Universitat de Lleida

DEGREE CURRICULUM
COMPUTER GRAPHICS AND MULTIMEDIA

Coordination: SEBE FEIXAS, FRANCISCO

Academic year 2020-21

Subject's general information

Subject name	COMPUTER GRAPHICS AND MULTIMEDIA
Code	103085
Semester	1st Q(SEMESTER) CONTINUED EVALUATION

Typology	Degree	Course	Character	Modality
	Master's Degree in Informatics Engineering	1	COMPULSORY	Attendance-based

Course number of credits (ECTS)	4.5

Type of activity, credits, and groups	Activity type	PRALAB	TEORIA
	Number of credits	3	1.5
	Number of groups	1	1

Coordination	SEBE FEIXAS, FRANCISCO
Department	MATHEMATICS
Teaching load distribution between lectures and independent student work	4.5 ECTS correspond to 112.5 work hours (33 in-class, 79,5 out-of-class).
Important information on data processing	Consult this link for more information.
Language	English: 100%

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
SEBE FEIXAS, FRANCISCO	francesc.sebe@udl.cat	4,5	

Subject's extra information

Graphical and multimedia elements can be found in most current computer applications such as web navigation, scientific data visualization, videogames and virtual reality, among many others. This subject is devoted to the practical development of graphical applications in two and three dimensions using OpenGL.

Practical activities in the subject will be developed in C++, so that students should be proficient in using this programming language.

This subject is in the computer technology modulus.

It is recommended to course this subject together with "Intelligent systems" and "Embedded and ubicuos systems".

Learning objectives

- Apply knowledge on mathematics to the development of graphical applications.

- Schedule activities and projects so as to hand them in time.

- Carry out the tasks detailed in a work plan in an autonomous way making use of Internet to complement the information provided.

- Implement graphical applications in two and three dimensions in C++ using the functionalities provided by OpenGL.

- Know the procedures used for the development of two and three dimension graphical applications

- Know how to develop virtual surroundings in three dimensions

Competences

General competences

- CG4. Capacity to mathematically model, calculate and simulate in technological companies and engineering centres, particularly with regard to research, development and innovation tasks in all fields related to computer engineering.

Strategic competences of UdL

- UdL2. Command of a foreign language.

- UdL3. Mastering ICT's.

Cross-disciplinary competences

- EPS1. Capacity of planning and organizing the personal work

- EPS4. Capacity to conceive, design and implement projects and/or contribute to new solutions, using engineering tools

Basic competences

- CB2. That the students can apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study..

- CB5. Students should possess learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous.

Specific competences

- CE1. Capacity for the integration of technologies, applications and computer engineering systems, in general and wider and multidisciplinary contexts.

- CE10. Capacity to understand and apply advanced knowledge in high-performance computing and numerical or computational methods to problems of engineering.

- CE13. Capacity to use and develop methodologies, methods, techniques, specific use programmes, rules and graphic computation standards.

- CE15. Capacity for the creation and exploitation of virtual surroundings, and for the creation, management and distribution of multimedia contents.

Subject contents

1. Computer graphics on the plane with OpenGL

1.1. Creation of a graphical window

1.2. Coordinate systems

1.3. Points and straight lines drawing

1.4. Polygon drawing on the plane

1.5. Geometric transformations on the plane

2. Graphical applications animation in OpenGL

2.1. Time reading and use of timers

2.2. CFR animation (constant frame rate)

2.3. VFR animation (variable frame rate)

3. Computer graphics in the space with OpenGL

3.1. Parallel and perspective projection

3.2. Viewer positioning

3.3. Polygon drawing in the space

3.4. Texture mapping

3.5. Lighting effects

Methodology

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The subject will be imparted following a methodology in which the students will develop a project. Optionally, students can incorporate concepts studied in the "Intelligent systems" and "Embedded and ubicuos systems" subjects.

In-class sessions, which will take place in a computers class, will be devoted to the explanation of basic concepts, the study of graphical applications examples, and to work in the course project. The project will be completed during out-of-class hours.

Development plan

In this course, the project will be devoted to the development of a simple videogame. In this subject we will address the graphical part of the project. Optionally, you can provide artificial intelligence to game characters by applying the techniques studied in the "Intelligent systems" subject, and human-computer interaction by means of special devices by applying the concepts studied in the "Embedded and ubicuos systems". Hence, it is strongly recommended to follow through the three subjects at the same time, although it is not mandatory.

A week with in-class work will consist of two three hours sessions. At the end of these sessions, the students will be given a guide with the work to be carried out. At the beginning of the next week with in-class work, the carried out work will be handed in and evaluated. The overall amount of in-class weeks is four.

In-class week	Chapter	Project tasks
1	1. "Computer graphics on the plane with OpenGL"	Random generation of scenarios Graphical representation of a scenario in 2D
2	2. "Graphical applications animation in OpenGL"	Addition of "food" elements to the scenario Addition and animation of the main character Addition and animation of the enemy character
3	3. "Computer graphics in the space with OpenGL"	Representation of game graphics in 3D Addition of textures
4	3. "Computer graphics in the space with OpenGL"	Addition of lighting effects

Evaluation

At the conclusion of an in-class work week, the student will be given a guide detailing the work to be done before the beginning of the next in-class work session. This guide will include the objectives to achieve and the evaluation criteria. This work will have to be handed in and will be evaluated by the professor. The professor will interview the students about the carried out work.

Activity	Weight	Minimum mark	In group	Mandatory	Recuperable
Workpackage 1	25%	No	Yes	No	Yes
Workpackage 2	25%	No	Yes	No	Yes
Workpackage 3	25%	No	Yes	No	Yes
Workpackage 4	25%	No	Yes	No	Yes

Mark = 0,25*PT1 + 0,25*PT2 + 0,25*PT3 + 0,25*PT4

Bibliography

- Donald D. Hearn, M.Pauline Baker, *Computer graphics with OpenGL*, Pearson Prentice Hall (2004).
- Peter Shirley, Michael Ashikhmin, Steve Marschner, *Fundamentals of computer graphics (3rd Ed.)*,

A.K.Peters (2009).
- *OpenGL - The Industry Standard for High Performance Graphics* (https://www.opengl.org/)