



Universitat de Lleida

DEGREE CURRICULUM  
**MODELIZATION AT SCHOOL**

Coordination: BARBERO SOLA, IVAN RAUL

Academic year 2023-24

Subject's general information

<b>Subject name</b>	MODELIZATION AT SCHOOL			
<b>Code</b>	100993			
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>
	Bachelor's Degree in Primary Training	4	OPTIONAL	Attendance-based
	Double bachelor's degree: Degree in Pre-school Education and Degree in Primary Training	5	OPTIONAL	Attendance-based
	Double bachelor's degree: Degree in Primary Training and Degree in Physical Activity and Sports Sciences	5	OPTIONAL	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRAULA		TEORIA
	<b>Number of credits</b>	1.8		4.2
	<b>Number of groups</b>	1		1
<b>Coordination</b>	BARBERO SOLA, IVAN RAUL			
<b>Department</b>	EDUCATION SCIENCES			
<b>Teaching load distribution between lectures and independent student work</b>	<p>Each enrolled credit requires a dedication of 25 hours on the part of the student. Of these 25 hours, 10 are given in the classroom and the remaining 15 must be dedicated by the student to independent work outside of class.</p> <p>The autonomous work teachers dedicated to the study of the contents worked on in class; to doing the proposed activities, problems and assignments and to reading recommended documents.</p>			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan and Spanish			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
BARBERO SOLA, IVAN RAUL	ivan.barbero@udl.cat	2	
CALLEJA SANZ, GERARD		4	

## Learning objectives

1. Identify the essential characteristics of the modelling process.
2. Recognise modelling as a process for interpreting and understanding scientific ideas.
3. Identify contextual problems in order to analyse and interpret them from different types of models.
4. Evaluate the relevance of models in the interpretation of different situations and/or phenomena.
5. Reflect on the importance of fostering the modelling process in Primary Education.
6. Recognise key aspects in the management of mathematical modelling activities for the Primary Education stage.
7. Design STEM proposals aimed at solving problems in today's society and that promote reflective and critical thinking.

## Competences

- Gather and interpret relevant data (usually within their area of study) in order to make judgements that include reflection on relevant social, scientific or ethical issues.
- Apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the elaboration and defence of arguments and problem solving within their area of study.
- Communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.
- Make a commitment to personal and professional development with oneself and the community. Adapt learning proposals to the most significant cultural evolutions.
- Know the curricular areas of Primary Education, the interdisciplinary relationship between them, the assessment criteria and the body of didactic knowledge about the respective teaching and learning procedures.
- Design, plan and evaluate teaching and learning processes, both individually and in collaboration with other teachers and professionals at the school.
- Encourage the reading and critical commentary of texts from the various scientific and cultural domains contained in the school curriculum
- Assume that the exercise of the teaching function must be perfected and adapted to scientific, pedagogical and social changes throughout life.
- Reflect on classroom practices in order to innovate and improve teaching work.
- Acquire essential notions of scientific thought.
- Acquire habits and skills for autonomous and cooperative learning and promote it among students.

- To understand the role, possibilities and limits of education in today's society and the fundamental competences that affect primary schools and their professionals.
- Acquire skills in the use of new technologies and information and communication technologies.

## Subject contents

### Models as part of scientific complexity

- Models for understanding scientific ideas.
- Phases in the modelling process.
- Connections and contexts.
- Realistic mathematical projects.
- Problem solving and modelling.
- Mathematical modelling activities.

### Els sentits matemàtics aplicats dins la filosofia STEM

- El sentit numèric, de la mesura, espacial, algebraic, estocàstic i socioemocional.
- El número pi. Descoberta i aplicació.
- Aproximació a Arquímedes, Thales, Pitàgores, Da Vinci. El número auri. Fractals.
- Optimització de recursos dins un món finit. Aplicació en impressió 3D.
- Matemàtica associada a estalvi energètic. Generadors i consumidors elèctrics.
- El pensament computacional i la modelització.

### Modelling in school mathematical activity

- Different ways of approaching a problem.
- Inquiry-based learning
- Researchable questions and modelling.
- Resources to support analysis in problem solving and modelling.

### The mathematics class with a focus on modelling

- Planning and design of modelling-oriented school proposals
- How to manage and evaluate modelling activities?
- Use of manipulative and technological materials in modelling.

## Methodology

- Case-based learning
- Use of ICT
- Individual assignments
- Tutoring
- Practices
- Collaborative/Cooperative
- Project/problem-based learning
- Reading/bibliographic consultation
- Personal study
- Presentations and/or discussions of work/didactic proposals
- Supervision of individual/group work
- Written tests/performance of work

## Development plan

The subject will take place during the months of October and November. During these two months, the contents mentioned above will be covered

## Evaluation

### Practical:

- Solving mathematical problems in different professional contexts (15%).
- Technological development practice adapted to mathematical modeling (10%)

**Project - Modelling** (Group): 25%.

**Exam** (individual): 40%.

**STEM Portfolio** (individual): 10%

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### ALTERNATIVE ASSESSMENT

Students completing the alternative assessment requirements must complete the following activities. The criteria are those established for each activity. The timing and assessment criteria are the same as those applicable to the continuous assessment student.

### Practical - (individual):

- -Solving mathematical problems in different professional contexts (15%).
- Technological development practice adapted to mathematical modeling (10%)

**Project - Modelling** (individual and in person): 25%.

**Exam** (individual and in person): 40%.

**STEM Portfolio** (individual): 10%

## Bibliography

Alsina, À., Toalongo-Guamba, X., Trelles-Zambrano, C., Salgado, M. (2021). Desarrollando habilidades de modelización matemática temprana en Educación Infantil: un análisis comparativo en 3 y 5 años. *Cuadrante* 30 (1), 74-93.

Alsina, À. Salgado, M. (2021). Introduciendo la Modelización Matemática Temprana en Educación Infantil: un marco para resolver problemas reales. *Modelling in Science Education and Learning*, 14(1), 2021 doi: <https://doi.org/10.4995/msel.2021.14024>

Ares, J. B. B., & Blanco, M. T. F. (2015). Introducción de la modelización en la Educación Secundaria. *Suma: Revista sobre Enseñanza y Aprendizaje de las Matemáticas*, (80), 19-29.

Calabuig, J. M., Ferrando, I., Gallart-Palau, C., García-Raffi, L. M., Sierra Galdón, L., Hurtado Soler, D. (2015). La modelización como competencia transversal en el sistema educativo español. *UNO. Revista de didáctica de las matemáticas*, (69), 44-51.

Gallart-Palau, C., Ferrando, I., García Raffi, L. (2015). Análisis competencial de una tarea de modelización abierta. *Números*, 88, 93-103.

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López, V., Couso, D., Simarro, C. (2020). Educación STEM en y para el mundo digital: El papel de las herramientas digitales en el desempeño de prácticas científicas, ingenieriles y matemáticas. *Revista de Educación a Distancia (RED)*, 20(62). <https://doi.org/10.6018/red.410011>

Monzó, O., Navarro, M. T., & Puig, L. R. (2016). Una actividad de modelización en el entorno informático de las tabletas. *Uno: Revista de didáctica de las matemáticas*.72, 67-74.

Romero, S., Romero, J. (2015). Modelización matemática en un centro de Infantil y Primaria: ¿ se pueden humanizar las matemáticas?. *Uno: revista de didáctica de las matemáticas*. 69, 22-32.

Sala, G.; Font, V. (2019). El papel de la modelización en una experiencia de enseñanza de matemáticas basada en indagación. *Avances de Investigación en Educación Matemática*, 16, pp. 73-85.

Simarro, C., Couso, D. (2018). Visiones en educación STEAM: y las mates, ¿qué?. *Uno. Revista de Didáctica de La Matemática*, 81, 49-56.

[Sol, M.](#), [Giménez, J.](#), [Rosich, N.](#) (2007). Competencias y proyectos matemáticos realistas. *Uno: Revista de didáctica de las matemáticas*, 46, 43-60.

## Documents oficials

Generalitat de Catalunya (2017). *Pla STEMcat d'impuls de les vocacions científiques, tecnològiques, en enginyeria i en matemàtiques*. <https://projectes.xtec.cat/steamcat/wp-content/uploads/usu1760/2019/09/pla-stem.pdf>

Generalitat de Catalunya (2017). Currículum educació primària (competències bàsiques). <https://agora.xtec.cat/ceiparturmartorell/wp-content/uploads/usu99/2016/04/curriculum-educacio-primaria.pdf>

Idees centrals matemàtiques (2019). <https://sites.google.com/xtec.cat/idees-centrals-matematiques-ip/inici>

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Competències bàsiques de l'àmbit matemàtic. Educació primària (2013). [http://ateneu.xtec.cat/wikiform/wikiexport/media/materials/sfec/competencies\\_mates\\_primaria.pdf](http://ateneu.xtec.cat/wikiform/wikiexport/media/materials/sfec/competencies_mates_primaria.pdf)

## Webs d'interès

<https://mathcitymap.eu/es/>

<https://nrich.maths.org/>

[https://www.fi.uu.nl/publicaties/subsets/icse\\_en/](https://www.fi.uu.nl/publicaties/subsets/icse_en/)

[https://www.fi.uu.nl/publicaties/subsets/rekenweb\\_en/](https://www.fi.uu.nl/publicaties/subsets/rekenweb_en/)

<https://projectes.xtec.cat/steamcat/categoria/pla-stemcat/>

<https://projectes.xtec.cat/steamcat/general/stemarium/>

<https://asturias4steam.eu/>

<http://educacionstem.educa.madrid.org/>

<https://stemie.fpg.unc.edu/>

<https://steam4u.eu/#project>

<https://stem.getintoenergy.com/>

<http://www.eduglobalstem.cat/>

<https://educacion.stem.siemens-stiftung.org/r>