COURSE DATA

Data Subject	
Code	34846
Name	Simulation
Cycle	Grade
ECTS Credits	6.0
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1407 - Degree in Multimedia Engineering	School of Engineering	3	Second term

Subject-matter

Degree	Subject-matter	Character
1407 - Degree in Multimedia Engineering	12 - Animación y Simulación por Computador	Obligatory

Coordination

Name	Department
LOZANO IBAÑEZ, MIGUEL	240 - Computer Science

SUMMARY

Simulation is a mandatory subject of matter Computer Animation and Simulation, taught in the second semester of the third year of the Degree in Multimedia Engineering.

The simulation course aims to review the main modeling and simulation techniques used in engineering, where the goal is to visualize and interact with simulation models created in a 2D/3D graphical application. Typically, simulators for civil / military (eg training, cars, airplanes, educational, ..) and entertainment applications or games 2D/3D, are the type of interactive graphical application under study in this course.

We will study and implement models of physical nature, from classical mechanics, and we will also review the main kinematic and dynamic problems of particles and solids with the numerical integration techiques required.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

Having passed the following courses: Physics, Mathematics, Programming, Graphic Computing and advanced graphics and sound. It is very important having passed Animation in the first semester

OUTCOMES

1405 - Grado en Ingenieria Multimedia

- G1 - Be able to relate and structure information from different sources and to integrate ideas and knowledge. (RD1393/2007)
- G4 - Be able to integrate into working groups and collaborate in multidisciplinary environments and be able to communicate properly with professionals from all fields.
- I10 - e able to design and evaluate human-computer interfaces that ensure accessibility and usability of computer systems, services and applications.
- MM1 - Have knowledge and ability to understand essential facts, concepts, principles and theories related to multimedia systems including all the disciplines covered by these systems.
- 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.
- MM3 - Be able to implement methodologies, technologies, processes and tools for the professional development of multimedia products in a real context of use by applying the appropriate solutions for each environment.
- MM7 - Be able to apply the principles of audiovisual graphic design and communication to multimedia products.
- MM8 - Integrate knowledge of different multimedia technologies to create products that offer global solutions that are appropriate to each context.
- MM9 - Program correctly in the different specific languages of multimedia systems taking into account time and cost restrictions.
- MM10 - Be able to analyse and integrate software components to develop multimedia applications.
- 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.
- MM22 - Have knowledge and ability to understand essential facts, concepts, principles and theories related to multimedia and to the spectrum of reference disciplines.

- 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.

LEARNING OUTCOMES

This course allows for the following learning outcomes

1. Knowing the time-related concepts in a multimedia system.
2. Provide the basics for defining, designing and implementing graphical simulations.
3. Meet the simulation models used in the graphic animation of complex systems.
4. Having the tools to plan, design and implement simulations with current multimedia systems.
5. Understand the phases of graphic simulation and the need for each of its components.
6. Analyze and properly characterize the performance issues associated with the graphic simulation.
7. Meet the framework of simulation and graphical animation
8. Join a creative team

To complement the above results, this subject also to acquire the following skills and social skills:

1. Teamwork

DESCRIPTION OF CONTENTS

1. Introduction to graphical simulation

Fundamentals of graphic simulation. Basics. Kinematics of rigid bodies.
Interactive graphics applications: games physics engines.

2. Physical models

Particle simulation. Emitters
Colisions
Hash table

3. Deformable objects

Soft bodies: Spring-mass (damper) system.
Wave simulation.

4. Rigid bodies

Angular velocity
Rigid Body dynamics: torque and angular momentum

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	20,00	0
Development of individual work	10,00	0
Study and independent work	15,00	0
Readings supplementary material	7,00	0
Preparation of evaluation activities	5,00	0
Preparing lectures	12,00	0
Preparation of practical classes and problem	12,00	0
Resolution of case studies	5,00	0
Resolution of online questionnaires	1,00	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 seminars, 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.

- 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

In the first call, evaluation will follow a Continuous Evaluation methodology:

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) Laboratory sessions will be assessed through a questionnaire that will be given at the end of the session, by evaluating the source code and / or by individual exams about the laboratory contents. Each laboratory handout will specify the evaluation system.

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

4) 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 .

5) 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.

The final grade will be:

0.4*(Lab grade) + 0.6 * (Projects and activities)

The minimum grade to average both parts will be 4 points in both cases.

Second call.

In seccond call, there will be a written exam, in which case the final grade will be:

0.4 * (Lab mark) + 0.6 * (Theoretical and practical examination mark)

Lab grade will be that of the continuous evaluation process and no minimum grade will be required in this part. The exam will have a minimum grade of 4 to average

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

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

REFERENCES

Basic

- [Eberly04] - Davis H. Eberly Game Physics. Elsevier. 2004.
- [Lengyel04] E. Lengyel. Mathematics for 3D game programming and computer graphics. Charles River Media. 2004
- [Ramtal11] Dev Ramtal y Adrian Dobre. The Essential Guide to Physics for Flash Games, Animation, and Simulations. APress, 2011

Additional

- [Parent08] Rick Parent, Computer Animation Algorithms and Techniques Morgan Kaufmann 2008.
- [Bourg02] David M. Bourg Physics for Game Developers O'Really 2002.
- [VanDenBergen] G. van den Berger Game physics pearls A.K. Peters. 2010.
- [Akenine08] Akenine Moller. Real Time Rendering . A.K. Peters 2010.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

If it is required by the sanitary situation, the Academic Committee of the Degree will approve the Teaching Model of the Degree and its adaption to each subject, establishing the specific conditions in which it will be developed, taking into account the actual enrolment data and the space availability.