

# **ACADEMIC PROGRAM**

# **PRINCIPLES OF 3D GRAPHICS**

# B.F.A. IN ANIMATION

**MODALITY: ON CAMPUS** 

ACADEMIC YEAR: 2023-2024



Name of the course:	Principles of 3D Graphics
Degree :	Animation
Location:	Centro Universitario de Tecnología y Arte Digital
Area:	Artistic Fundamentals
Year:	1º
Teaching period:	1
Туре:	В
ECTS credits:	6
Teaching modality:	On campus
Language:	English
Lecturer / Email	Pablo Antón Gutierrez/pablo.anton@u-tad.com
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## SUBJECT DESCRIPTION

### Area description

The subject Artistic Foundations provides the students with the necessary fundaments for a digital graphics creator: identification and historical context of artistic currents, knowledge of color, light and photography, three-dimensional representation of space and learning of the basis and classical principles of animation and visual development. Knowledge and learning of traditional principles and techniques is one of the essential basis for training professionals to be able to adapt and take advantage of the progress of digital animation technology.

### **Subject description**

Subject oriented to provide a practical knowledge of digital technologies and tools themselves. Divided into a four-block structure, this course will study modeling, shading, lighting and animation, to be completed later with the specialization subjects. Each of these areas corresponds to a specific part of an audiovisual production process, in which specialized software is used to solve specific aspects.

## COMPETENCIES AND LEARNING OUTCOMES

Competencies BASIC AND GENERAL



CG1 - Critically understand the interrelationships between the different arts and their currents of thought throughout history and the evolution of aesthetic, historical and cultural values.

CG2 - Know the vocabulary and concepts inherent to the digital art field.

CG4 - Apply the aesthetic and perception fundamentals of the image in terms of structure, form, color and space in the representation of digital content.

CG9 - Use the techniques and artistic tools associated with the generation of digital content.

CB1 - That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.

CB2 - That students know how to apply their knowledge to their work or vocation in a professional manner and possess the competencies usually demonstrated through the development and defense of arguments and problem solving within their field of study.

CB3 - That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.

CB4 - Students should be able to convey information, ideas, problems and solutions to both specialized and non-specialized audiences.

CB5 - That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

#### TRANSVERSALS

CT5 - Demonstrate versatility, flexibility and creativity in the development of projects, activities and work.

SPECIFIC

CE18 - Devise, design and capture, through drawing, the design and construction of environments, landscapes and scenarios for their construction in 3D.

CE5 - Apply the traditional principles of animation to the digital animation of characters and other elements.

SC1 - Perform drawing with traditional and digital techniques of artistic creation for both ideation and representation of images.

SC2 - Know and apply the basics of photography, its elements of visual composition and the expressive value of lighting.

CE4 - Represent three-dimensional forms and spaces using the essential techniques of traditional and digital modeling. digital modeling techniques.

SC6 - Use the principles and techniques of artistic creation for the conceptualization, design and development of characters, environments, vehicles and props.

CE8 - Apply technical drawing to the representation of parts or spaces.

#### Learning outcomes

At the end of the degree, the graduate will be able to:

- Analyze artistic works taking into account aesthetic principles and cultural context.





- Interpret the visual and compositional language of a digital artwork.

- Use basic traditional drawing techniques such as charcoal, graphite or watercolor to represent images.

- Apply the physical and aesthetic principles of color in artistic and narrative creation.

- Handle with fluency digital tools for the creation of images, videos, modeling and artistic works.

- Use artistic expression techniques such as drawing, 3D modeling and postproduction for the generation of digital content.

- Develop strategies for continuous and autonomous training in new techniques and tools of the profession of an animator.

- Adapt the knowledge of traditional drawing techniques to digital environments.

- Draw with exclusively digital means and tools for the representation of images applied to the animation industry.

- Use the visual language applied to the different animation techniques to transmit ideas.

- Represent the physical environment, natural figures and objects through drawing with traditional or digital techniques.

- Apply the laws of representation systems for the visualization of objects, figures and spaces.

- Understand and use the photographic language for the creation of artistic and narrative images.

- Use light as a narrative and dramatic element in the creation of photographic images with knowledge of its physical principles.

- Operate a photographic camera according to its principles of operation for the creation of artistic images.

- Design characters through the visual expression of their psychological characteristics.

- Design environments, locations and atmospheres through the visual expression of their characteristics.

- Represent on a two-dimensional plane a three-dimensional space or object according to the systems of representation.

- Discriminate the volumetric, chromatic, space and environment interrelations that occur between the characters and physical spaces used in an animation

scene.

- Apply ideation and creativity techniques to artistic production such as flow state or lateral thinking.

### CONTENTS

- · Introduction to CGI production: digital images.
- · Fundamentals of digital image: Bits -Bit Depth.
- · Digital color: color spaces and treatment.
- · Modeling techniques: uses and applications.
- Techniques and realism: shading, lighting, camera, render.





- · Lighting and composition in the CG pipeline.
- · Basic composition techniques: Channels, alphas, layers, proportion and fields
- · Introduction to animation: curves, interpolations, tangents. Hierarchies and groups.

### SUBJECT SYLLABUS

-Introduction to 3D Graphics. Structure of a 3D production. How an animated film is made

-1.1 Modelling interface and toolsModelling basicsModelling componentsGeometry componentsObject management

-Topic 2. Modelling

- -2.1 Polygonal modellingModelling processes: extrusions, snapping, etc.
- 3D Modelling Systems2.2 Uses and Applications of Modelling Systems -2.3 Basic Modelling Operations
- -2.3 Basic Modelling Operations
- -2.4 Polygon Meshes
- -2.5 Geometry Mapping
- -Topic 3. Realism.
- -3.1 Shading
- -3.1.1 Light-object interaction. The shading process
- -3.1.2 Characteristics of the materials: colour, specularity and transparency.
- -3.1.4 Bump and displacement
- -3.1.5 Procedural textures
- -3.2 Lighting
- -3.2.1 Types of lights and their characteristics Shadows
- -3.2.2 Exterior lighting
- -3.2.3 Interior lighting
- -Theme 4. Animation.
- -4.1 Basic principles of animation. Introduction to animation.
- -4.2 Techniques and types of animation
- 4.3 Basic concepts: curves, interpolation methods, tangents, etc. -4.4 Hierarchies and hierarchies.
- -4.4 Hierarchies and groups
- -4.5 Animation by paths
- 4.6 Non-linear deformers





- -Topic 5 Rendering
- -5.1 Description of the rendering process
- -5.2 Tessellation of geometry
- 5.3 Contour smoothing and texture filtering -5.4 Quality aspects of rendering
- -5.4 Image quality aspects
- -5.5 Performance aspects
- -5.6 Rendering for compositing. Render layers and render passes

## TRAINING ACTIVITIES AND TEACHING METHODOLOGIES

#### **TRAINING ACTIVITIES**

LEARNING ACTIVITIES	Total hours	Hours of presence
Theoretical / Expository classes	31,25	31,25
Practical classes	23,75	23,75
Tutorials	4,50	2,25
Independent study and autonomous work of the student	47,50	0,00
Elaboration of work (group or individual)	37,50	0,00
Evaluation Activities	5,50	6,00
TOTAL	150	63,25

### **Teaching methodologies**

Expository method or master class Case method Problem-based learning Cooperative or collaborative learning Inquiry-based learning Flipped classroom or inverted classroom methodology Gamification

## **TEMPORAL DEVELOPMENT**





Theme 1-2 weeks

Theme 2-3 weeks

Theme 3-3 weeks

Theme 4-3 weeks

Topic 5-3 weeks

## **EVALUATION SYSTEM**

ASSESSMENT SYSTEM	MINIMUM SCORE RESPECT TO THE FINAL ASSESSMENT (%)	MAXIMUM SCORE RESPECT TO THE FINAL ASSESSMENT (%)
Assessment of participation in class, exercises or projects of the course	10	20
Assessment of assignments, projects, reports, memos	20	60
Objective test	30	70

## **GRADING CRITERIA**

ASSESSMENT SYSTEM	ORDINARY EVALUATION	EXTRAORDINARY EVALUATION
Assessment of participation in class, exercises or projects of the course	10	10
Assessment of assignments, projects, reports, memos	60	60
Objective test	30	30

#### **General comments on the evaluations/assessments**

Final numerical grade will be from 0 to 10, being a 5 the minimum grade to pass.

A follow-up of the work in the classroom will be made, evaluating the global process of learning, as well as the acquisition of competences and knowledge.

-If the student fails the course, he/she must attend the extraordinary exam. In extraordinary call the exam will be 100% of the grade.



-Participation and effort in class will be valued very positively through 10% of the final grade.3

- It is essential to follow the requirements indicated for each activity (order, nomenclatures) as well as the delivery dates.

- The use of the bibliography is recommended as a support element both for the expository classes and for the realization of the assignments.

-Any detection of plagiarism in a work or exam will imply the failure of that work with a zero, the report to the faculty and academic coordinator and the application of the current regulations, which can lead to very serious penalties for the student.

-It is crucial to hand in assignments on time. There will be 10 minutes of courtesy in which the delivery is considered done on time. After that time, work may be handed in within 24 hours after the deadline, but with a penalty on the grade to be determined by the teacher (1 point). No work will be accepted after 24 hours.

## LIST OF REFERENCES (BOOKS, PUBLICATIONS, WEBSITES):

Basic:

-Baechle, Oscar, Greer, Xury, (2020) Blender 3D By Example: A project-based guide to learning the latest Blender 3D, EEVEE rendering engine, and Grease Pencil. Packt Publishing

-Jeremy Cantor, Pepe Valencia (2004). Inspired 3D Short Film Production. Thomson Course Technology

-Isaac V. Kerlow (2004). The Art of 3D Computer Animation and Effects. John Wiley&Sons, Inc.

-Vaughan, William (2012). Digital Modeling. New RidersReferencias.

Recommended:

Tom Capizzi (2002). Inspired 3D Modeling & Texture Mapping. Premiere Press.

-Jeremy Birn (2006). Digital Lighting and Rendering. New Riders

-Owen Demers (2001). Digital Texturing and Painting. New Riders

-Dan Ablan (2002). Digital Cinematography & Directing.New Riders

-Harold Whitaker, John Halas, Tom Sito (2009). Timing for Animation. Focal Press

•C.Webster (2005). The Mechanics of Motion . Focal Press

•Ed Hooks (2011). Acting for Animators. Routledge.

-Virginia Bowman Wissler (2013). Illuminated pixels. Course technology

## **REQUIRED MATERIALS, SOFTWARE AND TOOLS**





## Type of classroom

Theory

Materials: Display - Digital whiteboard, Laptop

Software:

#NAME?