COURSE DATA

DATA SUBJECT

Code: 36482
Name: Computer graphics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1407 - Degree in Multimedia Engineering	Escola Tècnica Superior d'Enginyeria	2	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1407 - Degree in Multimedia Engineering	Gráficos y Audio por Computador	COMPULSORY

COORDINATION

GIMENO SANCHO JESUS

SUMMARY

The subject Computer Graphics is part of the Computer Graphics and Audio module, whose general objective is to introduce students to the fundamentals and basic techniques used in the generation of two-dimensional and three-dimensional synthetic images in graphic applications. It is a compulsory and semester-long course taught in the second year of the Bachelor¿s Degree in Multimedia Engineering, during the second semester. According to the curriculum, it carries a total of 6 ECTS credits.

Specifically, the course covers topics related to different lighting models (local and global), materials, 3D object representation models, and optimization methods. Students will learn the technical vocabulary of these fields and how to assess and discuss the advantages and disadvantages of using the various techniques presented, as well as apply the contents to the analysis and resolution of the proposed problems.

Throughout the course, industry-standard software will be used to demonstrate the practical application and functionality of the theoretical content.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

The course has a direct bearing upon the subject of the matter to be taught in the first semester: Foundations of Computer Graphics and assumes the correct acquisition of the skills taught there. Also as recommended in this course have completed the courses Computer Programming and Mathematics I and II.

COMPETENCES / LEARNING OUTCOMES

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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)

G3 - Take into account the economic and social context in engineering solutions, be aware of diversity and multiculturalism and ensure sustainability and respect for human rights and equality between men and women.

G4 - Be able to integrate into working groups and collaborate in multidisciplinary environments and be able to communicate properly with professionals from all fields.

G5 - Be able to lead working groups properly, respect and appreciate the work of others, take into account the needs of the group and be available and accessible.

I2 - Know, design and make an efficient use of the data types and data structures that are most suited to solving a problem.

MM10 - Be able to analyse and integrate software components to develop multimedia applications.

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.

MM12 - Know current 2D and 3D graphic systems and their application to multimedia developments.

MM13 - Know and be able to use the techniques of digital audio and directional audio systems that can be integrated into multimedia applications.

MM15 - Be able to respond professionally to the requirements at each step of a multimedia production process: show skills for preparing and understanding scripts and communication, graphic design for communication, management of streaming technology, web design and production and post-production processes.

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.

MM5 - Know how to apply the theoretical and practical resources to deal with a multimedia application as a whole.

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.

DESCRIPTION OF CONTENTS

1. Basic Rendering and Local Lighting

Basic Interaction Light and Matter. Computational Color Representation
Types of Local Illumination
Shading & texturing
Rendering and GPU-based shaders

2. High Level Graphical Structures

Display cost factors.
Optimization techniques.
Advanced Graphical structures.
3D graphics formats.

3. Global Lighting Models

Model of light radiation.
Optical approximation, ray-tracing.
Thermodynamic approximation, radiosity.

4. Advanced Geometrical Modelling

Surface Model Representation
Spatial partitions
Fractals and Generative Grammars.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	20,00
Classroom practices	10,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	8,00
Independent study and work	17,00
Preparation of lessons	40,00
Preparation for assessment activities	5,00
Resolution of case studies	20,00
Total hours	**90,00**

TEACHING METHODOLOGY

The course will follow a methodology based on problem-based learning and project-based learning.

To make better use of the lecture hours, the teaching staff will provide students with the necessary materials to prepare for the face-to-face theoretical classes. These materials may include: slide presentations, videos, and additional resources (scientific articles, book chapters, etc.). During the lectures, discussions will be encouraged and doubts will be addressed.

In the problem-solving sessions, real-world problems based on the theoretical content will be presented so that students can work on finding appropriate solutions. Work will be carried out individually or in groups, depending on the type of problem.

In the practical sessions, students will work on projects that apply the theoretical content. Finally, a final project will be developed, integrating the knowledge and skills acquired in the previous projects.

EVALUATION

For the evaluation of the course the following aspects will be considered.

(C) Continuous assessment, based on participation and the degree of involvement on the teachinglearning process. The attendance on regular basis to on-campus lectures/activities will be taken into account. A set of activities consisting of individual and group work to do at home or in class, oral presentations, resolution of issues and problems in class, and some partial individual tests may be conducted during the course. These exercises may be proposed without previous notice. The activities of continuous assesment cannot be retaken.

(E) There will be a final individual test consisting of one or more written exams or test of knowledge. These tests will consist of both theoretical questions and practical problems.

(P) Assessment of practical activities based on the achievement of objectives in the laboratory sessions and problems and a final work.

The final mark is calculated as follows:

Final Mark = 0.2 * C + 0.5 * E + 0.3 * P

A minimum of 5 (over 10) in parts E and P is required in order to calculate the Final Mark.

In the second call, note of the continuous assessment (C) and parts (E and P) approved will be kept. For unapproved parts (E and P) will be an exam, calculating the final mark as you would at first call.

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

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

REFERENCES

- Computer graphics : principles and practice. Hughes, John F. Upper Saddle River, N.J. : Addison-Wesley, 2014. 3rd ed.
- Gráficos por computadora con Opente. Hearn&Baker. Prentice Hall. 2006
- Interactive Computer Graphics. Edwar Angel. Addison Wesley.2001
- Computer Graphics and Virtual Environments. Slater M., Steed, A., Chrysantou Y.
- Lighting for animation, the art of visual storytelling. P. Jasmine Katatikarn & Michael Tanzillo. Ed. CRC Press. 2016.
- Beginner's guide to Unity Shader Graph : create immersive game worlds using Unity's Shader tool. Alda, Álvaro. New York : Apress Media LLC. 2023.