing of images, as well as the good practices existing in the operation of unmanned aerial systems and know how to apply the regulations in force
D6	Ability to work as a team
D7	Capacity for organization and planning
D8	Ability of analysis and synthesis
D9	Capacity for critical reasoning and creativity

Expected results from this subject	
Expected results from this subject	Training and Learning Results
To know the classical systems of communications and navigation	A3 B4 D8

To understand the operation of antenas and the link budget ratio.	A5 B5 D9
To know radionavigation systems such as NDB, VOR/DME e ILS	B3 B4 C2 D7
To understand the operation of a GNSS positioning system	A4 B3 C2 D6
To learn the characteristics of automatic surveillance systems based in ADS-B and ADS-C	A5 B4 D6

Contents	
Topic	
Classical communication and navigation systems	Classical communication systems Classical navigation ystems
Antennas and link budget	Antennas Link budget
Navigation systems	NDB VOR/DME ILS
GNSS positioning systems	GPS, GLONAS, GALILEO, BEIDU. Differential positioning, RTK. User, space and control Segment Augmentation systems such as SBAS and EGNOS
Automatic surveillance systems	ADS-B ADS-C

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	10	0	10
Practices through ICT	14	14	28
Mentored work	7	63	70
Case studies	14	14	28
Problem and/or exercise solving	2	4	6
Report of practices, practicum and external practices	1	7	8
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	It will be 2 session of group tutoring of 2:30 h
Practices through ICT	It will be 2 session of group tutoring of 2:30 h
Mentored work	It will be 2 session of group tutoring of 2:30 h
Case studies	It will be 2 session of group tutoring of 2:30 h

Personalized assistance	
Methodologies	**Description**
Lecturing	In this methodology, we take care of and answer all the questions that each student can do.
Practices through ICT	We attend each student individually.
Case studies	We attend each student individually.
Mentored work	We attend each student individually.

Assessment				
	Description	Qualification	Training and Learning Results	
Problem and/or exercise solving	Final exam: it consists of a test for the evaluation of the competences acquired by the students by solving simple problems and short questions of theory.	60	A3 B3 C2 D7 A5 B4 D8 B5 D9	

Report of practices, practicum and external practices	Participation in activities on the part of the students, especially of the practices, delivering a final memory of the same. This section corresponds to the continuous assessment of the student.	40	A4 A5	B3 B4 B5	C2	D6

Other comments on the Evaluation

The final examination, will represent 60% for the students that opt by continuous evaluation and 100% of the final note in case of not opting by the continuous evaluation.

In case of detection of plagiarism in any of the works/proofs realized, the final qualification of the subject will be of "fail (0)" and the professors will communicate to the direction of the school this so that they can take the actions that consider appropriate.

Sources of information

Basic Bibliography

Marcos Arias Acuña, Oscar Rubiños López, **Radiocomunicación**, 1a, Andavira Editora, 2011

José María Hernando Rábanos, **Transmisión por Radio**, 6a, Editorial Universitaria Ramón Areces, 2008

John Griffits, **Radio Wave Propagation and Antennas. An Introduction**, 1st, Prentice Hall, 1985

Complementary Bibliography

Robert R. Collin, **Antennas and Radiowave Propagation**, 1st, Mc Graw Hill, 1985

Constantine A. Balanis, **Antenna Theory. Analysis and Design**, 3rd, Wiley, 2005

ITU-R, Recommendations,

Recommendations

Subjects that continue the syllabus

Active sensor-based payloads/O07M174V01202