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Course guide
200253 - MTD - Mathematics of Digital Technologies

Last modified: 11/04/2024

Unit in charge:	School of Mathematics and Statistics
Teaching unit:	749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN MATHEMATICS (Syllabus 2009). (Optional subject).

Academic year: 2024   **ECTS Credits:** 3.0   **Languages:** Catalan

LECTURER

Coordinating lecturer:	ANTONIO SUSIN SANCHEZ
Others:	Primer quadrimestre: ANTONIO SUSIN SANCHEZ - M-A

REQUIREMENTS

Have passed the 2nd year of Degree

TEACHING METHODOLOGY

Project-based learning

LEARNING OBJECTIVES OF THE SUBJECT

Applications of mathematics to different fields of technology.
Mastery of programming and numerical methods.

STUDY LOAD

Type	Hours	Percentage
Hours large group	15,0	20.00
Self study	45,0	60.00
Hours small group	15,0	20.00

Total learning time: 75 h

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CONTENTS

MATHEMATICS OF DIGITAL TECHNOLOGIES

Description:
Topic 1: Images and videos
Images as 2D and 3D matrices. Image processing based on transformations and derivation.
Volume models of medical images (TAC and MRI), segmentation by isosurfaces. Nets
neurons in images. Videos as temporal evolution of images. Video creation
of mathematics animation.
Topic 2: Computer graphics and 3D models
Definition of the topology of a 3D model. Editing and simplification of meshes of triangles or tetrahedrons.
Screen representation of a 3D model. Concepts of lighting and camera placement
in a scene 3D printing models and formats.
Theme 3: Animation based on Physics
Simulation of real-world physics on a computer. Particle systems: deformable objects versus rigid objects. Collisions between
objects. Simulation of fluids with particles.
Topic 4: Virtual and augmented reality
Creation of scenes for virtual reality devices. Animation of objects and characters.
Interaction with virtual objects. Augmented reality concept and applications.

Full-or-part-time: 2h
Theory classes: 2h

GRADING SYSTEM

Qualification of the projects

BIBLIOGRAPHY

Basic:
- Erleben, Kenny; Sporring, Jon; Henriksen, Knud; Dohlmann, Henrik. Physics-Based animation. Charles River Media, 2005. ISBN 1584503807.

RESOURCES

Other resources:
Computer graphics (http://www.opengl-tutorial.org/) />Image processing (https://web.stanford.edu/class/ee368/) />Matlab (https://www.mathworks.com) />Unity (https://www.unity.com) />Python (https://www.python.org)