Universidad Zaragoza

Academic Year/course: 2021/22

28602 - Foundamentals of building materials

Syllabus Information

Academic Year: 2021/22
Subject: 28602 - Foundamentals of building materials
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 422 - Bachelor's Degree in Building Engineering
ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Basic Education
Module:

1. General information

1.1. Aims of the course

The aim of the course is the acquisition of a basic view of the structure of matter in connection to its properties and the chemical transformations that matter can undergo. Also, knowledge of the composition of the Earth and the geological processes, as well as the environmental impact of construction waste.

1.2. Context and importance of this course in the degree

The course belongs to the Basic Training module and is scheduled in the first semester of the first year of the Degree in Technical Architecture. It provides the necessary chemical knowledge to any graduate in Engineering and Architecture studies, particularly for the understanding of concepts that will be acquired in other courses such as Environment and Materials Engineering.

1.3. Recommendations to take this course

It is advisable to have taken the subject of Chemistry in the Sixth Form at School.

2. Learning goals

2.1. Competences

Organizational and planning abiliy.

Ability to solve problems.

Ability to make decisions.

Aptitude for oral and written communication in the native language.

Ability for analysis and synthesis.

Ability to manage information.

Ability to work in a team.

Ability for critical thinking.

Ability to work in an interdisciplinary team.

Aptitude to work in an international context.

Ability to improvise and adapt to face new situations.

Aptitude for leadership.

Positive social attitude towards social and technological innovations.

Ability to think, discuss and present your own ideas.

Communication skills through words and images.

Ability to search, analyze and select information.

Ability for autonomous learning.

Knowledge in an area of ??study that starts at secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that involve avant-garde knowledge from your field of study.

Application of their knowledge to their work in a professional way and possession of the competences that are usually demonstrated through the production and defense of arguments and problem solving within their area of ??study.

Ability to collect and interpret relevant data (usually within of their study area), to make judgments that include a reflection on relevant issues of a social, scientific or ethical nature.

Transmission of information, ideas, problems and solutions to a specialized and non-specialized audience.

Development of those learning skills necessary to undertake further studies with a high degree of autonomy.

Knowledge and understanding of respect for fundamental rights, equal opportunities for women and men, universal accessibility for people with disabilities, and respect for values. typical of the culture of peace and democratic values.

Promotion of entrepreneurship.

knowledge of information and communication technologies

2.2. Learning goals

Explaining the concepts related to the structure of matter, solutions and reactions as well as the geological foundations of the Earth's crust.

Applying the acquired knowledge of Chemistry and Geology.

Using numerical methods in solving the chemical problems that are proposed.

Solving questions and problems of General Chemistry.

Showing an adequate use of basic laboratory equipment to carry out simple chemical experiments.

Having the ability to handle chemistry language; particularly symbolic and formal language.

Interpreting and presenting contents of basic scientific texts.

Understanding the technique used in reports regarding the chemical analysis of materials.

2.3. Importance of learning goals

This subject is included in the basic training module of the degree, which, in a broad sense, aims to unify the knowledge of students and prepare them to tackle more specific subjects of the degree. In this sense, together with the rest of the basic subjects, the course Fundamentals of Construction Materials contributes to laying the foundations of a scientific model and, in addition, to providing future graduates with the necessary chemical and geological concept tools to tackle other disciplines of the degree that they need.

3. Assessment (1st and 2nd call)

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

The assessment process will include two types of action:

- A split assessment system, which will be carried out throughout the course and which will include:

Carrying out practice tasks in the laboratory.

Carrying out one or more works on practical aspects of the course.

Carrying out partial tests that can assess the knowledge acquired.

- A global assessment test to be carried out if the continuous assessment process has not been successful.

SPLIT ASSESSMENT SYSTEM

In order to be eligible for this assessment system, the student must attend class regularly, with at least 80% attendance in classroom activities (classes, practice tasks, technical visits, etc.). In the split assessment system, the teacher will assess the participation and works derived from laboratory practice tasks or others. Finally, the student must take several written tests that show the knowledge acquired and the ability to solve practical problems. The criteria of Assessment to be applied will be as follows:

Laboratory practice tasks and assignments:

It will account for 10% of the final grade and will be carried out according to the assessment of problems, questions or assignments related to the practices carried out in the laboratory or to other topics specific to the course that might appear, requiring at least a 5 in this section in order to pass the course. If the practical course could not be carried out, it would be replaced by the completion of a job, which would score in the same measure.

Partial assessment tests:

There will be two partial tests. Each of them will have a theory and practice load of approximately 50% each. This part will account for 90% of the final grade and to be able to pass it, it is necessary to have passed the two tests or, having passed one of them, to have a mark not lower than 3.

Students who, not having passed the previous criteria, might have a failed partial test must go to the final global exam to pass the missing parts.

GLOBAL FINAL ASSESSMENT TEST

This test must be seated by those students who have not chosen the split assessment system or those who, having opted for such a system, were not successful. The latter should only go in for the missing partial tests.

Students who, having passed the split assessment system, wish to increase their grade may also take this test. In this case, they should complete the whole test.

The test will be written and will consist of specific or applied to practical questions and problems theory. The theory and practice load will be approximately 50% each. In addition, to pass the course, you must have completed the practical activities and passed the corresponding project (or, failing that, the work to be carried out if the practicals could not be carried out).

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, laboratory workshops, and tutorials.

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.** 2 hours per week. Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the course are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.
- **Practice sessions**: The teacher solves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.
- **Laboratory workshop.** 2h per week. The lecture group is divided up into various groups, according to the number of registered students, but never with more than 16 students, in order to make up smaller sized groups.
- **Tutorials.** Tutorials are set up in order to give individual, personalized attention with a teacher from the department. They can be face-to-face or online.

4.3. Syllabus

This course will address the following topics:

Section 1. THE ATOM AND THE PERIODIC SYSTEM

- Topic 1.- **The atom.**
  - Elemental particles. Atomic models. The Bohr atom. The quantum mechanical model. Atomic orbitals; quantum numbers. Principles for the electronic construction of atoms.
- Topic 2.- **General overview of the periodic table.**
  - Description of the current periodic table: groups and periods. Study of the electron shell and the periodic system. Periodic properties.

Section 2. THE CHEMICAL BOND

- Topic 3**.- The ionic bond**
  - General characteristics of the ionic bond. Network energy. General properties of ionic compounds.
- Topic 4**.- The covalent bond**
  - Simplified model: the Lewis theory. Bond polarity and geometry. Valence bond theory. Orbital hybridization. Molecular orbital theory.
- Topic 5**.- The metallic bond**
  - General characteristics of metals. Theories of the metallic bond: the electron sea theory and valence bond theory. Alloys: classes.

Section 3. BONDS BETWEEN MOLECULES

- Topic 6**.- Intermolecular bonds**
  - Van der Waal forces. Hydrogen bonds.

Section 4. AGGREGATION STATES

- Topic 7**.- The gas state**
  - General characteristics of gases. Laws that govern the gas state. Equations of state. Kinetic theory. Gas mixtures: Dalton's Law. Gas diffusion and effusion: Graham's Law. Real gases: The Van der Waal equation.
- Topic 8**.- The liquid state**
  - General characteristics of liquids. Vapour pressure. The effect of temperature on vapour pressure. Critical phenomena. Condensation of vapours and gases. Solidification.
- Topic 9**.- The solid-state**
  - Characteristics of solids. Classes of crystal network. Classes of solids based on bonding type. The phase rule and the triple point.

Section 5. INTRODUCTION TO THE STUDY OF SOLUTIONS

- Topic 10**.- Introduction to the study of solutions**
- Disperse systems. Types of solutions. Means of expressing concentration. Solid-in-liquid solutions. Liquid-in-liquid solutions. Gas-in-liquid solutions. Colligative properties of solutions. Colloidal solutions.

Section 6. INTRODUCTION TO THE STUDY OF REACTIONS

- Topic 11**.- Chemical reaction. Stoichiometry.**
  - Chemical Equations. The Limiting Reactant Concept and Percent Yields from Chemical Reactions.

Section 7. INTRODUCTION TO STUDY OF THE MATERIALS AND ENVIRONMENTAL IMPACT

- Topic 12**.- Introduction to Analytical Chemistry in Materials**

- Gravimetric Methods. Volumetric Methods. Spectroscopic Methods and Others
- Topic 13.- **Environmental Impact and Waste Management in Construction**
  - Introduction. Environmental Impact Assessments. Legislation.

Section 8. INTRODUCTION TO THE GEOLOGY

- Topic 14.- **Introduction to the Geology. Rocks.**
- History. Plate tectonics. Structure and Composition of the Earth. Geological Processes. Rocks and Minerals Classification of Rocks.

PRACTICE SESSIONS

Each student will undertake a total of six practice sessions during the academic year during the period assigned for them. In order to pass the course, students must attend these sessions and submit a report once they have been completed.

The content of the practical course is as follows:

- Session 1. **Standards in Chemical Laboratory.** Techniques, Equipment and Safety
- Session 2. **Solution Preparation** Na_2CO_3 0,1 M from Na_2CO_3 solid; $CaCl_2$ 0,1 M from $CaCl_2$ 2 M.
- Session 3. **Filtration.** Gravity Filtration and Vacuum Filtration
- Session 4. **Volumetric Analysis.** Water hardness; carbonates and bicarbonates in water.
- Session 5. **Distillation.**

4.4. Course planning and calendar

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

SECTION	Topic	Nº hou
0 y 1	Presentation. Atom (Topic 1) and the Periodic System (Topic 2)	10
2 and 3	The Chemical Bond (Topics 3, 4, 5) and Intermoleculars Bonds(Topic 6)	12
4	Aggregation Sates (Topics 7, 8, 9)	6
5 and 6	Introduction to the study of solutions and reactions (Topics 10,11)	14
7 and 8	Introduction to Study of the Materials and Environmental Impact. Introduction to the Geology (Topics 12,13,14)	6
	Practical Course	6
	Exams	6
TOTAL		60

Further information concerning the timetable, classroom, office hours, assessment dates (http://www.eupla.unizar.es/asuntos-academicos/examenes) 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=28602