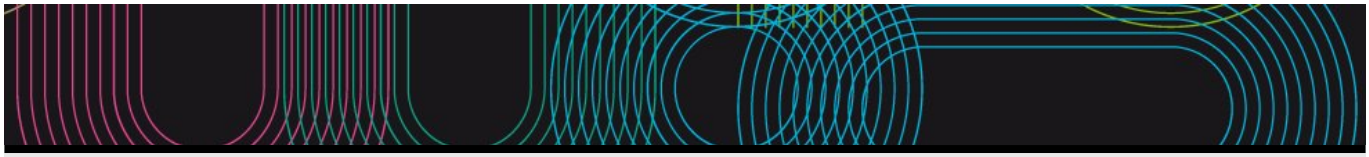

IDENTIFYING DATA				
Imaging Systems				
Subject	Imaging Systems			
Code	V05G300V01633			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Martín Rodríguez, Fernando			
Lecturers	Docio Fernández, Laura Martín Rodríguez, Fernando			
E-mail	fmartin@uvigo.es			
Web	http://faitic.uvigo.es			
General description	In this course we study several families of image systems, including computer vision, remote sensing and medical imaging.			

Competencies	
Code	
A3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
A43	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.
A75	(CE66/OP9) The ability for selection of circuits, subsystems and systems of remote sensing.
B1	The ability for critical reading of scientific papers and docs.

Learning aims		
Expected results from this subject	Training and Learning Results	
Know and know how to choose image acquisition/generation systems that are most widely used in photography/video studios, computerl vision, medical diagnostic and remote sensing (C1).	A3 A43 A75	B1
Understand the principles of operation of such systems. Know the influence of capture foundations in the obtained results for especific examples (C2).	A3 A43 A75	B1
Knowledge and understanding about the capabilities and limitations of such systems (C3).	A3 A43 A75	B1
Knowledge about the most common applications of such systems (C4).	A43 A75	B1

Contents	
Topic	
Image acquisition using cameras.	Camera concept, principles of operation, camera types. Monochrome cameras, color (Bayer and triple CCD). Field and linear cameras. Frame grabbers, multi-camera systems (mono/stereo). Capture Parameters: shutter speed, aperture and sensitivity (ISO). Influence in obtained results. Illumination systems (studio lighting, color temperature, hard and soft light, LED, Laser, fluorescent).

Medical imaging and non destructive testing (NDT).	Generation of ultrasonography, X-ray, computerized axial tomography, nuclear magnetic resonance and positron emission tomography. Processing of images and/or signals aimed to obtain diagnostic quality images.
Aerial, satellite and proxy remote sensing systems.	Acquisition, processing and applications of panchromatic images, single-band, multispectral and hiperspectral, active and passive in UV/VIS/SWIR/NIR/FIR/Thermal/GHz, Radar and Lidar. Geometrical correction, registration and geo-referenciation.

Planning

	Class hours	Hours outside the classroom	Total hours
Practice in computer rooms	12	23.5	35.5
Tutored works	7	35	42
Master Session	21	41.5	62.5
Reports / memories of practice	0	8	8
Long answer tests and development	2	0	2

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

Methodologies

	Description
Practice in computer rooms	After theoretical classes, the lecturer defines some practical exercises to be started just at the moment and to be continued later via autonomous work. Related capabilities: A3, A43, A75, B1, C1, C2, C3, C4.
Tutored works	It consists of supervision of small projects initiated in computer lab classes. This initial works are enhanced though reading and analysis of related technical documentation and defining new objectives that will be implemented by students. Related capabilities: A3, A43, A75, B1, C1, C2, C3, C4.
Master Session	Presentation by the teacher of subject contents, encouraging the critical discussion of the concepts. Related capabilities: A3, A43, A75, C1, C2, C4.

Personalized attention

Methodologies	Description
Practice in computer rooms	Students will have the opportunity to solve doubts in personalised attention sessions. These sessions will take place: - Individually or in reduced groups (typically with a maximum of 2-3 students). - Unless otherwise stated, with previous appointment with the corresponding teacher. The appointment should be required and agreed by e-mail, preferably in the timetable and place officially assigned.
Tutored works	Students will have the opportunity to solve doubts in personalised attention sessions. These sessions will take place: - Individually or in reduced groups (typically with a maximum of 2-3 students). - Unless otherwise stated, with previous appointment with the corresponding teacher. The appointment should be required and agreed by e-mail, preferably in the timetable and place officially assigned.

Assessment

	Description	Qualification
Practice in computer rooms	They are the beginning of the tutored works. They do not have a grade percentage assigned because they will be implicitly assesed through the submited final reports. Related capabilities: A3, A43, A75, B1, C1, C2, C3, C4.	0
Tutored works	Works that continue the exercises started in computer class. They do not have a grade percentage assigned because they will be implicitly assesed through the submited final reports. Related capabilities: A3, A43, A75, B1, C1, C2, C3, C4.	0

Reports / memories of practice	They are the final result of the tutored works. For each work (or small project), the lecturers will establish a "soft" deadline. This means that if it is delivered within the first deadline, the author wins the right to submit a second version (improvement). The second version will have to be delivered in the 10 days following the publication of the first version marks. Structure of the improved report will have to be: first, the former text foloowed by an annex that describes the new enhancements. If works are noit delivered in the first proposed date, students will still be able to deliver it. ALWAYS before the end of class period. When a student delivers a practical work is choosing the option of continuous evaluation. This means that his final grade will be the average of his works. Depending on the works proposed, the lecturers will be able to decide the weight in the final grade for each. Related capabilities: A3, A43, A75, B1, C1, C2, C3, C4.	100
Long answer tests and development	Examination of all contents seen in the subject. This exam will be taken by those students that have not delivered any practical work and, therefore, do not use the procedure of continuous evaluation. It will take place in the classroom and date approved by the school board. The examination will include all the studied issues in theoretical classes and also the works proposed this year (the lecturers could to ask questions about additional bibliography recommended and/or the methods that recommend for practical works implementation). Related capabilities: A3, A43, A75, B1, C1, C2, C3, C4.	100

Other comments on the Evaluation

Extraordinary assesment in July consist of a single exam for those students that have not passed neither the continuous evaluation nor the final exam in May. The final grade in this subject will be that one derived from the July exam in both cases. This extraordinary final examination will be graded between 0 and 10 points, and it will include all topics in the subject (including the practical works, as in the may exam). To passs, the student has to achieve, at least, five points.

Notice that there are not two calls, but there is only one. Although there are two final examinations.

Sources of information

Arnulf Oppelt, **Imaging Systems for Medical Diagnostics**, 2ª,

John Robert Schott, **Remote Sensing: The Image Chain Approach**, 1ª,

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

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

Erik Reinhard et al., **Color Imaging: Fundamentals and Applications**, 1ª,

In addition to this bibliography, the lecturers will provide (through the faitic platform) the following material:

- Scripts for theoretical classes (slides).

- Requirements documentation for the tutored works.

- In the tutored works, lecturers could provide bibliography: tutorials, papers... They will be made available through faitic either directly (in PDF format) or through Internet links.

Recommendations

Subjects that continue the syllabus

Image Processing and Analysis/V05G300V01931
Audiovisual Production/V05G300V01935

Subjects that are recommended to be taken simultaneously

Fundamentals of Image Processing/V05G300V01632

Subjects that it is recommended to have taken before

Fundamentals of Sound and Image/V05G300V01405