

Course guide

804450 - MT - Mathematics

Last modified: 08/07/2024

Unit in charge: Image Processing and Multimedia Technology Centre
Teaching unit: 804 - CITM - Image Processing and Multimedia Technology Centre.

Degree: BACHELOR'S DEGREE IN DIGITAL DESIGN AND MULTIMEDIA TECHNOLOGIES (Syllabus 2023).
(Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Calvo Herrero, Felipe

Others:

TEACHING METHODOLOGY

There will be two two-hour sessions per week. The following activities will be combined during the two weekly sessions:

Resolution of doubts regarding the exercises proposed in the previous session.

Explanation and defence of the solved exercises.

Acquisition of new knowledge.

Explanation of the next exercise and complementary materials.

These activity slots are modulated according to the complexity of the exercises and the corresponding contents.

LEARNING OBJECTIVES OF THE SUBJECT

Knowledge

Recognise the basic operation of the electrical and electronic circuits that make up audiovisual systems.

Skills

Use logical reasoning and mathematical tools in an applied context focused on the design of multimedia products.

Solve basic problems of numerical, matrix and vector calculus in order to develop scientific foundations that can be applied to multimedia design and development.

Construct and accurately model geometric objects and solve problems related to geometric objects, in order to acquire scientific fundamentals that can later be applied to animation.

STUDY LOAD

Type	Hours	Percentage
Guided activities	12,0	8.00
Hours medium group	18,0	12.00
Hours large group	30,0	20.00
Self study	90,0	60.00

Total learning time: 150 h



CONTENTS

Numerical representation systems

Description:

1. Positional and non-positional numbering systems
2. Base b numbering systems
3. Binary systems. Arithmetic operations
4. Octal and hexadecimal systems

Related activities:

Theoretical explanation class with problems

Full-or-part-time: 12h

Theory classes: 4h

Guided activities: 4h

Self study : 4h

Logic

Description:

1. Basic logic functions
2. Boole algebra. Basic operations.

Specific objectives:

Theoretical explanation class with problems

Full-or-part-time: 12h

Theory classes: 4h

Guided activities: 4h

Self study : 4h

Arrays calculus

Description:

1. Arrays. Definitions
2. Basic operations with matrices: addition, product, inversion
3. Applications of matrices
4. The set \mathbb{R}^3
5. Scalar and vector product of vectors
6. Transpose, sum and product of vectors

Related activities:

Theoretical explanation class with problems

Full-or-part-time: 24h

Theory classes: 8h

Guided activities: 8h

Self study : 8h

Systems of linear equations

Description:

1. Array modelling
2. Homogeneous and non-homogeneous systems, the kernel of a array.
3. Solving linear systems.

Related activities:

Theoretical explanation class with problems

Full-or-part-time: 24h

Theory classes: 8h

Guided activities: 8h

Self study : 8h

Linear transformations

Description:

1. Definition and behaviour
2. Composition and inverse
3. How to determine a linear transformation
4. Basic animations

Related activities:

Theoretical explanation class with problems

Full-or-part-time: 6h

Theory classes: 2h

Guided activities: 2h

Self study : 2h

Homogeneous coordinates

Description:

1. How do they work?
2. Points to infinity
3. Equations of straight lines in the plan and of plans in space
4. Incidence relations

Related activities:

Theoretical explanation class with problems

Full-or-part-time: 6h

Theory classes: 2h

Guided activities: 2h

Self study : 2h

Functions, function graphs and representation

Description:

- 1 Elementary functions. Definition and properties.
- 2 Study and representation of functions in Cartesian coordinates.
- 3 Continuity of functions. Definition
- 4 Limit of a function. Definition
- 5 Calculation of limits

Related activities:

Theoretical explanation class with problems

Full-or-part-time: 30h

Theory classes: 10h

Guided activities: 10h

Self study : 10h

Derivatives of functions and local approximation of a function

Description:

- 1 Definition and tools for the calculation of a derivative
- 2 Applications in the study of functions
- 3 Theorems about continuous and derivable functions
- 4 Taylor's formula

Related activities:

Theoretical explanation class with problems

Full-or-part-time: 24h

Theory classes: 8h

Guided activities: 8h

Self study : 8h

Infinite series and Fourier series

Description:

- 1 Successions
- 2 Numerical series
- 3 Fourier series associated with a periodic function
- 4 Development in Fourier series. Sinus and cosine. Complex form

Related activities:

Theoretical explanation class with problems

Full-or-part-time: 12h

Theory classes: 4h

Guided activities: 4h

Self study : 4h

GRADING SYSTEM

The evaluation system will be as follows:

- Two exams: a mid-term (20%) and a final (40%).
- Practical work (assessed by means of written tests and/or class exercises): 30%.

Participation and learning attitude: 10%. These will be evaluated taking into account the student's participation in the training activities of the subject and the learning attitude by means of a follow-up of their interventions in class and the proportion of exercises or practicals presented.

A pass mark is obtained with 50% of the overall assessment.

The overall assessment system of the course is completed, with the re-evaluation for those students who do not pass the course through continuous assessment. The re-evaluation does not include the practical notes. Students who pass the course through continuous assessment and students with a "no-show" grade will not be able to take part in the re-evaluation. The re-evaluation will be of the whole subject syllabus.

Irregular actions that may lead to a significant variation in the grade of one or more students constitute a fraudulent performance of an evaluation act. This action will lead to a descriptive grade of fail and a numerical grade of 0 for the ordinary global assessment of the subject, without the right to re-evaluation.

If the teachers have evidence of the use of AI tools that are not permitted in the assessment tests, they may summon the students involved to an oral test or a meeting to verify the authorship.

EXAMINATION RULES.

The output of the planned activities will be released in PDF format. The documents released in PDF will come from texts written in LaTeX, Word or any other word processing.

BIBLIOGRAPHY

Basic:

- García López, A. . Cálculo I: teoría y problemas de análisis matemático en una variable. 2a. Madrid: Clagsa, 1994. ISBN 8460509443.
- Piskunov, N. Cálculo diferencial e integral. 2a. Mèxic: Limusa, 1998. ISBN 9789681839857.
- Hefferon, Jim. Linear algebra [on line]. Vermont , 2008Available on: <http://joshua.smcvt.edu/linalg.html/>.

Complementary:

- Bonet, Carles. Càlcul numèric [on line]. Barcelona: Edicions UPC, 1994 [Consultation: 14/10/2024]. Available on: <http://hdl.handle.net/2099.3/36356>. ISBN 8476533764.
- Amer Ramon, R. . Àlgebra Lineal: problemes, exercicis i qüestions. Barcelona: Universitat Politècnica de Catalunya, 1998. ISBN 8482641204.

RESOURCES

Hyperlink:

- <https://citmalumnes.upc.es/~julianp/apuntes-geometria/>. Lecture notes