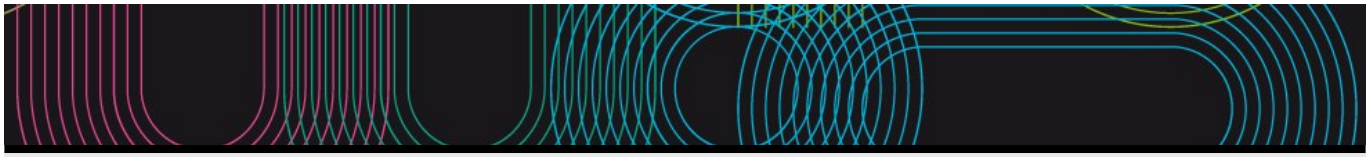

IDENTIFYING DATA				
Imaging Systems				
Subject	Imaging Systems			
Code	V05G306V01332			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Martín Herrero, Julio			
Lecturers	Martín Herrero, Julio			
E-mail	julio@uvigo.es			
Web	http://moovi.uvigo.es			
General description	The study of several families of systems of generation of images, including artificial vision, remote sensing and medical image. English Friendly subject: International students may request from the teacher: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
B7	CG7: The ability to analyze and assess the social and environmental impact of technical solutions.
B10	CG10 The ability for critical reading of scientific papers and docs.
C34	CE34/SI1The ability to construct, exploit and manage telecommunication services and applications, such as receiving, digital and analogical treatment, codification, transporting and representation, processing, storage, reproduction, management and presentation of audiovisual and multimedia information services.
C66	(CE66/OP9) The ability for selection of circuits, subsystems and systems of remote sensing.

Expected results from this subject	Training and Learning Results	
Know most common imaging (capture) systems for medical diagnosis, essay and remote sensing.	B3 B10	C34 C66
Understand the principles of operation of such systems.	B3 B10	C34 C66
Knowledge about the most common applications of such systems.	B3 B10	C34 C66
Knowledge about the capabilities and limitations of such systems.	B3 B10	C34 C66
To understand the role of the engineer as a generator of technology on the basis of scientific advances.	B3 B4 B7	

Contents	
Topic	
Computer vision systems	Illumination systems (LED, laser, fluorescent), monochrome cameras, Bayer and 3 CCD color cameras, matrix and line cameras, framegrabbers, multicamera systems (mono/stereo)

Medical image and non destructive testing (NDT) systems	Generation and processing of echography, X-ray, computerized axial tomography, nuclear magnetic resonance, and positron emission scanner.
Satellital, airborne and proxy remote sensing	Acquisition, processing and applications of panchromatic images, monoband, multispectral, and hyperspectral, active and passive in UV / VIS / SWIR / NIR / FIR / Thermal / GHz, Radar and Lidar.

Planning

	Class hours	Hours outside the classroom	Total hours
Practices through ICT	17.6	35.2	52.8
Mentored work	0	35.2	35.2
Lecturing	21	21	42
Essay questions exam	2	8	10
Systematic observation	0.01	0	0.01
Presentation	2	8	10
Essay	0.01	0.01	0.02

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

Methodologies

	Description
Practices through ICT	Handling and tuning analytic tools and algorithms, identifying which ones to use in different scenarios. We will work mainly in C/C++. Competencies: CG3, CG10, CE34, CE66.
Mentored work	Personal work on the fundamentals, functioning and state of the art of a given imaging system. All competences are addressed.
Lecturing	Master talks by the teacher on central topics, promoting critical discussion of concepts. All learning aims are addressed.

Personalized assistance

Methodologies	Description
Practices through ICT	Doubts can be solved in the teacher's office hours, individually or in small groups. Except otherwise noted, upon previous appointment with the teacher via email, preferably in the schedules and location officially reserved.

Assessment

	Description	Qualification	Training and Learning Results	
Essay questions exam	All teaching aims specified in the corresponding section of this guide are evaluated.	100	B3 B10	C34 C66
Systematic observation	Personalized follow-up of the work of the student in the laboratory, with feedback. All competences are evaluated.	50	B3 B10	C34 C66
Presentation	Presentation to the classroom of the personal work, and attitude and participation in the presentations of their classmates.	25	B3 B10	C34 C66
Essay	Content and quality of the personal work.	25	B3 B10	C34 C66

Other comments on the Evaluation

The assistance to class under continuous evaluation is compulsory, unless exceptional circumstances concur. Continuous evaluation is used for assessment, based on the work of the student. There is a final exam in the official date marked by the Board of School in May, for those students that have not passed the continuous evaluation. This final exam will be marked between 0 and 10 points. It covers all the subjects seen during the semester. To approve, the student has to obtain, at least, five points. Students wishing to improve their continuous evaluation marks can also attend the final exam: in this case the mark of this exam will be the final mark. The students that have passed the continuous evaluation and are satisfied with their mark do not need to attend the final exam. Along the semester the students will receive feedback on their progress, and the final mark of continuous evaluation will be communicated to the students well before the final exam. The delivery of the personal work the last week of class will imply the official participation in continuous evaluation. The extraordinary evaluation of July will be an extraordinary final exam, for those students that have not passed neither the continuous evaluation neither the final exam in May. The final mark will be the mark of the extraordinary final exam in both cases. This extraordinary final exam will be marked between 0 and 10 points, and covers all the subjects. To approve, the student has to obtain, at least, five points. Note that there are two final exams, but both correspond to a single and the same call ("convocatoria").

Sources of information

Basic Bibliography

Erik Reinhard et al., **Color Imaging: Fundamentals and Applications**, 1ª, A K Peters, 2008

John Robert Schott, **Remote Sensing: The Image Chain Approach**, 1ª, Oxford University Press, 2007

Michael Vollmer and Klaus-Peter Möllmann, **Infrared Thermal Imaging: Fundamentals, Research and Applications**, 1ª, Wiley-VCH, 2010

Arnulf Oppelt, **Imaging Systems for Medical Diagnostics**, 2ª, Wiley-VCH, 2005

Complementary Bibliography

Oleg S. Pianykh, **Digital Imaging and Communications in Medicine (DICOM)**, 2ª, Springer, 2012

Recommendations

Subjects that are recommended to be taken simultaneously

Fundamentals of Image Processing/V05G301V01333

Other comments

Simultaneously taking the subject Fundamentals of Image Processing is highly recommended.

Abundant digital bibliographic material will be provided to the students through the subject's web, covering all the subject matter in the program.