310605 - Geomorphology

Coordinating unit: 310 - EPSEB - Barcelona School of Building Construction
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN GEOPHYSICAL AND GEOMATIC ENGINEERING (Syllabus 2016). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: LUCILA CANDELA LLEDÓ
Rubio Cerdà, M. Amparo
Others: Lucila Candela Lledó
M Amparo Rubio Cerdá

Opening hours

Timetable:
LUCILA CANDELA: Monday 12-14
M Amparo Rubio:

Degree competences to which the subject contributes

Specific:

E3. (ENG) Comprendre i analitzar els problemes de implantació en el terreny de les infraestructures, construccions i edificacions projectades des de l'enginyeria en topografia, analitzar els mateixos i procedir a la seva implantació.
E8. (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.
E6. (ENG) Reunir i interpretar informació del terreny i tota aquella relacionada geogràficament i econòmicament amb ell.

Transversal:

G4. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
G5. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
G6. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

Teaching methodology

The course is organized in four hours of class a week, usually divided in two hours in large group and two hours in small groups. Large group classes are devoted to theory sessions (lessons) (21 h). In the classes small group carried out the practices (17 h) and various workshops (solving practical examinations, public consultations on the bibliographic work and learning portfolio, and presentation of work) (7 h). There are also participatory classes consisting of questionnaires discussion workshops and theory examinations (6 h, medium group).

Part of non-contact work is guided and involves different group activities (38 h): resolution of questionnaires and exercises (20 h) in conducting a bibliographic work (12 h) and the organization of the learning portfolio (6 h).
Learning objectives of the subject

The student has to be able of:
- Identifying the landscape forms
- To understand the processes leading to these forms
- To interpret simple geological and morphological maps
- To represent basic morphological features on cartographic support
- Be able to assess the relief for efficient selection of topographic points
- Search and select information in an efficient way
- Synthesize information and results communication
- Working in group

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>24h</th>
<th>16.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>36h</td>
<td>24.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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</table>
I. INTRODUCTION TO THE EXTERNAL GEODYNAMICS

Description:
Presentation of the subject. (1/4h)

Unit 1. The terrestrial surface. (Lesson 1, 3/4 h)
General characteristics of the Moon, Mars and Earth. Great measurements of the terrestrial relief: morfotechtonic great measurements of the continents and the submerged zones. Continental edges.

Unit 2. The dynamic terrestrial. (Lesson 2, 1 h)

Unit 3. Basic representation of relief. (Lesson 3, 1 h)
Elements of a map. Level curves map. Topographic profiles. The elemental shapes of relief and its representation by level curves.

Unit 4. The kinds of relief and its determinants. (Lesson 4, 1 h)

Related activities:
· Activity 1.1. Practice to recognise the relief in level curve maps. (1 h)

Specific objectives:
· Knowledge of the big relief measurements of the terrestrial surface.
· Synthetic vision of the different geologic processes that are in our planet.
· Knowledge of the topographic maps of level curves and carrying out topographic profiles.
· Knowledge of the classification of the reliefs according to its determinant factors.
· Introduction to the geologic maps
II. LITHOLOGYC AND STRUCTURAL GEOMORPHOLOGY

Learning time: 150h
- Theory classes: 21h
- Practical classes: 5h
- Laboratory classes: 24h
- Guided activities: 5h
- Self study: 95h

Description:
Unit 5. Geologic Materials (Lessons 5-6, 2h)

Unit 6. Geologic structures. (Lessons 5 and 6, 2h)

Unit 7. Meteorization. (Lesson 8, 1 h)

Unit 8. Lithologic reliefs. (Lesson 9, 1h)

Unit 9. Structural reliefs. (Lesson 10, 1 h)
Passive and active structural contents. Landscapes with geologic structure inherited: tabular and relief, residual relief, relief in sheet zones.

Related activities:
1) Activities in class
   - Activities 1.2, 1.3 i 1.4: practice of geologic maps. (6 h, small group)
   - Activity 1.5: practice of recognition of relief forms in aerial photographs. (1 h, small group)
   - Activities 2.1 i 2.2: workshop of test 1 (1h, medium group) and workshop of revision (previous to the 1st theory exam). (1 h, medium group).
   - Activitats 2.3 i 2.4: workshops of exam resolution of the first theoretical test and of the questionary 1 (1 h, medium group) and workshop of resolution of the practical exam of geologic maps (1 h, small group).

2) Evaluation activities:
   a) Managed project: delivery 1 (questionnaire 1), delivery 2 (practice 3), delivery 3 (carpet of knowledge, activity 5).
   b) Acts of evaluation:
      - Activity 4.1: practical exam of geologic maps (1,5 h)
      - Activity 4.2: test of questionnaire 1. (10 min)
      - Activity 4.3: partial exam of theory (units 1 and 2). (1 h)

Specific objectives:
- Knowledge of the main characteristics of the rocks and its formation processes.
- Knowledge of the geologic structures.
- Knowledge of the meteorization processes, the geological products that come of and the environmental and engineering problems associated.
- Knowledge of the influence of lithology and the geologic structure in relief and knowledge of the main lithologic and structural reliefs.
### III. DYNAMIC AND TECTONIC GEOMORPHOLOGY

<table>
<thead>
<tr>
<th>Learning time: 68h</th>
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<tbody>
<tr>
<td>Theory classes: 11h 30m</td>
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<tr>
<td>Practical classes: 2h 30m</td>
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<tr>
<td>Laboratory classes: 11h</td>
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<tr>
<td>Guided activities: 3h</td>
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<tr>
<td>Self study: 40h</td>
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</table>

**Description:**

Unit 10. Model of gradients. (Lesson 11, 1 h)

Unit 11. Fluvial morphology. (Lessons 12 and 13, 2 h)

Unit 12. Glacial morphology. (Lesson 14, 1 h)
Definition and types of glaciers. Movements of the glaciers. Erosion and forms of relief. Sedimentation and forms of relief depositionals. The last glaciation in the Pirinees.

Unit 13. Coast morphology. (Lesson 15, 1 h)

Unit 14. Tectonic and volcanic reliefs. (Lesson 16, 1 h)

Unit 15. Horizontal movements of the terrestrial surface. (Lessons 17 and 28, 2 h)

Unit 16. Vertical movements on the terrestrial surface. (Lessons 19 and 20, 2 h)

Unit 17. Local shifts of the ground and its control (Lesson 21, 1 h)
Syntesis of the geomorphologic events that cause the shift of the ground. Types of shifts. Introduction to the conventional and modern techniques of movement control.

**Related activities:**
1) Activities in class
   · Activity 1.6: cartographic practice of relief forms over a topographic base. (2 h, small group)
   · Activities 1.7 to 1.10: curve practices. (7 h, small group)
   · Activities 2.5 i 2.6: workshop of questionnaire 2 (1 h, medium group) and workshop of revision (1 h, medium group).
   · Activity 2.7: workshop of resolution of the theoretical exam. (1/2 h, medium group)
   · Activities 2.8 i 2.9: workshop of resolution of the practical exam (1 h, small group) and workshop about the evaluation of the knowledge carpet (1 h, small group).

2) Evaluating activities
   a) Guided project: delivery 4 (pràctica 9), delivery 5 (questionnaire 2), delivery 6 (knowledge carpet, activity 5) and delivery 8 (knowledge carpet activity 5).

   b) Acts of evaluation:
      - Activity 4.4: questionnaire 2. (10 min)
      - Activity 4.6: Practice exam of curves. (1 h 50 min)
      - Activity 4.7: Second theoretical partial exam (unit 3). (1 h)

Specific objectives:
   · Knowledge of the main processes of gradient, fluvial, glacial, coasts and the morphology of the ground resulting from the erosion and sedimentation made by them.
   · Knowledge of the active tectonic and volcanic processes and the resulting morphologies of the ground.
   · Knowledge of the horizontal movements of the terrestrial lithosphere. Notions of tectonic plates, comprehension about the spatial distribution of the tectonic activity, volcanic and seismic at global scale.
   · Knowledge and comprehension of the formation and destruction of mountain chains, and other vertical movements at regional scale.
### IV. REGIONAL GEOMORPHOLOGY, HISTORIC AND CLIMATE. TOPOGRAPHIC CONTROL OF ACTIVE GEOLOGIC PROCESSES

<table>
<thead>
<tr>
<th>Description:</th>
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<tbody>
<tr>
<td>This content is developed by carrying out the presentation of mandatory group projects (look activity 3). The topics to develop in the projects are the following ones:</td>
</tr>
<tr>
<td>· Regional and historic geomorphology (6 projects):</td>
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<tr>
<td>Geology and geomorphology of Catalonia.</td>
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<td>Geology and geomorphology of the Iberic Peninsula.</td>
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<tr>
<td>The formation of Pyrenees.</td>
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<tr>
<td>Paleogeography of Catalonia.</td>
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<td>Old orogeny theories.</td>
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<tr>
<td>· Climate geomorphology (9 projects):</td>
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<tr>
<td>Morfolimate zones.</td>
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<tr>
<td>Geomorphology of the periglacial zones.</td>
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<td>Geomorphology of the arid zones.</td>
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<tr>
<td>Geomorphology of the tropical zones.</td>
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<tr>
<td>Causes climate changes.</td>
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<tr>
<td>Changes in the level of the sea.</td>
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<tr>
<td>· Topographic control of external geodynamic processes (5 projects):</td>
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<tr>
<td>Active volcanos.</td>
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<tr>
<td>Gradient movements.</td>
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<tr>
<td>Superficial erosion.</td>
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<tr>
<td>Subsidence.</td>
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<tr>
<td>Coast processes.</td>
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<tr>
<th>Learning time: 16h</th>
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<tbody>
<tr>
<td>Laboratory classes: 4h</td>
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<tr>
<td>Self study: 12h</td>
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### Related activities:

1) Guided activities in class:

   - Activities 3.1 i 3.2: consultation workshop (public) of the bibliographic project (small group). (2h)
   - Activity 3.3: assistance to the presentations of other groups (small group). (1 h i 3/4)

2) Evaluation activities:

   - a) Guided project: delivery 7 (copy of the presentation project).
   - b) Evaluation acts: activity 4.5, presentation of the bibliographic project (1/4 h).

### Specific objectives:

- Ampliation of content in the subject to topics of regional, historic and climate geomorphology and examples of application of topographic and geomatic techniques to the control of active geological processes.
- Autonomous search and analysis of information
- Group project
- Oral communication
# Planning of activities

## ACTIVITY 1: PRACTICES

<table>
<thead>
<tr>
<th>Description:</th>
<th>Hours: 37h</th>
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<tbody>
<tr>
<td>Resolution of 10 practical exercises, conducted in the classroom, including the interpretation of simple geological maps and identification of landforms on topographic maps and aerial photography.</td>
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<tr>
<td>- Activity 1.1: Recognition of the relief represented in contour maps. Performing topographic profiles. A practice (1 h).</td>
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<tr>
<td>- Activities 1.2, 1.3 and 1.4: Geological maps: introduction to simple geological maps and conducting geological profiles. Three practices (6 h).</td>
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<tr>
<td>- Activities 1.5 and 1.10: Photo-interpretation and mapping of landforms on topographic map. Two practices (3 h).</td>
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<tr>
<td>- Activities 1.6 to 1.9: Curvados: tracing contour on geomorphological approximate scheme. Four practices (7 h).</td>
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<tr>
<td>Each exercise is solved in the next class of practices.</td>
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### Support materials:

- Exercises will be shown in Atenea

### Descriptions of the assignments due and their relation to the assessment:

- Deliveries and links with the evaluation
- Each solved practice will be added to the knowledge folder (that has its own evaluation) to its revision in the following practice class.
- The student must autocorrect the practice with the solution talked about in class (and upload in Atenea). The autocorrect exercise also has to be attached to the folder.
- The practical exercises 3 and 8 (activities 1.3 and 1.8) will be delivered the following week to its beginning in class (deliveries 2 and 8). These exercises will be carried out in groups of 3-4 students and will be evaluated. The qualification of each exercise counts for a 3% of the subject's final mark.
- Two practice exams and another one of curves will be carried out.

### Specific objectives:

- At the end of this activity the student must be capable of:
  - Identify the relief from level curved maps and carry out topographic profiles from themselves.
  - Interpret easy geologic maps and carry out geologic profiles, as a base to the comprehension of the lithologic and structural reliefs.
  - Reconstruct the geological history of the represented zones in the maps.
  - Identify the most frequent relief forms and map them into level curves maps.
  - Trace in a correct way the level curves into a geomorphologic scheme that involves a limited number of LEVELS.
  - Work in a cooperative group, discuss and think in group and reach agreements.

### ACTIVITY 2: QUESTIONNAIRES AND WORKSHOPS

<table>
<thead>
<tr>
<th>Hours: 18h</th>
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<tbody>
<tr>
<td>Practical classes: 5h 30m</td>
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<tr>
<td>Laboratory classes: 2h</td>
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<tr>
<td>Guided activities: 0h 30m</td>
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<tr>
<td>Self study: 10h</td>
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</table>
ACTIVITY 3: BIBLIOGRAPHIC PROJECT

Description:
- Questionnaires: they are lists of 25-30 questions of short answer (10 - 15 lines) of topics treated in theoretical classes. The solution to most of the questions is not only to memorize but also require to some concepts (for example between process and results of themselves), and in consequences it requires reflection and assimilation of the knowledge teach in class.
There are two questionnaires to resolve. They will be carried out outside of class and in groups of 3-4 students and they will be delivered across Atenea for its evaluation.

- Workshops and questionnaires: the questionnaire 1 is answered and discussed in class in two sessions workshop type (big group, 1 h per session).
The questionnaire 2 is carried out and discussed in a workshop (1 h). After the discussion of each questionnaire is performed and individual short test that includes 5 questions of the list. The tests of two questionnaires will be carried out two weeks before each partial exam.

- Exam workshops: they are carried out after theoretical and practical exams, where the same ones are answered and doubts are set out. These workshops take place immediately after, or in the same week of the exam. The week before the final exam another workshop is done to set out and discuss all the remaining doubts.

Support materials:
- Wording of the questionnaires in Atenea. Resolution in class of the questionnaires and the exams.

Descriptions of the assignments due and their relation to the assessment:
Deliveries:
- Delivery 1 (questionnaire 1, part 1), delivery 4 (questionnaire 1, part 2), delivery 6 (questionnaire 2).
Acts of evaluation:
- Activity 4.2: test of questionnaire 1. (10 min)
- Activity 4.4: test of questionnaire 2. (10 min)
Each questionnaire counts 8% of the subject's mark.

Specific objectives:
At the end of this activity the student must be capable of:
- Define the big units of continental and oceanic reliefs of our planet.
- Describe the external geodynamic preocesses and the fundamental geomorphologic agents.
- Describe the more abundant type of rocks and the main geologic structures.
- Describe the lithologic types of reliefs, structurals, fluvials, glaciers, coasts, volcanics and tectonics.
- Relate the types of relief, the properties that condition them and the processes that originate them. Explain these relations.
- Ennumerate the external geodynamic processes that cause changes in the topography noticeable in a anual scale.
- Comprehend the mechanisms that operate in this processes.
- Work in cooperative groups, distribute tasks, assume compromises, plan the working time, discuss in group and reach agreements.
- Identify lacks of knowledge and look for the ressources to supply them.
- Recognise wrong concepts and conclusions and correct them.

ACTIVITY 3: BIBLIOGRAPHIC PROJECT

Hours: 15h
Practical classes: 3h
Self study: 12h
**ACTIVITY 4: KNOWLEDGE FOLDER**

**Description:**
- Consists in an autonomous project of investigation, análisis, selection, sintesis and communication of bibliographic information in a topic of geomorphology.
- The topic is choosen from a list of topics shown by the teacher (see unit 4).
- The project is done in group (3-4 students).
- It must be presented in form of oral communication of 10 minutes.
- After the presentation follows a turn of 5 minutes questions made by rest of schoolmates and the teacher.
- The presentations will be done in various sessions, in practical schedule of the subject and at the third quarter of the course.

**Support materials:**
Are scheduled two workshops of group consult and supervisión of the project (of 15 minutes) in practical schedule.

**Descriptions of the assignments due and their relation to the assessment:**
- Delivery 7: printed copy of the oral presentation, at the first sesión of the presentations.
- Oral presentation (activity 4.5), weight 12% of the final mark. It will be valued the content of the presentation as well as the quality of the communication.

**Specific objectives:**
At the end of this activity the student must be capable of:
- Acquire experience and group work.
- Use resources of information in a solvent way.
- Analyze and select information in a autonomous and efficient way.
- Synthesize the information and learn the knowledge about the topic treated.
- Prepare an oral communication efficiently and adjusted to time.
- Carry out the presentation (communicate) in an efficient way and adjusted to time.
- Carry out an autoevaluation and an autocorrection of the work done.

**ACTIVITY 4: KNOWLEDGE FOLDER**

**Description:**
The folder must contain the evidences of the work done and the learning progression. The folder must be done in group and in a cooperative way. In class (small group) will be carried out two workshops about the preparation of the folder (1/2 h each one). The folder must include all the documentation given by the profesor and all the documentation generated by the group of students. In particular:
- The presentations of the theory and practic classes.
- The notes taken in theory classes.
- The questionnaires 1 and 2: the delivered versión and the autocorrected versión after its resolution in class.
- Practices: all of the solved exercises and its autocorrected version after the final resolution in class, in particular the two delivered practices evaluated by the teacher.
- The midterm exams after its resolution in class.
- A printed copy of the presentation of the bibliographic Project in group.
- Summary of the reflexions about the knowledge obtained (methods and contents) (optional).

**Support materials:**
The documentation given by the faculty acroos Atenea and the resolution in class of the questionnaires, practical exercises, midterm exams.

**Descriptions of the assignments due and their relation to the assessment:**
- Delivery 3 (first revisión) and delivery 9 (third and last revisión). Weight: 10% of the final mark of the subject.
### ACTIVITAT 5: INDIVIDUAL TESTS

**Description:**
- Carrying out 4 exams, 2 midterms of theory and 2 midterms of practices.
- The first midterm exams (one of theory and one of practice) will be made at the half of the course and the second midterms at the end of the course.
- The first midterm of theory includes the units 1 to 10, and the second midterm the units 11 to 17.
- The first midterm of practice is an exercise of geologic map, like the ones done in practices 2 to 4.
- The second midterm of practices is a curved exercise, like the ones done in practices 6 to 9.

**Support materials:**
Folder of knowledge, that must include the documentation specified in the activity 4.

**Descriptions of the assignments due and their relation to the assessment:**
Weight: 52% of the mark of the subject. See "System of qualification".

**Specific objectives:**
In addition to what is described in the activities 1 and 2, to obtain the máximum qualification on the tests the student must be capable of:
- Explain the formation of the big unities of the terrestrial relief, in particular the formation of orogenys and cratons and its relation with the phisiography.
- Describe synthetically the classic and modern models of evolution of relief, analize and compare them.

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**Specific objectives:**
At the end of this activity the student must be capable of:
- Organize and revise the documentation generated by the group.
- Plan the study
- Carry out autocorrections and autoevaluations taking as example the resolution in class of questionnaires, exercises and exams.
- Think about the process of learning.

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**ACTIVITAT 5: INDIVIDUAL TESTS**

<table>
<thead>
<tr>
<th>Hours: 5h 30m</th>
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<tr>
<td>Guided activities: 5h 30m</td>
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**Guided activities:**
5h 30m

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Universitat Politècnica de Catalunya
Qualification system

The evaluation has the following components:

- Exams (56% of the course grade): four tests, two sets of two partial theory and practice. The value of each exam is 14% of the grade for the course. If the first part of suspense theory (or practices) can recover that part in the final exam conducting a comprehensive test theory (or practices). Recovery is mandatory for grades below 4. There will be a final exam reevaluation for students who have not passed the subject (note 4); should recover only partial unsurpassed (theory or practice) by an individual written test.

- Questionnaires (16%): delivery of two questionnaires resolved in a group outside of class, and after each delivery of an individual written test (type test) realization. Each questionnaire is 8% of the grade for the course. The note is the geometric mean of the delivered questionnaire and individual test. See Activity 2.

- Practical exercises (6%): delivery of two exercises, each represents 3% of the grade for the course. See Activity 1 (group activity).

- Bibliographic work (12%) (see Activity 3, group activity).

- Folder learning (10%) (see activity 5 group activity).

The overall rating of "no show" will be applied in cases of non-delivery of any evaluable activity or absence of some act of evaluation of the subject.

In group activities that are assessable it provides a mechanism for detecting and compensating for poor performance by any member of the group. In particular, when a member is suspected inaction, what teachers call a personal assessment interview. Failure to attend the interview will lead to a rating of "not presented" to the activity and the subject.

Attendance and classwork will be assessed.

Regulations for carrying out activities

The specific rules of activities are indicated in the relevant section.

- Most activities are carried out in groups. Groups may be formed freely in the first two weeks of the semester, in teams of 4 students. Occasionally groups of 3 students will be admitted only when the enrollment is not a multiple of four. After this period, the other groups will be formed by teachers. The only possible change in the composition of a group is that caused by the separation manifests one of the members.

- All activities that generate a deliverable are required (see rating system).
Bibliography

Basic:


Complementary:


Others resources:

Hyperlink

http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/title_page.html

The physical environment - Michael Ritter

http://highered.mcgraw-hill.com/sites/0072402466/student_view0/

Physical Geology 9 ed

http://www.csus.edu/indiv/s/slaymaker/Archives/Geo10L/landforms.htm

Landforms and topographic maps

http://geogweb.berkeley.edu/Geol10LImages/Wells/wells.html

Lisa Wells’ Geomorphology Images