Course guides
270180 - DCS - Curve and Surface Design

Unit in charge: Barcelona School of Informatics
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2021  ECTS Credits: 6.0  Languages: English

LECTURER
Coordinating lecturer: RODRIGO IGNACIO SILVEIRA ISOBA
Others: Segon quadrimestre: RODRIGO IGNACIO SILVEIRA ISOBA - 10

PRIOR SKILLS
- English
- Basic knowledge of JavaScript

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

General:
G3. THIRD LANGUAGE: to know the English language in a correct oral and written level, and accordingly to the needs of the graduates in Informatics Engineering. Capacity to work in a multidisciplinary group and in a multi-language environment and to communicate, orally and in a written way, knowledge, procedures, results and ideas related to the technical informatics engineer profession.
G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.
G9. PROPER THINKING HABITS: capacity of critical, logical and mathematical reasoning. Capacity to solve problems in her study area. Abstraction capacity: capacity to create and use models that reflect real situations. Capacity to design and perform simple experiments and analyse and interpret its results. Analysis, synthesis and evaluation capacity.

TEACHING METHODOLOGY
The course has a theoretical and a practical part. The theory lectures will introduce the main mathematical concepts related to the different types of curves and surfaces. The students will get familiar with the practical aspects of these different topics by carrying out a number of practical, implementation-based assignments.

LEARNING OBJECTIVES OF THE SUBJECT
1. Know the main types of curves used in graphics and CAD/CAM
2. Become familiar with practical aspects in the implementation of algorithms for curves
3. Know some of the types of surfaces used in graphics and CAD/CAM
4. Become familiar with practical aspects in the implementation of algorithms for surfaces
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>3.57</td>
</tr>
<tr>
<td>Laboratory classes</td>
<td>60,0</td>
<td>35.71</td>
</tr>
<tr>
<td>Self study</td>
<td>102,0</td>
<td>60.71</td>
</tr>
</tbody>
</table>

Total learning time: 168 h

CONTENTS

Fundamentals
Description:
Basic notions of vector and affine spaces. Parametrizations of affine varieties.

Parametrizing curves
Description:
How to mathematically describe a curve. Tangent vector, normal vector, osculating plane and curvature. Conics.

Interpolating curves
Description:

Approximating curves
Description:
Bézier curves. B-Splines. Considerations on the efficiency of the computation of the curves.

Surfaces: parametrization and approximation
Description:
Methods to model a surface. Quadric surfaces. Vector normal to a surface at a point. Bézier surfaces. NURBS surfaces.
## ACTIVITIES

### Theory

**Description:**
Lectures about the different types of curves and surfaces

**Specific objectives:**
1, 3

**Related competencies:**
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G9. PROPER THINKING HABITS: capacity of critical, logical and mathematical reasoning. Capacity to solve problems in her study area. Abstraction capacity: capacity to create and use models that reflect real situations. Capacity to design and perform simple experiments and analyse and interpret its results. Analysis, synthesis and evaluation capacity.

**Full-or-part-time:** 41h 30m
Theory classes: 36h 30m
Self study: 5h

### Lab work

**Description:**
Implementation of some of the topics covered in the theory lectures

**Specific objectives:**
2, 4

**Related competencies:**
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G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

**Full-or-part-time:** 34h 36m
Laboratory classes: 15h 48m
Guided activities: 3h 48m
Self study: 15h
Exam

Specific objectives:
1, 2, 3, 4

Related competencies:
G3. THIRD LANGUAGE: to know the English language in a correct oral and written level, and accordingly to the needs of the graduates in Informatics Engineering. Capacity to work in a multidisciplinary group and in a multi-language environment and to communicate, orally and in a written way, knowledge, procedures, results and ideas related to the technical informatics engineer profession.
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G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 14h
Theory classes: 1h
Laboratory classes: 3h
Self study: 10h

GRADING SYSTEM
The course will be graded based on:
- Handing-in the practical assignments that will be carried out during the lab sessions (50% of the final grade).
- A final exam, covering theory and practice (50% of the final grade).

BIBLIOGRAPHY

Basic:

Complementary: