VNIVERSITAT DE VALÈNCIA

Course Guide
46747 GIS Applications in Palaeontology

COURSE DATA

DATA SUBJECT

Code: 46747
Name: GIS Applications in Palaeontology
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
2266 - Master's Degree in Applied Palaeontology	Facultat de Ciències Biològiques	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2266 - Master's Degree in Applied Palaeontology	Palaeontology applied to the exploration of geological resources and to environmental studies	ELECTIVES

COORDINATION

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SUMMARY

Geographic Information Systems or GIS applications (GIS in the Catalan meaning), are used as tools for the treatment of all kinds of information related to the surface of a land. And not only this, these tools transcend the space of topography and approach other fields of study, now the theoretical morphology or the interpretation of the form of the set or the parts of a living being. This subject therefore seeks to bring the student closer to the understanding and use of these tools in the study and management of the territory from the aspect of paleontological heritage, and on the other hand, it proposes the student to delve into new concepts and challenges around the organic form and GIS tools. Thinking of students with a very reduced training, or almost no in the use and management of GIS tools, this subject proposes to deepen from the initial stages of the computer tool, and gradually go deeper into it, until you have a sufficient domain to allow you the proportionate and directed use of these tools. Apart from professional payment applications, the course will be developed in the field of free software, being the working applications, GVSig and QGIS programs. In this subject, the student will learn to use the existing vector cartographic information (topographic, geological, etc.) and, on the other hand, will learn to generate from previous information (inventories, paleontological databases, information collected in the field, etc.) cartographies implementable in GIS programs. Based on this information the student should be able to use it in the management of paleontological heritage and in the elaboration of all types of thematic cartographies.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

No enrolment restrictions have been specified for other subjects in the curriculum.

Basic knowledge of Excel and Word applications (Microsoft Office) and basic geolocation concepts (coordinates, maps, etc.).

COMPETENCES / LEARNING OUTCOMES

2266 - Master's Degree in Applied Palaeontology

Access information tools from other areas of knowledge and use them appropriately.

Access the necessary information in the specific field of the subject (databases, scientific articles, etc.) and have sufficient judgement to interpret and use it.

Apply critical reasoning and argumentation based on rational criteria.

Apply science from a social and economic point of view, promoting the transfer of knowledge to society.

Apply the knowledge acquired and problem-solving abilities in new or unfamiliar situations within broader (or multidisciplinary) contexts related to the field of study.

Apply the research experience acquired to initiate the research phase of a PhD programme on biodiversity-related topics.

Apply the research experience acquired to tasks specific to the profession, both in the private sector and in public institutions.

Assess the need to complement their scientific, historical, language, IT, literature, social and human ethics education by attending lectures or courses and/or carrying out complementary activities, self-evaluating the contribution that these activities make to their overall education.

Assume an ethical commitment and sensitivity towards environmental problems and natural and cultural heritage.

Be familiar with, develop and manage georeferenced databases of elements from the geological and palaeontological record, as well as the software used for the spatial representation and analysis of these elements.

Communicate and popularise scientific ideas.

Communicate conclusions and the knowledge and rationale supporting them to specialised and non-specialised audiences clearly and unambiguously.

Conduct studies, applying the methods and techniques needed to preserve and manage palaeontological heritage.

Continue the learning process in a manner that is largely self-directed or independent.

Demonstrate in-depth understanding of the historical nature of the evolutionary process, both in its aspects of unrepeatability and contingency and in those linked to the fulfilment of laws of nature of all kinds and, therefore, of necessity.

Demonstrate intellectual curiosity and encourage responsibility for one's own learning.

Develop experimental skills in the handling of laboratory material and equipment in palaeontology.

Have an in-depth knowledge and understanding of the regional geology of Spain and surrounding areas, particularly the Valencian Community, with detailed knowledge of the main palaeontological sites found in the Iberian Peninsula and North Africa.

Integrate knowledge and confront the complexity of making judgements based on information that, although incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of knowledge and judgements.

Interpret environmental and ecological variables of the past from the study of organism traces in the fossil record.

Know, understand and draw conclusions, applicable to the present time, about the crises of biological diversity, and their causes and consequences within the framework of actualism.

Know and confidently handle the divisions of the geological time scale and the biostratigraphic scales constructed from different groups of biota in the fossil record.

Know and understand past biological events, as well as the zonations, in time and space, of biota in order to establish the relative stratigraphic position of sedimentary rocks from different geographical areas.

Know and understand the palaeodiversity of living beings, their ecosystemic relationships and the palaeogeographical distribution achieved by the main groups of living beings throughout the Earth's history.

Make quick and effective decisions in complex situations in their professional or research work, by developing new and innovative work methodologies adapted to the scientific/research, technological or professional field in which they carry out their activity.

Plan and manage available resources, taking into account the basic principles of quality, risk prevention, safety and sustainability.

Prepare, write and present reports and projects in public in a clear and coherent manner, defend them with rigour and tolerance and respond satisfactorily to any criticism that may arise from the presentation.

Produce all types of reports related to palaeontological matters clearly and concisely at an official or professional level (reports, grants, heritage impact reports, research projects, etc.)

Skillfully handle the field, laboratory and office techniques for the extraction, preparation, cataloguing, digital reconstruction, study and dissemination of microfossils and macrofossils.

Understand the causes of climate change and the proxies used (diatom studies, foraminifera, tree growth rings, ice cores, current climate data, etc.) to characterise past climates.

Understand the fundamental principles of facies analysis in continental, transitional and marine depositional systems, and the use of fossils for palaeoenvironmental interpretation of the stratigraphic record.

Understand the fundamentals of the use of microfossils and macrofossils for the characterisation of geological deposits containing resources such as oil, gas, coal, peat, etc.

Use acquired knowledge as a basis for originality in the development or application of ideas, often in a research context.

Work efficiently in a professional or research team, acquiring the ability to participate in research projects and scientific or technological collaborations.

DESCRIPTION OF CONTENTS

1. Introduction, general concepts on geo-referencing and base mapping

Unit 1.- Environmental Information. Typologies. Coordinate Systems. Basic Concepts on Georeferencing. Geographic Information Systems. Software. Cartographic information implementable in a GIS. Official sources of information: Registration and use, CNIG, IGME, Ministerio de Medio Ambiente (MAGRAMA), Institut Cartogràfic Valencià (ICV). Downloads.

2. Computer module

Unit 3.- Structure of a GIS: Views, Tables, Layouts, etc. Information implementation. Data structure (tables).

Unit 4.- Data selection processes and creation of new information topics based on the original information. Creating new layers of information from Views and geo-referenced media elements.

Unit 5.- Development of information layers from information collected in the field. Data matrices. Event layers. Implementation in GIS.

Unit 6.- Spatial relations between layers of information (Topics). Procedures for data selection based on relationships between layers of information. Outcome: usefulness, similarities and differences between types of selection procedures.

Unit 7.- Creation of new information layers from buffer analysis. Complex territorial analyses based on relationships between base vector mapping information (topographic-geological) and derived information.

Unit 8.- GIS analysis applied to paleontological heritage evaluations for its management, territorial planning, reporting, selection of areas of action and evaluation of projects.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	4,00
Laboratory	26,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

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

TEACHING METHODOLOGY

Theoretical and practical classes

- Master lessons with computer presentations
- Face-to-face case work
- Development and consultation of databases with teacher's guidance
- Preparation of reports with teacher's guidance on legislative case studies
- Tests and examinations

Practical classes of laboratory-cabinet (computer)

- Introduction and planning of each practice
- Monitoring, data collection, information collection
- Evaluable individual work

- Development and consultation of databases with teacher's guidance

- Preparation of reports

EVALUATION

The evaluation of the matter is carried out with a test. This test, of an individual nature, is carried out in a computer classroom with computer assistance, in which the student will have to complete a practical assignment related to paleontological heritage and obtain a series of results. On the other hand, participation and attendance at class will be valued.

The weight (percentage on the final grade) of the aspects considered in the evaluation of the subject are reflected in the following table:

Evaluation activities	**Weighing**
Test in computer room	90%
LIG report	10%

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REFERENCES

- Introducing geographic information systems with ArcGIS a workbook approach to learning GIS. Kennedy, M. Hoboken : John Wiley & Sons, 2009. - Iniesto, M. y Núñez, A. 2014. Introducción a la infraestructura de datos espaciales. Foro de Ingeniería en Geomática y Topografía del Grupo de Trabajo de la IDEE. Descarga gratuita en: http://www.ign. es/ign/layoutIn/libDigitalesPublicaciones.do#resp-libro-IDEE A - Navarro Jover, J.M. 2005. Prácticas de SIG con Arcview. Editorial Universidad Politécnica de Valencia. - Navarro Jover, J.M. 2009. Prácticas de SIG con ArcGIS. Universidad Politécnica de Valencia. Servicio de Publicaciones, 2009 - SIG sistemas de información geográfica. Gutiérrez Puebla, J., Gould, M. Madrid : Síntesis, D.L. 1994 - SIG y localización óptima de instalaciones y equipamientos. Bosque Sendra, J. Paracuellos de Jarama : Ra-Ma , D.L. 2004

- http://www.gvsig.com/ - http://training.esri.com/gateway/index.cfm?fa=search.results&CourseTypeID=1 - http://www.gabrielortiz.com/MappingGIS (http://mappinggis.com/2012/06/tutoriales-sig-gratis/) - http://www.wiley.com/legacy/wileychi/gis/Home.html - http://edugvsig.blogspot.com/Centro Nacional de Información Geográfica. Centro de descargas (http://centrodedescargas.cnig.es/CentroDescargas/). Institut Cartogràfic Valencià (http://www.icv.gva.es/) - http://inspire-geoportal.ec.europa.eu/