

COURSE PROGRAM

Academic Year: 2020/2021

Identification and characteristics of the course			
Code	502857	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 nd 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	Decanato	dggomez@unex.es	
Subject Area	Didactics of Experimental Science		
Department	Didactics of Experimental Science and Mathematics		
Coordinating Lecturer (If more than one)			
Competencies*			
CB2 - Students can apply professionally their knowledge to their work or vocation and possess the skills that are usually demonstrated through the elaboration and defence of arguments and the resolution of problems within their study area.			
CB3 - Students have the ability to gather and interpret relevant data (usually within their study area) to make value judgements that includes reflection on relevant social, scientific or ethical issues.			
CB4 - Students are able to convey information, ideas, problems and solutions to both specialised and non-specialised audiences.			
CB5 - Students have developed the required learning skills to undertake further studies with a high degree of autonomy.			
CG1 - To be familiar with the interdisciplinary nature of Primary Education curricular areas, the assessment criteria and the body of didactic knowledge required for teaching and learning processes.			
CG9 - To assess individual and collective responsibility in the achievement of a sustainable future.			
CG10 - To reflect upon classroom activities so as to innovate and improve teaching practices. To acquire habits and skills for autonomous and cooperative learning and promote it among students.			
CT1.3 - To use new information technologies as a tool for intellectual work and as an essential element for gathering information, learning and communicating.			
CT1.4 - To manage and use social and interpersonal skills in relationships with other peoples and work in multidisciplinary groups in a cooperative way.			

* The sections concerning competencies, course outline, educational activities, teaching methodologies, learning outcomes and assessment systems must conform to that included in the ANECA verified document of the degree program.

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Firmado Por	Francisco Miguel Leo Marcos	Firmado	04/11/2022 20:32:08
Observaciones		Página	1/5
Url De Verificación	https://uex09.unex.es/vfirma/code/LZuuM4DXdb9J+wFuDfh1Lw==		
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CT2.4 - To maintain an attitude of innovation and creativity in the exercise of their profession.
CE25 - To understand the basic principles and fundamental laws of the experimental sciences (Physics, Chemistry, Biology and Geology).
CE26 - To know the school curriculum of these sciences.
CE27 - To raise and solve problems associated with life sciences.
CE28 - To value the sciences as a cultural fact.
CE29 - To recognize the mutual influence between science, society and technological development, as well as the relevant citizen behaviour, to ensure a sustainable future.
CE30 - To develop and evaluate curriculum content through appropriate teaching resources and promote the acquisition of basic skills in students (Experimental Science).
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.

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Firmado Por	Francisco Miguel Leo Marcos	Firmado	04/11/2022 20:32:08
Observaciones		Página	2/5
Uri De Verificación	https://uex09.unex.es/vfirma/code/LZuum4DXdb9J+wFuDfh1Lw==		
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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
Assessment **	22	2		1				19
TOTAL	150	45		15				90

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

Teaching Methodologies*

- Lecture in large group: To explain general concepts and procedures related with the subject by means of multimedia material or bibliographic documents.
- 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.
- 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.
- Assessment activities: These activities aim to assess the students' learning outcome regarding the learning objectives and skills included in the course syllabus.
- Analysis and discussion of bibliographic and multimedia materials.
- Project design: Through these activities, students will learn how to design and use a project for teaching.
- 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.
- Reading of documents prior to the teacher's oral presentation.

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%

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

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Continuous assessment	Seminars assessment and practical activities will depend on attendance, teacher monitoring, submitted projects and practical tests. At the end of the seminars students will to do a written test (exam).	30%
<p>All students must inform the professor during the first 3 weeks of each semester the type of assessment selected. If no information is provided, the continuous assessment system will be assigned to the student. No changes of assessment systems are allowed up until the following evaluation. Students following continuous assessment system must attend at least the 80% of the seminar sessions. Students following global assessment system will do a final theoretical exam (70%), and a seminar exam (30%) covering the contents worked in the seminars of the subject.</p> <p>In both assessment system, students must get at least 5 points of 10 in each part (final exam and seminar exam) in order to pass the subject.</p>		
Bibliography (basic and complementary)		
<p>BANET, E., JAEN, M. y DE PRO, A. (2005). Didáctica de las Ciencias Experimentales. ICE. MURCIA.</p> <p>CRAIG, A. Y ROSNEY C. (2010). Enciclopedia del mundo que nos rodea. Todo libro ediciones. Madrid.</p> <p>DRIVER AA.VV. (2009). Hacemos ciencia en la escuela. GRAÓ.Barcelona.</p> <p>PETRUCCI, R.H., WILLIAN, S.H., GEOFFREY, H. (2009). Química General. Prentice-Hall. Madrid</p> <p>BROWN, T.L., LEMAY, H.E., BURSTEN, B.E., BURDGE, J.R. (2004). Química: la ciencia central. Pearson Educación. México</p> <p>GARRIDO, J.M.; PERALES, F.J. y GALDÓN, M. (2008). Ciencia para educadores. Pearson. Madrid.</p> <p>Koch, J. (2018) Science stories: science methods for Elementary and Middle School teachers Ed. Cengage Learning 6th. ed.</p> <p>LAHERA, J. (2007). Aprendiendo Física Básica en el Laboratorio. CC.S. Madrid</p> <p>Martí, J. (2012). Aprender Ciencias en Educación Primaria. GRAÓ. Barcelona.</p> <p>M.E.C. (2008). El desarrollo del pensamiento científico-técnico en Educación Primaria.MEC. Madrid.</p> <p>PERALES, F.J. (2005). La resolución de problemas en física. Anaya. Madrid</p> <p>PERALES, f.j. y CAÑAL, P. (2000). Didáctica de las Ciencias Experimentales. Marfil. Alcoy.</p> <p>PUJOL, R. (2003). La didáctica de las ciencias en la educación primaria. Síntesis. Madrid.</p> <p>SÁNCHEZ, G. y VALCARCEL, M.V. (2009). El estudio de los materiales de uso cotidiano en Educación Primaria. Alambique. 59, 9-23.</p> <p>SEARS & ZEMANSKY (2009) Física Universitaria. Addison-Wesley. México.</p> <p>VÍLCHEZ GONZÁLEZ, J.M. (2014) Didáctica de las Ciencias Para la Educación Primaria. Pirámide. España</p>		
Other resources and complementary educational materials		
<p>Websites:</p> <p>Ciencia Recreativa http://disfrutalaciencia.es/exp_5.html</p> <p>Educación en la Red http://www.educaplus.org</p> <p>Ciencias Físicas http://es.geocities.com/fisicas/</p> <p>El rincón de la ciencia http://centros5.pntic.mec.es/ies.victoria.kent/Rincon-C/rincon.htm</p> <p>Didáctica de la Química y la vida cotidiana</p>		

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Observaciones		Página	4/5
Uri De Verificación	https://uex09.unex.es/vfirma/code/LZuuM4DXdb9J+wFuDfh1Lw==		
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 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)

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