Universidad Zaragoza

Academic Year/course: 2021/22

28607 - Materials I

Syllabus Information

Academic Year: 2021/22
Subject: 28607 - Materials I
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 422 - Bachelor's Degree in Building Engineering
ECTS: 6.0
Year: 1
Semester: Second 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.

These 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.

8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead.

12.2 By 2030, achieve the sustainable management and efficient use of natural resources.

12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.

1.2. Context and importance of this course in the degree

The course of Materials I 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 Degree's verification memory, 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 (Stony, Floors, Woo

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 I 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 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 ev

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). 35%

Theory written exam: 15%.

Written exam problems: 50%

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, practice 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 real 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 6 ECTS (150 hours) course is organized as follows:

- **Theory sessions**. 3 hours per week. The theoretical concepts of the course will be explained.
- **Practice sessions**. Students will develop examples and conduct problems or case studies concerning the theoretical concepts studied.
- **Lab / Workinshop / computer room**: 1 hour per week. Practical activities in laboratories, in the working site, in the computer rooms.
- **Tutorials**:
    - **Group**. Learning tracking scheduled activities in which the teacher meets with a group of students to guide their autonomous learning work that requiring a very high degree of counseling from the teacher.
    - **Individual**. Face-to-face or online.
- **Autonomous work and study** (90 hours).
    - Study and understanding of the theory taught in the lectures.
    - Understanding and assimilation of the problems and practical cases solved in the practice sessions.
    - Preparation of seminars, solutions to proposed problems, etc.
    - Preparation of laboratory workshops, summaries and reports.
    - Preparation of the written tests for continuous assessment and final exams.
- **Reinforcement activities**: With a strong non-class character, through a virtual learning portal (Moodle) several activities that reinforce the basic contents of the subject will be conducted. These activities might be customized or not, but always under control.

4.3. Syllabus

This course will address the following topics:

Unit 1. General Concepts

- MAJOR CONCEPTS FOR THE STUDY OF PROPERTIES OF MATERIALS
- PREVIOUS TERMS
- GENERAL PHYSICAL PROPERTIES OF MATERIALS
- HYDROLOGICAL PROPERTIES OF MATERIALS
- MECHANICAL PROPERTIES OF MATERIALS
- HERMAL PROPERTIES OF MATERIALS

Unit 2. Rocks

- COMPOSITION OF THE EARTH
- COMPOSITION OF THE EARTH CRUST
- GEOLOGICAL PROCESSES
- HISTORY AND GENERAL POINTS ? EVOLVING CYCLE OF ROCKS
- PETROGRAPHY
- ROCKS, MINERALS AND ELEMENTS

- KINDS OF ROCKS BY ORIGIN
- STUDY TECHNIQUES
- STONE PATHOLOGY
- APPENDIX A: UNE STANDARDS FOR THE APPLICATION OF STONY MATERIALS

Unit 3. Soils

- PHYSICAL CHARACTERISTICS OF SOILS
- ORIGIN OF SOILS
- TYPES OF SOILS
- SAMPLING COLLECTION
- CLASSIFICATION OF SOIL PARTICLES BY SIZE
- GRAIN SIZING AND GRAIN-SIZING CURVE
- ? PLASTICITY
    - LIMITS AND INDEXES
    - NUMBER OF ACTIVITY (EXPANSION TENDENCY)
    - LINEAR CONTRACTION
    - SAND EQUIVALENT
- MECHANICAL PROPERTIES-COMPACTATION
- CLASSIFICATION OF SOILS
- NEWSLETTER
- APPENDIXES

Unit 4. Ceramics

- INTRODUCTION
- RAW MATERIALS
- MANUFACTURING
- PREPARING THE CLAY EARTH
- MECHANICAL PREPARATION
- MOLDING
- DRYING
- CERAMIC PRODUCT BOILING
- OVENS
- COOKING PROCESS CONTROL
- CLAY PRODUCTS
    - BRICKS AND CERAMIC BLOCKS
    - CERAMIC HOLLOW BRICKS
    - CERAMIC TILES
    - CERAMIC COBBLESTONES
    - TILES
    - SANDSTONE
    - REFRACTORY PRODUCTS
    - SANITARY CERAMICS

Unit 5. Timber

- TIMBER OVERVIEW
- TYPES OF TIMBER
- PHYSICAL PROPERTIES OF TIMBER
- MECHANICAL PROPERTIES
- TIMBER PROPERTIES TO FIRE
- TESTS IN TIMBER
- EXPLODED VIEW AND SQUARENESS
- PRODUCTS FOR CONSTRUCTION COMING FROM TIMBER
- BOARD COATINGS
- TIMBER-DESTROYING AGENTS
- PROTECTION OF TIMBER
- PROTECTION SURFACE TREATMENTS

- PROTECTION TREATMENTS
- GRAPHIC FOR THE CALCULATION OF THE APPARENT DENSITY DEPENDING ON MOISTURE

? Unit 5. Corks

- CORK OVERVIEW
- CORK PRODUCTION
- PROPERTIES OF CORK
- USE OF CORK

Unit 6. Glass

- GLASS OVERVIEW
- CLASSIFICACON OF GLASS
- GLASS PRODUCTION
- PROPERTIES OF GLASS
- USE OF GLASS

Unit 7. Polymers

- CLASSIFICATION
- POLYMER PRODUCTION
- STRUCTURE OF POLYMERS
- RHEOLOGY OF POLYMERS
- FIBERS
- APPLICATIONS

The specific goals achieved in the making of the syllabus 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 behavior of the circuit, machine or system.
- Show students how the results of a solution are used to find additional information about the behavior 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 previous table can be shown in greater detail, taking into account the following overall distribution:

- 45 hours of lectures, with 70% theoretical demonstration and 30% solving type problems.
- 9 hours of laboratory workshop, in 2 hours per sessions.
- 4 hours of written assessment tests, 2 hours per test.
- 3 hours of PPT presentations, 1 hour per PPT
- 90 hours of personal study, over the 15 weeks of the 2nd semester.

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=28607