Teaching Guide				
Identifying Data				2022/23
Subject (*)	Image, Video and Audio Processing		Code	614G02028
Study programme	Grao en Ciencia e Enxeñaría de Datos			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Third	Obligatory	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Ciencias da Computación e Tecnoloxías da Información			
Coordinador	Gonzalez Penedo, Manuel	E-mail	manuel.gpenedo@udc.es	
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Web				
General description				

Study programme competences	
Code	Study programme competences
A23	CE23 - Coñecemento e capacidade de aplicación dos conceptos, metodoloxías e tecnoloxías de procesado de audio, imaxe e vídeo en diferentes formatos.
B2	CB2 - Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo
B3	CB3 - Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética
B4	CB4 - Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado
B7	CG2 - Elaborar adecuadamente e con certa orixinalidade composicións escritas ou argumentos motivados, redactar plans, proxectos de traballo, artigos científicos e formular hipóteses razoables.
B8	CG3 - Ser capaz de manter e estender formulacións teóricas fundadas para permitir a introdución e explotación de tecnoloxías novas e avanzadas no campo.
B9	CG4 - Capacidade para abordar con éxito todas as etapas dun proxecto de datos: exploración previa dos datos, preprocesado, análise, visualización e comunicación de resultados.
B10	CG5 - Ser capaz de traballar en equipo, especialmente de carácter multidisciplinar, e ser hábiles na xestión do tempo, persoas e toma de decisións.
C1	CT1 - Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C4	CT4 - Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.

Learning outcomes	
Learning outcomes	Study programme competences

To understand the basic concepts and techniques of image, video and digital audio processing and analysis. To know how to evaluate the adequacy of the methodologies applied in specific audiovisual processing problems. To know how to describe an image signal, at a content level, by its different characteristics. To apply different basic techniques to computer vision problems.	A23	B2 B3 B4 B7 B8 B9 B10	C1 C4

Contents	
Topic	**Sub-topic**
1. Introduction to the representation of visual information. Preprocessing	The digital image and its properties Image digitalization Properties, metrics and topology Statistical properties, histogram Gray level transformations Geometric transformations Interpolation
Fundamentals of visual information processing.	Spatial filters: Convolution Frequency filters: Fourier Applications: Noise, Enhancement, Smoothing Morphological Operators Edge Operators
Image Modeling and Analysis	Keypoints (Corners, Singular Points) Shape Descriptors Contours Representations Texture
Fundamentals of Segmentation and Pattern Recognition	Thresholding Region-based segmentation AI-based segmentation (Clustering, ...etc) Hough Transform Deformable models. Segmentation Evaluation Pattern Recognition and Image Classification
Fundamentals of Dynamic Vision	Motion Detection and Characterization Optical Flow Tracking
Fundamentos de Procesado y represantación de información sonora	Descriptores Temporales Descriptores Espectrales Descriptores cepstrales

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Laboratory practice	A23 B2 B3 B4 B8 B9 B10 C1 C4	10	30	40
Research (Research project)	A23 B2 B3 B4 B7 B8 B9 B10 C1 C4	10	50	60
Workbook	B8 B9 B10 C4	6	12	18
Mixed objective/subjective test	B9 B10 C1	1	1	2

Guest lecture / keynote speech	A23 B2 B3 B4 B9 B10 C1 C4	15	15	30
Personalized attention		0	0	0
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Laboratory practice	Activity that allows students to learn effectively through hands-on activities such as demonstrations, exercises, or simulations
Research (Research project)	Activity that allows students to study and learn the application and combination of the different techniques studied to solve problems based on real application areas.
Workbook	Set of texts and written documentation, mainly in foreign language (English), which were compiled and edited as a source of information and deepening in the contents worked in the master classes.
Mixed objective/subjective test	Activity for the evaluation of the comprehension and analytical capacity of the techniques used by the student to solve certain problems.
Guest lecture / keynote speech	Oral exposition complemented with the use of audiovisual media and the introduction of some questions addressed to the students, with the aim of transmitting knowledge as well as stimulating the critical reasoning of the students.

Personalized attention	
Methodologies	**Description**
Research (Research project)	Given the broad scope of the research work, it will be necessary both to periodically monitor the work in order to guide its development and ensure its quality, as well as to allow students to clarify with the professor any particular doubts about the project.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Mixed objective/subjective test	B9 B10 C1	Objective test with different assumptions and questions that will evaluate the student's capacity of understanding, reasoning and knowledge of the subject.	45
Research (Research project)	A23 B2 B3 B4 B7 B8 B9 B10 C1 C4	Completion of the work of study, implementation and combination of computer vision techniques.	30
Laboratory practice	A23 B2 B3 B4 B8 B9 B10 C1 C4	Compulsory attendance and completion of the lab practices. Understanding and critical analysis of each one of them.	25

Assessment comments
In each of the following parts it will be mandatory to achieve a minimum grade in order to pass the subject: Mixed test (written): 30% of the maximum grade in this sectionLaboratory practices (oral defense): 30% of the maximum grade in this section.Research project (oral defense): 30% of the maximum grade in this section.If a student presents any of the assignments subject to assessment, he/she will be considered PRESENTED and, therefore, if he/she does not attend any of the other parts, the final grade will be a FAIL MARK. Students enrolled on a part-time basis may be given facilities, prior communication with the professor in charge.

Sources of information	
Basic	- Rafael González (1996). Tratamiento Digital de Imágenes. Addison-Wesley - Milan Sonka (1999). Image Processing, Analysis and Machine Vision. PWS - Anil Jain (1989). Fundamentals of Digital Image Processing. Prentice Hall - Andrew Blake (1998). Active Contours . Springer
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.