1. BASIC INFORMATION

Course	Architectural Geometry
Degree program	Bachelor's in the Fundamentals of Architecture 85% english
School	Architecture, Engineering and Design
Year	First year
ECTS	6 ECTS (150 hours)
Credit type	Basic
Language(s)	English
Delivery mode	Classroom
Semester	2
Academic year	2025/2026
Coordinating professor	Diego García Cuevas
Professor	Diego García Cuevas / Jorge Cerdá Inglés/ Raquel Serrano Vázquez / Eduardo González Requeijo / Víctor Tellado Milesi

2. PRESENTATION

This course is taught in the second semester of the first year of the degree. It prepares the student both to analyse and interpret geometric forms and surfaces present in architecture, as well as to generate them under the criteria of architectural and constructive logic. With geometry, students are introduced to the use of physical and digital instruments as tools in the resolution of architectural problems of a geometric nature and as a means of transmitting their own ideas. The workshop develops own knowledge and skills acquired in the other courses taught simultaneously in which a cross-curricular coordination project is carried out through exercises, activities and joint sessions. In this way, the student will get a global vision of their studies and will understand the need for the continuous connection between the different types of knowledge.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies: 1,2,3,4,5

- CB1 That students have demonstrated knowledge and understanding in a field of study that is based on general secondary education, at a level which, although supported by advanced textbooks, imply some knowledge of the latest advances in their field of study.
- CB2 That students can apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defence of arguments and the resolution of problems within their area of study.
- CB3 That students have the ability to gather and interpret relevant data (usually within their field of study) to make judgements that include reflection on relevant social, scientific or ethical issues.
- CB4 That students can communicate information, ideas, problems and solutions to both the specialist and non-specialist.
- CB5 That students have developed the necessary learning skills to undertake further studies with a high level of autonomy.

Cross-curricular competencies: 2,4,5,6,9,10

- CT02 Self-confidence.
- CT04 Communication skills in the native language (both oral and written) and in the English language, in accordance with the principles of the *Universidad Europea de Madrid*, any concept or specification for the development of the regulated profession of architect. This includes learning the specific vocabulary of the degree as well as the ability to manage information.
- CT05 Interpersonal skills.
- CT06 Flexibility
- CT09 Planning and time management: ability to plan work in order to comply with delivery times and to respect the limits imposed by budgets and building codes.
- CT10 Innovation and creativity: creativity, imagination and aesthetic sensitivity applied to the design in order to satisfy the both the aesthetic and technical demands. This competence includes critical reasoning and historical culture.

Specific competencies: 1,5

- CE01 Ability to apply graphic procedures to the representation of spaces and objects.
- CE05 Knowledge of metric and projective geometry adapted and applied to architecture and urbanism.

Learning outcomes: 1,2,3,4,5

- LO1: understand the fundamental concepts related to geometry
- LO2: understand and graphically analyze the shape under the parameters of the metric and analytical representation systems using the computer tools to use.
- LO3: apply planning criteria when approaching the work, both individually and in groups.
- LO4: Initiative to deepen the search for fundamental bibliographic sources related to geometry.
- LO5: understand, communicate and express ideas in the language of geometry

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB1, CG1	LO1: understand the fundamental concepts related to geometry
CB4, CT10, CE1, CE5	LO2: understand and graphically analyze the shape under the parameters of the metric and analytical representation systems using the computer tools to use.
CT6, CT9, CT5	LO3: apply planning criteria when approaching the work, both individually and in groups.
CB3, CB5	LO4: Initiative to deepen the search for fundamental bibliographic sources related to geometry.
CB2, CT2, CB4, CT4, CT5, CE1	LO5: understand, communicate and express ideas in the language of geometry

4. CONTENT

The subject is organized into five Learning Units (U.A.), which, in turn, are divided into subjects each (depending on the units). In addition, the set of objectives that were set globally for the module are specifically linked to the development of each unit:

Unit 1: CAD drawing with Rhinoceros. Interface and basic tools. Delineated small models. Scale control and printing.

1.1 CAD of simple models. Workshop format, presentation and public-collective correction.
1.2 Construction of arches and flat curves. Workshop format, presentation and public-collective correction.
1.3 Construction of polygons and flat geometry. Workshop format, presentation and public-collective correction.
1.4 Assessable activity (exam). Development of a flat model. Workshop format, presentation and public-collective correction.

Unit 2: Architectural geometric analysis. Operations in 2 and 3 dimensions and its projection on the plane. Analysis of geometric concepts in buildings. Integration of architectural representation techniques. Graphic narration of the project.

2.1 Construction and control of free curves. Workshop format, presentation and public-collective correction.
2.2 Construction and control of free curves in Architecture. Workshop format, presentation and public-collective correction.
2.3 Transformations in the three-dimensional Euclidean environment. Workshop format, presentation and public-collective correction.
2.4 Basic Boolean Algebra Workshop format, presentation and public-collective correction.
2.5 Advanced Boolean algebra. Workshop format, presentation and public-collective correction.
2.6 Edition of solids. Workshop format, presentation and public-collective correction

Unit 3: Architectural geometric analysis with parametric systems. Operations in 2 and 3 dimensions of parametric form and its projection on the plane. Analysis of geometric concepts in buildings. Integration of architectural representation techniques. Graphic narration of the project.

3.1 Parametric design, creation of points and curves. Workshop format, presentation and public-collective correction.
3.2 Parametric design, drawing by coordinates. Workshop format, presentation and public-collective correction.
3.3 Parametric design, creation of ruled surfaces. Workshop format, presentation and public-collective correction.

Unit 4: Integration of the knowledge acquired in a project. Operations in 2 and 3 dimensions of parametric form and its projection on the plane. Analysis of geometric concepts in buildings. Integration of architectural representation techniques. Graphic narration of the project. Integrates knowledge of physical modeling and digital manufacturing through CNC cutting to an architectural graphic model using the same language

4.1 Editing of ruled surfaces. Workshop format, presentation and public-collective correction.

Unit 5: Portfolio. - Layout: image, color and typography.

5.1 Preparation of a graphic portfolio with the course exercises. Workshop format, presentation and public-collective correction

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Master class.
- Cooperative learning.
- Problem based learning.
- Project based learning.

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one as well as the course policy about the use of artificial intelligence (AI) in that activity.

Campus-based mode:

Learning activity	Number of hours	Use of AI
Lectures	12.5 h	Promoted
Guided studies, practical exercises and problem solving	50 h	Allowed for examples, not for evaluation
Presentation of projects	12.5 h	Allowed for examples, not for evaluation
Team work	12.5 h	Promoted
Independent study/work	37.5 h	Promoted
Tutorials, academic monitoring and assesment	25 h	Promoted
Lab work	0	
Internships	0	
TOTAL	**150h**	

Further details about the AI-use will be published through the virtual campus platform once the course started.

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Campus-based mode:

Assessment system	Weight
Activity 1: Simple models in CAD	5 %
Activity 2: Arcs and planar curves construction	5 %
Activity 3: Polygons and planar geometry construction	5 %
Activity 4: Exam. Development of a planar model	5 %
Activity 5: Construction and control of freeform curves	5 %
Activity 6: Construction and control of freeform curves in Architecture	5 %
Activity 7: Transformations in the Euclidean space	5 %
Activity 8: Basic booleans	10 %
Activity 9: Advanced Booleans	10%
Activity 10 : Solids edition	10%
Activity 11: Parametric design, points and curves	10%
Activity 12: Parametric design, drawing by coordinates. Ruled surfaces	10%
Activity 13: Graphic portfolio	15%

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average).

Assignments

- 1 – 12 assignments
- 13 Portfolio

The submission of all is compulsory to pass. If one of the activities is missing in the first call submission, the student will be graded as maximum 4 out of 10 and will go to the second call period and submission.
An additional test will be given in case there are authorship doubts.

7.2. Second exam period

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

The student must submit all the activities after having received the corresponding corrections from the professor in the three tutorial lessons. If one of the activities is missing, the student will be graded as maximum 4 out of 10.

An additional test will be given in case there are authorship doubts.

8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Activity 1: Simple models in CAD	Week 1
Activity 2: Arcs and planar curves construction	Week 2
Activity 3: Polygons and planar geometry construction	Week 3
Activity 4: Exam. Development of a planar model	Week 4
Activity 5: Construction and control of freeform curves	Week 5
Activity 6: Construction and control of freeform curves in Architecture	Week 6
Activity 7: Transformations in the Euclidean space	Week 7
Activity 8: Basic booleans	Week 8
Activity 9: Advanced Booleans	Week 9
Activity 10 : Solids edition	Week 10
Activity 11: Parametric design, points and curves	Week 11
Activity 12: Parametric design, drawing by coordinates. Ruled surfaces	Week 12
Activity 13: Graphic portfolio	Weeks 13 to 15

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.
Minimum attendance of 70% is required (as assessed by the University) to be able to submit in first call period, submitting in second call.

9. BIBLIOGRAFÍA

The main reference works for this subject is:

- TEDESCHI, Arturo. AAD Algorithms-Aided Design. Parametric strategies using grasshopper. Le Penseur, Milano, 2014.
- ALMAGRO GORBEA, Antonio. El levantamiento arquitectónico. Granada: Universidad de Granada, 2004.
- BOIS, Yves-Alain. 'Metamorphoses of axonometry' in AAVV, De Stijl. Neo Plasticism in Architecture. Delft: Delft University Press, 1983.
- CHING Francis D. K. 'Architecture: Form, Space, & Order'. John Wiley & Sons Inc., 4th edition, 2014.
- CHING Francis D. K. 'Architectural Graphics'. John Wiley & Sons Inc., 6th edition, 2015.
- LEWIS, Paul and TSURUMAKI, Marc. 'Manual of section'. Princeton: Princeton Architectural Press, 2016.
- DI MARI, Anthony and YOO, Nora. 'Operative Design: a catalogue of Spatial Verbs'. Amsterdam: BIS Publishers, 2013.
- ZELL, Mo. 'The architectural drawing course: understand the principles and master the practices'. Thames and Hudson Ltd., 2008.
- NEUFERT, Ernst and NEUFERT, Peter. 'Architect's data'. Wiley-Blackwell, 4th edition, 2012.
- DI MARCO, Giancarlo. Simplified Complexity. Method for advanced modelling NURBS with Rhinoceros. Le penseur, Milano, 2018.

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:
orientacioneducativa@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.