29909 - Chemistry extension I

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	435 - Bachelor's Degree in Chemical Engineering
ECTS	6.0
Course	1
Period	Second semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

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

1.2.Activities and key dates for the course

February: Starting of the classes on Physical Chemistry.

Middle of semester: Written exam on Physical Chemistry.

Middle of semester: Starting of the classes on Analytical Chemistry.

End of semester: Written exam on Analytical Chemistry.

Exams period: Global written exams.

2.Initiation

2.1.Learning outcomes that define the subject

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.

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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.

2.2.Introduction

Brief presentation of the subject

This subject of 6.0 ECTS is given in the second semester of the first course and belongs to the module of Education in Extension of Chemistry of the Degree in Chemical Engineering.

It focuses in the fields of Analytical Chemistry and Physical Chemistry.

It encompasses the thermodynamical aspects of chemical systems with a special attention to phase equilibria. It will also consider electrochemical systems (including electrolysis and types of galvanic cells discussing their advantages and shortcomings) as well as surface chemistry.

As an extension of the concepts of chemical equilibrium, their application to the chemical analysis in the industry will be shown. Finally, an introduction to instrumental analysis will be carried out.

3.Context and competences

3.1.Goals

The subject and its expected results meet the following proposals and goals:

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.

3.2.Context and meaning of the subject 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.

3.3.Competences

When passing the subject the student will be more competent to...

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Solve problems and take decisions with initiative, creativity and critical reasoning. Learn in a continued way and develop strategies for an autonomous learning.

Calculate the physicochemical parameters of chemical systems and reaction with special impact in the chemical equilibria in solutions and their application to chemical analysis.

3.4.Importance of learning outcomes

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.

4.Evaluation

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

Continuous evaluation:

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 evaluation could choose to do the global evaluation, 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 evaluation. This global evaluation will be carried out in the date fixed by the Centre.

Global evaluation:

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.

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Evaluation procedure

The evaluation 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.

5.Activities and resources

5.1.General methodological presentation

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

5.2.Learning activities

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

Classroom teaching of lecture and participative type. In these teaching 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.

Tutoring sessions

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 1 st 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.

5.3.Program

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

Part 1. Physical Chemistry

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The program of Physical Chemistry includes 3 blocks and 13 chapters. The time allocation for the three blocks includes solving problems in class.

Block I. Electrochemistry (13 h)

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

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

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

5.4.Planning and scheduling

Schedule of classroom teaching and work presentation

Classroom teaching: 60 hours

Personal study and work: 84 hours

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Exams: 6 hours

The student has 4 hours a week of lectures and problem solving 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.

Every professor will inform about his/her tutoring sessions 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.

5.5.Bibliography and recomended resources

BB	Atkins, Peter William. Química fisica / Peter Atkins, Julio de Paula . - 8ª ed. Buenos Aires [etc.] : Editorial Médica Panamericana, cop. 2008
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BB	Maron, Samuel H.. Fundamentos de fisicoquímica / Samuel H. Maron, Carl F. Prutton ; [colaboración en la traducción, Manuel Aragonés A.] Mexico : Limusa, cop. 2008
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BB	Skoog, Douglas A.. Principios de análisis instrumental / Douglas A. Skoog, F. James Holler, Timothy A. Nieman . - 5ª ed. en español Madrid : McGrawHill, D.L. 2000
BC	Adamson, Arthur W.. Problemas de química física / Arthur W. Adamson ; versión española por G. Martín Guzmán . - [1a ed.] Barcelona [etc] : Reverté, cop. 1979
BC	Hamilton, Leicester F.. Cálculos de química analítica / Leicester F. Hamilton, Stephen G. Simpson, David W. Ellis ; traducción Luis Rodríguez Terán ; revisión técnica José Luis Morales . - 2a.ed, reimp. México [etc.] : McGraw-Hill, 1992
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