Computational Graphics

Academic Year: (2019 / 2020) **Review date: 19-05-2020**

Department assigned to the subject:

Coordinating teacher: RECIO ISASI, GUSTAVO

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

OBJECTIVES

Competences and skills:

1. Ability to use and develop methodologies, methods, techniques, specific application programs, rules and standards for computer graphics.
2. Ability to design and compute systems, processes, and installations within the scope of Informatics.
3. Ability for continued self-learning

Learning Outcomes:

1. To learn the basics of computer graphics and the basic algorithms used in generating computer graphics.
2. Being able to apply the methodologies, methods, and techniques of computer graphics.
3. To know the main rules and standards of computer graphics.
4. Being able to use programs for modeling and visualization of graphical objects.
5. Being able to design systems that make use of computer graphics.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Basics of Computer Graphics.

2. Modeling and visualization of objects.
   - Curves and Surfaces

3. Fundamental Algorithms of Computer Graphics. Rendering
   - Ray tracing
   - Lighting and shading
   - Graphics pipeline

4. Foundations of Animation
   - Interpolation (Keyframing)
   - Kinematics (direct and inverse)
   - Interpolation of orientation: quaternions

5. Animation: dynamics
   - Particle systems
   - Rigid body

6. Behavioral animation:
   - Particle systems
   - Crowd animation

LEARNING ACTIVITIES AND METHODOLOGY

(AF1) Lectures: explanation of theory concepts, but also practical cases, in some cases with the use of computer graphics tolos.

(AF4) (AF6) Assignments in computer rooms (individually or in groups) for using modelling and visualization tools in computer graphics

(AF5) (AF7) Tutoring (individual / group)

(AF8) Exam

MD1 THEORY CLASS. Lectures with support of computer and audiovisual media, in which the main concepts of the subject are taught and the materials and bibliography are provided to complement the students' learning.
MD2. PRACTICES. Resolution of practical cases.
MD3. TUTORING. Individual or group.

ASSESSMENT SYSTEM

The aim of evaluation is to determine the degree of fulfillment of the learning objectives. Therefore all work carried out by students will be used to assess them, either individually or collectively, through ongoing evaluation of their activities (assignments).

The final mark takes into account the student's individual activities and team activities. There are two components in the final mark:

- (SE2) Ongoing evaluation (70%): there will be several assignments related to topics explained during the course. Students will work in groups of two members.

- (SE3) Final exam (30%): about topics, both theoretical and practical, explained during the course.

The final grade is the addition of the ongoing evaluation plus the final exam. In case the student does not carry out the ongoing evaluation, the final grade will be 60% of the final exam.

The extraordinary evaluation will follow the same criteria as the ordinary one.

% end-of-term-examination:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

BASIC BIBLIOGRAPHY

- Dalai Felinto, Mike Pan Game Development with Blender, Cengage Learning PTR; 1 edition, 2013
- Daniel Thalmann, Soraia Raupp Musse Crowd Simulation, Springer, 2012
- John M. Blain The Complete Guide to Blender Graphics: Computer Modeling and Animation, A K Peters/CRC Press; 1 edition, 2012
- Rick Parent Computer Animation: Algorithms and Techniques. 3 edition, The Morgan Kaufmann Series in Computer Graphics, 2012
- Shirley Fundamentals of Computer Graphics, Second Edition, AK Peters.

ADDITIONAL BIBLIOGRAPHY

- Foley, J.D Computer Graphics. Principles and Practice, Addison Wesley.
- Hearn, D. Gráficas por computadora, PrenticeHall.
- Pimentel, K Virtual Reality, Windcrest.
- Rolf R. Hainich The End of Hardware, 3rd Edition: Augmented Reality and Beyond, BookSurge Publishing.
- Tomas Akenine-Moller Real-Time Rendering, AK Peters, 2008
- XIANG ZHI GANG Schaums Outline of Computer Graphics, McGrawHill, 1991