

## TRAINING OVERVIEW



This ArcGIS Pro online course will provide a great deal of information about the link between earth's ecosystems and human impact on the environment. During this course, the students will learn about the advanced GIS techniques using vector and raster data models, which are most commonly used in the elaboration of environmental projects.

Students will gain knowledge in the usage of ArcGIS PRO software with application in environmental studies (environmental impact studies, environmental documents, fauna studies, etc.). They will master the creation of high quality maps, spatial multi-criteria analysis for environmental management, project alternative studies, as well as how to perform least impact routing analysis.

**Students will acquire skills like:** creation of spatial data bases from field sampling, fauna density maps, erosion studies, hydrological studies, environmental sensitivity maps for the location of projects, obtaining lineal construction routes with least environmental impact, etc.

## GOALS



- Demonstrate the importance and practicality of GIS in engineering and environmental management studies.
- Understand all the essential concepts, needed for an advanced manipulation of ArcGIS Desktop new release (ArcGIS PRO) and GIS in general, along with practical application in environmental management.
- Learn about GIS key tools used in the management of raster and vector data models, the creation of high quality cartography products and the development of complex spatial analysis.
- Find out about all the existing difficulties and solutions in the design of GIS environmental studies through practical exercises.
- Prepare and edit your own data, develop your own layouts and high quality map products for environmental impact studies, etc.



## ONLINE FORMAT METHODOLOGY

Enrolled students in this online course will have access to our virtual e-learning platform (which is available 24 hours), where they will find the content of the course, practical exercises, forum discussion and additional content. One of the advantages of this online platform, is that students can benefit of real time support and assistance offered by the instructor (2 hours per week), whom they can contact via direct messages, regarding course related issues, at any moment. They can also contact the instructor via email.

## STUDENT PROFILES



This course is aimed at students and professionals related to engineering, biology, geology and environmental sciences interested in the application of Geographic information Systems to its professional activities.

**Important note: this course doesn't require previous ArcGIS Desktop knowledge.**

## INSTRUCTOR



### Santiago Pardini Herranz

With Bachelor's degree in environmental sciences from Almeria University and master in engineering and environmental management from escuela de organización industrial (EOI), Santiago is a professional in the GIS consultancy sector and remote sensing at TYC GIS Integral Solutions.



Santiago has diverse specialist courses in geographic information systems, remote sensing, CAD and BIM. He has more than 7 years experience in application of those technologies in environmental consultancy, diverse engineering companies, Geomarketing, spatial planning, etc.





## 1 - INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS

Introduction.

Definition and basic concepts.

Uses of Geographic Information Systems.

Geographic information: vector data models, raster data models and other data models (CAD, TIN, etc.). Main features of each data module, advantages and disadvantages.

Introduction to ArcGIS Pro.

Arcmap interface, extensions and tools.

## 2 - VECTOR DATA MODEL. INFORMATION DISPLAY

Information layers: how to add layers, features and attribute tables.

Data tools: search and queries.

Selection tools: selection per feature, selection by spatial location and information capture.

Layer symbology: simple symbology, by category, by quantity and through graphs.

Other display options: labelling and transparencies.

## 3 - COORDINATE SYSTEMS, PROJECTIONS AND GEOREFERENCING

Introduction to Coordinate systems and projections.

Defining Coordinate Systems.

Coordinate system transformation. Reprojection of ED50 or ETRS89 geographic databases.

Image, layer and CAD files georeferencing.

## 4 - VECTOR DATA MODEL. EDITING AND CREATING INFORMATION

**Creation and editing of spatial data.**

– Creating spatial data: Editing tools bar. Digitization techniques

– Creating layers from CAD files

– Modifying existing layers

– Creating layers from coordinates and GPS data

**Creation and editing of data from the attribute table**

– Structure of an Attribute Table

– Types of data included in an Attribute Table

– Modify information from an Attribute table

– Calculate geometric information (surface, perimeter, length, etc.)

– Creation of statistics from an Attribute table

– Export tables to Excel and other formats. Reports and graphs creation

## 5 - DATABASE AND SPATIAL DATA BASE MANAGEMENT (GEODATABASE)

Designing databases.

Joining and relating databases.

Spatial joins. Obtain statistics from database information and spatial position of elements in a layer.

Geodatabase: Advantages. Properties.

Loading data to the geodatabase. Subtypes and domains.

**Guided exercise 1 (data collection): Collecting field data with GPS or coordinates manual, its processing and creating digital cartography linked to information gathered in the field, as well as in the office.**

## 6 - SPATIAL ANALYSIS USING VECTOR DATA

Extract (Clip, Split), overlay (intersect, union) and proximity toolsets (buffer analysis, Thiessen polygons).

Obtain sampling grids.

Multi-criteria analysis. Obtain optimum areas according to several criteria.

**Guided exercise 2 (environmental surveillance): Creation of sampling grids and combining them with field data applied to the environmental surveillance of wind farms.**

## 7 - SPATIAL ANALYSIS USING RASTER DATA

File conversion tools. File format conversion from vector to raster, and viceversa, ASCII or html files, and exporting files to KML (Google Earth) as well as CAD.

Create Digital Elevation Models from vector data, ASCII files and TIN files.

Extracting information from raster files by query, mask, entity and / or joining raster files.

Contour lines, slope calculation, hillshade maps, orientations and visibility studies.

**Guided exercise 3 (landscape): Creating a visibility study through viewsheds from high precision digital terrain models, defining specific views and project elements.**





## 8 - ADVANCED SPATIAL ANALYSIS

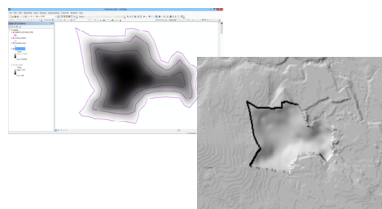
Reclassifying raster files. Euclidean distances, building Boolean layers, adding values to intervals or categories, and data conversion.

Map algebra (raster calculator), math calculations between raster layers, field statistics.

**Guided exercise 3 (geomorphology/erosion): Territory erosion risk analysis through variables like slope, type of soil, presence of vegetation, etc.**

Data interpolation. Different interpolation methodologies (IDW, kriging, natural neighbour).

**Guided exercise 4 (fauna and vegetation): Calculate density fauna and vegetation distribution by interpolating field and bibliographic data.**



## 9 - ADVANCED SPATIAL ANALYSIS II

Use in hydrology: obtaining a drainage system, flow direction, outlets, and identification of drainage basins.

**Guided exercise 6 (hydrology): Obtain the drainage network, the main flow direction, accumulation areas and hydrographic basins, sub basins and micro basins.**

Volume calculation.

Raster multi criteria analysis. Basic concepts and weightings. Weighted overlay. Non-compensatory analysis. Least cost route calculation.

**Guided exercise 7 (selection of alternatives): Selecting a project alternative with smaller impact by multi criteria analysis of environmental variables.**

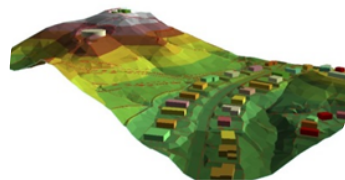
**Guided exercise 8 (selection of alternatives 2): Selecting a lineal construction route with smaller impact by multi criteria analysis.**

## 10 - WEB INFORMATION SOURCES AND RESOURCES

Downloading digital maps (IGN) and using WMS cartographic servers.

Regional, European and international Spanish spatial data infrastructure (IDEE).

Arcgis Online Services



## 11- MAP CREATION

Adjusting the sheet.

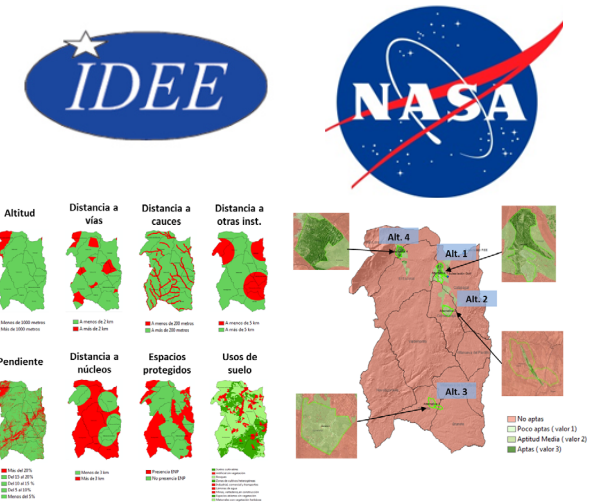
Inserting basic elements (north, scale bar, numeric scale, map legend, etc.)

Adding UTM coordinates grid, composition with several "Data frames", images, excel tables, etc.

Including other elements: images, graphs and tables.

Printing options.

**Guided exercise 9 (map composition): Create quality mapping focused on environmental studies according to the INSPIRE directive.**





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