UAB
Universitat Autònoma de Barcelona

Physics and Chemistry

Code: 44330
ECTS Credits: 10

2024/2025

Degree	Type	Year
4310486 Teaching in Secondary Schools, Vocational Training and Language Centres	OT	0

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

No requierements

Objectives and Contextualisation

The aim of the course is to complete the knowledge of physics and chemistry of future science teachers.

It consists of two parts:history of science (4cr) and Fundamentals of Physics and Chemistry (6cr).

Competences

- Acquire strategies to encourage student effort and enhance their capacity to learn by himself and others, and develop thinking skills and decision-making to facilitate autonomy, confidence and personal initiative.

- Communicate effectively both verbally and non-verbally.
- Design and develop learning spaces with special attention to equity, education and emotional values, equal rights and opportunities for men and women, civic education and respect for human rights that facilitate life in society, decision making and building a sustainable future.
- Generate innovative and competitive professional activities and research.
- Know the curricular content of the matters relating to the appropriate teaching specialization and the body of didactic knowledge around the respective teaching and learning.
- Make effective use of integrated information and communications technology.
- Own the learning skills necessary to carry out continuous training, both in content and teaching specialty, as in the general aspects of teaching.
- Search, obtain, process and communicate information (oral, printed, audiovisual, digital or multimedia), transform it into knowledge and apply it in the teaching and learning in their own areas of specialization.
- know the processes of interaction and communication in the classroom, mastering social skills and abilities necessary to encourage learning and coexistence in the classroom, and address problems of discipline and conflict resolution.

Learning Outcomes

1. Communicate effectively, both verbally and non-verbally.
2. Demonstrate knowledge of contexts and situations in which they are used and the physics and chemistry that composen the curriculum of Compulsory Secondary Education and Baccalaureate apply, highlighting its functional character and analyzing his impact.
3. Demonstrate knowledge of cultural and educational value of physics and chemistry and the contents of these disciplines taught in Secondary Education and Baccalaureate, and integrate this content in the framework of science and culture.
4. Demonstrate knowledge of the history and recent developments in physics and chemistry and his perspectives to convey a dynamic view of the same and make sense of the Physics and Chemistry School, highlighting the historical genesis of the knowledge of these sciences.
5. Demonstrate knowledge of the theoretical and practical developments in teaching and learning of Physics and Chemistry.
6. Design and develop learning spaces with special attention to equity, education and emotional values, equal rights and opportunities between men and women, civic education and human rights that facilitate life in society, decisions and building a sustainable future.
7. Generate innovative and competitive proposals for research and professional activities.
8. Identify and plan the resolution of educational situations that affect students with different abilities and different learning rates.
9. Know the processes of interaction and communication in the classroom, mastering social skills and abilities necessary to encourage learning and coexistence in the classroom, addressing issues of discipline and conflict resolution.
10. Possess learning skills necessary to carry out continuous training in both content and didactics of physics and chemistry, as well as general aspects of teaching.
11. Search, obtain, process and communicate information (oral, printed, audiovisual, digital or multimedia) to transform it into knowledge and apply it in the teaching-learning materials specific to the specialization studied.
12. Use information and communications technology and integrate them into the teaching and learning of physics and chemistry.

Content

History of Science (4cr)

Through critical analysis of authors and relevant episodes, this part is intended that the student acquire a basic historical master scientific culture.

1. What is science? Where is the History?

2. Origins

3. Gravity

4. Instruments

5. Elements

6. Workshop: Einstein and the experience of relativity

7. Workshop: Meinerheimer

8. Reading: Frankenstein o the modern Prometeus

9. Microorganisms

10. Evolution

11. Workshop: Individual, information and society

12. Workshop: Chaos, order and dinosaurs

Each session will be focused on one theme and the texts proposed in the campus virtual will be prsented and discussed.

Fundamentals Physics and Chemistry (6cr in total: 3 cr Fhysics+ 3 cr Chemistry)

Work on fundamental contents of physics or chemistry to supplement the initial training of future teachers of physics and chemistry.
The contents to study are:

Fundamentals of Physics (3cr)

- Measurement and analysis

- How to determine the correlation between variables.

- The Multilog-Pro team and Multilab program.

- Examples of relations between position, velocity and acceleration.

- Forces and Motion

- The concept of force and their types.

- Examples of movements with and without friction. Useful useof frictional forces.

- The dynamic equilibrium: motion at constant speed.

- Energy view of the processes

- Energy conservation.

- Mechanisms of energy transfer and its relationship withthe power quality. Probabilistic interpretation of the Second Law of Thermodynamics.

- Electromagnetism

- Theelectric field and magnetic. Experimental determination of the field lines.

- An experiment on electromagnetic induction.

- Wave phenomena.

Fundamentals of Chemistry (3cr)

- Pure substances and dissolutions. Chemical change.

Laboratory. Density measure. Saturated dissolution: crystallization. Visualisation of chemical change.

Discussion and exercises. Pure substances and mixtures. Dissolutions. Substances separation. Physical change and chemical change.

- Stoichiometry

Laboratory. Precipitation reaction. Filtration. Performance. Mass conservation in a chemical reaction.

Discussion and exercises. Atom and molecule. Mole concept. Chemical equation: levelling. Stoichiometric calculus.

- Heat of chemical reactions

Laboratory. Exothermic reaction. Endothermic reaction.

Discussion and exercices. Reaction heat. Inner energy and enthalpy. Calorimetry and stoichiometric calculus.

<pstyle="text-align: justify;">- Chemicalkinetics.

Laboratory. Chemical reaction speed observation. Reaction speed dependence regarding temperature and reagents.

Discussion and exercises. Fast and slow reactions. Chemical reaction speed concept. Order of reaction and constant of reaction.

- Chemical balance and acid-base reactions

Laboratory. Observations of chemical balance in different reactions.

Discussion and exercises. Chemical balance concept. Balance constant (Kc or Kps). Dependence of K regarding temperature. Balance displacement.

Laboratory. pH measure of real samples and solutions.

Discussion and exercises. Acid-base reaction concept: H+ transfer. Ionization of water (Kw) and acid or base strength (Ka and Kb). pH scale. Acid-base Indicators.

- Redox reactions and batteries

Laboratory. Redox reactions observation.

Discussion and exercises. Redox reaction: electron transference. Semireactions and global reactions. Oxidant/ reduction power of substances.

Laboratory. Battery construction and electromotive force (FEM)

Discussion and exercises. Battery electrodes: cathode and anode. Polarity. Semireactions and global reaction of a battery. Ion movement and saline bridge. Fem Calculus from tabulated data (E^o).

Students in the specialty of chemistry / physics participate in two interdisciplinary projects with students in the specialty of geology / biology, the first with content in physics and geology, and the second in biology and chemistry. These projects are worked on in interdisciplinary groups over three sessions.

Interdisciplinary Project of Biology and Chemistry

This is a transversal activity of "Fundamentals of Biology" and "Fundamentals of Chemistry", it is scheduled to be done in groups.

Interdisciplinary Project of Physics and Geology

This is a transversal activity of "Fundamentals of Physics" and "Fundamentals of Geology", it is scheduled to be done in groups.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Attendance and participation in master classes, laboratory practices, outings, etc. and the realization and evaluation of the proposed activities	65	2.6	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Type: Supervised			
Carrying out, reviewing and evaluating the proposed work (reports, case studies, problem solving, exhibitions, laboratory practices, fieldwork ...)	65	2.6	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Type: Autonomous			
Analysis of readings and proposals for didactic innovation, reporting, design of activities, analysis and resolution of cases.	120	4.8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

The hours indicated for each of the training activities are indicative and can be modified slightly depending on the schedule or the teaching needs.

In classroom activities, students will be proposed to work in small groups to promote the maximum participation of all students.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of fundamentals of chemistry	30%	0	0	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12
Evaluation of fundamentals of physics	30%	0	0	1, 2, 3, 5, 6, 7, 8, 9, 10, 12
Evaluation of the history of the sciences	40%	0	0	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12

General Evaluation criteria

The class attendance is mandatory. The student must attend a minimum of 80% of the full sessions of the module. Otherwise, it will be considered "no-show".

To pass the subject is necessary to have passed each of the parts of it.

Summative evaluation of each of the themes of each block includes group activities and individual activities. To make media should take at least 4 of each of the planned activities to be evaluated and that teachers previously indicated.

Throughout the part of the subject that each teacher teaches, complementary tasks can be requested without necessarily having to be considered assessment tasks, but they are compulsory.

Delivery of work is done via the virtual campus. We will not accept other ways of delivering or deliverables beyond the deadline.

Since the lingua franca of the master and secondary education is Catalan, oral and written tasks related to this module will be presented in this language. In written tasks, linguistic correction, composition skills and formal presentation aspects will be considered. Nevertheless, it is necessary to express yourself with fluency and correction in oral activities. A prominent level of comprehension of academic documents will also be required. An activity may not be assessed, not given back or failed if any of the mentioned requirements are not accomplished.

Work and examinations will be assessed at most one month after delivery or performance.

According to the regulations UAB, plagiarism or copying of any work will be penalized with a 0 rating, losing the ability to recover, whether it is individual work or group (in this case, all group members will have a 0).

Continuous evaluation

History of Science

To assess this course, students must write three essays from 600 words (max. extension) about the questions raised in the sessions. The first day of the course we shall provide the details of the delivering and the deadlines.

For the qualification we will take into consideration 1) the clarity and expression of the text; 2) the link of the argument with the sessions and 3) the proposed readings.

Fundamentals of Chemistry

- Lab book: 35%. Delivery date: at the end of each class

- Interdisciplinary project linked of Chemistry and Biology: 65%. Delivery date: To be determined (about May 2025)

Fundamentals of Physics

- Prracticum activity: 35% Delivery date: 20/01/2025

- Interdisciplinary project linked of Chemistry and Biology: 65%. Delivery date: 07/02/2025

Recuperation of the continuous evaluation. It will consist of a new delivery of the reports graded below 5.0/10.0. The delivery date will be 15 days after the publication of the qualifications. Maximum qualification will be 5.0/10.0

Single Evaluation

The students who asked for a single evaluation within the official period discarded the continuous evaluation. They have to deliver all the parts of evidence specified in the "continuous evaluation" not after 05/05/2025. The relative weight of each deliverable is the same as in the continuous evaluation. The recuperation will consist of the new delivery of the works graded below 5.0/10.0 not later than 15 days after the publication of the qualifications.

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Software

VideoTracker

Language list

Information on the teaching languages can be checked on the CONTENTS section of the guide.