

POLI ESCOLA SUPERIOR TECNOLOGIA GESTÃO TÉCNICO GUARDA	SUBJECT DESCRIPTION	MODELO PED.013.03
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Course	Topographic Engineering					
Subject	Mathematical Cartography					
Academic year	2023/2024	Curricular year	3rd	Study period	1st semester	
Type of subject	Compulsory	Student workload (H)	Total: 168	Contact: 75	ECTS	6
Professor(s)	Maria Elisabete Santos Soares, Ph.D.					
<input checked="" type="checkbox"/> Area/Group Coordinator <input type="checkbox"/> Head of Department	(select)	Maria Elisabete Santos Soares, Ph.D.				

PLANNED SUBJECT DESCRIPTION

1. LEARNING OBJECTIVES

Study different models to project and represent the Earth's surface in a plane and their associated deformations. Study the several cartographic projection systems used in Cartography, namely in Portuguese Cartography. Recognize and know how to interpret the various cartographic projection systems used in Portuguese Cartography. Study and apply coordinate transformation models between different geo-cartographic systems. At the end, the student should be able to recognize the parameters associated with cartographic projection systems related to Portuguese Cartography, be able to solve and interpret the transformation of coordinates between different geo-cartographic systems.

2. PROGRAMME

1. Reference surfaces. Geodetic datum.
2. Geometry of the meridian ellipse.
3. Cartographic projections.
4. Cylindrical transverse conform Gauss projection.
5. Geographic and cartographic grids for Portuguese cartography.
6. Cartographic projections systems for Portuguese cartography.
7. Transformation of coordinates between geo-cartographic systems. Coordinate transformation models. Use of different computer programs for transforming coordinates. Analysis of the different results obtained, considering the use of different computer programs and the several transformation models. Practical application.
8. Analysis and calculation of elements in a reference system. Linear deformation module (scale factor). Convergence of meridians. Angular applications.
9. Cartographic representation systems. Surface theory.

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

The syllabus of the curricular unit is developed in order to enable the student to know the mathematical models available for the projection of the Earth's surface on the plane and the associated deformations, focusing especially on the cartographic projection systems used in Portuguese cartography. The study of the geometry of the meridian ellipse and the theoretical models of the Earth's surface allow the spatial visualization and consequent understanding of the positions on the reference surface and their corresponding in the plane. The study of the various geo-cartographic systems, their characteristics and parameters, aims to understand and analyse their differences and how they relate to each other in order to perform the transformation of coordinates between them and be able to interpret the results.

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4. MAIN BIBLIOGRAPHY

Compulsory:

[1] Soares, M.E.S (2019) *Cartografia Matemática Textos de apoio à lecionação das aulas teóricas da UC Cartografia Matemática da licenciatura em Engenharia Topográfica*, 2.ª Edição, 108pp. Instituto Politécnico da Guarda, Portugal.

[2] Gaspar, J.A. (2005) *Cartas e Projecções Cartográficas*, Lidel – Edições Técnicas, Lisboa.

[3] Soares, F.J.M. (2014) *Sistemas de Referenciação*, 4.ª Edição, Instituto Geográfico do Exército, Lisboa.

Recommended:

[1] Asin, F.M. (1990) *Geodesia y Cartografia Matemática*, Editorial Paraninfo S.A., Madrid.

[2] Casaca, J.; Matos, J.; Baio, M., (2000) *Topografia Geral*, Lidel – Edições Técnicas. Lisboa.

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

The programme is transmitted using the theoretical, theoretical-practical and practical expository method in order to provide the student with knowledge to solve problems related to the contents. Use of audio-visual media and computer software.

Resolution of practical exercises. Carrying out practical work. Availability of e-learning contents.

Continuous Evaluation: practical work with oral presentation (30%) + theoretical-practical test (70%).

It is planned to carry out 3 practical works: a work of bibliographic research that deals with a topic requested by the teacher; an analysis of cartographic coordinate systems; a coordinate transformation work.

Practical work is valid for the current academic year.

Evaluation not continuous: theoretical-practical exam (100%).

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

The resolution of practical exercises for the application of the theoretical and theoretical-practical contents taught helps in understanding these contents in a more objective way.

The use of different computer programs to solve problems related to coordinate transformation, makes it possible to understand the available geo-cartographic coordinate transformation models and their respective parameters, as well as the differences between the various cartographic projection systems. The confrontation of results obtained by analytical resolution with those obtained by the use of the computer program stimulates critical thinking. Learning is reinforced by the development of thematic research, which the student will have to present to the class. This technique allows promoting the discussion of the various topics studied and sharing the knowledge acquired.

7. ATTENDANCE

Nothing to refer.

8. CONTACTS AND OFFICE HOURS

Email: esoares@ipg.pt

Office: 71 (ESTG)

Office hours:

Wednesday (11:30 am to 12:30 pm)

Thursday (10:30 am to 12:30 pm)

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9. OTHERS

Nothing to refer.

DATE

22 de setembro de 2023

SIGNATURES

Professor

(Maria Elisabete Santos Soares)

Area/Group Coordinator

(Maria Elisabete Santos Soares)