COURSE DATA

Data Subject	
Code	36477
Name	Procedural techniques in animation
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1407 - Degree in Multimedia Engineering	School of Engineering	4	First term

Subject-matter

Degree	Subject-matter	Character
1407 - Degree in Multimedia Engineering	19 - Optatividad	Optional

SUMMARY

Procedural Techniques in Animation is a subject of the *Optativity* track that is taught in the first semester of the fourth year of the degree in Multimedia Engineering. It focuses on the practical development of the fundamentals of the production of computer animations and digital visual effects

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

To have passed the following courses: Physics, Mathematics, Programming, Fundamentals of Computer Graphics, Computer Graphics, Animation and Simulation.

1407 - Degree in Multimedia Engineering

- G1 - Be able to relate and structure information from different sources and to integrate ideas and knowledge. (RD1393/2007)
- G2 - Have the learning skills needed to undertake further studies or to gain further training with a certain degree of autonomy. (RD1393/2007)
- I10 - e able to design and evaluate human-computer interfaces that ensure accessibility and usability of computer systems, services and applications.
- MM2 - Be able to understand and manage the different technologies involved in multimedia systems, both from the point of view of hardware and electronics and of software.
- MM7 - Be able to apply the principles of audiovisual graphic design and communication to multimedia products.
- MM11 - Have knowledge and ability to apply the different mechanisms and elements to create both linear and non-linear audiovisual stories according to different production formats, technologies and media.
- MM21 - Communicate effectively, both in writing and verbally, knowledge, procedures, results and ideas related to ICT and specifically to multimedia, and know their socioeconomic impact.
- MM24 - Be able to design, develop, evaluate and ensure the accessibility, ergonomics, usability and security of multimedia systems, services and applications and of the information that these manage.
- MM28 - Be able to solve problems with initiative, decision-making and creativity and to communicate and transmit the knowledge, abilities and skills of a multimedia engineer.

This course allows for the following learning outcomes
1. Know the technical and mathematical foundation of computer animation and visual effects
2. Analyze and properly characterize the performance problems associated with the production of animations.
3. To develop and bring into practice the apropriate techniques to solve problems of computer animation.
4. Meet the framework of simulation and graphical animation
5. Know recent techniques applied in this field

To complement the above results, this subject also to acquire the following skills and social skills:
1. Teamwork
2. self-employment
3. Communication skills

DESCRIPTION OF CONTENTS

1. Introduction

Structure and materials of the course.
Teaching and assessment methodology.
Present and future of computer animation.

2. Artificial Intelligence based animation

Agents and artificial perception .
Reactive behaviors: Flocking, Prey-Pred.
Proactive behaviors: maps and pathfinding algorithms.

3. Decision taking for virtual actors

Reasoning models. Inference. Rule based systems.
FSM-Finite State Machines.
Learning: basic models

4. Fluids

Navier-Stokes equations
Particle-based fluid simulation
SPH discretization

5. Deformable materials

Elasticity models.
Discretizations.
Position Based Dynamics

6. Procedural Modelling

Algorithms for geometric modelling of complex structures such as terrain, vegetation and other complex scenarios.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Attendance at events and external activities	3,00	0
Development of group work	10,00	0
Development of individual work	20,00	0
Study and independent work	17,00	0
Readings supplementary material	15,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	5,00	0
Resolution of case studies	15,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

Teaching will consist of a combination of lectures, problem sessions and practical activities to be performed by the student. This teaching will be supplemented by individual work of students, focusing on the study, problem solving, and job preparation for delivery. In addition, there will be sessions on lab work with your computer.

The theoretical activities consist of conducting master classes on topics that will be developed to provide a global and inclusive, analyzing in detail the key issues and more complex, promoting at all times, student participation.
Practical activities consist of exercises and problem solving. Depending upon the availability, seminars wil be held, which will address topics on applications and less formal aspects of the subject and conducting hands-on labs. Laboratory sessions will consist in solving problems related to the theoretical contents through the implementation of the techniques developed. Deliverable works (projects) will play an important role in the methodolgy. A reduced number of open projects in which the students will practice some of the proposed techniques. The student's personal work consists mainly in three aspects:
- Preparing lessons in advance and recommended reading texts
- Problem solving proposed by Professor
- Development works to be delivered to Professor

EVALUATION

Evaluation will follow a Continuous Evaluation methodology:

First Call

Continuous Evaluation.

1) Along the course a set of tasks to be assessed individually (laboratory sessions, problems, projects, individual and group work, etc.) will be proposed.

2) Other assessable tasks will be selected by the teacher from the following categories: problems, projects, individual work or group work.

3) Since the responsibility to learn and demonstrate what they have learned is individual, the teacher may request students to explain the work done in any given task .

4) A student will go to second call if

- A student fails or does not deliver on time two tasks proposed.
- A student copied a task (this can affect more students).
- A student is unable to explain or maintain an argument on issues related to the code, on the decisions taken or the writing of some of the tasks he has delivered.

Students who cannot atend lectures for a justified reason, must inform the professors and establish a work plan that is equivalent to classroom work.

Second call

Students who have not passed the first round evaluation shall establish a work plan with teachers to achieve the objectives of the course before the date scheduled for evaluation in second call, with similar jobs to those made during the course.

Grading

In any case, the evaluation of this subject will be done in compliance with the University Regulations in this regard, approved by the Governing Council on 30th May 2017 (ACGUV 108/2017)

REFERENCES

Basic

- K. Erleben et al. "Physics Based Animation". Charles River Media, 2005.
- Rick Parent, "Computer Animation - Algorithms and Techniques". Morgan Kaufmann 2008.
- E. Lengyel. "Mathematics for 3D game programming and computer graphics". Charles River Media. 2004
- D.M. Bourg y G. Seeman. "AI for game developers". O'Reilly, 2004

Additional

- I. Kerlow, "The art of 3D computer animation and effects". John Wiley & Sons, 2009.
- J.M. Van Verth y L.M. Bishop. "Essential mathematics for games and Interactive Applicacions". Morgan Kaufmann Publishers, 2008
- S. Rabin "AI game programming wisdom". Charles River Media, 2002