310620 - Physical Geodesy

Coordinating unit: 310 - EPSEB - Barcelona School of Building Construction
Teaching unit: 748 - FIS - Department of Physics
751 - DECA - Department of Civil and Environmental Engineering

Academic year: 2019
Degree: BACHELOR'S DEGREE IN GEOPHYSICS AND GEOMATICS ENGINEERING (Syllabus 2016).
(Teaching unit Compulsory)
ECTS credits: 4,5  Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: Nuñez Andres, María Amparo
Others: Blas Echebarria Domínguez
         Nuñez Andres, María Amparo

Prior skills
Knowledge of Geometric Geodesy, Spacial Geodesy and Geophysics

Degree competences to which the subject contributes

Specific:
1. Knowledge and application of the methods and techniques of the physics ans spacial geodesy; geomagnetism; sismology and seismic engineering; gravimetry.
2. (ENG) Planificació, projecte, direcció, execució i gestió de processos de mesura, sistemes d'informació, explotació d'imatges, posicionament i navegació; modelització, representació i visualització de la informació territorial en, sota i sobre la superfície terrestre.
3. (ENG) Reunir i interpretar informació del terreny i tota aquella relacionada geogràficament i econòmicament amb ell.

Teaching methodology

1. Attendance activity
   - Theoretical classes: masterclass (big group) and participative (medium group)
   - Seminars
   - Resolution of problems
   - Evaluation sessions

2. Personal Activity of the student:
   - Study of the theory
   - Resolution of problems
   - Preparation of projects

Learning objectives of the subject

Introduce the student to the basic concepts of Physic Geodesy. Highlight the advance of the last years related to the methods and techniques of use of the advanced technology in the measurements in-situ, aerotransportated and by satellite.
At the end of the study in this subject the student must be capable of know and apply, at least in a basic level, the methods and techniques of the Physic Geodesy that complement and interact with the Geometric Geodesy and the
Spacial Geodesy.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>18h</th>
<th>16.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>27h</td>
<td>24.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>67h 30m</td>
<td>60.00%</td>
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</tbody>
</table>
### Content

<table>
<thead>
<tr>
<th>Gravitational Field of the Earth</th>
<th>Learning time: 29h 35m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 6h 30m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study : 19h 05m</td>
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</tbody>
</table>

**Description:**
- Terrestrial gravitational field
- Development of gravitational potential in spheric harmonics
- Disturbing potential
- Reference ellipsoids
- Concept of geoid
- Orthometric height
- Geopotencial dimension
- Normal gravitational field
- Gravity anomalies
- Ondulation of the geoid
- Desviatiion of the vertical
- Bruns formula
- Stockes formula
- Vening-Meinesz formula

<table>
<thead>
<tr>
<th>Applications</th>
<th>Learning time: 13h 48m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 1h 48m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
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<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<td></td>
<td>Self study : 8h</td>
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</table>

**Description:**
- Determination of the sea level
- Applications of the Criosphere

<table>
<thead>
<tr>
<th>Determination of the Geoid Models</th>
<th>Learning time: 15h 25m</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
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<tr>
<td></td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<tr>
<td></td>
<td>Self study : 8h 25m</td>
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</tbody>
</table>

**Description:**
- Methods of determination of geoid models
  - Determination with anomalies at terrestrial level
  - Determination by statistic methods
### Qualification system

- **Midterm exam:** 20%
- **Resolution of delivery problems:** 30%
- **Writing and defense of a project:** 30%
- **Final exam:** 20%

### Learning time:

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
<th>Learning time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gravimetry</strong></td>
<td>Measurement of the absolute gravity; Measurement of the relative gravity; Types of gravimeters; Aerotransported gravimetry</td>
<td>11h 15m</td>
</tr>
<tr>
<td><strong>Gravimetric reductions</strong></td>
<td>Reduction at the fresh air; Bouger anomaly; Isostasy</td>
<td>18h 45m</td>
</tr>
<tr>
<td><strong>Geoid models</strong></td>
<td>Global models; Regional models; Local models; Adjustment of models; Applications in geosciences</td>
<td>23h 28m</td>
</tr>
</tbody>
</table>
Bibliography

Basic: