

POLI ESCOLA SUPERIOR TECNOLOGIA GESTÃO TÉCNICO GUARDA	SUBJECT DESCRIPTION	MODELO PED.013.03
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Course	Computer Science					
Subject	Computer Graphics					
Academic year	2023/2024	Curricular year	3rd	Study period	1st semester	
Type of subject	Compulsory	Student workload (H)	Total: 168	Contact: 83	ECTS	6
Professor(s)	Prof. Dr. Carlos Carreto					
<input checked="" type="checkbox"/> Area/Group Coordinator <input type="checkbox"/> Head of Department	(select)	Prof. Dr. José Carlos Fonseca				

PLANNED SUBJECT DESCRIPTION

1. LEARNING OBJECTIVES

Upon completion of the UC, students should be able to:

- Enunciate and explain the main concepts of 2D and 3D Computer Graphics;
- Design and implement 2D and 3D graphical applications through the use of modern graphical libraries.

2. PROGRAMME

1. Introduction

- Graphical System Components
- Java 2D and 3D

2. 2D Graphics - Basic Concepts

- Class Graphics2D
- Modeling and Primitives
- Constructive Area Geometry and General Path

3. Rendering Details

- Color, Paint and Stroke
- Affine Transformations
- Transparency and Composition
- Clipping
- Fonts and Text

4. Advanced Topics

- Custom Primitives
- Image Processing

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- Animation
- Graphics Printing

5. 3D Graphics - Basic Concepts

- Java 3D API and Scene Graph
- Backgrounds, Bounds and Capability Bits

6. 3D Graphical Objects

- Points and Vectors
- Geometries
- Fonts and Text
- Appearances

7. 3D Transformations

- Affine Transformations
- Compositions
- Construction of Geometries

8. Visualization

- View and Projections
- Picking

9. Light and Texturing

- Illumination Models
- Atmospheric Attenuation and Depth Cueing
- 2D Texture

10. Behavior and Interaction

- Interaction Behaviors
- Picking Behaviors

11. Animation

- Interpolators
- Morphing, LoD and Billboard

12. Advanced Topics

- Sound
- Shadow
- Geometry Change
- 3D Textures

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3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

For each of the 12 chapters of the program, the presentation and explanation of the theoretical concepts related to the topic of the chapter is made, which is consistent with the first goal.

Following the presentation and explanation of theoretical concepts, the components of the programming libraries Java 2D and 3D are presented and studied (through demonstrations and exercises), to design and implement graphical applications, which is consistent with the second goal.

4. MAIN BIBLIOGRAPHY

Mandatory

- Hong Zhang e Y. Daniel Liang, "Computer Graphics Using Java 2D and 3D", Editora Prentice Hall 2006, Print ISBN-10: 0-13-035118-0.
- Notes provided by the professor.

Recommended

- J. M. Pereira, J. Brisson, A. Coelho, A. Ferreira, M. R. Gomes, "Introdução à Computação Gráfica", FCA, 2018. ISBN 978-972-722-877-5.
- J. Foley, A. Van Dam, S. Feiner, J. Hughes, R. Philips, "Fundamentals of Interactive Computer Graphics", Addison-Wesley.
- J. Foley, A. Van Dam, S. Feiner, J. Hughes, R. Philips, "Computer Graphics: Principles and Practice", Second Edition in C, Addison-Wesley.
- R. Gonzalez, R. Woods, "Digital Image Processing", Second Edition, Addison-Wesley.
- D. Rogers, "Mathematical Elements for Computer Graphics". McGraw-Hill, 1990.
- E. Azevedo e A. Conci, "Computação Gráfica Teoria e Prática", Editora Elsevier. ISBN 85-352-1253-3.

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

Teaching Methodologies

- Lectures
- Presentation and/or interaction with demonstration
- Problem-solving

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- Project

Evaluation Rules

Evaluation by frequency

- Test about 2D Computer Graphics (Chapters 1 to 4) (30%)
- Project about 2D Computer Graphics (20%)
- Test about 3D Computer Graphics (Chapters 5 to 12) (30%)
- Project about 3D Computer Graphics (20%)

Evaluation by exam

- Exam about CG 2D and 3D (60%)
- Projects done by frequency
 - Project about 2D Computer Graphics (20%)
 - Project about 3D Computer Graphics (20%)

The evaluation rules are the same for all evaluation phases and all student statutes. The evaluation components are conducted individually. Projects are evaluated only once in the evaluation period by frequency, on dates defined for this purpose.

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

- **Lecture** is consistent with the objectives due to the need to present and explain the theoretical concepts of Computer Graphics.
- **Presentation and/or interaction with demonstration** is consistent with the objectives because it allows the presentation of the components of the programming libraries Java 2D and Java 3D and the study of its use to design and implement graphical applications.
- **Problem-solving** is consistent with the objectives because it allows students to solidify the knowledge gained on the theoretical concepts and graphical libraries of each chapter of the program, through the design and implementation of small graphical applications throughout the semester.
- **Project** is consistent with the objectives because it allows students to develop skills for designing and implementing complex graphical applications.

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7. ATTENDANCE

There is no attendance regime, but it is highly recommended that students follow the teaching of the subjects by attending classes.

8. CONTACTS AND OFFICE HOURS

Prof. Dr. Carlos Carreto

E-mail: ccarreto@ipg.pt

Office Nº 12

Office hours:

Tuesday - 16:00 -19:00

9. OTHERS

Nothing to add.

DATE

18 de setembro de 2023

SIGNATURES

Professor

(signature)

Area/Group Coordinator

(signature)