

## Course guide

# 250565 - GCMSINGEOG - Geographical Information Systems and Gns

Last modified: 30/05/2024

**Unit in charge:** Barcelona School of Civil Engineering

**Teaching unit:** 751 - DECA - Department of Civil and Environmental Engineering.

**Degree:** BACHELOR'S DEGREE IN MARINE SCIENCE AND TECHNOLOGY (Syllabus 2018). (Compulsory subject).

**Academic year:** 2024

**ECTS Credits:** 6.0

**Languages:** Catalan

## LECTURER

**Coordinating lecturer:**

**Others:**

## DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

### Specific:

13388. To know and apply the lexicon and concepts of the Marine Sciences and Technologies and other related fields.

13390. Establish a good practice in the integration of common numerical, laboratory and field techniques in the analysis of any problem related to the marine environment.

13401. Apply spatial and cartographic representation techniques for different environments and scales.

### Generical:

13380. Develop a professional activity in the field of Marine Sciences and Technologies.

13381. Address in a comprehensive manner the analysis and preservation of the marine environment with sustainability criteria.

13383. Develop a conceptual framework that links the scientific-technological and management aspects for marine resources, explaining the interactions with marine infrastructures and management plans in coastal areas.

13387. Combining preservation with economic activity within the framework of current legislation promoting the development of a social and environmental awareness.

## TEACHING METHODOLOGY

## LEARNING OBJECTIVES OF THE SUBJECT

## STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	20.00
Self study	90,0	60.00
Hours medium group	15,0	10.00
Hours small group	15,0	10.00

**Total learning time:** 150 h



## CONTENTS

### Introduction

**Description:**

What are GIS and GNSS used for?

**Full-or-part-time:** 4h 48m

Theory classes: 2h

Self study : 2h 48m

### Coordinate Reference Systems

**Description:**

Geoid and ellipsoid. Coordinate systems. Geodetic and altimetric networks. Sea reference levels and measurement methods.

Cartographic projections

Exercises

LAB 1. Introduction to the GIS, coordinate reference systems

**Specific objectives:**

Know the reference systems used in cartography and the different reference levels of the sea.

**Full-or-part-time:** 26h 24m

Theory classes: 6h

Practical classes: 2h

Laboratory classes: 3h

Self study : 15h 24m

### Geographic Information Systems

**Description:**

Data structure

Concepts of relational databases. Entity-relationship model. Primary and external keys. Integrity rules. Data relationship type.

SQL queries

3D data structure

GIS tools and techniques for combining vector maps and rasters, using topological properties of connectivity, proximity, inclusion, neighborhood, etc. Vector and raster spatial analysis tools with different quantitative or qualitative variables, which are necessary for decision making.

Geoprocessing exercises

LAB. Data structure

LAB. Databases

LAB. Geoprocessing 1 and Geoprocessing 2

**Specific objectives:**

Organize the information in an optimized and related way in a relational database, and make inquiries in it later.

From a series of initial maps, obtain thematic maps derived using GIS spatial analysis tools, necessary for making decisions.

**Full-or-part-time:** 48h

Theory classes: 8h

Practical classes: 2h

Laboratory classes: 10h

Self study : 28h



### Capture Techniques Acquisition

**Description:**

GNSS

CAMP 1. RTK

CAMP 2. DGPS

LAB. Processing of 3D data

LIDAR (aerial and terrestrial)

CAMP 3. Acquisition of data obtained with LIDAR terrestre

LAB. LIDAR data processed

Photogrammetry applied to massive data capture

FIELD 4. Photogrammetric acquisition with Dron

LAB. Photogrammetric processing

Exercises

**Full-or-part-time:** 64h 48m

Theory classes: 8h

Practical classes: 2h

Laboratory classes: 17h

Self study : 37h 48m

## GRADING SYSTEM

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## BIBLIOGRAPHY

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**Basic:**

- Lekkerkerk, H.-J. GPS handbook: for professional GPS users. Emmeloord: CMedia Productions, 2007. ISBN 9789081275415.
- Heritage, G.L.; Large, A.R.G. Laser scanning for the environmental sciences. Chichester, UK ; Hoboken, NJ: Wiley-Blackwell, 2009. ISBN 9781405157179.
- Burrough, P.A.; McDonnell, R.A. Principles of geographical information systems. 3rd ed. Oxford: Oxford University Press, 2015. ISBN 9780198742845.
- Leick, A.; Rapoport, L.; Tatarnikov, D. GPS satellite surveying. 4th ed. New York: John Wiley & Sons, 2015. ISBN 9781118675571.

**Complementary:**

- Núñez-García, A.; Valbuena, J.L.; Velasco, J. GPS: la nueva era de la topografía. Madrid: Ediciones de las ciencias sociales, 1992. ISBN 8487510310.