

**Teaching Physics and Chemistry**

Code: 44313  
ECTS Credits: 15

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

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

### Contact

Name: Digna Maria Couso Lagaron

Email: Digna.Couso@uab.cat

### Use of Languages

Principal working language: catalan (cat)

### Teachers

Jordi Domenech Casal

Begoña Oliveras Prat

### Prerequisites

No requirements

### Objectives and Contextualisation

The aim of the subject is to bring future science teachers closer to the knowledge of science teaching, and to the specific didactics of each discipline. So that they can teach the contents of the areas of knowledge of biology and geology and physics and chemistry, integrating disciplinary knowledge and those of science teaching taking into account the knowledge of other areas such as the 'epistemology, language and communication, psychology and pedagogy.

Includes 2 blocks: Learning and teaching Physics and Chemistry (9cr) and Teaching innovation and introduction to research in Physics and Chemistry didactics (6 cr)

### Competences

- "Design and conduct formal and no-formal activities that help make the center a place of participation and culture in the environment where it is located; develop the functions of mentoring and guiding students in a collaborative and coordinated manner; participate in the evaluation, research and innovation in teaching and learning"
- "Determine the curriculum that will be implanted in a school participating in the collective planning thereof; develop and implement both group and personalized teaching methodologies adapted to the diversity of students."
- 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.
- Interpret the different educational needs of students in order to propose the most appropriate educational activities.
- 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.
- Plan, develop and evaluate the teaching and learning process enhancing educational processes that facilitate the acquisition of the competences of the respective teachings, based on the level and previous training of students as well as the orientation of the same, both individually and in collaboration with other teachers and school professionals
- 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 and knows how to apply innovative teaching proposals in the Biology and Geology fields.
3. Demonstrate knowledge of contexts and situations in which they are used and the physics and chemistry that composes the curriculum of Compulsory Secondary Education and Baccalaureate apply, highlighting its functional character and analyzing his impact.
4. 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.
5. Demonstrate knowledge of the curricula of physics and chemistry of this and Baccalaureate.
6. 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.
7. Demonstrate knowledge of the theoretical and practical developments in teaching and learning of Physics and Chemistry.
8. 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.
9. Generate innovative and competitive proposals for research and professional activities.
10. Identify and plan the resolution of educational situations that affect students with different abilities and different learning rates.
11. Identify problems relating to the teaching and learning of physics and chemistry and propose possible alternatives and solutions.
12. Interpret the different educational needs of students in order to propose the most appropriate educational activities.
13. 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.
14. 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.
15. 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.
16. Select, use and develop materials for teaching physics and chemistry.

17. Transform the curriculum of physics and chemistry at sequences of learning activities and programmes of work.
18. Understand the evaluation as an instrument of regulation and to encourage the effort, and meet and develop strategies and techniques for the evaluation of learning physics and chemistry.
19. Use information and communications technology and integrate them into the teaching and learning of physics and chemistry.

## Content

The block "Physics and chemistry didactics" is divided into 2 parts: "Learning and teaching Physics and Chemistry" (9cr) and "Teaching innovation and introduction to research in Physics and Chemistry didactics" (6cr).

### Learning and teaching Physics and Chemistry (9cr)

Introduction to Science Education (3cr)

- Purpose of teaching science at ESO
- The teaching of science and development of scientific competence
- What is science? Reflections on the epistemology of science
- What science should be taught in school?
- Didactic models and preconceptions
- The learning cycle and activities
- Assessment and regulation of learning

Chemistry Didactics (3cr)

- Purposes of teaching chemistry.
- The great ideas of chemistry (substances "chemical species" chemical change, molecular-kinetic model). Identifying key curriculum models (model kinetic model atomicomolecular and atomic model classic). Selection and sequencing of content to teach.
- Scenarios and learning resources
- The teaching of chemistry in teaching and learning chemical change
- The water and ions dissolutions
- Electricity and chemical change
- Modeling, investigation and argumentation in school chemistry
- Laboratory work in Chemistry

Physics Didactics (3cr)

- The school physics models and key concepts: and because
- Ideas and ways of reasoning of the students in physics
- Modeling, school physics inquiry and argumentation
- Acts paradigmatic you real problems and controversy as socio-scientific contexts relevant to the teaching of physics.

- Using ICT Work and experimental physics

### Teaching innovation and introduction to research in Physics and Chemistry didactics (6 cr)

#### Teaching innovation

- The curriculum. Learning objectives, programming and evaluation.
- Diversity of types of competence teaching units according to the approach: progressions, projects, inquiry, ABP, modelling etc.
- Contexts and knowledge transfer.
- The development of transversal skills: critical thinking, cognitive-linguistic, digital, self-regulation, etc.

#### Introduction to Physics and Chemistry Education Research

- Reflective practice: reflection on practice and its relationship to educational innovation
- The classroom observation: goals, models of observation and instruments
- Methodological bases for innovation and educational research
- Current trends in research in science education

## Methodology

The proposed teaching methodology and assessment may undergo some modification depending on the attendance restrictions imposed by the health authorities.

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.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Assistència i participació a classes magistral, pràctiques de laboratori, sortides, etc. i al realització i avaluació de les activitats proposades	97.5	3.9	15, 1, 13, 3, 4, 5, 7, 2, 6, 8, 18, 9, 11, 10, 12, 14, 16, 17, 19
Type: Supervised			
Realització, revisió i avaluació dels treballs proposats (informes, estudis de cas, resolució de problemes, exposicions, pràctiques de laboratori, treballs de camp...	75	3	15, 1, 13, 3, 4, 5, 7, 2, 6, 8, 18, 9, 11, 10, 12, 14, 16, 17, 19

Type: Autonomous

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Anàlisi de lectures i propostes d'innovació didàctica, realització d'informes, disseny d'activitats, anàlisi i resolució de casos	202.5	8.1	15, 1, 13, 3, 4, 5, 7, 2, 6, 8, 18, 9, 11, 10, 12, 14, 16, 17, 19
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## Assessment

### 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 module is necessary to have passed each of the blocks of content and each of the themes that shape and can still be made independently

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 module part of each teacher / a imparts, you can ask additional tasks without having to be necessarily considered assessment tasks, but delivery obligations.

Delivery of work is primarily done via the virtual campus. They may enable other routes of delivery, in agreement with the teachers, informed via attendance in class and via virtual.o moodle campus. No work delivered by way not agreed with the teacher / a nor work with incorrect formats, which do not include the names of the authors and subject matter to which they refer or sent after the deadline will be accepted.

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 aspect 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 an individual work and group (in this case, all group members will have a 0).

### Introduction to Science Education

- Personal reflection in relation to an ideal science class.50%. Delivery date: the document is done the first day of the master and students' will reflect on it the last day of the teaching.

- Suggestion of a competency question for assessment purposes 50%. Delivery date: 29/10/2021

### Teaching innovation and introduction to research in Physics and Chemistry didactics

- Personal Portfolio 70%. Two entries in the whole course, digitally in a moodle forum. Each entry has to deal with an aspect chosed by the student from one of the two blocks of content of the subject, in relation with the preparation of her TLS and her teaching practice. It will be necessary to show an adequate mastery of the content knowledge of the subject for the teaching practice. First entry: 31/01/2022. Second entry: 15/05/2022

- Design of a proposal ABP 30% (group work). Delivery date: 15/05/2022

### Physics Education

Individual task: Throughout the course all students will perform a microteaching, ie a small classroom intervention where they will have to act as teachers to the rest of the group and implement a teaching activity designed for the occasion. Once the microteaching has been carried out, each student must prepare a written text that includes sufficient evidence of learning during the process of preparation (pre), implementation and reflection (post) of the microteaching: identifying own mistakes, proposing improvements, applying- to new contexts, relating it to didactic concepts learned during the course, etc. Therefore, the quality of the implementation of microteaching itself will not be qualifiable, but doing so is a prerequisite for preparing the subsequent reflection paper for the final individual qualification. Delivery: 27/04/2022. Recoverable task.

## Chemistry Education

Individual task: Throughout the course all students will perform a microteaching, ie a small classroom intervention where they will have to act as teachers to the rest of the group and implement a teaching activity designed for the occasion. Once the microteaching has been carried out, each student must prepare a written text that includes sufficient evidence of learning during the process of preparation (pre), implementation and reflection (post) of the microteaching: identifying own mistakes, proposing improvements, applying- to new contexts, relating it to didactic concepts learned during the course, etc. Therefore, the quality of the implementation of microteaching itself will not be qualifiable, but doing so is a prerequisite for preparing the subsequent reflection paper for the final individual qualification. Delivery: 27/04/2022. Recoverable task.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of Chemistry Education	20%	0	0	15, 1, 13, 3, 4, 5, 7, 2, 6, 8, 18, 9, 11, 10, 12, 14, 16, 17, 19
Evaluation of Innovation and Research in Education	40%	0	0	15, 1, 13, 3, 4, 5, 7, 2, 6, 8, 18, 9, 11, 10, 12, 14, 16, 17, 19
Evaluation of Introduction to Science Education	20%	0	0	15, 1, 3, 4, 5, 7, 6, 18, 14
Evaluation of Physics Education	20%	0	0	15, 1, 13, 3, 4, 5, 7, 2, 6, 8, 18, 9, 11, 10, 12, 14, 16, 17, 19

## Bibliography

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IZQUIERDO, Mercè., ALIBERAS, Joan., (2004). Pensar, actuar i escriure a la classe de ciències. Per un ensenyament de les ciències racional i raonable. Cerdanyola. Publicacions de la UAB.

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Official Documents

Curriculum secundària [www.xtec.cat](http://www.xtec.cat)

Informe PISA <http://www.gencat.net/educacio/csda/publis/quaderns.htm>

Revistas de Enseñanza de las Ciencias

Alambique. <http://alambique.grao.com>

Ciències: Revista del Professorat de Ciències d'Infantil, Primària i Secundària. [http://crecim.uab.cat/revista\\_ciencies/revista/index.htm](http://crecim.uab.cat/revista_ciencies/revista/index.htm)

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Eureka: <http://revistas.uca.es/index.php/eureka>

Curriculum projects

IZQUIERDO, M. (Coord.). (1993), Ciències 12-16. CDEC. Generalitat de Catalunya

Projecte Advancing Physics. IOP. <http://advancingphysics.iop.org/>

Projecte 21st Century Science. The University of York & Nuffield Foundation. <http://www.21stcenturyscience.org/>

Projecte Física i Química Salters i Salters Horners. The University of York, Nuffield Foundation, Salters Institute and Horners Co.

Salters Advanced Chemistry [www.salters.co.uk/institute/curriculum\\_advanced.html](http://www.salters.co.uk/institute/curriculum_advanced.html)

Salters Horners Advanced Physics [www.salters.co.uk/institute/curriculum\\_horners.html](http://www.salters.co.uk/institute/curriculum_horners.html)

Disponible en català a: [http://www.xtec.es/cdec/formacio/pagines/salters\\_f.htm](http://www.xtec.es/cdec/formacio/pagines/salters_f.htm)

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Original: [www.kcl.ac.uk/schools/sspp/education/research/projects/ideas.html](http://www.kcl.ac.uk/schools/sspp/education/research/projects/ideas.html)

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#### **Software**

No specific programmes needed