BASIC DETAILS:

Subject:	INTELIGENCIA ARTIFICIAL APLICADA A VIDEOJUEGOS		
Id.:	31390		
Programme:	GRADUADO EN DISEÑO Y DESARROLLO DE VIDEOJUEGOS. 2013 (BOE 28/03/2014)		
Module:	PROGRAMACIÓN DE VIDEOJUEGOS		
Subject type:	OPTATIVA		
Year:	4	**Teaching period:**	Segundo Cuatrimestre
Credits:	6	**Total hours:**	150
Classroom activities:	64	**Individual study:**	86
Main teaching language:	Inglés	**Secondary teaching language:**	Castellano
Lecturer:	IGLESIAS SORIA, ANTONIO (T)	**Email:**	aiglesias@usj.es

PRESENTATION:

Artificial Intelligence (AI) has seen immense progress in recent years. It is both, a thriving research field featuring an increasing number of important research areas, and a core technology for an increasing number of application areas. Artificial Intelligence is widely regarded in the computer games industry as the area where the most advances will be made in the coming decades. As well as equipping students for a career in the rapidly growing game industry, this couse will lead students to gain knowledge and skills in AI techniques that apply to other domains such as business planning and engineering. This course digs into the application of Artificial Intelligence to Games—focusing on core techniques, essential skills and principles transferable from one domain to another.The course explains the basic role of Artificial Intelligence (AI) in video games. The course shows how AI moves the story and its characters forward and shows how game programs can learn responses and generate plans and movements based on players' actions. It covers algorithms and languages that enable AI. These ideas are applied using Unity video game engine

The most important outcomes are:

- Identify tasks that can be tackled using AI techniques, and most important algorithms related.
- Select the appropriate AI technique for the problem under development.
- Design and implement basic AI algorithms for game tasks.
- Develop AI game engines.
- Use UNITY AI capabilities

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.
	G07	Ability to handle different complex knowledge models through a process of abstraction and its application to approach and solve problems.
Specific programme competences	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.
	E14	Ability to apply the main foundations and techniques of the smart systems and their practical application in diverse environments.
Learning outcomes	R01	Explain the artificial intelligence paradigms most used in video games. .
	R02	Apply methods and techniques of artificial intelligence to video games.
	R03	Evaluate different artificial intelligence techniques applied to video games.
	R04	Propose advanced alternatives to the basic techniques of artificial intelligence in video games.

PRE-REQUISITES:

It is recommended to have studied all subjects in previous semesters especially Intelligent Systems . Basic knowledge will be required in fields like AI, design, programming, object oriented programming, UML, version control...

Unity will be used as the main development platform, previous experience with Unity is not required, but it will help understanding the examples provided. Any other game engine can be used to develop any of the projects requested, but example templates for the projects will be delivered as Unity projects.

SUBJECT PROGRAMME:

Subject contents:

1 - Introduction to Artificial Intelligence in Videogames
1.1 - History
1.2 - Examples
2 - Planning
2.1 - Search Algorithms
2.2 - Pathfinding
3 - Decision Making
3.1 - Decision Trees and State Machines
3.2 - Behaviour Trees
3.3 - Scheduling
3.4 - Autonomous Movement
4 - Machine Learning
4.1 - State of the Art
4.2 - Machine Learning in Videogames
5 - Final project

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:

- **Master classes** Lecturer will explain the theoretical part of the subject supported by ICT resources (computer, projector, internet) and a whiteboard.Students will ask questions found during individual work sessions.Student involvement, discussions, questions and concerns will be valued and will be added to final marks.
- **Practical work** Practical sessions will lay out different problems with the aim on solving real world situations with the help of the lecturer.
- **Project based learning** An important part of the learning process of the subject, and the final marks, will be obtained by solving practical problems while working individually and in groups. Students will receive the initial wording of the problem and a deadline. The main objective is to prepare the students to face real world problems and reach the learning outcomes of the subject easily and seamlessly.
- **Tutorial** Students will be able to ask the lecturer those questions that were not answered during the master classes or the ones that showed up during individual study. Students may ask for additional bibliography about a specific

matter and any other kind of information related with this subject. On the other hand, along this sessions, students will be monitored and oriented in their way to complete the assigned tasks. Tutorial sessions will be set up by mutual agreement between the parts involved.

Student work load:

Teaching mode	Teaching methods	Estimated hours
Classroom activities	Master classes	15
	Practical exercises	15
	Workshops	15
	Laboratory practice	15
	Assessment activities	4
Individual study	Tutorials	8
	Individual study	20
	Individual coursework preparation	20
	Project work	25
	Research work	3
	Compulsory reading	5
	Recommended reading	5
	Total hours:	150

ASSESSMENT SCHEME:

Calculation of final mark:

Written tests:	20	%
Individual coursework:	20	%
Group coursework:	20	%
Final exam:	30	%
Involvement:	10	%
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:

Russell, Stuart, and Peter Norvig. "AI a modern approach." Learning 2.3 (2005): 4.
YANNAKAKIS, Georgios N.; TOGELIUS, Julian. Artificial Intelligence and Games (First Public Draft). 2017.

Recommended bibliography:

DÍAZ, Guillermo; IGLESIAS, Andrés. Swarm Intelligence Scheme for Pathfinding and Action Planning of Non-player Characters on a Last-Generation Video Game. En International Conference on Harmony Search Algorithm. Springer, Singapore, 2017. p. 343-353.
HASSABIS, Demis. Artificial Intelligence: Chess match of the century. Nature, 2017, vol. 544, no 7651, p. 413-414.
SHAKER, Noor; TOGELIUS, Julian; NELSON, Mark J. Procedural Content Generation in Games. Springer International Publishing, 2016.
SAFADI, Firas; FONTENEAU, Raphael; ERNST, Damien. Artificial intelligence in video games: Towards a unified framework. International Journal of Computer Games Technology, 2015, vol. 2015, p. 5.
CHAMPANDARD, Alex J. AI Game Development: Synthetic Creatures with Learning and Reactive Behaviors. New Riders. 2003.

Recommended websites:

Gamasutra	http://gamasutra.com/

GameDev	http://www.gamedev.net/
Unity	https://unity3d.com
Unreal Engine	https://www.unrealengine.com