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

Name of university: Universidad Complutense de Madrid

Contact person: Inés Mª Gómez Chacón, UCM

Pedagogic case:	• Inquiry-based approach to matrix factorization • 2nd year of the bachelor programme in Mathematics/Mathematical Engineering/Mathematics and Statistics.
Description (including temporal scheme for design, development and implementation)	• We will design tools based on inquiry to better understand this topic. • temporal scheme: - design: until February 2019 - development: March – May 2019 - discussion and improvement: June - July 2019 - implementation: October 2019

Aim of pedagogic case	• Analyze the difficulties of students to work with matrices and use them to solve problems. • Determine issues and problems (related to matrices and factorization) that may interest students. • Promote the collaborative work in the students. • Encourage autonomous study, the ability to pose questions and conjectures.
Mathematical concepts	• Elementary transforms and matrices. • Gaussian elimination. • Matrix factorization: PA=LU, LU, LDR, Cholesky, LDL'
Addressed practice	2nd year of the bachelor programme in Mathematics/Mathematical Engineering/Mathematics and Statistics.
Place in specific course Course name Place of units	• Numerical Methods course (third semester). • Matrix factorization is introduced as a tool for the resolution of linear systems. Three weeks of class are devoted to these topics.
Learners profile orientation, year, age, prior knowledge, other such as math anxiety, special needs, ..	• Second year undergraduate students. They have already studied Calculus and Linear Algebra. They know matrices and operations with them, but they usually have difficulties. • It is the first course in which problems of numerical type arise.
Organisation of specific course study credits/hours, location, group size	• This is a 6 ECTS course. The student has 2 hours of theory per week, two hours of problems (where the group is divided) and another one in the computer lab (where the group is also divided). • Each group consists of 60 students and they are divided for tutorial sessions (problems and laboratory) into two subgroups of about 30 students each.
Expected learning outcomes	• Learn to perform operations with matrices in order to factor matrices, to solve systems of linear equations. • Choose the most appropriate method for each problem. • It is expected that students can implement the matrix manipulation and factorization algorithms in order to solve linear systems.
Envisioned use of digital technology	• Students will use Matlab program to implement the different resolution methods.
Planning of tasks	• Study of similar experiences and bibliography. • Design of activities and proposal of issues. • Discussion of the proposal with other members of the Platinum team. • Revision of the whole proposal by introducing the

	agreed changes. • Perform the real experience including students evaluation • Evaluation of the experience • Eventual diffusion of the results
Names of persons involved	• Antonio Díaz-Cano • Juan Antonio Infante • All the Professors of the Spanish Platinum Team and Students of the course
Course:	Numerical Methods. Second year of the bachelor programme in Mathematics/Mathematical Engineering/Mathematics and Statistics. It is proposed to apply inquiry-based methodology just in one of the topics of the subject.
Learning objectives	Students learn: • How to work efficiently with matrices • Solve linear systems using matrix factorization • To implement algorithms to factor matrices
Learning contents	• Direct methods for solving linear systems: Transformations and elementary matrices. Gaussian elimination. Factorizations: PA=LU, LU, LDR, Cholesky, LDL'.
teaching /learning activities	• Course week consists of one 2-hours lecture; one 2-hours tutorial session; 1 hour computer tutorial session. In the three tutorial sessions students group is divided in two subgroups.
Media	• Tutorials, computers and computation software.
Evaluation	• The unit will be evaluated with a specific test that will count a percentage in the overall grade of the subject.
Instructor role	• Design of activities, teaching classes, discussion with students. • Approach of problems, tests, proofreading. • Overall evaluation of the experience, discussion with other teachers.
Student roles	• Active participation in lectures and practical sessions. • Implement algorithms with Matlab. • Perform the planned tests.