

COURSE PROGRAM

Academic Year: 2026/2027

Identification and characteristics of the course			
Code	501618 (FEP) 501667 (FFP) 502857 (FFP Bilingüe) 502034 (CUSA)	ECTS Credits	6
Course name (English)	Teaching of matter and energy		
Course name (Spanish)	Didáctica de la materia y la energía		
Degree programs	BA in Primary Education – 2nd Year		
Faculty/School	College of Education and Teacher Training College		
Semester	4	Type of course	Compulsory
Module	Didactic – disciplinary		
Matter	Teaching and learning of Experimental Sciences		
Lecturer/s			
Name	Office	E-mail	Web page
David González Gómez	1505-1-10	dggomez@unex.es	
Subject Area	Didactics of Experimental Science		
Department	Didactics of Experimental Science and Mathematics		
Coordinating Lecturer (If more than one)			
Competencies /Learning Outcomes			
CB1. Students have proven to possess and understand knowledge in an study area that stems from the basis of general secondary education, and it is often found at a level that, while supported by advanced textbooks, also includes some aspects which involve knowledge from the forefront of their field of study.			
CB2. Students can apply professionally their knowledge to their job and have the skills necessary to elaborate and defend reasonings and solve problems in their study area.			
CB3. Students can collect and interpret relevant data (within their study area) to make judgments that include a reflection on relevant issues of a social, scientific or ethical nature.			
CB4. Students can transmit information, ideas, problems and solutions to a specialized and non-specialized public.			
CB5. The development of the learning skills necessary to undertake further studies with a high degree of autonomy.			
CG1. Know the curricular areas of primary education, the interdisciplinary relationship between them, the evaluation criteria and the body of didactic knowledge around the respective teaching and learning procedures.			
CG9. Value individual and collective responsibility in achieving a sustainable future.			
CG10. Think over the classroom practices to innovate and improve teaching. Acquire habits and skills for autonomous and cooperative learning and promote it among students.			

CG11. To be familiar and apply the information and communication technologies in the classroom. To selectively discern audiovisual information that contributes to learning, civic education and cultural wealth.
CT1. To be able to convey information, ideas, problems and solutions to both specialised and non-specialised audiences.
CT1.3. Apply the ICTs as a working tool and a basic element to learn, communicate and get information.
CT1.4. Apply the social and interpersonal skills in the relation with other people and to work in multidisciplinary groups in a cooperative way.
CT2. To know how to apply the learning skills necessary to undertake further studies with a high degree of autonomy.
CT2.1. To know how to apply the learning skills necessary to undertake further studies with a high degree of autonomy.
CT2.2. To efficiently use a variety of resources, techniques and learning strategies that guarantee autonomous, responsible and continuous lifelong learning.
CT2.3. To be updated in the socio-educational field through research and to know how to analyse future trends.
CT2.4. To maintain an attitude of innovation and creativity in the exercise of their profession.
CT3. To acquire and declare an ethical commitment as a teacher, which needs to enhance the idea of comprehensive education, with critical and responsible attitudes; guaranteeing a true equality between men and women, equal opportunities, universal accessibility for people with disabilities, and the typical values of a culture of peace and of a democracy.
CT3.1 - To understand the evolutionary character and plurality of contemporary societies and develop attitudes of respect, tolerance and solidarity towards different social and cultural groups.
CT3.2 - To understand and practice the values of democratic societies such as tolerance, solidarity, justice, non-violence, freedom, co-responsibility and equality, and in general terms to use systems of values such as the Declaration of the Human Rights.
CT3.3 - To be aware of the right to equal treatment and opportunities between women and men and to apply measures that eliminate the obstacles that hinder effective equality between women and men and promote total equality between them.
CT3.4 - To be aware of the right for equal opportunities for people with disabilities and implement measures aimed at avoiding or compensating for the disadvantages of a person with disabilities to fully participate in political, economic, cultural and social living.
CT3.5 - To promote and enhance the values of a culture of peace.
CT3.6 - To reflect critically and logically on the need to eliminate all forms of discrimination, directly or indirectly, in particular racial, against women, and discrimination due to sexual orientation or disability.
CE25. Understand the basic principles and fundamental laws of experimental sciences, particularly Physics and Chemistry.
CE26. Know the school curriculum of experimental sciences.
CE27. Suggest and solve problems by applying sciences to daily.
CE28. Appreciate sciences as a cultural fact.
CE29. Recognize the mutual influence between science, society and technological development, as well as appropriate citizen behaviour, to ensure a sustainable future.
CE30. Develop and evaluate curriculum content through appropriate teaching resources and promote students' acquisition of competences in experimental sciences.

Contents

Course outline
Teaching and learning science in Primary Education in general, and specifically teaching about the Universe, the Matter and its transformation and the Energy. Learning how to apply different methodologies to teach scientific contents to Primary Education students.
Course syllabus
Name of lesson 1: Teaching and Learning Natural Science in Primary Education Contents of lesson 1: - Why teach natural sciences in Primary Education? - Learning how to teach natural sciences in Primary Education - Knowledge of the Natural Environment in Primary Education - Strategies, techniques, and resources for teaching Natural Sciences and their application in Primary Education - The school laboratory for Natural Sciences Description of the practical activities of lesson 1: Introductory practical activities in the science laboratory in Primary Education.
Name of lesson 2: The Universe and its didactics Contents of lesson 2: - Size of the Universe: a historical-didactic space walk - Origin and evolution of the Universe - Fundamental structures of the Universe: galaxies - Stars and planetary systems - The solar system - Didactic models of the sky for Primary Education - Use of techniques for orientation through observation of elements in the physical environment - Didactic use of the media Description of the practical activities of lesson 2: Practical experiences about the Universe in primary education.
Name of lesson 3: Matter and Its Didactics. Contents of lesson 3: - General conceptual analysis of matter using concept maps - Proposal of activities for Primary Education - Physical and chemical properties of substances in the environment - Structure of matter: interactions - Dichotomous classifications of substances for matter analysis in the early educational levels - Preconceptions about pure substances and mixtures. Suggestions for teaching - Fluids and their didactic projection in Primary Education Description of the practical activities of lesson 3: Practical experiences about the matter in primary education.
Name of lesson 4: Didactics of Matter Transformations. Contents of lesson 4: - Observable changes in matter: physical and chemical changes - Changes in the state of aggregation of matter - Chemical reactions: oxidation, combustion, and fermentation - Nuclear transformations. Production of electrical energy - Preconceptions about changes in matter. Suggestions for teaching - Properties of commonly used materials and their behavior in relation to light, sound, forces, magnetism, humidity, and electricity: introduction to simple investigations as a means of knowledge

Description of the practical activities of lesson 4: Practical experiences about the matter transformations in primary education.

Name of lesson 5: Energy and Its Didactics. Didactics of Energy Transformations.

Contents of lesson 5:

- Energy. Forms of energy manifestation
- Main sources of energy. Non-renewable and renewable energy sources. Transformation, transfer, degradation, and conservation
- The use of energy and its transformations
- Difficulties in learning about energy. Students' preconceptions
- Waves. Light and sound
- Electrical energy. Circuits. Magnetism
- Machines and energy: simple and compound machines. Didactic applications
- Energy, society, and the environment

Description of the practical activities of lesson 5: Practical experiences about the energy in primary education.

Sustainable Development Goals taken into account



Educational activities

Student workload in hours by lesson	Lectures	Practical activities	Monitoring activity	Homework
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Lesson	Total	L	HI	LAB	COM	SEM	SGT	PS
1	11	4		3				4
2	29	10		3				16
3	32	11		3				18
4	24	7		3				14
5	32	11		2				19
Assessment	22	2		1				19
TOTAL	150	45		15				90

L: Lectures (85 students)

LAB: Laboratory or field practices (15 students)

PS: Personal study, individual or group work and reading of bibliography

Teaching Methodologies

1. Lecture in large group: To explain general concepts and procedures related with the subject by means of multimedia material or bibliographic documents.
2. Debate and discussions: To foster students to construct knowledge from the previous knowledge students have. To achieve this learning goal, the instructor will combine lecturing with discussion activities.
3. Multimedia material: Some of the contents will be delivered by means of video-lessons or other multimedia material (movies, documentaries or speeches) together with discussion activities.
4. Assessment activities: These activities aim to assess the students' learning outcome regarding the learning objectives and skills included in the course syllabus.
5. Analysis and discussion of bibliographic and multimedia materials.
6. Project design: Through these activities, students will learn how to design and use a project for teaching.
7. Guidance, decision making and resolution of the questions raised by the student. Follow-up of individual works or in small groups. Consultation and individual and group counseling.
8. Reading of documents prior to the teacher's oral presentation.
9. Study of the subject and preparation of exams.

Learning outcomes

- Students will be able to explain, interlink and apply the most relevant and general scientific concepts.
- Students will be able to contextualize and critically analyze different aspects related with Science, Technology and Society in the Primary Education context.
- Students will be able to know and understand the main didactics theories of Sciences, as well as know how to apply the methodologies and contents to teach Science in Primary Education.

- Students will be able to write scientific reports, using a proper scientific language, interlinking different concepts, as well as having a proactive attitude in the classroom.
- Students will be able to deeply understand Scientific contents and how to teach them.

Assessment systems

Assessment system	Activities	Weight
Exams	Final exam (written test)	70%
Continuous	Seminars assessment and practical activities will depend on attendance, teacher monitoring, submitted projects and practical tests. At the end of the seminars' students will have to do a written test (exam).	30%
Global	Students following a non-continuous assessment system will do a final theoretical exam (70%), and a seminar exam (30%) covering the contents worked in the seminars of the subject.	100%

According to "Normativa de Evaluación de la UEx de 26 de octubre de 2020 (DOE de 3 de noviembre)", the evaluation can be either CONTINUOUS or GLOBAL. The choice of the global evaluation method lies with the students, who can select it during the first quarter of the teaching period for each examination (regular and extraordinary). In order to do so, the subject professors will manage these requests through a specific space created for this purpose in the Virtual Campus. In the absence of an explicit request from the student, the assigned evaluation method will be continuous. Once the evaluation type is chosen, students cannot change it for the regular examination of that semester and must adhere to the evaluation regulations for the extraordinary examination. Regardless of the chosen method, students are guaranteed the opportunity to achieve the maximum grade of "Outstanding-10".

Continuous evaluation: Students have to pass the written test with a minimum grade of 5 in order to pass the course. The proper use of language, including correct spelling and grammar, will be taken into account in both written tests and submitted assignments. Seminars and practical activities conducted in class and the virtual campus cannot be retaken in the regular examination, but they can be retaken in the extraordinary examination through a specific written test on the seminar and activity content.

Global evaluation: The final global exam consists of two parts: a) the same general exam as the continuous evaluation students, and b) a specific test on the seminar and activity content. It is necessary to pass the general exam with a minimum grade of 5.

Bibliography (basic and complementary)

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BROWN, T.L., LEMAY, H.E., BURSTEN, B.E., BURDGE, J.R. (2004). Química: la ciencia central. Pearson Educación. México.

CRAIG, A. Y ROSNEY C. (2010). Enciclopedia del mundo que nos rodea. Todo libro ediciones. Madrid.

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GARRIDO, J.M.; PERALES, F.J. y GALDÓN, M. (2008). Ciencia para educadores. Pearson. Madrid.

Koch, J. (2018) Science stories: science methods for Elementary and Middle School teachers Ed. Cengage Learning 6th. ed.

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Martí, J. (2012). Aprender Ciencias en Educación Primaria. GRAÓ. Barcelona.

M.E.C. (2008). El desarrollo del pensamiento científico-técnico en Educación Primaria. MEC. Madrid.

PERALES, F.J. (2005). La resolución de problemas en física. Anaya. Madrid

PERALES, f.j. y CAÑAL, P. (2000). Didáctica de las Ciencias Experimentales. Marfil. Alcoy.

PETRUCCI, R.H., WILLIAN, S.H., GEOFFREY, H. (2009). Química General. Prentice-Hall. Madrid

PUJOL, R. (2003). La didáctica de las ciencias en la educación primaria. Síntesis. Madrid.

SÁNCHEZ, G. y VALCARCEL, M.V. (2009). El estudio de los materiales de uso cotidiano en Educación Primaria. Alambique. 59, 9-23.

SEARS & ZEMANSKY (2009) Física Universitaria. Addison-Wesley. México.

VÍLCHEZ GONZÁLEZ, J.M. (2014) Didáctica de las Ciencias Para la Educación Primaria. Pirámide. España

Legal texts and documents:

Decreto 107/2022, de 28 de julio, por el que se establecen la ordenación y el currículo de la Educación Primaria para la Comunidad Autónoma de Extremadura. *Diario Oficial de Extremadura*, 151, de 5 de agosto de 2022. <https://doe.juntaex.es/eli/es-ex/d/2022/07/28/107/dof/spa/pdf>

Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación. Boletín Oficial del Estado, 340, de 30 de diciembre de 2020. <https://www.boe.es/eli/es/lo/2020/12/29/3>

Ley Orgánica 8/2021, de 4 de junio, de protección integral a la infancia y la adolescencia frente a la violencia. Boletín Oficial del Estado, 134, de 5 de junio de 2021. <https://www.boe.es/eli/es/lo/2021/06/04/8/con>

Ley Orgánica 10/2022, de 6 de septiembre, de Garantía Integral de la Libertad Sexual. Boletín Oficial del Estado, 215, de 7 de septiembre de 2022. <https://www.boe.es/eli/es/lo/2022/09/06/10/con>

Ley Orgánica 2/2023, de 22 de marzo, del Sistema Universitario. Boletín Oficial del Estado, 70, de 23 de marzo de 2023. <https://www.boe.es/eli/es/lo/2023/03/22/2/con>

Other resources and complementary educational materials

Websites:

Ciencia Recreativa
http://disfrutalaciencia.es/exp_5.html
 Educación en la Red
<http://www.educaplus.org>
 El rincón de la ciencia
<https://sites.google.com/site/elrincondelacienciavkent/>
 Didáctica de la Química y la vida cotidiana

<http://quim.iqi.etsii.upm.es/vidacotidiana/Inicio.htm>

Ciencia Teca

<http://www.cienciateca.com>

La ruta de la energía

<http://www.larutadelaenergia.org>

El CSIC en la Escuela

<https://www.csicenlaescuela.csic.es/>

Invadidos por la ciencia:

<https://www.invadidosporlaciencia.com/>

Aciertas:

<https://aciertas.org/recursos/>

Del espacio al aula. Oficina Europea de Recursos para la Educación Espacial en España (ESERO)

<https://esero.es/>