Universitat Autònoma de Barcelona

2022/2023

Geospatial Data

Code: 43845
ECTS Credits: 6

Degree	Type	Year	Semester
4315985 Geoinformation	OB	0	1

Contact

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Use of Languages

Principal working language: spanish (spa)

Teachers

Meritxell Gisbert Traveria

External teachers

Dolors Barrot Feixat

Prerequisites

This course has no specific requirements. Students should only have a basic knowledge of using general software such as Windows, Excel and Word.

Objectives and Contextualisation

The aim of the course is to provide advanced knowledge of the data models and standards for geographic information with special focus on international data and metadata standards, both european (INSPIRE) and global (OGC and ISO).

The course also covers the principles of geospatial information representation, oriented to cartographic production and digital (web services and mobile apps) and analog (printable documents) publishing of geoinformation

Finnally, the course includes a revision of the principles and properties of spatial reference systems with focus on specifications and case studies.

Competences

- Be able to evaluate inequalities for reasons of sex and gender to design solutions.
- Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
- Continue the learning process, to a large extent autonomously.
- Design and elaborate cartographic documents and, in general, geovisualization of geospatial data products, and implement the corresponding production and publication processes using analogue and digital media.

- Differentiate between and use different data models and standard of geospatial information (digital cartography, spatial databases and metadata), and be able to recognise their respective components and capacities.
- Integrate geospatial information technologies, services and applications with the aim of providing an optimal solution to each application case.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use knowledge critically and understand and take on board the ethical responsibility, legislation and social implications of the use and diffusion of geospatial information and its derived products.

Learning Outcomes

1. Apply the principles of cartographic design to design and compose cartographic documents for different analogical or digital publishing media.
2. Apply the principles of lettering for the use of toponymy and labelling in the creation of cartographic products.
3. Choose and apply publication-quality cartographic symbolisation.
4. Choose the type of map to be produced on the basis of the thematic variables to be represented, the geometry of the cartographic elements, and the purpose and audience of the map.
5. Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
6. Communicate results of complex spatial analysis processes using maps and other geovisualisation products.
7. Continue the learning process, to a large extent autonomously.
8. Create designs that comply with technical and aesthetic requisites.
9. Define and characterise the information products to be generated by a geographic information system in a corporate environment.
10. Define the content, structure of elements and data sources of all types of visual presentation products for geospatial information.
11. Design and create original, personalised symbol repertoires.
12. Evaluate the different components of the quality of geographic data, together with acceptable sources and margins of error.
13. Generate cartography and symbolisation of maps to analyse and visualise gender inequalities.
14. Identify and apply the different types of cartographic generalisation.
15. Identify the limitations of the different formats and standards of geospatial data.
16. Integrate geospatial information technologies, services and applications with the aim of providing an optimal solution to each application case.
17. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
18. Know and apply 3D visualisation methods for geospatial data.
19. Know and apply the different types of geometries for representing each component of geographic entities.
20. Know and apply the principles of graphic semiology specific to cartographic language.
21. Know the characteristics of the standard data models for geospatial data.
22. Know the principles and methods for producing the different types of thematic maps.
23. Know the visual variables and their perceptual properties.
24. Pick and use the most suitable geospatial data format for each product or application.
25. Recognise the importance and utility of metadata in the production and use of geospatial data.
26. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
27. Use knowledge critically and understand and take on board the ethical responsibility, legislation and social implications of the use and diffusion of geospatial information and its derived products.
28. Use programmes for the digital preparation of cartographic products.
29. Use resources of multitemporal cartographic representation.
30. Use state-of-the-art cartography production tools.
31. Use the visual variables on the basis of the thematic variables to be represented and the geometry of the cartographic elements.

Content

Geoinformation data models and standards

1. Introduction.
    - Geoinformation.
    - The structure of geographic data.
    - Visualization of geoinformation.
2. Spatial reference systems.
3. Production of cartographic documents for digital or analogical publication.
    - Topographic map 1:5.000 production process.
    - Visualisation and symbolisation of the topographic map.
4. Regulations and standards of geographical information.
5. Geoinformation INSPIRE standards.
    - Standard data models for geospatial data.
    - Standard data models for geospatial information metadata.
6. INSPIRE Services
    - Development policy: data sharing and networking services
    - INSPIRE Services use

Geoinformation visualization and design

1. Basic principles of cartographic representation.
2. Cartographic and visual communication. Visual variables and graphic design elements.
    - Position.
    - Shape.
    - Orientation.
    - Colour.
    - Texture.
    - Value.
    - Size.
3. Colour modelling and treatment.
4. Visualization of geospatial data.
5. Thematic maps.

Point Density map.

Choropleth map.

Graduated or proportional symbol map.

Cartogram.

Flow map.

Combined maps.

6. Simbolisation and cartographic semiology.

7. Graphic and cartographic design.

Layout preparation.

Bookmarks creation.

Legend.

Inset maps.

The marginals of the map.

8. Cartographic edition software. Structure and functionality.

Free software.

Commercial software.

9. Processing and symbolization of raster data for visualization and cartographic presentation.

Handling rasters.

Image improvement.

Reclassification of values.

Methods for raster data symbolization.

Methodology

Learning is achieved by means of three types of activities:

Directed activities: Directed activities are theoretical and practical lectures in a computer lab. They include solving case studies and practical exercises, using as the main method a problem based learning approach. Lectures serve to systematize all the content, to present the state of the art of the different subjects, to provide methods and techniques for specific tasks, and to sum up the knowledge to learn. Lectures organize also the autonomous and complementary work done by the students.

Supervised activities: Supervised activities are focused on the execution of a semester project, consisting of a real case study, carried out through workshop hours, autonomous work and tutorials. This semester project allows to apply together all the knowledge and technical skills learnt in all the courses of the semester. The semester project is a milestone for the students and the actual demonstration that they had achieved the learning goals of all the courses of the semester. It is also the main evidence for evaluation as students should have to submit at the end of the semester a report that summarizes the whole project and do an oral presentation.

Autonomous activities: Autonomous work of the students includes personal readings (papers, manuals, relevant reports, etc.), data and documentation search, complementary exercises and the personal development of the semester project.

The activities that could not be done onsite will be adapted to an online format made available through the UAB's virtual tools. Exercises, projects and lectures will be carried out using virtual tools such as tutorials, videos, Teams sessions, etc. Lecturers will ensure that students are able to access these virtual tools, or will offer them feasible alternatives.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures on basic concepts and practical exercises	36	1.44	1, 2, 12, 6, 22, 19, 20, 18, 21, 23, 8, 10, 9, 11, 24, 4, 3, 13, 17, 5, 7, 30, 27, 31, 28, 29
Type: Supervised			
Semester project, exercises	15	0.6	1, 2, 12, 6, 20, 18, 8, 10, 9, 11, 24, 4, 3, 17, 5, 7, 30, 27, 31, 28, 29
Type: Autonomous			
Readings, personal study and exercises	69	2.76	1, 2, 12, 6, 20, 18, 8, 10, 9, 11, 24, 4, 3, 13, 5, 7, 26, 30, 27, 31, 28, 29

Assessment

In the event that assessment activities cannot be taken onsite, they will be adapted to an online format made available through the UAB's virtual tools (original weighting will be maintained). Homework, activities and class participation will be carried out through forums, wikis and/or discussion on Teams, etc. Lecturers will ensure that students are able to access these virtual tools, or will offer them feasible alternatives.

CONTINUOUS EVALUATION

a) Evaluation procedure and activities:

Evaluation of the course is based mostly on the semester project, that comprises two evaluation activities. The elaboration and submission of a synthesis report and the oral presentation of the project done. Given the technical content of the course, the weight assigned to the project report is 45% of the total course grading, assuming that it is the most appropriate means to explain all the technical details of the project, and a weight of 25% at the oral presentation. The course assessment is completed with the evaluation of the practical exercises done along the course, that account for another 30% of the total course grading.

Except when expressly noticed, all the evaluation activities (report and oral presentation of the semester project, as well as practical exercises) have to carried out individually.

Time assigned to each evaluation activity includes the time spent in making all the material evidences for evaluating each activity (e.g., writing of the report, preparing the presentation slides, etc.).

b) Evaluation schedule:

1st semester project report: Making during all the semester. Submission at the end of semester, on January 20 th 2022.

1st semester project oral presentation: Making during all the semester. Oral presentation at the end of semester, on January 26th and 27th 2022.

Course practical exercises: Making and submission weekly or biweekly along the semester.

c) Grade revision:

Once the grades obtained are published, students will have one week to apply for a grade revision by arranging an appointment with the corresponding teachers.

d) Procedure for reassessment:

1st semester project report: It could be reassessed in the following two weeks after the submission date scheduled. Reassessment will require the submission of a new whole report in case of negative evaluation of the former report submitted.

1st semester project oral presentation: It could be reassessed in the following week after the date scheduled for the oral presentation. Reassessment will require doing again the oral presentation in case of negative evaluation of the former presentation done.

Course practical exercises: Can not be reassessed.

To have right to a reassessment the student will have to have been previously evaluated in a set of activities that account for at least two thirds of the total course grading. Therefore he or she will have to have been evaluated of the 1st semester project report (45%) and of the 1st semester project oral presentation (25%) inthe dates scheduled.

The right to a reassessment will only be granted to students that, having not passed the course (e.g., having a total course grade below 5 over 10), had obtained at least a total course grade above 3,5 over 10.

e) Conditions for a 'Not assessable' grade:

Students will receive the grade 'Not assessable' instead of 'Fail' if they had not submitted neither the 1st semester project report nor done the 1st semester project oral presentation. That is, if they only submit all or part of the course practical exercises.

f) UAB regulations on plagiarism and other irregularities in the assessment process:

In the event of a student committing any irregularity that may lead to a significant variation in the grade awarded to an assessment activity, the student will be given a zero for this activity, regardless of any disciplinary process that may take place. In the event of several irregularities in assessment activities of the same subject, the student will be given a zero as the final grade for this subject..

Assessment acitivities with a zero grade because of irregularities can not be reassessed.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Oral presentations	25	7.5	0.3	6, 14, 5, 27
Practical exercises	30	9	0.36	1, 2, 12, 6, 20, 18, 8, 10, 9, 11, 24, 4, 3, 13, 14, 17, 5, 7, 30, 27, 31, 28, 29

Report submissions	45	13.5	0.54	1, 2, 12, 6, 22, 19, 20, 18, 21, 23, 8, 10, 9, 11, 24, 4, 3, 14, 15, 16, 17, 5, 7, 25, 26, 30, 27, 31, 28, 29

Bibliography

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Bernabé, M. A.; Iturrioz, T. Elementos de diseño cartográfico. Universidad Politécnica de Madrid. Escuela Universitaria Ingeniería Técnica Topográfica, 1996. 305 p.

Dent, B.; Torguson, J. and Hodler, T. (2008) Cartography: Thematic Map Design. 6th edition. Boston: WCB/McGrawHill.

Maceachren, A. M.; Fraser Taylor, D.R.(ed.) (1994): Visualization in modern cartography. Elsevier.

Robinson, A.H.; Morrison, J.L.; Muehrcke, P.C. and Kimerling, A.J. (1987) Elementos de cartografía. Barcelona: Ediciones Omega. (trad. en castellà de la 5ª edició)

Santos Preciado, José Miguel. El tratamiento informático de la información geográfica. Madrid: Universidad Nacional de Educación a Distancia, 2002. 380 p. (Cuadernos de la UNED) ISBN 8436246268.

Slocum, T. A. (2009): Thematic cartography and geovisualization. Prentice Hall.

Software

ArcGis Desktop

ArcGis Pro

ArcGis Online

Qgis