29909 - Chemistry extension I

Información del Plan Docente

Academic Year	2018/19
Subject	29909 - Chemistry extension I
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	435 - Bachelor's Degree in Chemical Engineering
ECTS	6.0
Year	1
Semester	Second semester
Subject Type	Compulsory
Module	

1.General information

1.1.Aims of the course

The aim of this subject is to achieve that the student would acquire the basic notions about the behaviour of chemical equilibria in the thermodynamical and electrochemical aspects as well as in relation to their application to processes and chemical analysis.

1.2.Context and importance of this course in the degree

The subject extends and completes the learning results of the subject "Química" ("Chemistry") and its own results are indispensable for the subject "Experimentación en Química" ("Chemical Experiments"). At the same time, it provides the basis for subsequent subjects such as "Operaciones de separación" ("Separation operations"), "Diseño de reactores" ("Reactors design") and "Ingeniería del Medio Ambiente" ("Environmental engineering") as well as for the optional modules.

1.3.Recommendations to take this course

It is recommendable to have followed the subject "Química" ("Chemistry")

2.Learning goals

2.1.Competences

- C04 - Ability to solve problems and take decisions with initiative, creativity and critical reasoning.
- C11 - Ability to learn in a continued way and develop strategies for an autonomous learning.
- C30 - Ability to calculate the physicochemical parameters of chemical systems and reaction with special impact in the chemical equilibria in solutions and their application to chemical analysis.

2.2.Learning goals

To pass this subject the student must demonstrate the following results:

- He/she distinguishes the most relevant physicochemical parameters and is able to handle the laws that govern them

in different chemical systems.
- He/she is able to handle the basic laws that regulate the chemical equilibria (acid-base, formation of complexes, precipitation and redox) and applies them to chemical analysis.
- He/she knows the steps of the analysis procedure and the basis of the main methods of instrumental analysis.
- He/she solves exercises and problems in a complete and reasoned way.
- He/she uses a rigorous language in chemistry.
- He/she suitably presents and discusses data and results.

2.3.Importance of learning goals

The physicochemical parameters and the laws that rule them affect to all of the chemical systems and processes. Specifically, phase equilibria are fundamental for the separation operations which, in their turn, are indispensable for the chemical industry. Electrochemistry and surface chemistry also affect to subjects of great relevance to the industry such as corrosion phenomena or heterogeneous catalysis, to mention only two examples.

In the different steps of any industrial chemical process (raw materials, products, processes, residues...) it is fundamental to perform procedures of chemical control. These are carried out by means of methods of analysis, classical as well as instrumental ones. For this reason is important to acquire the basic knowledge about those methods.

3.Assessment (1st and 2nd call)

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

The student should show that he/she has reached the expected learning results by means of the following activities of assessment

Continuous assessment:

For the part concerning Physical Chemistry a written exam which would include problems dealing with the most relevant physicochemical parameters, phase diagrams and electrochemistry and will account for 80% of the final mark in this part. Besides, the fulfilment of several tests in the platform Moodle which will account for 20% of the final mark in this part.

For the part of Analytical Chemistry a written exam (test type) which would include multiple choice questions and problems dealing with the stages in the analytical process as well as with classical and instrumental analysis and will account for 80% of the final mark in this part. Besides, the delivery of small team works which will account for 20% of the final mark in this part.

All the students that would follow the continued assessment could choose to do the global assessment, either for the whole subject (100%) or for each of the written exams, tests (in the part of Physical Chemistry) and team works (in the part of Analytical Chemistry) that form the continuous assessment. This global evaluation will be carried out in the date fixed by the Centre.

Global assessment:

In the periods of exams fixed by the Centre a global exam will be programmed. This exam, which would include theoretical-practical questions dealing with the matters of the subject, will account for 100% of the final mark in the

subject.

Assessment procedure

The assessment will be carried out separately for the parts of Analytical Chemistry and Physical Chemistry, each one being marked over a maximum of 10 points. The final mark will be the average of those obtained in each part. To pass the subject it will be necessary to reach a minimum mark of 4.0 points in each part and a minimum average mark of 5 points.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process designed for this course is based on:

- The continuous study of the theoretical aspects and their subsequent application to solve problems of special relevance.
- The performance of small works which aimed to develop strategies directed to an autonomous learning as well as to decision making

4.2.Learning tasks

The program offered to the student in order to help him/her to attain the expected results consist of the following activities:

- Interactive lecture classes. In these lectures the theoretical aspects of the matter will be presented and problems related to them will be proposed and solved.
- Presentation of team works in order to deepen in specific subjects.
- Tutorials.
- Personal study and work. In this respect material on the subject will be included in the platform Moodle.
- Virtual works in the web.
- Possibility for students of 1st course of the Degree of following the subject "Gestión de la Información para el Grado en Ingeniería Química" (nivel básico)" managed by the Biblioteca Hypatia.

4.3.Syllabus

The subject is divided in two parts, one dedicated to Physical Chemistry and the other to Analytical Chemistry.

Part 1. Physical Chemistry

The program of Physical Chemistry includes 3 blocks and 13 chapters. The time allocation for the three blocks includes problem-solving sessions.

Block I. Electrochemistry (13 h)

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Chapter 1.E. Electrolytes in solution

Chapter 2.E. Electrolysis

Chapter 3.E. Debye-Hückel theory

Chapter 4.E. Electrochemical equilibrium

Chapter 5.E. Galvanic cells. Application of e.m.f. measurements

Chapter 6.E. Chemical sources of electrical energy

Chapter 7.E. Corrosion

Block II. Phase diagrams (12 h)

Chapter 1.F. Heterogeneous equilibria. One component systems

Chapter 2.a.F. Two component systems. Vapour-liquid and liquid-liquid equilibria

Chapter 2.b.F. Two component systems. Solid-liquid equilibrium

Chapter 3.F. Three component systems

Block III. Surface chemistry (5 h)

Chapter 1.S. Surface tension

Chapter 2.S. Adsorption

Part 2. Analytical Chemistry

The program of Analytical Chemistry includes 4 blocks and 9 chapters. The time allocation for the first three blocks includes problem-solving sessions. For the fourth block will have a work of calibration in T6 timetable

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Block I. Introduction to chemical analysis (7 h)

Chapter 1. Introduction to the Analytical Chemistry

Chapter 2. The analytic process

Block II. Gravimetric analysis (2 h)

Chapter 3. Gravimetry

Block III. Titrimetric analysis (13 h)

Chapter 4. Fundamentals of titrimetric analysis

Chapter 5. Acid-base titrations

Chapter 6. Precipitation titrations

Chapter 7. Complexometric titrations

Chapter 8. Oxidation-reduction titrations

Block IV. Instrumental analysis (8 h)

Chapter 9. Introduction to instrumental analysis

4.4.Course planning and calendar

Schedule of classroom teaching and work presentation

- Lectures: 60 hours
- Personal study and work: 84 hours
- Exams: 6 hours

The student has 4 hours a week of lectures and problem-solving sessions according to the timetable established by the centre and published before the starting date of the course. This timetable can be found in the web of the centre.

The presentation of works will be agreed with the students according to the time availability.

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Every professor will inform about his/her tutorials schedule which will be also available in the web of the centre.

The first written exam will be carried out about the middle of the semester and the second one to the end of the semester. In the period of exams established by the centre a written exam of global character will be carried out for those students that would have not attained the expected learning results during the semester.

- February: Starting of the classes on Physical Chemistry.
- Middle of semester: Starting of the classes on Analytical Chemistry.
- Middle of semester: Written exam on Physical Chemistry.
- End of semester: Written exam on Analytical Chemistry.
- Exams period: Global written exams.

4.5.Bibliography and recommended resources