COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Informatics and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		**SEMESTER**	**7th**
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	
Laboratory Work	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	Scientific Area, Skills Development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	

(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

The course represents the fundamental course concerning the theoretical concepts and the relevant technologies of Computer Graphics and Image Synthesis.

The course material aims to:
(a) Familiarize students with the fundamental theoretical concepts, their position and their role in the overall computer graphics production pipeline. These include the fundamental concepts of light and color spaces and models, the relevant linear algebra topics of transformations, projections and three-dimensional modeling, the fundamental algorithms for drawing, antialiasing, clipping, hidden surface elimination and triangulation, the fundamental algorithms for parametric curved line and surface drawing as well as the fundamental algorithms for texture and lighting.

(b) Familiarize students in a practical manner, through computer laboratory exercises and projets, with the development of graphics applications where they are expected to implement versions of the aforementioned concepts in modern technological platforms, understanding the later, both in terms of basic hardware architecture, as well as in terms of software and the different degrees of abstraction and efficiency they offer.

Upon successful completion of the course, the student:

- Knows the fundamental theoretical concepts of Computer Graphics, their position and

their role in the overall graphics production pipeline and image synthesis
- Has the ability to design and develop professional graphics applications utilizing modern technical platforms
- Understands the differences, the advantages and disadvantages of the capabilities of the available technological solutions related to Computer Graphics and he/she act in a consulting role towards their choice
- Has the ability to follow the evolution and to understand and appreciate the novel capabilities offered by the technological and theoretical progress in the area of Computer Graphics
- Has competent background in order to attend courses with content concerning advanced Computer Graphics concepts both at theoretical as well as technological level.

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

- Individual Work
- Team Work
- Research, analyze and synthesize information and data, also with the use of necessary technologies

(3) SYLLABUS

- History and Basic Computer Graphics Production and Image Synthesis pipeline
- Light, Color Gamuts and Models
- Relevant Linear Algebra Topics
- Transformations
- Three-dimensional Modeling
- Projection and Object, World, Observer and Screen Spaces
- Drawing and Antialiasing Algorithms
- Clipping and Hidden Surface Elimination Algorithms
- Triangulation Algorithms
- Parametric Curved Lines and Surfaces
- Polygons
- Texture and Lighting Management
- Scene Graphs and Declarative Modeling
- Computer Graphics Technologies: programming languages
- Computer Graphics Technologies: software applications
- Computer Graphics Technologies: basic hardware architecture

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face in classroom
Face-to-face in computer laboratory</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Use of ICT in teaching, laboratory education, communication with students</td><td>WebGL API,
GLSL
Javascript
Compatible Browsers
Debugging and Matrix Manipulation Libraries
Support of learning process through the e-learning platform of the Department</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
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.

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>26</td></tr>
<tr><td>Laboratory Exercise aiming to familiarize with modern graphics technologies</td><td>26</td></tr>
<tr><td>Development Project of Computer Graphics application</td><td>37</td></tr>
<tr><td>Individual Study</td><td>36</td></tr>
<tr><td>Course Total (25 hours of work load per credit unit)</td><td>125</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

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

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>1. Written final examination (50%) which includes:
• Multiple Choice questions
• Problem Solving
• Comparative Evaluation of theory elements
• Short Answer Questions
• Other

2. Laboratory Exercise (25%)
• Laboratory Work
• Documentation/Report
• Other

3. Project (25%)
• Laboratory Work
• Project Document
• Documentation/Report
• Other</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Γραφικά και Προγραμματισμός WebGL, Μπαρδής Γ., 2022.
2. Γραφικά και Οπτικοποίηση, Θεοχάρης Θ., Πλατής Ν., Παπαϊωάννου Γ., Πατρικαλάκης Ν., 2010.
3. John F. Hughes, Andries Van Dam, James D. Foley, Morgan McGuire, Steven K. Feiner, David F. Sklar, Kurt Akeley, Computer Graphics: Principles and Practice, Addison-Wesley, 2014.
4. Professional WebGL Programming: Developing 3D Graphics for the Web, Andreas Anuru, WROX, 2012

5. Plemenos D., Miaoulis G., (Eds.) Intelligent Scene Modeling Information Systems, Springer, 2009.
6. Beginning WebGL for HTML5, Brian Danchilla, Springer, 2012.
7. Foley J.D., van Dam A., Feiner S.K., Hughes J.F. Phillips R.L., Introduction to Computer Graphics, Addison-Wesley, 1994.
8. K.Matsuda, R.Lea, WebGL Programming Guide: Interactive 3D Graphics Programming with WebGL, Addison-Wesley, 2013.
9. Γραφικά με ηλεκτρονικό υπολογιστή, Στυλιάδης Αθανάσιος Δ., 1999.

- Related academic journals:

1. ACM Transactions on Graphics
2. IEEE Transactions on Visualization and Computer Graphics
3. The Visual Computer, Springer