804221 - MAT1VJ - Mathematics

Coordinating unit: 804 - CITM - Image Processing and Multimedia Technology Centre
Teaching unit: 804 - CITM - Image Processing and Multimedia Technology Centre
Academic year: 2017
Degree: BACHELOR’S DEGREE IN VIDEO GAME DESIGN AND DEVELOPMENT (Syllabus 2014). (Teaching unit Compulsory)
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ECTS credits: 6
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: MARIA DE LOS ANGELES FERNÁNDEZ MORA
Others: Miguel Ángel Gutiérrez Antuñano

Prior skills
Algebra, Geometry, and Trigonometry or Precalculus

Requirements
Basic Algebra (factoring, solving for y), Euclidean Geometry, Trigonometric Functions (Sine, Cosine, Tangent) and Identities

Degree competences to which the subject contributes

Generical:
4. (ENG) Interpretar i dominar els conceptes bàsics de matemàtica discreta, lògica, algorísmica i complexitat computacional, i la seva aplicació per al tractament automàtic de la informació per mitjà de sistemes computacionals i la seva aplicació per a la resolució de problemes propis de l'enginyeria.
5. (ENG) Resoldre els problemes matemàtics que puguin plantear-se en l'enginyeria. Aplicar els coneixements sobre: àlgebra lineal; geometria; càlcul diferencial i integral; mètodes numèrics; estadística.

Transversal:
1. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
2. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
3. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
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Teaching methodology

The weekly lectures consist in 4 hours (2 sessions of 2 h each).
During the sessions:
- Theory lectures (new concepts and basic tools, with application examples)
- In-class tutorials

Activities schedule may change, depending on the difficulty of the exercises and the corresponding contents. The supporting material to be used will be available at the virtual campus site.

Learning objectives of the subject

At the end of the course the student should be able to:
- Apply logical reasoning and mathematical tools within relevant contexts, as well as display proficiency with the covered software.
- Make conversions between number systems and basic operations of matrix calculus.
- Solving basic problems of mathematical analysis in a variable for differentiable functions and / or integrated into a dimension with both analytical and numerical means.
- Graphic the main elementary functions.
- Understand the basics of optimization and solve basic problems.
- Carry out tasks on time, working with information sources, according to the guidelines set by lecturers.
- Carry out autonomous learning.
- Work in groups.
- Access and utilize the milieu of resources that exist within electronic databases or on campus.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
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<tbody>
<tr>
<td>Hours large group: 34h 22.67%</td>
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<td>Hours medium group: 16h 10.67%</td>
</tr>
<tr>
<td>Hours small group: 0h 0.00%</td>
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<td>Self study: 90h 60.00%</td>
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# Content

## 1. Algebra

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<td>Practical classes: 4h</td>
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<td>Self study : 6h</td>
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**Description:**
Introduction to numerical systems and Boolean algebra
- Numbers and representation
- Boolean Algebra

**Related activities:**
Lectures and tutorial exercises

## 2. Trigonometry

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<td>Self study : 9h</td>
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**Description:**
Description of relations of length and angles in a triangle and main trigonometric functions
- The unit circle
- Trigonometric functions
- Identities, double angle formula and basic relations

## 3. Vectors and matrices

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<td>Self study : 15h</td>
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</table>

**Description:**
Vectorial and matricial calculus
- Vectors 2D and 3D.
- Vectorial calculus
- Scalar product: distance, angle between vector lines
- Inverse matrix
## 4. Functions

**Learning time:** 40h  
Practical classes: 16h  
Self study: 24h

**Description:**
- Description of functions
- Domain, rank and inverse. Basic functions and representation.
- Definition of limit. Continuity. Types of functions.
- Bolzano and Weirstrass theorems.
- Solutions of systems of linear equations.

## 5. Analytical geometry 2D

**Learning time:** 20h  
Practical classes: 8h  
Self study: 12h

**Description:**
- Description of the spatial relation between geometrical elements
- Coordinate system. Change of coordinate system.
- Definition of lines, circles, planes in the space.
- Relative positions.
- Curve description

## 6. Differential calculus

**Learning time:** 30h  
Practical classes: 12h  
Self study: 18h

**Description:**
- Description and application of derivatives and integration methods
- Derivative definition.
- Standard derivatives, composition and high order derivatives.
- Application: gradient, tangent, normal, maxima/minima.
- Integration definitions
- Standard and definite integrals.
- System of differential equations.
- Interpolation/approximation
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7. Statistics and probability

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<tr>
<td>Basic concepts on statistical and probabilistic analysis</td>
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<tr>
<td>- Numerical series and convergence</td>
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<tr>
<td>- Basic statistics</td>
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<tr>
<td>- Probability and combinatorial.</td>
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Learning time: 10h

- Practical classes: 4h
- Self study: 6h

Qualification system

Subject qualification follows a continued evaluation system. There will be two written tests during the course (Partial I and Partial II), five (5) tutorial exercises to be submitted within the corresponding deadline, and a final exam. The weights of each part are the following:

- Partial Exam I  20 %
- Partial Exam II  20 %
- Final Exam  30 %
- Tutorial Exercises (5)  20 %
- Participation  10 %

The pass degree is obtained on getting at least a mark of 5 in the final evaluation, computed by considering the weights detailed above. Miss-submitting an exam or tutorial exercise results on a null mark for that deliverable. At least, the 60% of deliverables should be submitted/attended. On the contrary, the student will be considered as NOT PRESENTED.

If the pass mark is not obtained, there is the possibility of a reevaluation exam. The qualification of this exam will substitute those of the partial and final exams. The maximum mark to be obtained in the reevaluation is 5.

Regulations for carrying out activities

In-class exercises:
During the theory lectures, student will develop exercises to be discussed and solved in the same lecture. These exercises act as training to develop the Tutorial Exercises (individual).

Tutorial Exercises (TE):
At the beginning of each package, the corresponding tutorial exercises (TE) will be delivered, and should be submitted within the indicated deadline, in pdf format. Complementary material (Excel, Matlab, Phyton), if convenient, should be submitted as well.
Bibliography

Basic:


Complementary:


Others resources: