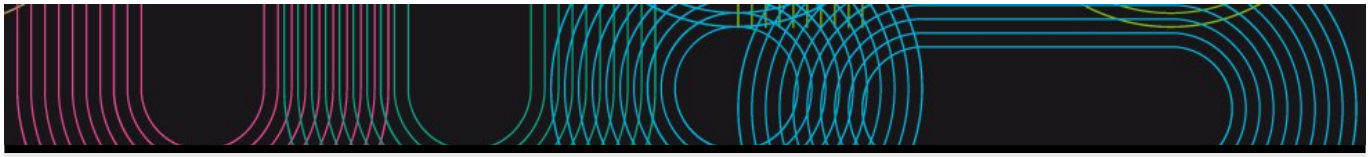

IDENTIFYING DATA				
Multimedia technology and computer graphics				
Subject	Multimedia technology and computer graphics			
Code	V05G300V01932			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Pena Giménez, Antonio			
Lecturers	Pena Giménez, Antonio			
E-mail	apena@gts.uvigo.es			
Web	http://faitic.uvigo.es			
General description	Topics related to Virtual Environments (video games, augmented reality, virtual reality). A videogame is developed in a multidisciplinary group, with students from other degrees. The development engine is Unity and programming language is C #.			

Competencies	
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
B9	CG9: The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics.
B12	CG12 The development of discussion ability about technical subjects
C74	(CE74/OP17) The ability to construct, exploit and manage image and synthetic video generation systems and interactive multimedia applications.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.
D4	CT4 Encourage cooperative work, and skills like communication, organization, planning and acceptance of responsibility in a multilingual and multidisciplinary work environment, which promotes education for equality, peace and respect for fundamental rights.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Understand the foundations of the synthesis of image by computer.	B3 B12	C74	D3
As result of the learning, the students purchases the competitions described, particularly the indicated as specific of the subject			
As result of the learning, the students purchases the competitions described, particularly the indicated as specific of the subject			
Apply methods of synthesis of image by computer.	B3 B12	C74	D3
Apply methods of synthesis of effects of audio by computer.	B3 B12	C74	D3
Develop multimedia applications.	B3 B9	C74	D3 D4

Contents

Topic	
Computer image synthesis	Approach to the associated electronics with the graphic processing boards on computers.
3D Modeling	Understanding the differences between different applications and what it implies on design compatibility issues. File formats for virtual environments and games.
3D Animation	Programming of simple animations of rigid objects (rotation, translation, scale). Illumination of scenes and video rendering from these scenes. Integration of animations in a virtual environment.
Audio 3D	Programming the soundscapes in a three-dimensional virtual environment. Mixing of different sound sources (environment, dialogues, effects, ...).
Virtual Reality, Enhanced Reality	Description of the mathematics underlying the creation of a Virtual Environment. Description and issues of virtual reality and augmented reality applications.
Video games	Multidisciplinarity in the construction of a video game. Notions of video game design. Pipeline in the development of a video game. Management and programming of a virtual environment engine (Unity).

Planning

	Class hours	Hours outside the classroom	Total hours
Projects	7	59.5	66.5
Practice in computer rooms	16	8.5	24.5
Master Session	17	26	43
Autonomous practices through ICT	0	14	14
Short answer tests	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
Projects	Collaborative work in a small multidisciplinary group, with students from other Degrees of the University of Vigo, for the elaboration of a video game, following the professional production process of the related industry, from an initial concept to a final product. Group work, role assignments, working in common, planning, technical reports and oral presentation are considered. Through this methodology, competencies CG3, CG9, CE74, CT3, CT4 are developed.
Practice in computer rooms	Management and adjustment of the engine of a Virtual Environment. Programming of components in virtual objects. Through this methodology, competencies CG3, CG12, CE74, CT3 are developed.
Master Session	Exposition by the teacher of the contents of the subject, encouraging the critical discussion of the concepts. The theoretical bases of algorithms and procedures used to solve problems are laid down. Through this methodology, competencies CG3, CG12, CE74, CT3 are developed.
Autonomous practices through ICT	Written and / or audiovisual material is provided to study and prepare an online test. This activity is prior to the master class or computer room sessions where doubts will be solved and challenges will arise. Through this methodology, competencies CG3, CE74 are developed.

Personalized attention

Methodologies	Description
Master Session	Tutoring to solve issues related to master sessions or lab practice is implemented either individually or in reduced groups (no more than 2-3 students). E-mail confirmation to match the date of the appointment is needed.
Practice in computer rooms	Tutoring to solve issues related to master sessions or lab practice is implemented either individually or in reduced groups (no more than 2-3 students). E-mail confirmation to match the date of the appointment is needed.
Projects	During group projects an individualized tracking of the student is developed. Cross-evaluation within the group and autoevaluation may be used.

Assessment

	Description	Qualification	Training and Learning Results

Projects	Assessment of a collaborative work, developed along the semester, including a written report and oral presentation.	55	B3 B9	C74	D3 D4
Practice in computer rooms	Work assessment in the computer room.	20	B3 B12	C74	D3
Autonomous practices through ICT	Automatic corrected online test.	5	B3	C74	
Short answer tests	Written test with short questions and problems to solve.	20	B3 B12	C74	D3

Other comments on the Evaluation

*** "Students who choose continuous evaluation" conditions:**

A student follows the continuous evaluation system if she/he assigns a document that will be delivered and collected during weeks 1-3, so the collaborative work can begin.

Some tasks are evaluated:

* Collaborative work in a group C (weight: 55%): during approx. 12 weeks each group develops a project. Some evidences are picked during this period (cross evaluation, written test, etc.) and a final report must be delivered at the end. An oral presentation ends this activity. Individual assessment mark in group work is obtained from cross evaluation by the other members of the group, oral questions during presentations and/or written questions about the content of the work. Group work, role assignments, working in common, planning, technical reports and oral presentation are considered.

* Written exam (weight: 20%): short questions related to computer room and master classes activities, plus additional material. At the end of the semester, the same day when the final exam is planned.

* Automatic corrected online test. (Weight : 5%): prior to the sessions.

* Laboratory tests (Weight: 20%): at the end of the laboratory session.

If a student has participated in continuous evaluation and does not pass the course he/she will receive a grade of fail, regardless of he/she takes the written exam or not.

CONDITIONS TO PASS THE SUBJECT

In order to ensure that students acquire a balanced minimum on the subject competences, they will pass the course if they meet these two conditions:

1) get a final mark equal to or greater than 5 (on a ten-points scale)

2) and a score equal to or greater than 4 (on the same scale) in each of the partial marks (written exam and collaborative group, respectively).

If some of these conditions are not fulfilled, then the final grade (on a ten-points scale) will be the minimum between the final mark and the value "4".

*** "Students who choose for evaluation at the end of the semester" conditions:**

The possibility of a final examination will be provided to students who do not opt for the continuous evaluation.

In order to ensure that students acquire a balanced minimum on the subject competences, they will pass the course if they meet both these two conditions:

1) get a final mark equal to or greater than 5 (on a ten-points scale)

2) and a score equal to or greater than 4 (on the same scale) in each of the sections of the exam. These sections, respectively, correspond with:

* contents included in all activities

* project developed in group, including group internals, management, writing of technical reports and oral presentations.

If some of these conditions are not fulfilled, then the final grade (on a ten-points scale) will be the minimum between the final mark and the value "4".

--- RETAKE

Two different situations:

=> Students that are evaluated using continuous evaluation:

Two options to choose (just before the exam begins):

* repeat the written exam included in the continuous evaluation planning an be evaluated under the "Students who choose continuous evaluation" conditions, described above.

* be evaluated with the same final exam of students who choose for evaluation at the end of the semester, under the "Students who choose for evaluation at the end of the semester" evaluation conditions, described above. No other activities are considered.

=> Students who choose for evaluation at the end of the semester:

A final examination will be provided to students who do not opt for the continuous evaluation, and are evaluated under the "Students who choose for evaluation at the end of the semester" conditions, described above. No other activities are considered.

Sources of information

Basic Bibliography

Jeremy Gibson, **Introduction to Game Design, Prototyping, and Development (Game Design and Development)**, Ed. 1, Addison Wesley, 2014

Fletcher Dunn, Ian Parberry, **3D Math Primer for Graphics and Game Development**, Ed. 2, A K Peters/CRC Press, 2011

Unity, **Unity web: API description, tutorials and more. (https://unity3d.com)**,

Complementary Bibliography

Jason Gregory (Editor), **Game Engine Architecture**, Ed. 2, A K Peters/CRC Press, 2014

Durant R. Begault, **3-D sound for virtual reality and multimedia (https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20010044352.pdf)**, Ed. 1, 1994

Eric Lengyel, **Mathematics for 3D Game Programming and Computer Graphics**, Ed. 2, Course Technology, 2011

Guy Somberg, **Game Audio Programming: Principles and Practices**, Ed. 1, CRC Press, 2016

Steven M. LaValle, **Virtual Reality (http://vr.cs.uiuc.edu/vrbooka4.pdf)**, Ed. 1, University of Illinois, 2017

Robert Nystrom, **Game Programming Patterns (http://gameprogrammingpatterns.com/contents.html)**, Ed. 1, 2014

Dieter Schmalstieg, Tobias Hollerer, **Augmented Reality: Principles and Practice (Usability)**, Ed. 1, Addison-Wesley Professional, 2016

Recommendations

Subjects that are recommended to be taken simultaneously

Image processing and analysis/V05G300V01931
Audiovisual production/V05G300V01935

Subjects that it is recommended to have taken before

Fundamentals of Image Processing/V05G300V01632
Imaging Systems/V05G300V01633
Audiovisual Technology/V05G300V01631
Video and Television/V05G300V01533

Other comments

There will be group work sessions on Wednesday mornings, alternating between the Campus of Vigo and Pontevedra. The University will provide free round trip transportation from the Escola de Enxeñaría de Telecomunicación or the Facultad de Ciencias Sociais e a Comunicación, respectively.

In 2017/18, multidisciplinary groups will be formed by students of the following three subjects: (1) Video Games: design and development, 4th year, Degree in Audiovisual Communication. (2) Multimedia Technology and Computer graphics, 4th year, Degree in Telecommunication Engineering Technologies, Sound and Image module. (3) Intelligent systems programming, 4th year, Degree in Telecommunication Engineering Technologies, Telematics module. The activity is coordinated by teachers of the Teaching Innovation Group: ComTecArt (Communication, Technology and Art in Virtual Environments).