

Academic Year/course: 2021/22

## 28722 - Procedures and Organisation

### Syllabus Information

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**Academic Year:** 2021/22

**Subject:** 28722 - Procedures and Organisation

**Faculty / School:** 175 - Escuela Universitaria Politécnica de La Almunia

**Degree:** 423 - Bachelor's Degree in Civil Engineering

**ECTS:** 6.0

**Year:** 3

**Semester:** First semester

**Subject Type:** Compulsory

**Module:**

## 1. General information

### 1.1. Aims of the course

The subject "Procedures and organization" will approach the student to the knowledge of the most common construction processes in civil works and the machinery used in them. The procedures for earthmoving, those for the use of concrete and those for bituminous mixtures are identified and studied in the subject. It also defines the use of machinery and auxiliary means common to many engineering processes such as formwork, shoring, shoring, cranes, compressors and various tools.

All these theoretical knowledge are applied in a practical way by solving problems related to performance calculations, work cycles and costs.

These approaches and objectives are in line with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>), in such a way that the acquisition of the course learning outcomes provides training and competence to contribute to their achievement to some degree.

Goal 4: Quality Education

### 1.2. Context and importance of this course in the degree

The subject "Procedures and organization" aims to be a starting point that introduces the student to the way in which the most common engineering works are built, providing the necessary technical base to learn the methods used and the machinery necessary for this. In addition to this basic knowledge of knowing "how" and "with what" it is important that the student learn the aspects related to the duration, limitations, selection criteria, phases, prices and in general of all the particularities necessary for a correct "execution of work".

### 1.3. Recommendations to take this course

The study of the procedures of movement of lands leaves from the knowledge that the student has had to acquire on the stony materials in the subject of "Geotechnics" (28718) of 2<sup>o</sup> course.

The study of the constructive procedures of putting concrete into concrete and executing part of the knowledge that the student has had to acquire on cements, aggregates, steels, bitumen and manufacture of bituminous mixtures in the subject of "Science and Technology of materials" (28712) of 2nd year.

For all the above it is highly recommended to have passed both subjects.

## 2. Learning goals

### 2.1. Competences

- G01. Ability for organization and planning.
- G02. Ability to solve problems.
- G03. Ability to make decisions.
- G04. Aptitude for oral and written communication in their mother tongue.
- G05. Ability for analysis and synthesis.
- G06. Ability to manage information.
- G07. Ability for teamwork.
- G08. Ability for critical thinking.
- G09. Ability to work in an interdisciplinary team.
- G10. Ability to work in an international context.
- G11. Ability to improvise and adapt themselves to face new situations.
- G12. Leadership ability.
- G13. Positive social attitude towards social and technological innovations.
- G14. Reasoning ability, discussion and presentation of ideas.
- G15. Communication skills through word and image.
- G16. Ability to Search, analyze and select information.
- G17. Ability for independent learning.
- G23. Learn and understand the respect to fundamental rights, equal opportunities between men and women, universal accessibility for people with disabilities, and respect for the values of the culture of peace and democratic values.
- G24. Foster entrepreneurship.
- G25. Knowledge on information and communication technology. Context and meaning of the subject in the degree

CB1 - Students must have shown knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge coming from the forefront of their field of study

CB2 - Students must know how to apply their knowledge to their work or vocation from a professional approach and possess the skills that are usually verified through the elaboration and defense of arguments and problem solving within their area of study

CB3 – Students must have the ability to gather and interpret relevant data (usually within their area of study) to convey views that include a reflection on relevant issues of a social, scientific or ethical nature

CB4 - Students must be able to convey information, ideas, issues and solutions to a specialized and non-specialized audience

C09 - Ability to analyze the problems concerning health and safety in construction sites

C11 - Ability to apply environmental impact assessment and study methodologies

C12 - Knowledge of construction procedures, construction machinery and techniques for organizing, measuring and evaluating works.

## 2.2. Learning goals

The specific objectives of the subject are to know:

1. the general physical aspects of earthmoving procedures
2. the performance characteristics of earthmoving machinery
3. the modes of use and work cycles of earthmoving machinery
4. the procedures for carrying out cuttings by blasting
5. the aggregates manufacturing process
6. the concrete manufacturing and commissioning process
7. the manufacturing and commissioning process of bituminous mixtures
8. the form of execution of shoring, formwork, ironwork, falsework and shoring
9. the use of load lifting elements
10. the use of auxiliary machinery for common use in the execution of works

## 2.3. Importance of learning goals

Once the subject has been completed, the student will understand and learn with full performance the subjects to be taken in the fourth year of the Degree.

The detailed knowledge of this subject will allow the student when he integrates into the world of work as a Civil Engineer to develop more efficiently the functions of Site Manager and Project Writer

### 3. Assessment (1st and 2nd call)

#### 3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Due to the characteristics of the syllabus of this subject with two clearly differentiated blocks, the evaluation will be carried out independently for each of the didactic units, UD I and UD II.

Two forms of evaluation will be followed: a continuous one with two exams carried out throughout the semester and a final global evaluation, the latter with two calls (February and September). These evaluations (continuous and final global) are not exclusive, being able to opt for the second in case of not having passed the subject throughout the exams programmed during the course of the semester.

A student who passes the two continuous assessment exams will not have to take the final global exam. Those students who do not reach this condition will have to sit the final exam of the two teaching units, even if they have passed one of them through continuous evaluation (regardless of the grade obtained). The final grade to be recorded in the minutes, in case of being "suitable" in both UD, s, will be the result of averaging the qualifications obtained in both.

In both modalities of qualification, continuous and global final, the student must deliver the assignments that have been entrusted during the course. Failure to deliver any of these works will mean the loss of the right to correct the exam.

The works will be carried out in teams of 2 students expressly designated by the teacher and their content, definition and delivery conditions will be published through the Moodle platform. These works will have a percentage value of 10% on the final grade in each of the didactic units:

- **UD I evaluation (65% grade):**

- EV-I or EV-F-I exam 90%
  - UD-I works 10%

- **UD II evaluation (35% grade):**

- EV-II or EV-F-II exam 90%
  - UD-II works 10%

**In global assessment test** the following points the approximate weights of the evaluation process are shown:

- Projects / Mandatory tasks 10%
- Final Assessment Test 90%

Parts or notes will not be saved from one academic year to another.

### 4. Methodology, learning tasks, syllabus and resources

#### 4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, tutorials, autonomous work and study, and exams.

*"If due to health reasons the in-person teaching-learning process is not possible, it shall be carried out telematically."*

#### 4.2. Learning tasks

The course consists of 6 ECTS credits, which represents 150 hours of student work in the course during the semester. 40% of this work (60 h.) Will be done in the classroom, and the rest will be autonomous. A semester will consist of 15 teaching weeks. To make the temporal distribution, the teaching week is used as a measure, in which the student must dedicate 10 hours to the study of the subject.

- Theoretical classes 26 hours
- Practical classes 16 hours
- Individual tutored practices 11 hours
- Evaluations 7 hours
- Individual non-contact work 90 hours

#### 4.3. Syllabus

This course will address the following topics:

SECTION I: SAND MOVING METHODS

TOPIC 1. SAND MOVING MACHINERY

- 1.1. Sand moving
- 1.2. Sand moving basic operations and machinery
- 1.3. Land classification based on their hardness
- 1.4. Advantages and limitations of the sand moving machines
- 1.5. Machinery choice
- 1.6. Mechanization of works

## TOPIC 2. SAND VOLUMES

- 2.1. Sand volume changes
- 2.2. Swelling and swelling factor
- 2.3. Consolidation and compaction
- 2.4. Swelling values
- 2.5. Practical considerations in soil layer extension
- 2.6. Land clearing and land filling.
- 2.7. Land movement cuttings and landfills
- 2.8. Cross section areas
- 2.9. Determining the mass to be moved between two profiles
- 2.10. Mass diagram
- 2.11. Soil compensation

## TOPIC 3. MACHINE TRACTION REQUIREMENTS

- 3.1. Required traction
- 3.2. Balance between available and usable tractions
- 3.3. Resistance to traction
- 3.4. Speed calculation. Motion Equation.
- 3.5. Practical exercises

## TOPIC 4. PRODUCTION AND COST OF THE MACHINERY

- 4.1. Cost Calculation of the work unit
- 4.2. Definition of production
- 4.3. Cost of using machinery

## TOPIC 5. EXCAVATION AND PUSHING: DOZER

- 5.1. Models and scope
- 5.2. Mechanical properties
- 5.3. Working equipment
- 5.4. Production cycle
- 5.5. Working capabilities
- 5.6. Excavation and pushing distances
- 5.7. Calculating dozer production
- 5.8. Excavation and pushing techniques
- 5.9. Ripping techniques
- 5.10. Practical exercises

## TOPIC 6. EXCAVATION AND LOADING: FRONT LOADER

- 6.1. Definition, types and applications
- 6.2. Front loader elements and working equipment
- 6.3. Characteristic parameters
- 6.4. Working cycle
- 6.5. Buckets
- 6.6. Calculating front loader production
- 6.7. Match factor
- 6.8. Practical exercises

## TOPIC 7. LOADING AND HAULING: SCRAPERS

- 7.1. Scraper functions
- 7.2. Scraper types and fields of application
- 7.3. Scraper elements and working equipment
- 7.4. Production cycle
- 7.5. Excavation methods
- 7.6. Different ways of working
- 7.7. Working tips
- 7.8. Calculating scraper production
- 7.9. Match factor
- 7.10. Practical exercises

## TOPIC 8. EXCAVATION MACHINERY: EXCAVATORS

- 8.1. Definition, types and applications
- 8.2. Hydraulic excavators
- 8.3. Cable excavators
- 8.4. Practical exercises

## TOPIC 9. HAULING: TRUCKS AND DUMPERS

- 9.1. Typology

- 9.2. Dump trucks
- 9.3. Dump semi-trailers
- 9.4. Dumpers
- 9.5. Off-road dumpers: rigid frame and articulated rear-dump trucks
- 9.6. Dump bodies
- 9.7. Hauling cycle and match factor
- 9.8. Calculating dumpers production
- 9.9. Practical exercises
- 9.10. Transport of heavy machinery

#### TOPIC 10. FINISHING EQUIPMENT: GRADERS

- 10.1. Definition and field of applications
- 10.2. Grader elements
- 10.3. Working equipment
- 10.4. Grader operations
- 10.5. Calculating grader production
- 10.6. Practical exercises

#### TOPIC 11. COMPACTION

- 11.1. Types of compacting equipment
- 11.2. Compacting diagram
- 11.3. Compacting methods
- 11.4. Factors affecting compactation
- 11.5. Compaction specifications and control
- 11.6. Compaction tests
- 11.7. Calculating compaction production
- 11.8. Compaction tips
- 11.9. Selecting a compactor
- 11.10. Practical exercises

### SECTION II: GENERAL CONSTRUCTIVE PROCEDURES

#### TOPIC 12. AUXILIARY EQUIPMENT

- 12.1. Electric generator
- 12.2. Air compressors and hammers
- 12.3. Equipment for pumping water
- 12.4. Gas cutting procedures
- 12.5. Welding procedures
- 12.6. Rock and soil drilling machinery

#### TOPIC 13. AGGREGATE PRODUCTION

- 13.1. General information:
- 13.2. Aggregate production machinery
- 13.3. Calculating aggregate production
- 13.4. Aggregates classification: Screeners
- 13.5. Aggregates washing
- 13.6. Feeders and belt conveyors
- 13.7. Surge piles
- 13.8. Facilities
- 13.9. Practical exercises

#### TOPIC 14. FLEXIBLE PAVEMENTS: MACHINERY AND EXECUTION

- 14.1. Soil stabilization
- 14.2. Bituminous coats: prime, tack and seal
- 14.3. Aggregate and bituminous coats
- 14.4. Bituminous concrete

#### TOPIC 15. CONCRETE: EQUIPMENT AND PLACING

- 15.1. Concrete mixers
- 15.2. Concrete plants
- 15.3. Execution: Concrete pumping
- 15.4. Execution: Consolidating and finishing
- 15.5. Execution: Concrete pavements
- 15.6. Execution: Shotcrete

#### TOPIC 16. TIMBERING, FORMWORK AND FALSEWORK

- 16.1. Timbering
- 16.2. Formwork
- 16.3. Concrete reinforcement
- 16.4. Falsework

#### TOPIC 17. CRANES AND LIFTING SYSTEMS

- 17.1. Introduction
- 17.2. Major crane types

17.3. Mobile cranes:

17.4. Tower cranes

## TOPIC 18. PRACTICAL EXAMPLES OF CONSTRUCTION METHODS

### 4.4. Course planning and calendar

- Week 1: SECTION I.
- Week 2: SECTION I.
- Week 3: SECTION I.
- Week 4: SECTION I.
- Week 5: SECTION I.
- Week 6: SECTION I.
- Week 7: SECTION I.
- Week 8: SECTION I.
- Week 9: SECTION I / ASSESSMENT
- Week 10: SECTION II.
- Week 11: SECTION II.
- Week 12: SECTION II.
- Week 13: SECTION II.
- Week 14: SECTION II.
- Week 15:SECTION II / ASSESSMENT

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of EUPLA website and Moodle.

### 4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28722>