250333 - SISINF GEO - Geographic Information Systems

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2017
Degree: BACHELOR'S DEGREE IN GEOLOGICAL ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 4,5
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: MARIA DE LAS NIEVES LANTADA ZARZOSA
Others: MARIA DE LAS NIEVES LANTADA ZARZOSA, CAROLINA PUIG POLO

Degree competences to which the subject contributes

Specific:
4042. General and detailed topography
4061. Knowledge of topography, photogrammetry and cartography

Transversal:
592. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
595. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
599. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
602. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
584. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Teaching methodology

The course consists of 3 hours per week of classes. Approx. 1 hour a week in class (large group) and approx. 2 hours per week in the medium group practices.

In the lecture classes the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises to consolidate the objectives of general and specific learning.
Laboratory practices are carried out with different programs. They are devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.
It uses material support through the virtual campus ATENEA: theoretical content, guidelines for evaluation and directed learning, teaching videos and literature.

Learning objectives of the subject

Students will acquire an understanding of geographical information systems and learn how they apply to geological engineering.
Upon completion of the course, students will be able to: 1. Use photogrammetry and orthophoto map systems; 2. Understand and use satellite positioning systems; 3. Create and use digital ground models.

Data capture systems; Automatic generation of plans and maps; Photogrammetry and orthophoto maps; GPS: Satellite positioning systems; Applications; GIS: Geographical information systems; Introduction and data structures; Topology; Errors and editing; Databases; Spatial analysis; Presentation of results; Applications; Digital ground models: Definition and properties; Interpolation methods; Topographic variables; Applications

Learn the basics of the structure and thematic spatial data using Geographic Information Systems. Elaborating on the creation of thematic maps and maps derived from 2D and 3D and the spatial analysis. Learn the latest methods of collection and processing of spatial data.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Theory classes:</th>
<th>17h</th>
<th>15.11%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total learning time: 112h 30m</td>
<td>Practical classes:</td>
<td>5h</td>
<td>4.44%</td>
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<tr>
<td></td>
<td>Laboratory classes:</td>
<td>23h</td>
<td>20.44%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>4h 30m</td>
<td>4.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>63h</td>
<td>56.00%</td>
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</tbody>
</table>
# Content

<table>
<thead>
<tr>
<th>Item 01. Introduction to GIS</th>
<th>Learning time: 4h 48m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
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<tr>
<td></td>
<td>Self study : 2h 48m</td>
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</tbody>
</table>

**Description:**
Introduction to the course. Principles of GIS

<table>
<thead>
<tr>
<th>Item 02. Spatial Data Infrastructures (SDI)</th>
<th>Learning time: 9h 36m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study : 5h 36m</td>
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**Description:**
Management tools and data visualization. Search the web mapping and metadata management

<table>
<thead>
<tr>
<th>Item 03. Spatial data structures (raster and vectorial and 3D)</th>
<th>Learning time: 16h 48m</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study : 9h 48m</td>
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</tbody>
</table>

**Description:**
Raster and vector models
Creating raster and vector structure in the GIS
3D surfaces. TIN
Problems of spatial data structures

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<thead>
<tr>
<th>Item 04. Georeferencing</th>
<th>Learning time: 12h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 1h</td>
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<tr>
<td></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study : 7h</td>
</tr>
</tbody>
</table>

**Description:**
Georeferencing
Georeferencing maps and images
### Item 05. Databases

**Learning time:** 9h 36m  
- Theory classes: 1h  
- Practical classes: 1h  
- Laboratory classes: 2h  
- Self study: 5h 36m

**Description:**
- Databases  
- E-R model in relational databases  
- Databases in GIS

### Item 06. Spatial Analysis

**Learning time:** 14h 23m  
- Theory classes: 2h  
- Laboratory classes: 4h  
- Self study: 8h 23m

**Description:**
- Spatial Analysis  
- Vectorial Spatial Analysis  
- Raster spatial analysis

### Item 07. Spatial Analyst with DEM

**Learning time:** 14h 23m  
- Theory classes: 2h  
- Practical classes: 2h  
- Laboratory classes: 2h  
- Self study: 8h 23m

**Description:**
- Digital terrain models  
- Creation and analysis of digital terrain models  
- Troubleshooting GIS
The mark of the course is obtained from continuous assessment as follows:

1) Note exams (Ne): There will be two tests of continuous assessment (PAC1, PAC2) in the middle and end of semester, about theoretical concepts associated with the learning objectives of the subject with regard to knowledge or understanding. The final exam note will be Ne=(PAC1+PAC2)/2

2) Note of practical activities (Np): problems and practices of both individual and group training and additive in nature, carried out during the year (in the classroom and outside it). The final grade is made by an average (weighted on the importance of each activity). Approximately Np=GIS project 65% + DGPS 10% + Remote Sensing 20% + others 5%

The final mark will be Ne*0.7+Np*0.3, however, if Ne>=5 and Np>=5, then Nf=max(Ne*0.5+Np*0.5; Ne*0.7+Np*0.3)

Criteria for re-evaluation qualification and eligibility: Students that failed the ordinary evaluation with Ne>2.5 and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment tests due to certifiable force major will be ensured extraordinary evaluation periods. These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

Qualification system

The mark of the course is obtained from continuous assessment as follows:

1) Note exams (Ne): There will be two tests of continuous assessment (PAC1, PAC2) in the middle and end of semester, about theoretical concepts associated with the learning objectives of the subject with regard to knowledge or understanding. The final exam note will be Ne=(PAC1+PAC2)/2

2) Note of practical activities (Np): problems and practices of both individual and group training and additive in nature, carried out during the year (in the classroom and outside it). The final grade is made by an average (weighted on the importance of each activity). Approximately Np=GIS project 65% + DGPS 10% + Remote Sensing 20% + others 5%

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Regulations for carrying out activities

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

Extraordinary Evaluation: the reserved week for it, the students that could not attend some of the tests PAC for justified (and approved by the boss of studies) could make a recovery exam.
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Bibliography

**Basic:**


**Complementary:**
