# 270532 - DSIGE - Software Development for Geographic Ans Spacial Information

**Coordinating unit:** 270 - FIB - Barcelona School of Informatics  
**Teaching unit:** 749 - MAT - Department of Mathematics  
**Academic year:** 2018  
**Degree:** MASTER'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2012). (Teaching unit Optional)  
**ECTS credits:** 3  
**Teaching languages:** Catalan, Spanish

## Degree competences to which the subject contributes

| Basic: | CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.  
| | CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.  
| Specific: | CTE7. Capability to understand and to apply advanced knowledge of high performance computing and numerical or computational methods to engineering problems.  
| | CTE12. Capability to create and exploit virtual environments, and to the create, manage and distribute of multimedia content.  
| | CTE11. Capability to conceptualize, design, develop and evaluate human-computer interaction of products, systems, applications and informatic services.  
| General: | CG4. Capacity for mathematical modeling, calculation and simulation in technology and engineering companies centers, particularly in research, development and innovation tasks in all areas related to Informatics Engineering.  
| | CG8. Capability to apply the acquired knowledge and to solve problems in new or unfamiliar environments inside broad and multidisciplinary contexts, being able to integrate this knowledge.  
| | CG6. Capacity for general management, technical management and research projects management, development and innovation in companies and technology centers in the area of Computer Science.  
| Transversal: | CTR4. INFORMATION LITERACY: Capability to manage the acquisition, structuring, analysis and visualization of data and information in the area of informatics engineering, and critically assess the results of this effort.  
| | CTR6. REASONING: Capacity for critical, logical and mathematical reasoning. Capability to solve problems in their area of study. Capacity for abstraction: the capability to create and use models that reflect real situations. Capability to design and implement simple experiments, and analyze and interpret their results. Capacity for analysis, synthesis and evaluation.  

## Teaching methodology

The course will consist of presentations of the main theoretical topics, followed by a discussion of the more practical aspects associated with them, and the presentation of practical tools to address them.

## Learning objectives of the subject

1. Learn what geographic information systems (GIS) are.  
2. Analyze concrete problems that a GIS must be able to solve.  
3. Study some of the algorithms behind GIS.  
4. Learn different ways to represent and process geographic and spatial data.
## Study load

<table>
<thead>
<tr>
<th></th>
<th>Total learning time: 75h</th>
<th>Theory classes:</th>
<th>27h</th>
<th>36.00%</th>
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<tr>
<td></td>
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<td>Practical classes:</td>
<td>0h</td>
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<td>Laboratory classes:</td>
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<td>Guided activities:</td>
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<td>Self study:</td>
<td>48h</td>
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</table>
Introduction to geographic information systems, spatial information, and geometric algorithms.

Degree competences to which the content contributes:

Description:
Principios básicos de la información espacial y los sistemas de información geográfica. Ejemplos de aplicaciones de GIS. Introducción a los algoritmos geométricos. Relación entre la implementación de un GIS y los algoritmos geométricos.

Map representation, combination and overlay of geographic subdivisions.

Degree competences to which the content contributes:

Description:

Digital terrain models, vector and raster terrains

Degree competences to which the content contributes:

Description:

Algorithms for terrain analysis: visibility and hydrology problems

Degree competences to which the content contributes:

Description:
Aplicaciones de análisis de terrenos en visibilidad e hidrografía. Cálculo de viewsheds y watersheds en rasters y TINs. Eliminación de mínimos locales y otros artifacts.

Voronoi diagrams applied to facility location and pattern analysis problems

Degree competences to which the content contributes:

Description:

Basic algorithms for digital cartography: map generalization and labeling
Extra topics to be chosen by the students.

Degree competences to which the content contributes:
Description:
Los temas específicos serán definidos por los estudiantes y los docentes durante la primer mitad del curso.
# Planning of activities

<table>
<thead>
<tr>
<th>Planning of activities</th>
<th>Hours</th>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Laboratory classes</th>
<th>Guided activities</th>
<th>Self study</th>
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<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>4h</td>
<td>2h</td>
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<td>0h</td>
<td>2h</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
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<tr>
<td><strong>Map representation, combination and overlay of geographic subdivisions</strong></td>
<td>8h</td>
<td>4h</td>
<td>0h</td>
<td>0h</td>
<td>0h</td>
<td>4h</td>
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<td><strong>Specific objectives:</strong></td>
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<td><strong>Digital terrain models</strong></td>
<td>7h</td>
<td>5h</td>
<td>0h</td>
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<td>2h</td>
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<td><strong>Voronoï diagrams</strong></td>
<td>6h</td>
<td>4h</td>
<td>0h</td>
<td>0h</td>
<td>0h</td>
<td>2h</td>
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<td><strong>Specific objectives:</strong></td>
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## Algorithms for terrain analysis

**Hours:** 6h  
- Theory classes: 4h  
- Practical classes: 0h  
- Laboratory classes: 0h  
- Guided activities: 0h  
- Self study: 2h  

**Specific objectives:**  
2, 3

## Basic algorithms for digital cartography

**Hours:** 5h 30m  
- Theory classes: 4h  
- Practical classes: 0h  
- Laboratory classes: 0h  
- Guided activities: 0h  
- Self study: 1h 30m

**Specific objectives:**  
2, 3

## Extra topics to be defined during the course

**Hours:** 4h  
- Theory classes: 4h  
- Practical classes: 0h  
- Laboratory classes: 0h  
- Guided activities: 0h  
- Self study: 0h

**Specific objectives:**  
2, 3

## Qualification system

Evaluation will be based on a final project that will consist of theory and bibliography research tasks about a concrete GIS problem, and in class participation.
Bibliography

Basic:


Complementary:

