



POLITÉCNICA

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PR/CL/001



E.T.S. de Ingenieros
Informáticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000714 - Programming of virtual environments and 3d interaction techniques

DEGREE PROGRAMME

10AQ - Eit Digital Master's Programme In Human Computer Interaction And Design

ACADEMIC YEAR & SEMESTER

2018/19 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000714 - Programming of virtual environments and 3d interaction techniques
No of credits	4.5 ECTS
Type	Optional
Academic year of the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AQ - Eit digital master's programme in human computer interaction and design
Centre	10 - Escuela Tecnica Superior de Ingenieros Informaticos
Academic year	2018-19

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Angel Lucas Gonzalez Martinez (Subject coordinator)	2304	lucas.gmartinez@upm.es	M - 16:30 - 18:00 Tu - 11:30 - 14:00 W - 11:30 - 13:30 Se debe concertar cita previa por e-mail, con el fin indicar en que despacho estará el profesor

Jaime Ramirez Rodriguez	5112	jaime.ramirez@upm.es	Tu - 11:00 - 14:00 Th - 11:00 - 14:00
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* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

El plan de estudios Eit Digital Master's Programme In Human Computer Interaction And Design no tiene definidas asignaturas previas recomendadas para esta asignatura.

3.2. Other recommended learning outcomes

- Knowledge of object-oriented programming
- Programming skills in C++ or C#

4. Skills and learning outcomes *

4.1. Skills to be learned

CB09 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan, a públicos especializados y no especializados de un modo claro y sin ambigüedades

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CE15 - Capacidad para la creación y explotación de entornos virtuales, y para la creación, gestión y distribución de contenidos multimedia

CG01 - Capacidad de organizar y planificar

CG12 - Capacidad de trabajar de forma independiente en su campo profesional

4.2. Learning outcomes

RA16 - Work with other peers collaborating in the design, prototype, and implementation interactive systems

RA21 - Understand tools and process needed to deploy virtual reality applications

RA18 - Implement basic interactive desktop applications

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

This course introduces the use of 3D virtual reality as a tool for computer human interaction, more precisely, how to use these technics for a game developing and educative software. The course will be structure in a set of lectures and practical exercises. The core subjects will be:

- **U1:** 3D Modelling Tools. Case study Sketchup
- **U2:** Graphic Engines. Case study Unity 3D
- **U3:** 3D Interaction Devices. Case study Samsung VR gear* / Microsoft Kinect V2*

* Depending on devices availability

5.2. Syllabus

1. 3D Modelling Tools. Case study Sketchup
 - 1.1. Introduction to Sketchup
 - 1.2. Exporting models to Unity 3D
2. Graphic Engines. Case study Unity 3D
 - 2.1. What is Unity 3D?
 - 2.2. Introduction to Unity 3D IDE
 - 2.3. Creation of a simple scene
 - 2.4. Providing interaction capabilities (Scripting for Unity)
 - 2.5. Importing models
 - 2.5.1. Importing models from asset store
 - 2.5.2. Importing models from Sketchup
 - 2.6. Animation
3. 3D Interaction Devices

6. Schedule

6.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Other face-to-face activities	Assessment activities
1	Lecture about Introduction to Sketchup Duration: 01:00 Lecture			
2	Lecture about exporting models to Unity 3D Duration: 01:00 Lecture	Practice with Sketchup Duration: 01:00 Problem-solving class	Practice with Sketchup Duration: 02:00 Additional activities	
3		Practice with Sketchup Duration: 02:00 Problem-solving class		Develop a 3D model with Sketchup Individual work Continuous assessment and final examination Duration: 05:00
4	Lecture about What is Unity 3D? Duration: 00:30 Lecture Lecture about Introduction to Unity 3D IDE Duration: 00:30 Lecture	Practice with Unity 3D Duration: 01:00 Laboratory assignments		Develop a 3D model with Sketchup Individual work Continuous assessment and final examination Duration: 05:00
5	Lecture about Introduction to Unity 3D IDE Duration: 00:30 Lecture Lecture about creation of a simple scene Duration: 00:30 Lecture	Practice with Unity 3D Duration: 01:00 Laboratory assignments		Develop a simple game in Unity 3D Other assessment Continuous assessment and final examination Duration: 05:00
6	Lecture about creation of a simple scene Duration: 00:30 Lecture Lecture about providing interaction capabilities (Scripting for Unity) Duration: 00:30 Lecture	Practice with Unity 3D Duration: 01:00 Laboratory assignments		Develop a simple game in Unity 3D Other assessment Continuous assessment and final examination Duration: 05:00
7	Lecture about Importing models from asset store and Sketchup Duration: 00:30 Lecture	Practice with Unity 3D Duration: 01:30 Laboratory assignments		Develop a simple game in Unity 3D Other assessment Continuous assessment and final examination Duration: 05:00
8	Lecture about animation Duration: 01:00 Lecture	Practice with Unity 3D Duration: 01:00 Laboratory assignments		Develop a 3D application in Untiy3d using a 3D interaction device Other assessment Continuous assessment and final examination Duration: 10:00

9	Lecture about 3D Interaction Devices Duration: 01:00 Lecture	Practice with Unity 3D and 3D interaction device Duration: 01:00 Laboratory assignments		Develop a 3D application in Unity3d using a 3D interaction device Other assessment Continuous assessment and final examination Duration: 10:00
10	Lecture about 3D Interaction Devices Duration: 01:00 Lecture	Practice with Unity 3D and 3D interaction device Duration: 01:00 Laboratory assignments		Develop a 3D application in Unity3d using a 3D interaction device Other assessment Continuous assessment and final examination Duration: 10:00
11				Develop a 3D application in Unity3d using a 3D interaction device Other assessment Continuous assessment and final examination Duration: 10:00
12				Develop a 3D application in Unity3d using a 3D interaction device Other assessment Continuous assessment and final examination Duration: 10:00
13				Develop a 3D application in Unity3d using a 3D interaction device Other assessment Continuous assessment and final examination Duration: 10:00
14				Develop a 3D application in Unity3d using a 3D interaction device Other assessment Continuous assessment and final examination Duration: 10:00
15				Pupil portfolio presentation Individual presentation Continuous assessment and final examination Duration: 03:00
16				

The independent study hours are training activities during which students should spend time on individual study or individual assignments.

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The subject schedule is based on a previous theoretical planning of the subject plan and might go through experience some unexpected changes along throughout the academic year.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
3	Develop a 3D model with Sketchup	Individual work	No Presential	05:00	7.5%	5 / 10	CB10
4	Develop a 3D model with Sketchup	Individual work	No Presential	05:00	7.5%	5 / 10	CB10
5	Develop a simple game in Unity 3D	Other assessment	No Presential	05:00	10%	5 / 10	CB10 CE15 CG12
6	Develop a simple game in Unity 3D	Other assessment	No Presential	05:00	10%	5 / 10	CB10 CE15 CG12
7	Develop a simple game in Unity 3D	Other assessment	No Presential	05:00	5%	5 / 10	CE15 CG12 CB10
8	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	5%	5 / 10	CB10 CE15 CG01 CG12
9	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	5%	5 / 10	CE15 CG01 CG12 CB10
10	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	5%	5 / 10	CB10 CE15 CG01 CG12
11	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	Face-to-face	10:00	5%	5 / 10	CB10 CE15 CG01 CG12
12	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	Face-to-face	10:00	5%	5 / 10	CB10 CE15 CG01 CG12

13	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	5%	5 / 10	CB10 CE15 CG01 CG12
14	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	10%	5 / 10	CG01 CG12 CB10 CE15
15	Pupil portfolio presentation	Individual presentation	Face-to-face	03:00	20%	5 / 10	CB09

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
3	Develop a 3D model with Sketchup	Individual work	No Presential	05:00	7.5%	5 / 10	CB10
4	Develop a 3D model with Sketchup	Individual work	No Presential	05:00	7.5%	5 / 10	CB10
5	Develop a simple game in Unity 3D	Other assessment	No Presential	05:00	10%	5 / 10	CB10 CE15 CG12
6	Develop a simple game in Unity 3D	Other assessment	No Presential	05:00	10%	5 / 10	CB10 CE15 CG12
7	Develop a simple game in Unity 3D	Other assessment	No Presential	05:00	5%	5 / 10	CE15 CG12 CB10
8	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	5%	5 / 10	CB10 CE15 CG01 CG12
9	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	5%	5 / 10	CE15 CG01 CG12 CB10
10	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	5%	5 / 10	CB10 CE15 CG01 CG12
11	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	Face-to-face	10:00	5%	5 / 10	CB10 CE15 CG01 CG12
12	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	Face-to-face	10:00	5%	5 / 10	CB10 CE15 CG01 CG12

13	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	5%	5 / 10	CB10 CE15 CG01 CG12
14	Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	No Presential	10:00	10%	5 / 10	CG01 CG12 CB10 CE15
15	Pupil portfolio presentation	Individual presentation	Face-to-face	03:00	20%	5 / 10	CB09

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Develop a 3D model with Sketchup	Other assessment	Face-to-face	05:00	20%	5 / 10	CB10
Develop a simple game in Unity 3D	Other assessment	Face-to-face	15:00	30%	5 / 10	CB10 CE15 CG12
Develop a 3D application in Untiy3d using a 3D interaction device	Other assessment	Face-to-face	25:00	50%	5 / 10	CB10 CE15 CG01 CG12

7.2. Assessment criteria

Grade Criteria based on students work

A+ Outstanding

All works proposed have been presented in time.

All Works contents are excellent

The student has participated actively on discussions classes and he provided good argument or point of view about the subject

A Excellent

All works proposed have been presented in time.

All Works contents are excellent

B Good

All works proposed have been presented in time.

At least 60% of works have been marked as excellent and the remaining works have been marked as good.

C Acceptable

At most one proposed work has been presented out of time

The average mark is at least Good

D Weak

At most two proposed work has been presented out of time

The average mark is at least Acceptable

E Poor

At least one of these proposed works: 'Develop a 3D model with Sketchup' or 'Pupil portfolio presentation?', has not been presented or more than three proposed works have been presented out of time

F Failing

More than one proposed works have not been presented

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Unity3D Personal edition	Others	https://unity3d.com/
SketchUp Free version	Others	https://www.sketchup.com/es/products/sketchup-free
Tutorial de Unity	Web resource	https://unity3d.com/es/learn