COURSE DATA

DATA SUBJECT

Code: 34917
Name: Chemistry I
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1404 - Degree in Industrial Electronic Engineering	Escola Tècnica Superior d'Enginyeria	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1404 - Degree in Industrial Electronic Engineering	Chemistry	BASIC

COORDINATION

ALMORA BARRIOS NEYVIS

SUMMARY

Chemistry I is a basic subject of 6 ECTS credits to be taught in the second semester of the first degree course in Industrial Electronics. Along with chemistry II, the course intends the students to complete and formalize their knowledge of chemistry acquired during the high school or vocational training.

Chemistry I focuses on the study of chemical reactions. In particular, it describes their thermodynamic and kinetic aspects. The contents of the Chemistry I course are: Stoichiometry. Solutions. Fundamentals of chemical reactivity. Chemical thermodynamics. Chemical kinetics. Chemical equilibrium. Ionic equilibria in solution.

The general objectives of the course are:

- To formalize the knowledge of chemistry acquired by students in their High School courses.
- To lay solid foundations supporting successful learning courses later. It is intended the students to acquire a basic understanding of some key parts of the discipline such as: their language (chemical formula), stoichiometric calculations, thermodynamics and chemical kinetics of reactions, chemical equilibrium, and ionic equilibria in solution.

- To achieve the students to acquire the basic language of chemistry, so they express chemical concepts with precision. It is also intended the students to be able to establish relationships between the concepts, their knowledge of conventions, and a properly management of the units.

- To ensure the students are able to pose and solve numerical problems and interpret the results.
- To ensure they are able to search and select information in the field of chemistry.
- To enhance the students skills for teamwork.
- To promote those values and attitudes inherent in scientific activity.

* **NOTE:** The specific objectives of the student learning will be provided by teachers of the subject.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

The student must possess certain basic skills to successfully completing the course. These are listed below:

Nomenclature and inorganic and organic chemical formulation.
Setting of equations of chemical reactions.
Basic stoichiometric calculations.
Identification of acidic-basic common compounds.
Obtaining the oxidation state of the elements of a compound.
Calculation of simple derivatives and integrals.
Management of logarithms and exponentials.

COMPETENCES / LEARNING OUTCOMES

1404 - Degree in Industrial Electronic Engineering

CG15 - Ability to understand and apply the basics of general chemistry, organic and inorganic chemistry and their applications in engineering.

CG3 - Knowledge of basic and technological subjects that allows students to learn new methods and theories and provides them with versatility to adapt to new situations.

CG4 - Ability to solve problems with initiative, decision-making skills, creativity and critical reasoning and to communicate and transmit knowledge, abilities and skills in the field of industrial engineering (with specific industrial electronics technology).

CG7 - Ability to analyse and assess the social and environmental impact of technical solutions.

DESCRIPTION OF CONTENTS

1. INTRODUCTION TO CHEMISTRY

What is chemistry? Review of basic concepts. Formulation. Mole concept. Atomic, molar, and molecular mass. Stoichiometric ratio concept. Limiting reagent. Reaction advance degree concept. Calculations related to ideal gases. Solutions. Ways of expressing concentration.

2. THE ENERGY OF THE CHEMICAL REACTIONS

Thermodynamic systems. Thermodynamic variables. State functions. Processes. Energy, heat and work. First law of thermodynamics. The enthalpy of chemical reactions. Standard enthalpy of formation. Heat of combustion. Thermodynamic cycles. Hess's Law.

3. CHEMICAL CHANGE: REVERSIBLE AND IRREVERSIBLE PROCESSES

Spontaneity. Second Law of Thermodynamics. Absolute entropies. Third law of thermodynamics. Gibbs free energy. Criterion of spontaneity and equilibrium.

4. CHEMICAL EQUILIBRIUM

Condition of chemical equilibrium. Chemical equilibrium in ideal gas systems. Variation of equilibrium constant with temperature. Heterogeneous equilibrium in gaseous systems. Le Chatelier's Principle.

5. ACID-BASE EQUILIBRIA

Definitions of acids and bases: Arrhenius, Bronsted-Lowry and Lewis. The autoionization of water. PpH scale. Strength of acids and bases. Equilibrium constants. Calculation of pH. Sales. Hydrolysis. Buffer solutions.

6. EQUILIBRIA INVOLVING SLIGHTLY SOLUBLE ELECTROLYTES

Equilibrium among ionic solids and saturated solutions. Solubility and solubility product. Factors affecting solubility.

7. OXIDATION-REDUCTION REACTIONS AND ELECTROCHEMISTRY

Electrochemical systems. Oxidation-reduction reactions. Galvanic cells. Emf of batteries. Electrode potentials. Nernst equation.

8. CHEMICAL KINETICS

Rate equation. Simple integrated kinetic equations. Reaction mechanisms. Limiting step approach. Influence of temperature on reaction rate. Arrhenius equation. Catalysis.

9. LABORATORY OF GENERAL CHEMISTRY I

1. INTRODUCTION TO WORK IN THE CHEMISTRY LABORATORY. Safety regulations. Equipment and instrumentation. Waste disposal. Weighing and balances. Volume measurement.

2. PREPARATION OF SOLUTIONS AND pH MEASUREMENT. Preparing solutions from solids, from liquids, and by dilution. Measurement, analysis, and discussion of solution pH.

3. ACID¿BASE TITRATIONS. Strong acid¿strong base titrations with indicator. Potentiometric titrations of weak acid¿strong base.

4. KINETICS OF PHENOLPHTHALEIN DECOLORIZATION IN BASIC MEDIUM BY ABSORBANCE MEASUREMENTS. Rate law. Integrated rate equations. Absorbance. Lambert¿Beer Law. Spectrophotometer.

5. OXIDATION¿REDUCTION REACTIONS. Qualitative redox reactions. Galvanic cells.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	15,00
Classroom practices	15,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	25,00
Independent study and work	0,00
Preparation of lessons	35,00
Preparation for assessment activities	10,00
Resolution of case studies	20,00
Total hours	**90,00**

TEACHING METHODOLOGY

The development of the subject is based on the following methodology: the theory, the problem, and laboratory sessions. Theory sessions provide an overview of the subject, emphasize the key concepts for understanding, and identify the resources needed to study the topic in depth by students (G3).

The problem sessions are developed two ways. In some sessions, prototype problems are explained with the aim the students learn to pose and solve problems. In these sessions, the spotlight falls on the teacher who performs the exposure to the group. In other sessions, the spotlight falls on the students, who face similar but more complex problems. After the work, the problems are corrected and discussed by students (G4+G15).

Lab sessions are mandatory and take place in groups of 16 students advised by a teacher. Students work in pairs performing chemical experiments. Before each session, students will have the information necessary to carry out the experiments, and must answer a few questions prior to preparatory work in the laboratory. The teacher in charge will discuss the characteristics of the practice at the beginning of the session. Students must prepare a lab notebook in which to collect the main aspects of the experiment (G4+B4+G7).

After the supervised work in the lab, students must write down the results in a brief report and answer a number of issues. These issues will be delivered and used for evaluation. In conjunction, the teachers of the course will decide the development of detailed reports of the experiments by students (B4).

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EVALUATION

Type A:

Assessment of learning will take place through continuous evaluation of progress and the work developed throughout the course. These items will take into account: class participation, activities scheduled, and the resolution of the proposed activities to be worked independently (questionnaires multiple choice questions, numerical problems, etc ...).

Another part of the note will be obtained by the evaluation of laboratory practices.

Finally, the knowledge and skills acquired will also be assessed through exams throughout the course.

The proposed grading scheme:

1. Activities throughout the year 12.5% (recoverable) (G4+G15)

2. Continuous assessment tests 17.5% (not recoverable) (G4+G15)

3. Laboratory Practice 20% (not recoverable) (G4+G7+G15+B4)

4. Final exam 50% (recoverable) (G3+G4+G15)

In order to pass the course is considered mandatory attendance at all laboratory sessions, as well as having passed the tests or examinations.

Short (15 to 20 min) continuous evaluation tests will be posed every two or three issues in class time.

These tests do not eliminate material.

There will also be an exam at the end of the semester consisting of a first part of theoretical issues, and a second involving the resolution of numerical problems. The final exam grade will be equal to the average obtained in theory and problems. In order to pass the course, the final exam grade must be higher or equal to 3.5. Otherwise, the course will be suspended and qualified with the final exam grade. Students who fail the first official announcement will be submitted for consideration by the second call.

Type B:

Students who cannot attend classes regularly to do the continuous assessment tests will be evaluated according to the following alternative scheme:

1. Laboratory Practice 20% (not recoverable) (G4+G7+G15+B4)

2. Final exam 65% (recoverable) (G3+G4+G15)

3. Activities along the course 15% (recoverable) (G4+G15)

However, attendance is considered mandatory for all laboratory sessions to approve, as well as having passed the final exam, in order to average with other items that make the assessment.

There will also be an exam at the end of the semester consisting of a first part of theoretical issues, and a second involving the resolution of numerical problems. The final exam grade will be equal to the average obtained in theory and problems. In order to pass the course, the

final exam grade must be higher or equal to 3.5. Otherwise, the course will be suspended. Students who fail the first official announcement will be submitted for consideration by the second call.

* **NOTE:** If a student got more category A grade at the discretion of the mode B, the student will be assessed by the latter.

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

REFERENCES

- CHANG, R.; GOLDSBY, K.A. "Química". México: Mc Graw Hill, ISBN 978-607-15-0928-4 11ª edición, 2013
- Apuntes de clase proporcionados por el profesor.
- T.L. Brown, H.E. LeMay y B.E. Bursten. Química. La ciencia central (9ª ed.). Pearson.Prentice Hall. México (2004).

- American Chemical Society Química. Un proyecto de la ACS. Reverté. Barcelona (2005).
- J.E. McMurray y R.C. Fay Química General (5ª ed.). Pearson Educación. México (2009).
- W.L. Masterton, C.N. Hurley. Química. Principios y reacciones (4ª ed.). Thomson. Madrid (2003).
- J.C. Kotz, P.M. Treichel. Química y reactividad química (5ªed.). Thomson. México (2003).
- B.G. Segal. Chemistry. Experiment and Theory (2ªed.). (En inglés) Wiley. Nueva York (1989).
- J. Peidró. Problemas de Química para el primer ciclo. EUB. Barcelona (1996).
- P. Atkins, L. Jones. Principios de Química. Los caminos del descubrimiento (3ªed.). Ed. Médica Panamericana. Madrid (2006).
- H. Petrucci, W.S. Harwood y F.G. Herring. Química general. Principios y aplicaciones modernas (8ªed.). Prentice Hall. Madrid (2003).
- Amparo Olba. Química General: Equilibri i canvi. (En valencià) Col.lecció: Educació. Materials. PUV, València (2007).
- M.A. Herrero, J. Atienza, P. Noguera y L.A. Tortajada. La Química en Problemas: Un enfoque práctico. Ed. Universidad Politécnica de Valencia, (2008).