BASIC DETAILS:

Subject:	ANIMACIÓN Y SIMULACIÓN		
Id.:	31827		
Programme:	DOBLE GRADO EN INGENIERÍA INFORMÁTICA Y DISEÑO Y DESARROLLO DE VIDEOJUEGOS		
Module:	PROGRAMACIÓN DE VIDEOJUEGOS		
Subject type:	OBLIGATORIA		
Year:	3	**Teaching period:**	Segundo Cuatrimestre
Credits:	6	**Total hours:**	150
Classroom activities:	65	**Individual study:**	85
Main teaching language:	Inglés	**Secondary teaching language:**	Castellano
Lecturer:		**Email:**	

PRESENTATION:

The subject covers an introduction to simulation and animation techniques from a computer science perspective, applied to real time interactive products, like videogames and educational / training environments.

The goals include learning fundamentals on mathematical / physical methods in real time application programming, as well as understanding the implications of the derived behaviours in gameplay mechanics and user experience.

PROFESSIONAL COMPETENCES ACQUIRED IN THE SUBJECT:

General programme competences	G01	Ability to use learning strategies independently for use in the continuous improvement of professional practice.
	G02	Ability to analyse and synthesise problems of their professional activity and apply in similar environments.
	G03	Ability to achieve common results through teamwork in a context of integration, cooperation and encouraging critical discussion.
	G04	Ability to critically think about information, data and lines of action and their implementation in relevant social, scientific ethical issues.
	G05	Ability to communicate in Spanish and English for professional issues in oral and written form.
	G06	Ability to solve complex problems or contingencies that arise during professional activity within any organisation and adapt to the needs and demands of their professional environment.
	G07	Ability to handle different complex knowledge models through a process of abstraction and its application to approach and solve problems.
	G08	Ability to understand the role of the scientific method in the generation of knowledge and its application to a professional environment.
	G09	Ability to work with respect for the environment and society through the proper use of technology and its application in promoting a sustainable economy and environment.
	G10	Ability to master information and communication technologies and their application in their professional field.
Specific programme competences	E01	Ability to solve mathematical problems inherent to engineering. Ability to apply knowledge about: algebra; geometry; differential and integral calculus; optimisation and numerical methods
	E02	Ability to understand and master the concepts of the general laws of classical mechanics, fields, waves and electromagnetism and their application for solving video game development problems.
	E03	Ability to develop the use and programming of computers, operating systems, databases and software and their application in the development of video games.
	E04	Ability to understand and master the basic concepts of discrete logic, algorithmic mathematical and computational complexity, and their application for solving engineering problems.
	E05	Ability to program applications both correctly, and efficiently, choosing the most appropriate paradigm and programming languages, applying knowledge of basic algorithmic procedures and using the types and structures of the most appropriate data.
	E06	Ability to learn, understand and evaluate the structure and architecture of computers, as well as their

		basic components.
	E07	Ability to design, analyse and implement applications based on the characteristics of the database.
	E08	Ability to learn and master the features, functionality and structure of the Distributed Systems, Computer Networks and the Internet and design and implement applications based on them.
	E09	Ability to learn and master the tools necessary for the storage, processing and access to information systems, including web-based.
	E10	Ability to be familiar with the characteristics, functions and structure of operating systems.
	E11	Ability to develop online games for multiple players.
	E12	Ability to understand and analyse the structure, organisation, function and interconnection of the devices and systems in video game platforms.
	E13	Ability to discover, design and assess the main foundations and techniques of player-computer interaction that guarantee the accessibility and userability of the systems, services and IT applications including video games.
	E14	Ability to apply the main foundations and techniques of the smart systems and their practical application in diverse environments.
	E15	Ability to apply the main foundations and techniques of programming in real time.
	E16	Ability to fully manage and plan software projects and handle suitable tools to do so.
	E17	Ability to understand and analyse the structure and function of the main hardware systems and peripherals in video game platforms.
	E18	Ability to understand and apply the principles of ergonomics and "Design for all" in order to develop universally accessible interfaces and devices in the field of video games.
	E19	Ability to recognise and apply the principles, methodologies and life cycle of software engineering.
	E20	Ability to generate and analyse expressive and narrative resources and their application to video games.
	E21	Ability to execute the art of video games, create characters and settings.
	E22	Ability to manage techniques and tools used for artistic representation and expression.
	E23	Ability to use creative processes in the design and development of video games.
	E24	Ability to specially visualise and have knowledge of the graphical representation techniques, both in terms of traditional methods of metrical geometrics and descriptive geometrics using computer-assisted design application.
	E25	Ability to design and create graphical elements and their application in the development of video games.
	E26	Ability to perform the design and creation of animated characters and their application in the development of video games.
	E27	Ability to apply the methods in the creation and preservation of synthetic images
	E28	Ability to perform the design and construction of models with the information necessary for the creation and display interactive images.
	E29	Ability to understand and apply the techniques of visualisation, animation, simulation and interaction on models
	E30	Ability to design, develop, select and evaluate applications and systems, ensuring reliability, safety and quality, according to ethical principles and legislation and regulations.
	E31	Ability to perform the evaluation of video games from their different approaches.
	E32	Ability to evaluate, use and spread game engines.
	E33	Ability to develop production developments in the field of video games.
	E34	Ability to create and analyse games on their fundamentals and develop the understanding of what are the keys that determine how they work and their development.
	E35	Ability to know and understand the video game industry from a business point of view
	E36	Ability to identify and implement legal and ethical aspects of the gaming industry
	E37	Ability to design and create sounds and sound environments and their application in game development
	E38	Ability to produce an original project that integrates the skills acquired throughout the degree along with its presentation and defence before a university tribunal that relates to the field of design and game development.

PRE-REQUISITES:

This subject doesn't have pre-requisites. The students should have object oriented programming knowledge, experience with Unity Engine and C#, as well as basic physics, geometry, calculus and algebra knowledge.

SUBJECT PROGRAMME:

Subject contents:

1 - Introduction
1.1 - Methodology Initial Overview
1.2 - Mathematics and Physics Review
1.3 - Basic Behaviour Use
2 - Rigid-Body Dynamics
2.1 - Motion Basics
2.2 - Force Management
2.3 - Object Interaction
3 - Applied Mechanics
3.1 - Vehicle Modeling Notions
3.2 - Projectiles
3.3 - Role of Entity Animation/Mocap
4 - Beyond Basics Appendix
4.1 - Non-Rigid Bodies
4.2 - Inverse Kinematics
4.3 - Audio Simulation

Subject planning could be modified due unforeseen circumstances (group performance, availability of resources, changes to academic calendar etc.) and should not, therefore, be considered to be definitive.

TEACHING AND LEARNING METHODOLOGIES AND ACTIVITIES:

Teaching and learning methodologies and activities applied:

Theory/ Practice Sessions:

During these sessions, the contents featured in the subject will be exposed using resources like whiteboards, slideshows, etc., to show examples and illustrate properly the different sections. Additionally, active involvement will be encouraged through theoretical or real life case discussion. These sessions will be supported by different exercises.

Individual/ Team Exercises:

A part of the overall score will depend on individual exercises dealing with the different sections studied. These exercises will involve programming or tool usage and they are meant not to be independent, but interrelated, as new content is presented/ added in the course. Each exercise will consist of a set of instructions and certain results to be delivered before a specific date. Apart from individual work, a group activity will be developed forming teams and under similar conditions.

Tests/ Exams:

A written test will act as a theory/ practice assessment method, covering the content in the subject. The main purpose of this test is evaluating the knowledge acquired and underlying the processes and cases studied and explored in both lectures and exercises.

Tutorials:

The students will take part, on demand, in tutorials to be conducted on Thursdays at 11:00 AM, but schedules may vary according to particular necessities or circumstances. The main goal pursued is to clear up doubts, and help students strengthen the knowledge and skills to be acquired. Just like with other subjects, the PDU is a useful communication tool to ask for/ share information on the course.

Student work load:

Teaching mode	Teaching methods	Estimated hours

Classroom activities	Master classes	15
	Practical work, exercises, problem-solving etc.	12
	Workshops	12
	Laboratory practice	16
	Assessment activities	4
	Extra-curricular activities (visits, conferences, etc.)	6
Individual study	Tutorials	4
	Individual study	22
	Individual coursework preparation	22
	Project work	23
	Research work	4
	Compulsory reading	5
	Recommended reading	5
	Total hours:	150

ASSESSMENT SCHEME:

Calculation of final mark:

Written tests:	25	%
Individual coursework:	25	%
Group coursework:	30	%
Final exam:	20	%
TOTAL	100	%

*Las observaciones específicas sobre el sistema de evaluación serán comunicadas por escrito a los alumnos al inicio de la materia.

BIBLIOGRAPHY AND DOCUMENTATION:

Basic bibliography:

BOURG, David M., BYWALEC, Bryan. Physics for Game Developers. Second Edition. Sebastopol, CA: O'Reilly Media, Inc., 2013.

Recommended bibliography:

GREGORY, Jason. Game Engine Architecture. Second Edition. Boca Raton, FL: A K Peters / CRC Press, 2014.

Recommended websites:

Unity Technologies	https://unity3d.com/

* Guía Docente sujeta a modificaciones