

## COURSE PROGRAM

Academic Year: 2023/2024

Identification and characteristics of the course			
Code	502857 (TTC-B)	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 – 2 <sup>nd</sup> 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	<a href="mailto:dggomez@unex.es">dggomez@unex.es</a>	
Javier Vaquero Martínez	1505-1-14	<a href="mailto:javier_vm@unex.es">javier_vm@unex.es</a>	
Subject Area	Didactics of Experimental Science		
Department	Didactics of Experimental Science and Mathematics		
Coordinating Lecturer (If more than one)	David González Gómez		
Competencies			
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.			
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			
CT2.5. Keep an innovative and creative attitude in the working environment			
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 behavior, 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 Science in Primary Education

**Contents of lesson 1:** Science literacy: science, technology and society. Science in primary education, the Spanish curricula. Instructional models to teach science. Strategies, techniques and resources to teach science.

**Description of the practical activities of lesson 1:** Introduction to the science lab in Primary Education.

**Name of lesson 2:** The Universe

**Contents of lesson 2:** The size of the Universe: a spatial, historical and didactic walk. Origins and evolution of the Universe. The Universe fundamental structures: galaxies. The stars and planetary systems. The Solar System. Didactic sky models for Primary School Education. Orientation techniques through the observation of the physical environment. Didactic use of mass media. Design of and discussion about activities for the Primary School classroom.

**Description of the practical activities of lesson 2:** Practical experiences about the Universe in primary education.

**Name of lesson 3:** The matter and how to teach it in Primary Education.

**Contents of lesson 3:** Using conceptual maps to study the states of the matter. Task and activities for Primary Education. Physic and chemical properties of the substances found in the pupils' surround. Matter structure: Interactions. Dichotomy classification of substances to analyze the matter with Primary Education pupils. Misconceptions about matter and solutions. How to teach these concepts? Fluids and how to work with them in Primary Education. Design of tasks and activities to work with Primary Education Students.

**Description of the practical activities of lesson 3:** Practical experiences about the matter in primary education.

**Name of lesson 4:** The matter transformations and how to teach it in Primary Education.

**Contents of lesson 4:** Matter visible changes: physical and chemical. Changes of the matter states. Chemical reactions. Nuclear transformations. Production of electricity. Some materials behaviors towards humidity: introduction to simple research as a source of knowledge. Design and dissemination of activities for the Primary School classroom.

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

**Name of lesson 5:** The Energy and how to teach it in Primary Education.

**Contents of lesson 5:** Types of energy. Transformation, transfer, degradation and conservation. Energy use and transformation. Difficulties of learning about energy. Students' alternative ideas. Waves. Light and sound. Electric energy. Circuits. Magnetism. Machines and energy: simple and compound machines. Didactic applications. Energy, society and environment. Design and development of didactic and experimental activities

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

Educational activities								
Student workload in hours by lesson		Lectures	Practical activities				Monitoring activity	Homework
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
<b>Assessment **</b>	22	2		1				19
<b>TOTAL</b>	<b>150</b>	<b>45</b>		<b>15</b>				<b>90</b>
<p>L: Lectures (100 students)            HI: Hospital internships (7 students)            LAB: Laboratory or field practices (15 students)            COM: Computer room or language laboratory practices (30 students)            SEM: Problem classes or seminars or case studies (40 students)            SGT: Scheduled group tutorials (educational monitoring, ECTS type tutorials)            PS: Personal study, individual or group work and reading of bibliography</p>								
Teaching Methodologies								
<ul style="list-style-type: none"> <li>➤ Lecture in large group: To explain general concepts and procedures related with the subject by means of multimedia material or bibliographic documents.</li> <li>➤ 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.</li> <li>➤ 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.</li> <li>➤ Assessment activities: These activities aim to assess the students' learning outcome regarding the learning objectives and skills included in the course syllabus.</li> <li>➤ Analysis and discussion of bibliographic and multimedia materials.</li> <li>➤ Project design: Through these activities, students will learn how to design and use a project for teaching.</li> <li>➤ 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.</li> <li>➤ Reading of documents prior to the teacher's oral presentation.</li> </ul> <p>Study of the subject and preparation of exams.</p>								
Learning outcomes *								
<ul style="list-style-type: none"> <li>- Students will be able to explain, interlink and apply the most relevant and general scientific concepts.</li> <li>- Students will be able to contextualize and critically analyze different aspects related with Science, Technology and Society in the Primary Education context.</li> <li>- 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.</li> <li>- 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.</li> <li>- Students will be able to deeply understand Scientific contents and how to teach them.</li> </ul>								

\*\* Indicate the total number of evaluation hours of this subject.

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)

- BANET, E., JAEN, M. y DE PRO, A. (2005). Didáctica de las Ciencias Experimentales. ICE. MURCIA.
- CRAIG, A. Y ROSNEY C. (2010). Enciclopedia del mundo que nos rodea. Todo libro ediciones. Madrid.
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- Koch, J. (2018) Science stories: science methods for Elementary and Middle School teachers Ed. Cengage Learning 6th. ed.
- LAHERA, J. (2007). Aprendiendo Física Básica en el Laboratorio. CC.S. Madrid
- 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.
- 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

### Other resources and complementary educational materials

Websites:

Ciencia Recreativa

[http://disfrutalaciencia.es/exp\\_5.html](http://disfrutalaciencia.es/exp_5.html)

Educación en la Red

<http://www.educaplus.org>

Ciencias Físicas

<http://es.geocities.com/fisicas/>

El rincón de la ciencia

<http://centros5.pntic.mec.es/ies.victoria.kent/Rincon-C/rincon.htm>

Didáctica de la Química y la vida cotidiana

<http://www.etsii.upm.es/diquima/vidacotidiana/Inicio.htm>

Ciencia Teca

<http://www.cienciateca.com/>

Portal Eureka

<http://www.portaleureka.com/>

La ruta de la energía

<http://www.larutadelaenergia.org>

Viaje al interior de la materia

<http://www.ite.educacion.es/w3/eos/MaterialesEducativos/mem2000/materia/web/index.htm>

Historia de la medida en Extremadura

[http://centros4.pntic.mec.es/ies.zurbaran/REPERCUTEC/Actividades/Medidas/Historia\\_de\\_la\\_medida.htm](http://centros4.pntic.mec.es/ies.zurbaran/REPERCUTEC/Actividades/Medidas/Historia_de_la_medida.htm)