

**1. General information****Course:** CLIL FOR MATHEMATICS AND NATURAL SCIENCE**Code:** 311155**Type:** CORE COURSE**ECTS credits:** 6**Degree:** 2369 - MÁSTER UNIVERSITARIO EN ENSEÑANZA BILINGÜE Y TIC PARA INFANTIL Y PRIMARIA**Academic year:** 2022-23**Center:** 101 - FACULTY OF EDUCATION IN ALBACETE**Group(s):** 10**Year:** 1**Duration:** C2**Main language:** English**Second language:** Spanish**Use of additional languages:****English Friendly:** N**Web site:****Bilingual:** Y**Lecturer:** SILVIA MARTINEZ SANAHUJA - Group(s): 10

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**2. Pre-Requisites**

Not established

**3. Justification in the curriculum, relation to other subjects and to the profession**

The current bilingual programs/projects include Mathematics and Natural Sciences as areas taught in English through the CLIL methodology and ICT. Thus, this course is divided into the following areas:

- Mathematics: The Teaching of Mathematics in linguistic programs/bilingual projects.
- Natural Sciences (Biology, Geology, Physics and Chemistry): The Teaching of Sciences in linguistic programs/bilingual projects.
- Computing: Development and application of new technologies and software in these areas, specifically in the integrated teaching of languages and content.

**4. Degree competences achieved in this course****Course competences**

Code	Description
CB08	To be able to integrate knowledge and face the complexity of making judgments founded on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of knowledge and judgments.
CE01	To integrate knowledge to adapt and create didactic materials for bilingual English/Spanish teaching, estimating the linguistic level with sensitivity to the different learning rhythms and styles.
CE03	To justify the implementation of diverse teaching/learning methods and approaches based on the integration of language and content (CLIL).
CE05	To adapt ICT tools that promote educational innovation and informational, audiovisual, and digital literacy of students in the bilingual classroom.
CE08	To define and design activities, tasks, and intervention projects for Primary Education integrating the first foreign language and the contents of the knowledge areas of the linguistic programs (Natural Sciences, Social Sciences, Mathematics, Physical Education, Social and Civic Values, Artistic Education).
CE11	To apply the CLIL/AICLE methodology and evaluate the results of its implementation in real bilingual educational contexts and facilitate improvement measures.
CE12	To create materials for the integrated acquisition of language and contents through ICT.
CG01	To acquire advanced scientific training applied to Bilingual Education in the stages of Early Childhood and Primary Education.
CG02	To analyze the specific teaching problems of foreign languages (FL) and non-linguistic disciplines (DNL) linguistically, culturally, and methodologically within the framework of Bilingual Education.
CT01	"To adequately and publically express ideas and explain the content of a scientific-technical nature adapted to the different audiences or groups of interest (teachers, educators, families, students, etc.)."
CT02	To integrate ethical values in their professional and research performance and the management of pedagogical innovation.
CT07	To critically analyze the teaching practice, as well as the good practices, in the field of Bilingual Education using quality indicators.
CT10	To master Information and Communication Technologies (ICT).

**5. Objectives or Learning Outcomes****Course learning outcomes**

Description

Application of ICT tools aimed at informational, audiovisual and digital literacy of students in the bilingual classroom

Planning and implementation of the CLIL/CLIL methodology in real bilingual educational contexts

Mastery of the different teaching/learning methods and approaches based on the integration of language and content

Planning and design of activities and tasks for Primary Education pupils integrating the first foreign language and the contents of the knowledge areas from the linguistic programs (Natural Sciences, Social Sciences, Mathematics, Physical Education, Social and Civic Values, Artistic Education)

## 6. Units / Contents

**Unit 1: CLIL for Mathematics**

**Unit 2: CLIL for Biology**

**Unit 3: CLIL for Geology**

**Unit 4: CLIL for Physics**

**Unit 5: CLIL for Chemistry**

**Unit 6: ICT for content subjects**

## ADDITIONAL COMMENTS, REMARKS

Detailed contents:

- CLIL and Scientific Literacy.
- Mathematics/Natural Sciences in the curriculum.
- CLIL for the teaching of Mathematics/Natural Sciences. Methodological approaches.
- Activity planning.
- ICTs for teaching Mathematics/Natural Sciences.

## 7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Computer room practice [ON-SITE]	Practical or hands-on activities	CB08 CE01 CE05 CE08 CE12	0.2	5	Y	N	Students will do practical activities related to Mathematics and Natural Sciences through the use of ICT. Attendance at these activities will be mandatory and non-recoverable, both in continuous and non-continuous evaluation.
Class Attendance (theory) [ON-SITE]	Lectures	CB08 CE01 CE03 CE05 CE08 CE11 CE12 CG01 CG02 CT01 CT02 CT07 CT10	1	25	N		Development of lectures, with support of new technologies and participation of students
Progress test [ON-SITE]	Problem solving and exercises	CB08 CE01 CE03 CE05 CE08 CE11 CE12 CG01 CG02 CT01 CT02 CT07 CT10	0.2	5	Y	Y	A final test or test will assessed the knowledge students have acquired. It is compulsory to get a minimum rate of 40%
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB08 CE01 CE05 CE08 CE12 CG01 CT01	0.4	10	Y	N	Internship in the laboratory and problem solving
Project or Topic Presentations [ON-SITE]	Individual presentation of projects and reports	CB08 CE08 CE11 CT01	0.4	10	Y	Y	Students will present the projects in class. It is compulsory to get a minimum rate of 40%
Writing of reports or projects [OFF-SITE]	Self-study	CB08 CE01 CE03 CE08 CE11 CE12 CG02 CT02 CT07 CT10	2	50	Y	N	Students will work in workgroups. They will bring together the theoretical contents previously explained, in order to be able to elaborate the corresponding project or projects.
Study and Exam Preparation [OFF-SITE]	Self-study	CB08 CE01 CE03 CE05 CE08 CE11 CE12 CG01 CG02 CT02 CT07 CT10	0.8	20	N		Organization, preparation and study of the contents learned in class
Analysis of articles and reviews [OFF-SITE]	Reading and Analysis of Reviews and Articles	CB08 CE03 CG01 CG02 CT07	0.8	20	Y	N	Students will search, read and analyze the scientific bibliography related to the course
In-class Debates and forums [ON-SITE]	Case Studies	CG02 CT07	0.2	5	Y	N	In-Class discussion on theoretical content
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>			<b>Total class time hours: 60</b>				
<b>Total credits of out of class work: 3.6</b>			<b>Total hours of out of class work: 90</b>				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

## 8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
			A tests corresponding to the part of Mathematics and to the part of Natural Sciences will be taken. These will have a maximum

Progress Tests	30.00%	30.00%	weight of 30%. Students must obtain a minimum rating of 4 out of 10 in each.
Oral presentations assessment	20.00%	20.00%	Students will present the projects in class.
Assessment of activities done in the computer labs	10.00%	10.00%	Students will do practical activities related to Mathematics and Natural Sciences through the use of ICT. Students attendance at these activities will be mandatory and irremediable, both in continuous and non-continuous evaluation.
Theoretical papers assessment	40.00%	40.00%	Students will have to perform projects related to the contents of Mathematics and Natural Sciences.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

#### Evaluation criteria for the final exam:

##### Continuous assessment:

See the above table.

To pass the course, it will be necessary to obtain an average of 5 between all the tests and tasks. As established by the Student Evaluation Regulations of the UCLM of 2022, it will be necessary to obtain at least a 4 out of 10 to be able to make the average between the different tests and tasks.

If a fraudulent practice is detected in the evaluation test carried out by a student, the exam will result into failure, with a final grade of zero (0) in the corresponding subject.

The detection by the teacher that an assignment, essay or similar test has not been prepared by the student will result in a numerical grade of zero (0) both in the tests and in the subject in which it has been detected, regardless of the rest of the grades obtained by the student.

(See Article 8 of the UCLM Student Assessment Regulations).

For each of the errors made which are included in the "mistakes to avoid" list (see Moodle), 0.25 will be deducted in the corresponding activity up to a maximum of 3 points out of 10 (12 errors). If the mistake is repeated, repetitions will also be penalized.

##### Non-continuous evaluation:

See the above table.

To pass the course, it will be necessary to obtain an average of 5 between all the tests and tasks. As established by the Student Evaluation Regulations of the UCLM of 2022, it will be necessary to obtain at least a 4 out of 10 to be able to make the average between the different tests and tasks.

If a fraudulent practice is detected in the evaluation test carried out by a student, the exam will result into failure, with a final grade of zero (0) in the corresponding subject.

The detection by the teacher that an assignment, essay or similar test has not been prepared by the student will result in a numerical grade of zero (0) both in the tests and in the subject in which it has been detected, regardless of the rest of the grades obtained by the student.

(See Article 8 of the UCLM Student Assessment Regulations).

For each of the errors made which are included in the "mistakes to avoid" list (see Moodle), 0.25 will be deducted in the corresponding activity up to a maximum of 3 points out of 10 (12 errors). If the mistake is repeated, repetitions will also be penalized.

#### Specifications for the resit/retake exam:

The evaluation criteria will be the same as in the ordinary call.

To pass the course, it will be necessary to obtain an average of 5 between all the tests and tasks. As established by the Student Evaluation Regulations of the UCLM of 2022, it will be necessary to obtain at least a 4 out of 10 to be able to make the average between the different tests and tasks.

If a fraudulent practice is detected in the evaluation test carried out by a student, the exam will result into failure, with a final grade of zero (0) in the corresponding subject.

The detection by the teacher that an assignment, essay or similar test has not been prepared by the student will result in a numerical grade of zero (0) both in the tests and in the subject in which it has been detected, regardless of the rest of the grades obtained by the student.

(See Article 8 of the UCLM Student Assessment Regulations).

For each of the errors made which are included in the "mistakes to avoid" list (see Moodle), 0.25 will be deducted in the corresponding activity up to a maximum of 3 points out of 10 (12 errors). If the mistake is repeated, repetitions will also be penalized.

#### Specifications for the second resit / retake exam:

Same evaluation criteria as previous calls.

To pass the course, it will be necessary to obtain an average of 5 between all the tests and tasks. As established by the Student Evaluation Regulations of the UCLM of 2022, it will be necessary to obtain at least a 4 out of 10 to be able to make the average between the different tests and tasks.

If a fraudulent practice is detected in the evaluation test carried out by a student, the exam will result into failure, with a final grade of zero (0) in the corresponding subject.

The detection by the teacher that an assignment, essay or similar test has not been prepared by the student will result in a numerical grade of zero (0) both in the tests and in the subject in which it has been detected, regardless of the rest of the grades obtained by the student.

(See Article 8 of the UCLM Student Assessment Regulations).

For each of the errors made which are included in the "mistakes to avoid" list (see Moodle), 0.25 will be deducted in the corresponding activity up to a maximum of 3 points out of 10 (12 errors). If the mistake is repeated, repetitions will also be penalized.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Unit 1 (de 6): CLIL for Mathematics	
Activities	Hours
Computer room practice [PRESENCIAL][Practical or hands-on activities]	2.5
Class Attendance (theory) [PRESENCIAL][Lectures]	12.5
Progress test [PRESENCIAL][Problem solving and exercises]	2.5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	5

Project or Topic Presentations [PRESENCIAL][Individual presentation of projects and reports]	5
Writing of reports or projects [AUTÓNOMA][Self-study]	25
Study and Exam Preparation [AUTÓNOMA][Self-study]	10
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	10
In-class Debates and forums [PRESENCIAL][Case Studies]	2.5
<b>Teaching period:</b> 09/02/2023-18/05/2023	
<b>Unit 2 (de 6): CLIL for Biology</b>	
<b>Activities</b>	<b>Hours</b>
Computer room practice [PRESENCIAL][Practical or hands-on activities]	.5
Class Attendance (theory) [PRESENCIAL][Lectures]	2.5
Progress test [PRESENCIAL][Problem solving and exercises]	.5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	1
Project or Topic Presentations [PRESENCIAL][Individual presentation of projects and reports]	1
Writing of reports or projects [AUTÓNOMA][Self-study]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	2
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	2
In-class Debates and forums [PRESENCIAL][Case Studies]	.5
<b>Teaching period:</b> 09/02/2023-18/05/2023	
<b>Unit 3 (de 6): CLIL for Geology</b>	
<b>Activities</b>	<b>Hours</b>
Computer room practice [PRESENCIAL][Practical or hands-on activities]	.5
Class Attendance (theory) [PRESENCIAL][Lectures]	2.5
Progress test [PRESENCIAL][Problem solving and exercises]	.5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	1
Project or Topic Presentations [PRESENCIAL][Individual presentation of projects and reports]	1
Writing of reports or projects [AUTÓNOMA][Self-study]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	2
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	2
In-class Debates and forums [PRESENCIAL][Case Studies]	.5
<b>Teaching period:</b> 09/02/2023-18/05/2023	
<b>Unit 4 (de 6): CLIL for Physics</b>	
<b>Activities</b>	<b>Hours</b>
Computer room practice [PRESENCIAL][Practical or hands-on activities]	.5
Class Attendance (theory) [PRESENCIAL][Lectures]	2.5
Progress test [PRESENCIAL][Problem solving and exercises]	.5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	1
Project or Topic Presentations [PRESENCIAL][Individual presentation of projects and reports]	1
Writing of reports or projects [AUTÓNOMA][Self-study]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	2
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	2
In-class Debates and forums [PRESENCIAL][Case Studies]	.5
<b>Teaching period:</b> 09/02/2023-18/05/2023	
<b>Unit 5 (de 6): CLIL for Chemistry</b>	
<b>Activities</b>	<b>Hours</b>
Computer room practice [PRESENCIAL][Practical or hands-on activities]	.5
Class Attendance (theory) [PRESENCIAL][Lectures]	2.5
Progress test [PRESENCIAL][Problem solving and exercises]	.5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	1
Project or Topic Presentations [PRESENCIAL][Individual presentation of projects and reports]	1
Writing of reports or projects [AUTÓNOMA][Self-study]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	2
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	2
In-class Debates and forums [PRESENCIAL][Case Studies]	.5
<b>Teaching period:</b> 09/02/2023-18/05/2023	
<b>Unit 6 (de 6): ICT for content subjects</b>	
<b>Activities</b>	<b>Hours</b>
Computer room practice [PRESENCIAL][Practical or hands-on activities]	.5
Class Attendance (theory) [PRESENCIAL][Lectures]	2.5
Progress test [PRESENCIAL][Problem solving and exercises]	.5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	1
Project or Topic Presentations [PRESENCIAL][Individual presentation of projects and reports]	1
Writing of reports or projects [AUTÓNOMA][Self-study]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	2
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	2
In-class Debates and forums [PRESENCIAL][Case Studies]	.5
<b>Teaching period:</b> 09/02/2023-18/05/2023	
<b>Global activity</b>	
<b>Activities</b>	<b>hours</b>
In-class Debates and forums [PRESENCIAL][Case Studies]	5
Computer room practice [PRESENCIAL][Practical or hands-on activities]	5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10

Writing of reports or projects [AUTÓNOMA][Self-study]	50
Class Attendance (theory) [PRESENCIAL][Lectures]	25
Study and Exam Preparation [AUTÓNOMA][Self-study]	20
Project or Topic Presentations [PRESENCIAL][Individual presentation of projects and reports]	10
Progress test [PRESENCIAL][Problem solving and exercises]	5
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	20
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
González-Calero, J.A., Martínez, S. y Sotos, M.A.	Erroneous resolution patterns on LCM and GCD problems	Universidad de Zaragoza.	Zaragoza, España:			En Muñoz, José María; Arnal-Bailera, Alberto; Beltrán-Pellicer, Pablo; Callejo, M.C. Investigación en Educación Matemática XXI (p. 533).
Mare van Hooijdonk, Tim Mainhard, Evelyn H. Kroesbergen, Jan van Tartwijk,	Creative Problem Solving in Primary Education: Exploring the Role of Fact Finding, Problem Finding, and Solution Finding across Tasks <a href="https://doi.org/10.1016/j.tsc.2020.100665">https://doi.org/10.1016/j.tsc.2020.100665</a> .			ISSN 1871-1871,	2020	
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Ören, T., Turnitsa, C., Mittal, S., Diallo, S.Y.	Simulation-Based Learning and Education <a href="https://doi.org/10.1007/978-3-319-61264-5_13">https://doi.org/10.1007/978-3-319-61264-5_13</a>	Springer, Cham			2017	
Bybee, R. W.	Scientific inquiry and science teaching.	Springer			2006	
Fallon, G.	Using simulations to teach young students science concepts: An Experiential Learning theoretical analysis <a href="https://doi.org/10.1016/j.compedu.2019.03.001">https://doi.org/10.1016/j.compedu.2019.03.001</a>	Elsevier			2019	
HarlEn, W.	Inquiry-based learning in science and mathematics. <a href="https://efe.library.upatras.gr/index.php/review/article/view/2042">https://efe.library.upatras.gr/index.php/review/article/view/2042</a>					
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Arvanitaki, M., Zaranis, N.	The use of ICT in teaching geometry in primary school. <a href="https://doi.org/10.1007/s10639-020-10210-7">https://doi.org/10.1007/s10639-020-10210-7</a>				2020	
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UNESCO	Global Action Programme on Education for Sustainable Development.				2018	
Kirschner, P. A., Sweller, J., &	Why minimal guidance during instruction does not work: An analysis of the failure of				2006	

Clark, R. E.	constructivist, discovery, problem-based, experiential, and inquiry-based teaching.	
Lazonder, A. W., & Harmsen, R.	Meta-Analysis of Inquiry-Based Learning: Effects of Guidance.	2016
Gropper, S. S., & Smith, J. L.	Advanced nutrition and human metabolism.	2018
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