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: 2018
Degree: BACHELOR'S DEGREE IN VIDEO GAME DESIGN AND DEVELOPMENT (Syllabus 2014). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN VIDEO GAME DESIGN AND DEVELOPMENT (Syllabus 2014). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: Gutiérrez Antuñano, Miguel Ángel
Others: Sánchez Corrales, Helem Sabina

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 plantejar-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.

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 mileu of resourses that exist within electronic databases or on campus.

## Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 34h</th>
<th>22.67%</th>
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</thead>
<tbody>
<tr>
<td>Hours medium group: 16h</td>
<td>10.67%</td>
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<tr>
<td>Hours small group: 0h</td>
<td>0.00%</td>
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<tr>
<td>Guided activities: 10h</td>
<td>6.67%</td>
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<tr>
<td>Self study: 90h</td>
<td>60.00%</td>
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</table>
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## Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time</th>
<th>Description</th>
<th>Related activities</th>
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</thead>
<tbody>
<tr>
<td><strong>1. Algebra</strong></td>
<td>10h</td>
<td><strong>Description:</strong> Introduction to numerical systems and Boolean algebra</td>
<td><strong>Related activities:</strong> Lectures and tutorial exercises</td>
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<tr>
<td></td>
<td></td>
<td>- Numbers and representation</td>
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<tr>
<td></td>
<td></td>
<td>- Boolean Algebra</td>
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<tr>
<td><strong>2. Trigonometry</strong></td>
<td>15h</td>
<td><strong>Description:</strong> Description of relations of length and angles in a triangle and main trigonometric functions</td>
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<td></td>
<td></td>
<td>- The unit circle</td>
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<td></td>
<td></td>
<td>- Trigonometric functions</td>
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<td></td>
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<td>- Identities, double angle formula and basic relations</td>
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<tr>
<td><strong>3. Vectors and matrices</strong></td>
<td>25h</td>
<td><strong>Description:</strong> Vectorial and matricial calculus</td>
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<tr>
<td></td>
<td></td>
<td>- Vectors 2D and 3D</td>
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<tr>
<td></td>
<td></td>
<td>- Vectorial calculus</td>
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<td></td>
<td></td>
<td>- Scalar product: distance, angle between vector lines</td>
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<td></td>
<td></td>
<td>- Inverse matrix</td>
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</tbody>
</table>
## 4. Functions

**Description:**
- 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.

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

## 5. Analytical geometry 2D

**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

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

## 6. Differential calculus

**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.

**Learning time:** 30h
- Practical classes: 12h
- Self study: 18h
7. Statistics and probability

**Description:**
Basic concepts on statistical and probabilistic analysis
- Basic statistics
- Probability and combinatorial.

<table>
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<tr>
<th>Learning time:</th>
<th>10h</th>
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<tbody>
<tr>
<td>Practical classes:</td>
<td>4h</td>
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<tr>
<td>Self study:</td>
<td>6h</td>
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**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. A

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 exercices:
during the theory lectures, student will develope exercices to be discussed and solved in the same lecture. These exercices act as training to develope the Tutorial Exercices (individual).

Tutorial Exercices (TE):
At the beginning of each package, the corresponding tutorial exercices (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.
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Bibliography

Basic:


Complementary:


Others resources: