Universidad Zaragoza

**Year : 2020/21**

# 28613 - Materials II

## Syllabus Information

**Academic Year:** 2020/21
**Subject:** 28613 - Materials II
**Faculty / School:** 175 - Escuela Universitaria Politécnica de La Almunia
**Degree:** 422 - Bachelor's Degree in Building Engineering
**ECTS:** 6.0
**Year:** 2
**Semester:** First semester
**Subject Type:** Compulsory
**Module:** ---

# 1.General information

## 1.1.Aims of the course

**The course and its expected results respond to the following approaches and objectives:**

Showing the basic concepts of Material Engineering and studying the different types of materials in construction. The contents aim at providing an adequate response to relevant issues for the graduates such as the acquisition of knowledge that meets the requirements demanded by today's society, and the necessary skills to carry out their profession in a convenient and competitive way. Taking into account the students for whom the subject is intended, the focus, as well as the content, should be directed, fundamentally, to the acquisition of the basic principles of the Materials Science, the classification of the different families of materials , its properties, applications and behavior in service, and the technology developed to improve the properties of the materials, in such a way that it allows the students to choose, in a first approach, the most suitable material for each application.

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

The course of Materials II is part of the Degree in Technical Architecture offered by EUPLA, within the group of subjects that make up the module called Technical and Technological Building Training. It is a compulsory subject (OB), offered in the second semester of the first year with a teaching load of 6 ECTS credits. Its contents must provide the basic knowledge necessary for the follow-up of further subjects of the Curriculum.

Every subject that makes up the Degree aims at covering a field in the Technological and Scientific training of the students, in this case the choice of material the first step in building. Both the viability of the project and its design and aesthetics will depend on the chosen material.

To be able to choose a material, its mechanical, chemical, optical properties, its behavior with other materials and its durability depending on the environments in which it is located must be known

## 1.3.Recommendations to take this course

There are no necessary conditions to take this course. However, skills and abilities in areas such as Physics, Mathematics and Fundamentals of Construction Materials will be an asset.

# 2.Learning goals

## 2.1.Competences

The student will acquire generic and specific competences listed in the verification memory of the degree, such as:

CB1

CB2

CB3

CB4

CB5

CE4

CE5

G01

G02

G03

G04

G05

G06

G07

G08

G09

G10

G11

G12

G13

G14

G15

G16

G17

G18

G19

G20

G21

G22

### 2.2.Learning goals

The student, to pass this subject, must demonstrate the following results:

1. Know the behavior and technology of certain materials.

2. Explain the manufacturing technologies and the implementation technologies of the different materials.

3. Explain the differentiating criteria for the ?classification? of the different families of construction materials (Cement, Lime, Pla

4. It is able to relate the properties of the materials with the structure and / or microstructure.

5. It is able to relate the properties of the materials, obtained from tests, with the applications and their behavior in service.

6. It is able to choose the materials based on the applications and their behavior in service.

7. Has a sufficient knowledge base to broaden and deepen the study and development of the materials used in construction.

8. Know the importance of innovation in the development of manufacturing, commissioning and application of materials.

9. Has the ability to critically analyze the results obtained in an experimental work and extract correct conclusions, as well as pr

10. Is able to carry out, individually and / or in teams, a research experiment in the field of Materials Engineering in a correct wa

### 2.3.Importance of learning goals

This course is highly technical, it offers training with application content and immediate development in the labor and professional market. For this, Materials II constitutes one of the pillars on which their training must be based, since the structures, components, devices ... that the Graduate will design, manufacture, use and supervise different kind of materials, and wich are the properties of these, which ultimately define both the limits of use and the capacities of the structure or device, as well as the techniques that can be used for its manufacture.

For all these reasons, the acquisition of basic knowledge about the most relevant properties of materials, and the relationship between them and their composition and structure, should be a fundamental aspect of Graduate training.

At the end of the course, the student will have knowledge of the materials used in the building, their varieties, and the physical and mechanical characteristics that define them. Ability to adapt construction materials to the type and use of the building, manage and direct the reception and quality control of the materials, their placement, control of the execution of the work units and the conduct of tests and trials endings. Likewise, it will be able to manage and direct the reception and quality control of the materials in the works.

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

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

**Continuous assessment:**

To opt for the Continuous Assessment system, you must attend at least 80% of the face-to-face classes and comp

The student must demonstrate that they have achieved the expected learning outcomes by evaluating the followin

Written assessment tests: They will consist of a classic written exam or tests scored from 0 to 10 points.
Exercises, theoretical questions and proposed works: The teacher will propose exercises, problems, practical ca
Individual activities in class: This activity will materialize in the presentation, exposition and discussion of a work
Laboratory practices: They will not count in the final grade, but will be compulsory to be eligible for this type of e

As a summary of the above, the following weighting table of the grading process of the different activities has beer

Evaluation / weighting activity:

Individual activities in class, exercises, theoretical questions and proposed works (PPT presentations). 10%
Theory written exam / tests: 45%.
Written exam problems: 45%
Laboratory practices: 0%

The course will have been passed based on the sum of the scores obtained in the different activities carried out, e

There will be a presentation of the subject on the first day of class where the parts that make up the continuous as

**Global assessment test:**

Following the regulations of the University of Zaragoza in this regard, in subjects that have continuous or gradual e

As a summary, the following weighting table of the grading process of the different activities has been designed, in

Evaluation / weighting activity:

Theory written exam: 50%.
Written exam problems: 50%

The course will have been passed based on the sum of the scores obtained in the different activities carried out, e

# 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, problem-solving sessions, laboratory sessions, tutorials, and autonomous work and study.

The teaching methodology is based on a strong interaction between the teacher/student. This interaction is made a reality through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

If classroom teaching were not posssible due to health reasons, it would be carried out on-line.

## 4.2.Learning tasks

This course is organized as follows:

- **Theory sessions**: The theoretical concepts of the subject are explained and illustrative examples are developed as a support to the theory when necessary.
- **Problem-solving sessions.** Problems and practical cases are carried out, complementary to the theoretical concepts studied.
- **Laboratory Workshop**: This work is tutored by a teacher, in groups of no more than 20 students. Computer room.
- **Tutorials.**
    - Group tutorials: Learning tracking scheduled activities in which the teacher meets a group of students to guide their autonomous work and learning that requires a very high degree of counselling from the teacher.
    - Individual tutorials: face-to-face or online.
- **Autonomous work and study.**
    - Study and understanding of the theory taught in the lectures.
    - Understanding and assimilation of the problems and practical cases solved in the practical classes.
    - Preparation of seminars, solutions to proposed problems, etc.
    - Preparation of laboratory workshops, preparation of summaries and reports.
    - Preparation of the written tests for continuous assessment and final exams.

## 4.3.Syllabus

This course will address the following topics:

**Theoretical Contents**

Unit 1 **Plasters**

- 1 BINDING AGENTS - BINDERS
- 2 GENERALITIES AND HISTORY OF PLASTER
- 3 NATURE OF PLASTER
- 4 PRODUCTION OF PLASTER
- 5 SETTING OT PLASTER
- 6 PROPERTIES OF PLASTER
- 7 TYPES OF PLASTER FOR CONSTRUCTION
- 8 TESTING AND SAMPLING
- 9 DESIGNATION OF PLASTER FOR CONSTRUCTION AND BINDERS BASED ON PLASTER FOR CONSTRUCTION
- 10 OTHER ORIGINS OF PLASTER
- 11 APPLICATIONS OF PLASTER
- 12 PLASTER COLOURING

Unit 2 **Limes**

- 1 HISTORY
- 2 NATURE OF LIMES
- 3 NOMENCLATURE
- 4 LIME MANUFACTURING
- 5 LIME SLAKING
- 6 LIME LIFE CYCLE
- 7 CLASSIFICATION OF LIME
- 8 PROPERTIES OF LIME
- 9 LIME TESTING
- 10 LIME USES

Unit 3 **Cements**

- 1 HISTORY
- 2 NATURE OF CEMENT

- 3 NOMENCLATURE
- 4 CEMENT MANUFACTURING
- 5 CEMENT CONSTITUENTS
- 6 CEMENT HYDRATION
- 7 CLASSIFICATION OF CEMENT
- 8 PROPERTIES OF CEMENT
- 9 CEMENT TESTING
- 10 USES OF CEMENT

Unit 4 **Metal**

- 1. INTRODUCTION
- 2 CRYSTAL STRUCTURE
- 3 FORMATION AND NATURE OF ALLOYS
- 4 MECHANICAL PROPERTIES
- 5 CONCEPTS
- 6 PHYSICAL PROPERTIES
- 7 CHEMICAL PROPERTIES
- 8 METALS IN CONSTRUCTION
- 9 IRON AND ITS ALLOYS
- 10 IRON CARBON DIAGRAM
- 11 UNIONS (BOLTED AND WELDED)
- 12 NON-FERROUS METALS

**Practical Contents**
The theoretical knowledge of the previous section has associated practice tasks. The Laboratory practice tasks in Materials I are an important complement to the comprehensive training of the student in the Civil Engineering degree.

It is impossible to even try to give a minimal description of the different types of gadgets and commercial devices used for measuring different magnitudes. This is not the purpose of the subject. It is to cover the learning outcomes through a comprehensive program of laboratory practice activities, including aspects related to the following issues:

? Generically, a clear idea of ??the importance of the field of material testing as well as t

? Students must, at least, acquire knowledge about the most common techniques for measuring ma

The guidelines followed to develop the contents were as follows:

- The contents proposed in the verification report were respected.
- A syllabus whose chapters are generally consistent with the titles of the specified program was developed. When this was not done it was because, due to its size and / or correlation, it was included in another.
- A large bibliography of current technical, classical and issues was selected
- The best-suited units from the bibliography were selected and turned into a single text, with our own design and layout and innovative teaching resources. The teacher didn't mean to be creative in its preparation, but he based his work on renowned prestige texts. Only the goals, organization and presentation of the material and drafting of some sections of the issues are original. The full text is available in the reprographic service of the school, as well as on digital media published in Moodle.
- The main features of the text layout can be summarized as having nine units, which coincide with the content, completely developed, avoiding summaries.
- The specific goals achieved in the making of the text itself can be summarized as follows:
    - Highlight the relationship between conceptual analysis and problem solving, using the number of examples needed to show approaches for their solution, stressing that solving is a process in which the conceptual knowledge is applied, and it is not merely a mechanized solving model. Therefore, in the text and the solved examples, the mind processes for problem-solving based on the concepts are stressed, instead of highlighting the mechanical procedures.
    - Provide students with practice in the use of analytical techniques presented in the text.
    - Show students that the analytical techniques are tools, not goals, allowing in different situations to practice in choosing the analytical method they will use to obtain the solution.
    - Encourage student interest in engineering activities, including real application problems.
    - Develop problems and exercises using realistic values ??representing feasible situations.
    - Encourage students to evaluate the solution, either with a different method of resolution or by testing to see if it makes sense in terms of the known behaviour of the circuit, machine or system.

- Show students how the results of a solution are used to find additional information about the behaviour of a circuit, machine or system.
- The resolution of most problems will require the type of analysis to be performed by an engineer to solve real-world problems. Developed examples, where the particular way of thinking of engineering is emphasized, can also be used as a basis for solving real problems.

## 4.4.Course planning and calendar

The course has 6 ECTS, which represents 150 hours of student work in the course during the semester, in other words, 10 hours per week for 15 teaching weeks. This includes 3 hours of lectures per week, 1 hour of laboratory and 6 hours of other activities.

Nevertheless, this can be shown in greater detail, taking into account the following overall distribution:

- 50 hours of lectures, with 70% theoretical demonstration and 30% solving type problems.
- 6 hours of laboratory workshop, in 2 hours per sessions.
- 2 hours of written assessment tests, 2 hours per test.
- 2 hours of PPT presentations, 1 hour per PPT
- 90 hours of personal study, over the 15 weeks of the 2$^{nd}$ semester.

**Assessment schedule**

It will be fixed depending on the development of the lectures.
The written assessment tests will have a connection with the following topics:

- Test 1: Topic: Metals and Cements
- Test 2: Topic: Limes and plasters.

In the continuous assessment mode, a weekly written test of each of the following issues (ceramics, timber, glass and polymers) will be done.

The issues about which the projects will be developed will be proposed in the third week, and they should be handed in and orally presented before the last two teaching weeks. The exact dates will be specified along the year.

Next, the practice tasks to be developed in the laboratory that will be carried out by the students in sessions of two hours are shown below.

| | |
|---|---|
| Practice 1 | Identification of Corrugated bars |
| Practice 2 | Identification of beams |
| Practice 3 | Beginning and end of cement setting |
| Practice 4 | Plaster Flexotraction |
| Practice 5 | Beginning and end of plaster setting |
| Practice 6 | Identification of microspheres in paintings |
| Practice 7 | Insulation and Waterproofing |
| Practice 8 | Mechanical properties of metals (tensile, hardness, resilience, etc.) |
| Practice 9 | Microstructure of metals (steel) |

Further information concerning the timetable, classroom, office hours, assessment dates ( http://www.eupla.es/secretaria/academica/examenes.html) 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=28613&year=2020