# COURSE OUTLINE

## (1) GENERAL

| | | | |
|---|---|---|---|
| **SCHOOL** | Social Sciences | | |
| **ACADEMIC UNIT** | Cultural Technology and Communication | | |
| **LEVEL OF STUDIES** | Undergraduate | | |
| **COURSE CODE** | PLR107 | **SEMESTER** | **4** |
| **COURSE TITLE** | Computer Graphics | | |

| **INDEPENDENT TEACHING ACTIVITIES** *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits* | **WEEKLY TEACHING HOURS** | **CREDITS** |
|---|---|---|
| Lectures | 2 | 3 |
| Laboratories | 2 | 2 |
| | | |
| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | 4 | 5 |

| | |
|---|---|
| **COURSE TYPE** *general background, special background, specialised general knowledge, skills development* | Core Course/General Background |
| **PREREQUISITE COURSES:** | None |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | Yes |
| **COURSE WEBSITE (URL)** | https://eclass.aegean.gr/courses/131137/ |

## (2) LEARNING OUTCOMES

**Learning outcomes**

*The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.*

*Consult Appendix A*

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

At the end of this course, the students will be able to:

- report with accuracy the basic characteristics of vector images and the input/output devices.
- Identify the basic differences between 2D and 3D graphics.
- Define the parameters of affine transforms in computer graphics.
- Be aware of the 3D and 2D modeling techniques (polygons, particle systems, constructive solid geometry, fractals).
- Understand algorithms for: line printing, oval printing, cycle printing, Bresenham algorithms, RasterOp algorithm.
- Be familiar with new technologies in animation such as: key-frame animation, procedural animation, motion capture techniques and devices, particle systems.
- Describe the effect of aliasing and anti-aliasing.
- Design algorithmic procedures for process, analyze, and design computer graphics, considering specific issues for object modeling, placing objects in global coordination systems, inserting texture in objects, defining lighting conditions and projecting objects in 2D planes.
- Composing algorithmic structures for object modeling using modern freeware software.

- Generate executable applications using modern freeware software (Unity) and related libraries in javascript for game development.
- Describe the appropriate procedures for composing affine transformations related to translation, rotation, warping and object scaling.
- Communicate efficiently their knowledge, which is acquired from the lectures, to colleagues to establish fruitful co-operations for creating cultural informatics applications and computer games.

**General Competences**

*Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?*

*Search for, analysis and synthesis of data and information, with the use of the necessary technology*
*Adapting to new situations*
*Decision-making*
*Working independently*
*Team work*
*Working in an international environment*
*Working in an interdisciplinary environment*
*Production of new research ideas*
*Project planning and management*
*Respect for difference and multiculturalism*
*Respect for the natural environment*
*Showing social, professional and ethical responsibility and sensitivity to gender issues*
*Criticism and self-criticism*
*Production of free, creative and inductive thinking*
*……*
*Others…*
*……..*

• Search for, analysis and synthesis of data and information, with the use of the necessary technology
• Working in an interdisciplinary environment
• Production of free, creative and inductive thinking
• Transfer of know-how in other environments
• Working independently
• Practice Critical Thinking

**(3) SYLLABUS**

This course introduces the theory of computer graphics and digital processing of vector images. The lectures also include the principles of computer animation and aspects related to 2D and 3D graphics. A brief structure of the course is the following:

1. Introduction to mathematical background
2. 3D representation models – Polygonal model
3. 3D representation models – Algorithms for drawing lines
4. Algorithms for drawing circles
5. Algorithms for drawing circles
6. Transformations in 2D and 3D
7. Homogeneous coordinates
8. Transformations - Homogeneous coordinates -examples
9. Transformations - Homogeneous coordinates -examples
10. Transformations - Homogeneous coordinates -examples
11. Clipping
12. Texture – Illumination models
13. Course summary

## (4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY<br>Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY<br>Use of ICT in teaching, laboratory education, communication with students</td><td>Use of open source software for laboratory education. Use ICT in teaching and communication with students (Blender).</td></tr>
<tr><td>TEACHING METHODS<br>The manner and methods of teaching are described in detail.<br>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.<br><br>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>13 *2 hours =26 hours</td></tr>
<tr><td>Lectures’ study</td><td>13*4 hours = 52 hours</td></tr>
<tr><td>Laboratory Practice</td><td>13*2 = 26 hours</td></tr>
<tr><td>Laboratory Preparation and semester assignment</td><td>45 hours</td></tr>
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<tr><td>Course total</td><td>149 hours</td></tr>
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</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION<br>Description of the evaluation procedure<br><br>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other<br><br>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>The evaluation of students’ performance evaluation is conducted at the end of the semester with written exams in the form of open questions that require critical thinking. These examinations during the periods of January and September are the major evaluating methods. Students’ performance is measured on a 1-10 scale (10: excellent). A final assignment for the course is released at the middle of the course, which is not mandatory, but it contributes to the final grade with a weighted percentage of 30%.<br>Students are familiar with the evaluation criteria from the first course lecture. All notes are stored in the course’s area in University e-class platform (eclass.aegean.gr).</td></tr>
</table>

## (5) ATTACHED BIBLIOGRAPHY

*- Suggested bibliography:*


- Θεοχάρης Θ., Μπεμ Α., Γραφικά: Αρχές και Αλγόριθμοι, Σ.ΑΘΑΝΑΣΟΠΟΥΛΟΣ & ΣΙΑ Ο.Ε. 1999, ISBN: 978-960-11-0004-3.
- Η. Bakers, Γραφικά Υπολογιστών με OpenGL, Α. Τζιόλα & υιοι Α.Ε. 2010, ISBN: 978-960-418-257-2.
- Θεοχάρης Θ., Παπαιωάννου Γ., Πλατής Ν., Πατρικαλάκης Ν.Μ., Γραφικά και Οπτικοποίηση: Αρχές και Αλγόριθμοι, Εκδόσεις ΕΚΠΑ, 2019, 978-960-466-210-4.


*- Related academic journals:*

- IEEE Transactions on Visualization and Computer Graphics, IEEE Society
- ACM Transactions on Graphics
- IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems
- Visual Computer
- IEEE Computer Graphics and Applications
- Computers and Graphics
- Graphical Models

- Computer Animation and Virtual Worlds