

Pedagogic case and specific course in which designed tasks and units are used

Name of university: Universidad Complutense de Madrid

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Pedagogic case:	Teaching Differential Equations with Modeling and visualization <i>Elements of Ordinary Differential Equations</i>
Description (including temporal scheme for design, development and implementation)	<p>One of the main goals of the subject entitled <i>Elements of Ordinary Differential Equations</i> is to learn different techniques for solving differential equations. On the other hand, in the subjects <i>Physics</i> the students are encouraged to model the reality through ODEs.</p> <p>Our aim is to provide these methods on a real context, modelling a problem and trying to develop the tools to solve them with specific problems that appear in real life. This will also help them to understand the qualitative theory of differential equations, that is the other item in the official program.</p>
Aim of pedagogic case	Check whether students perform better on ODEs when realizing that they have potential for real cases
Mathematical concepts	Differential equation, existence of solution, uniqueness, stability modelling, Laplace transform,
Addressed practice	
Place in specific course (course name, place of units)	<i>Elements of Ordinary Differential Equations</i>
Learners profile orientation, year, age, prior knowledge, other such as math anxiety, special needs, ..	Second year of BSc Mathematics, Bsc Economics and Mathematics, Bsc Mathematics and Statistics, Bsc Engineering Mathematics
Organisation of specific course study credits/hours, location, group size	The course <i>Elements of Ordinary Differential Equations</i> is a 6 credit course includes 3 hours theory+1 hour problems+1 hour to fix concepts. The plan is to devote this hour
Expected learning outcomes	Initiation into Ordinary Differential Equations in real world situations

Envisioned use of digital technology	Videos, simulation,+++
Planning of tasks	Some problems that can be posed to students are: <ul style="list-style-type: none"> - Free fall with air resistance - Harmonic oscillator - A Predator-Prey System - Modelling the growth of a virus - Modelling efficient radio telescopes - Celestial mechanics
Names of persons involved	David Gómez Castro Teresa Luque Martínez
Course:	<i>Elementos de Ecuaciones Diferenciales</i>
Learning objectives	The idea in these classes is to follow the pedagogy problem-based learning.
Learning contents	Introduction to solution techniques for analytically solvable ordinary differential equations
teaching /learning activities	The typical course consists solely on blackboard classes with professor exposition
Media	Usually none
Evaluation	The typical class is graded by a final exam
Instructor role	to facilitate learning by supporting, guiding, and monitoring the learning process
Student roles	This classes would be focused on the student's reflection and reasoning to construct their own learning. They would identify the situations they want to understand (situations that their understanding involve an ODE), then they have to see what they want to understand, to model the problem and to see if they are able to solve it with the methods they have learn or if they need new tools.