

## GEOMETRY AND PROJECTION I

Degree in Graphical Design

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Code: 11508

Main Scientific Area: Drawing

Lecturer: Manuel António Carneiro Gaspar de Melo Albino

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 95h

ECTS: 6,0

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### Objectives

Discover the history and the cultural relations present in the concepts of geometry as a discipline that relates design, mathematics and art.

Promote a rigorous and rational approach to the design and mathematical principles underlying it in various systems of representation.

Cultivating the "spirit of rigor", discovering the potential of a rational approach to representation and its communicative and plastic properties.

### Learning Outcomes

- Have the analytical ability to interpret geometrically visual and spatial forms;
- Enhance the creativity in the production of visual patterns using geometric transformation processes;
- Have the capacity of producing formal synthesis;
- Have the power to understand and decode representations in technical drawing acquiring knowledge of their representation standards.

### Course Contents

Two-dimensional constructions

Simple geometric constructions: parallelism, squareness, typology and properties of angles between two straight lines, properties and typology of polygons, homotheties, symmetries, concetricity and eccentricity between circumferences, notions of scale, etc.;

Tangency and concordances between lines and circles using various concepts and constructs: positive and negative dilation centers, axis and radical center, operation of inversion, etc.;

Conic curves: construction and properties of circles, ellipses, parabolas and hyperbolas.

Introduction to geometric transformations. Introduction to regular division of surface and symmetries in the plan.

Technical drawing

Representation standards in technical drawing (dimensioning, subtitles, type of strokes, project sheets, representation and function of cuts and sections in standard technical drawings);

Distinction between European and American methods of projection;

Representation of polyhedrons;

Representation of solids of revolution;

Representation of compounds of solids of revolution (intersection of projecting plans with cylinders, cones, spheres, ellipsoids, and torus; intersection of solids of revolution: two cylinders, a cylinder and a sphere, a cylinder and a cone, two cone, a cylinder and an ellipsoid, a torus and a cylinder, etc.);  
Plane representation of polyhedral and solids of revolution.

### **Recommended Bibliography**

Cunha, L. V. (1982). Desenho Técnico . Fundação Calouste Gulbenkian, Lisboa.  
Morais, S.(2007) Desenho Técnico Básico 3, 24ª Edição . Porto Editora: Porto.  
Abajo, F. J.R.B.; Álvares, V. (1984) Dibujo Tecnico . Ed. Donostiarra: San Sebastian, Espanha.

### **Learning and Teaching Methods**

The four work proposals submitted in Geometry and Projection I cover the main objectives of the course because:  
When addressing the divisions of regular surfaces the student comes into direct contact with various geometric constructions problems, including regular polygons, with a practical outcome of wide application in different areas of Design: standardization, modularization, illustration, etc.

In the second work proposal the student have to represent accurately a wrought iron panel using only tangent circles and straight lines in order to verify the properties of the simplest geometrical shapes and their relations: secant, tangent, parallel, concentric, eccentric, etc.

In the third work proposal the student brings together the knowledge acquired on the properties of isometries in the plane, with the knowledge of geometric constructions of concordances and tangency, to create a panel that constitutes a cylindrical rapport.

In the fourth work proposal the student experience the formal and metric transposition of an three-dimensional object. It is a crucial stage of the semester in which the student ceases to think only in two-dimensional shapes and comes to represent three-dimensional objects. It is with this experience that the student begins to realize the problems of rigorous measurement and representation.

### **Assessment Methods**

35% Project 01> Isometries in the Plan  
(Visual patterns and regular surface division)  
Creating original compositions of geometric patterns (3 studies in A3 sheets). Study and analysis of Islamic patterns (3 studies in A3 sheets).

35% Project 02> geometric constructions and concordances  
Interpretation and synthesis, in rigorous geometric design, a wrought iron panel.  
Research (5%): 6 (six) studies on A3 sheets of parchment paper or millimeter paper in pencil, and previous studies of synthesis of form made with teacher monitoring.  
Final Object (20%): pencil end panel A3 sheet of paper horse.

30% of the evaluation will be dedicated to a theoretical and practical test carried out in a class to be determined. This test is of mandatory presence and execution and, when failure to appear the same, be a sufficient condition to reproof.