



IDENTIFYING DATA

Video games and virtual reality

Subject	Video games and virtual reality			
Code	V05G301V01417			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Pena Giménez, Antonio			
Lecturers	Pena Giménez, Antonio			
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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 #. English Friendly subject, 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	
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.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
Understand and apply the production pipeline of a video game code, as an example of a complex virtual environment.	B3 B12	C74	D3
Know how to optimize the performance of graphics engines in virtual environments.	B3	C74	D3
Understand and apply the necessary mathematical tools in three-dimensional virtual environments.	B12		
Understand the key aspects when designing Augmented Reality applications.	B3	C74	D3
Understand the key aspects when designing Virtual Reality applications.	B9		D4

Contents

Topic

Computer image synthesis	Approach to the associated electronics with the graphic processing boards on computers.
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).
(*)Iranse plantexando exercicios prácticos usando ordenador.	(*)Sobre varios temas.
(*)Se plantearán exercicios prácticos usando ordenador.	(*)Sobre varios temas.
Some PC-based exercises will be delivered.	About several subjects.

Planning

	Class hours	Hours outside the classroom	Total hours
Project based learning	7	59.5	66.5
Practices through ICT	16	8.5	24.5
Lecturing	17	26	43
Flipped Learning	0	14	14
Problem and/or exercise solving	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
Project based learning	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.
Practices through ICT	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.
Lecturing	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.
Flipped Learning	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 assistance

Methodologies	Description
Lecturing	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. Contact: https://moovi.uvigo.gal/user/profile.php?id=11310
Practices through ICT	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. Contact: https://moovi.uvigo.gal/user/profile.php?id=11310
Project based learning	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		
Project based learning	Assessment of different tasks in a collaborative work, developed along the semester, including a written report and oral presentation.	50	B3 B9	C74	D3 D4

Practices through ICT	Work assessment in the computer room.	15	B3 B12	C74	D3
Flipped Learning	Automatic corrected online test.	10	B3	C74	
Problem and/or exercise solving	Written test with short questions and problems to solve.	25	B3 B12	C74	D3

Other comments on the Evaluation

* "Students who choose continuous assessment" conditions:

A student follows the continuous assessment system if she/he assigns a document that will be delivered and collected after week 4.

If a student has participated in continuous assessment 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 4.9.

* "Students who choose for global assessment" conditions:

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

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 4.9.

--- EXTRAORDINARY EXAM

Two different situations:

=> Students that are evaluated using continuous assessment:

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

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

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

=> Students who choose for global assessment:

A final examination will be provided to students who do not opt for the continuous assessment, and are evaluated under the "Students who choose for exam-only assessment" conditions, described above. No other activities are considered.

In case of detection of plagiarism in any of the exams or assignments, the final grade will be SUSPENSE (0) and the fact will

be communicated to the management of the Center for the corresponding effects.

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/vrbook4.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 continue the syllabus

Final Year Dissertation/V05G301V01991

Subjects that are recommended to be taken simultaneously

Audiovisual production CGI/V05G301V01420

Subjects that it is recommended to have taken before

Interactive Audio Systems/V05G301V01331

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.

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) Video games and virtual reality, 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).