

28607 - Materials I

Syllabus Information

Academic Year: 2019/20

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.

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

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, 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.

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 / Workshop / 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
- THERMAL 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
- CLASSIFICATION 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://biblos.unizar.es/br/br_citas.php?codigo=28607&year=2019