

Course guide

270180 - DCS - Curve and Surface Design

Last modified: 30/01/2024

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: 2023 **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

Generical:

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

Type	Hours	Percentage
Guided activities	6,0	3.57
Self study	102,0	60.71
Hours small group	60,0	35.71

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:

Piecewise linear interpolation. Polynomial interpolation. Uniform and non-uniform polynomial parametric interpolation. Hermite (cubic) interpolation. Spline interpolation.

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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Full-or-part-time: 44h

Theory classes: 29h

Self study: 15h

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: 92h

Laboratory classes: 27h

Self study: 65h



Exam

Specific objectives:

1, 2, 3, 4

Related competencies :

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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:

- Salomon, D. Curves and surfaces for computer graphics. Springer, 2006. ISBN 0387241965.
- Farin, G.E. Curves and surfaces for CAGD: a practical guide. 5th ed. Morgan Kaufmann : Academic Press, 2002. ISBN 9781558607378.

Complementary:

- De Boor, C. A practical guide to splines. Rev. ed. Springer-Verlag, 2001. ISBN 0387953663.