Universitat Autònoma de Barcelona

2020/2021

3D Visualisation

Code: 104391
ECTS Credits: 6

Degree	Type	Year	Semester
2503740 Computational Mathematics and Data Analytics	OB	2	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Enric Martí Godia

Prerequisites

Linear Algebra

Objectives and Contextualisation

The main objective is to provide students with the theoretical framework necessary to graphically represent three-dimensional objects and recover their geometric properties from two-dimensional projections.

Competences

- Calculate and reproduce certain mathematical routines and processes with ease.
- Demonstrate a high capacity for abstraction and translation of phenomena and behaviors to mathematical formulations.
- Formulate hypotheses and think up strategies to confirm or refute them.
- Make effective use of bibliographical resources and electronic resources to obtain information.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Work cooperatively in a multidisciplinary context assuming and respecting the role of the different members of the team.

Learning Outcomes

1. "Explain ideas and mathematical concepts pertinent to the course; additionally, communicate personal reasonings to third parties."
2. Contrast, if possible, the use of calculation with the use of abstraction in solving a problem.
3. Develop autonomous strategies for solving problems such as identifying the ambit of problems within the course, discriminate routine from non-routine problems, design an a priori strategy to solve a problem, evaluate this strategy.
4. Evaluate the advantages and disadvantages of using calculation and abstraction.
5. Make effective use of bibliographical resources and electronic resources to obtain information.
6. Manage homographic transformations and consequent representation.
7. Manage quaternions in data-representation algorithms.
8. Read and understand a mathematical text at the current level of the course.
9. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
10. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
11. Understand the group of quaternions and their application to geometry and visualization.
12. Work cooperatively in a multidisciplinary context, taking on and respecting the role of the distinct members in the team.

Content

1. Euclidean geometry. Rigid motions. Clifford's algebras, quaternions and rotations.

2. Affine geometry. Affine transformations, simple ratio, convex combinations of points. Bezier's curves.

3. Projective geometry. Projectivities, cross ratio.

4. Differential geometry of curves. Frenet's frame.

Methodology

There will be three types of directed activities: theory classes where the concepts of the subject will be introduced, problem classes where the students will manipulate these concepts and seminary classes where specific software will be used to obtain accurate graphic representations of three-dimensional objects.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problems	13	0.52	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 12, 5
Seminars	10	0.4	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 12, 5
Theory	30	1.2	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 12, 5
Type: Supervised			
Tutorship sessions	10	0.4	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 12, 5
Type: Autonomous			
Programming	27	1.08	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 12, 5
Solving problems	27	1.08	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 12, 5

Study	25	1	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 12, 5

Assessment

The evaluation will consist of an intrasemestral exam that will count 40% of the note, an examination at the end of the semester that will count 40% of the note and the remaining 20% will be obtained from the work made in the seminar classes. In case that the continuous assessment note thus obtained does not reach 5, the student who has completed 2/3 of the evaluation activities may take a recovery exam whose grade will substitute that of the two partial exams.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Final exam	40%	3	0.12	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 5
Midterm exam	40%	3	0.12	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 5
Seminar work	20%	2	0.08	4, 2, 11, 3, 1, 8, 7, 6, 10, 9, 12, 5

Bibliography

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