

## 28620 - Works Equipment

### Syllabus Information

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**Academic Year:** 2019/20

**Subject:** 28620 - Works Equipment

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

**Degree:** 422 - Bachelor's Degree in Building Engineering

**ECTS:** 6.0

**Year:** 3

**Semester:** First semester

**Subject Type:** Compulsory

**Module:** ---

## 1.General information

### 1.1.Aims of the course

Within the studies of Technical Architecture it is essential to know what we commonly call "work equipment and auxiliary means", making known to the students the main characteristics, uses, functions, performances, productions, main components, etc. ., of the equipment, machines and tools that are commonly used in building and urbanization works. With this you will be familiar with the design and planning for the correct choice of said equipment, tools and machinery in each type of work and / or in each phase of the same, as well as its most favorable location.

It will also analyze the needs in terms of supplies, especially energy that the equipment and machinery will need for proper operation, should be able to calculate the provisional connections of work of electricity, water, pluvial and fecal drainage, etc. . linked to the period of completion of the works.

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

The subject of EQUIPMENT OF WORK is the fourth contact that the students of the Degree in Technical Architecture have with the constructive fact, from which one begins to become aware of how the process is developed in the global construction and of the paper (or papers) played by the Technical Arquitecto within it.

It is part of a group of specific training subjects and mandatory character structured throughout the four courses of the degree, which will provide much of the specific skills and subsequent professional skills of these graduates.

### 1.3.Recommendations to take this course

The current curriculum does not establish any prerequisite to take this subject. However, it would be advisable not only to possess the basic knowledge of mathematics, physics, fundamentals of materials and graphic expression, but also to have completed and / or passed the following subjects:

- Construction Materials I.
- Construction Materials II.
- Structures I and II.
- Building I, II and III.

## 2.Learning goals

### 2.1.Competences

### 2.2.Learning goals

### 2.3.Importance of learning goals

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

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

## 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 theory sessions, practice sessions, exams, tutorials, and autonomous work and study.

The teaching methodology is based on a strong interaction between the teacher and the student. This interaction is materialized by a division of labor / responsibilities among students and teachers.

## 4.2. Learning tasks

This course is organized as follows:

- **Theory sessions:** theoretical concepts of the subject will be explained and illustrative practical examples to support the theory will be developed when deemed necessary.
- **Practice sessions:** problems and case studies to complement the theoretical concepts studied will be made. Students using notes, rules and bibliography, will real work in class, which will be delivered for review before finishing it.
- **Autonomous work and study**
  - Study and assimilation of the theory presented in lectures.
  - Understanding and assimilation of the problems solved in practice sessions.
  - Autonomously resolution of problems and proposed examples.
  - Preparation of practices, information search, group meetings, preparation of scripts and reports.
  - Preparation of the written tests of continuous assessment and / or final exams overall assessment.
- **Tutorials. They can be on-site or online.**

## 4.3. Syllabus

This course will address the following topics:

### **SECTION I: EARTH MOVING METHODS**

#### **TOPIC 1. EARTH MOVING MACHINERY**

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

#### **TOPIC 2. EARTH VOLUMES**

- 2.1. Earth 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. Storage 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**

The course consists of 6 ECTS credits which represent 150 hours of work of the student in this course, ie 10 hours per week during 15 weeks of teaching of the course.

From week 1 to 9 first section of the syllabus will be studied and an assessment will take place in the 9th week. From week 10 to 15 we will study the second section of the syllabus and a later assessment of this section will take place.

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://biblos.unizar.es/br/br\\_citas.php?codigo=28620&year=2019](http://biblos.unizar.es/br/br_citas.php?codigo=28620&year=2019)