COURSE DATA

DATA SUBJECT

Code: 36536
Name: Spatial and Spatio-temporal Data
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1332 - Degree in Business Intelligence and Analytics	Facultat d'Economia	3	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1332 - Degree in Business Intelligence and Analytics	Herramientas y Técnicas de Análisis de Datos	COMPULSORY

COORDINATION

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SUMMARY

Spatial and Spatio-Temporal Data is a compulsory subject within the area of Quantitative Methods for Economics and Business, taught in the second semester of the third year of the Bachelor's Degree in Business Intelligence and Analytics. It carries a total workload of 6 ECTS credits.

Nowadays, virtually all the information we generate (through connected devices) has a spatial component. Naturally, over time, this information also acquires a temporal dimension. Exploiting this type of data requires new methods and innovative talent that has not previously been applied.

Organizations are increasingly aware that, in order to remain competitive, they must understand the location of data, relying on the technologies provided by Geographic Information Systems (GIS). Geospatial data exploitation is a discipline focused on transforming spatial information into business value through data enrichment and predictive analysis.

The great usefulness of spatial data is based on Tobler's First Law of Geography (1970), which states: "*Everything is related to everything else, but near things are more related than distant things*".

In this subject, students will learn to perform spatio-temporal analyses, detect patterns, and make predictions using advanced statistical techniques. The approach is strongly practice-oriented, aiming to apply acquired knowledge to extract value from data with spatial and temporal dimensions.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

The course does not have any prerequisite. However, it is assumed that the student has some knowledge of the R statistical program.

COMPETENCES / LEARNING OUTCOMES

1332 - Degree in Business Intelligence and Analytics

Acquire basic training that can be used to learn new methods and technologies and to adapt to new situations in academic and professional areas.

Apply methods and techniques of analysis, synthesis and graphical representation by means of software tools.

Be able to analyse and search for information from diverse sources.

Be able to learn autonomously.

Be able to make autonomous decisions in digital environments characterised by the abundance and dynamism of data.

Be able to use ICT, both in academia and in professional practice.

Demonstrate skills for analysis and synthesis.

Express situations of uncertainty and randomness using mathematical, synthetic and graphic languages.

Make predictions using appropriate software tools to manage time series.

Manage and distinguish the concepts of universe, population, sample, parameters and estimators in real problems.

Reorganise and restructure variables and databases.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

DESCRIPTION OF CONTENTS

1. Introduction to spatial data

1.1. Types of spatial data.
1.2. Geographic Information Systems (GIS).
1.3. Sources and Aacquisition of spatial data.

2. Spatial data analysis

2.1. Descriptive analysis techniques.
2.2. Visualization of spatial data.
2.3. Spatial data exploration.

3. Spatial Models

3.1. Point Patterns.
3.2. Geostatistics.
3.3. Regional data.

4. Prediction with spatial data

4.1. Spatial prediction techniques.
4.2. Machine Learning algorithms for spatial data.

5. Multivariate and spatiotemporal data

5.1. Multivariate data.
5.2. Spatiotemporal data.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	15,00
Computer classroom practice	45,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	30,00
Independent study and work	30,00
Preparation of lessons	10,00
Preparation for assessment activities	20,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The subject is structured mainly around in-person sessions, both theoretical and practical. Theoretical sessions last one hour (25%), and practical sessions last three hours (75%). The methodology therefore emphasizes the more practical and computational aspects of the subject.

Theoretical sessions will present all the necessary concepts to subsequently undertake the practical work. The main teaching method will be participatory lectures, allowing the lecturer to address large student groups in an organized manner without limiting participation, thus fostering interaction between teacher and students. Class participation and discussion help assimilate new content and highlight the subject's practical relevance.

During practical sessions, the theoretical concepts will be implemented by applying technical aspects from a computational perspective using specialized software. Students will need to become familiar with this environment in order to solve the practical problems proposed. This gives a central role to the use of digital tools, which are essential in today¿s society. These sessions will include exercises based on real-world scenarios to help students practice solving problems similar to those they will encounter in assessed activities.

EVALUATION

During the course there will be several practices and assessment tests through which the students will be able to demonstrate the concepts acquired, both theoretical and practical. The total of the practices and assessment tests carried out will account for 60% of the final grade.

As a final project of the course, the students will have to carry out a research work in which they will have to reflect the knowledge acquired in the course. This report must be delivered, at the latest, on the date set for the first exam (40% of the final grade).

Although the practicals are not recoverable, students who do not pass the course in the first call will be able to recover the final report, which must be delivered, at the latest, on the date set for the exam of the

second call.

In order to apply the aforementioned percentages, it will be necessary to obtain at least a grade of 5 on the final project.

REFERENCES

Baddeley, A., Rubak, E., & Turner, R. (2021). Spatial point patterns: Methodology and applications with R. Chapman and Hall/CRC.

Bivand, R. S., Pebesma, E., & Gómez-Rubio, V. (2013). Applied Spatial Data Analysis with R (2nd ed.). Springer.

Brunsdon, C., & Comber, L. (2019). An introduction to R for spatial analysis and mapping (2nd ed.). SAGE Publications.

Lovelace, R., Nowosad, J., & Muenchow, J. (2025). Geocomputation with R (2nd ed.). Routledge.

Mas, J.F. (2013). Análisis espacial con R: Usa R como un Sistema de Información Geográfica. European Scientific Institute.

Pebesma, E. & Bivand, R. (2023). Spatial Data Science with Applications in R. Chapman and Hall/CRC.

Wikle, C. K., Zammit-Mangion, A., & Cressie, N. (2019). Spatio-temporal statistics with R. CRC Press.