Fill in for each course/integrated course included in the curriculum

Course: Numerical Methods		Teaching Language: English
SSD (Subject Areas): Mathematics, Mathematical Engineering [in the case of an integrated course, indicate the SSDs in each module]		**CREDITS: 9** [in the case of an integrated course, indicate the ECTs for each module]
Course year: 2022-2023	**Type of Educational Activity:** [1, 2, 3 o 4 (si veda manifesto)]	
Contents extracted from the SSD declaratory list consistent with the learning objectives of the course: Vector spaces and norms. Fundamental Theorem of Linear Algebra. Least Squares and Regularization. Real World Problems. Singular Value Decomposition. Real Problems-Data-driven analysis. Pseudoinverse. Principal Component Analysis. Real World Problems. Linear Discriminant Analysis. Iterative methods for linear systems. The Power Method. The Richardson iteration. The Banach Lemma and approximate inverses. Jacobi, Gauss Seidel. Preconditioning. Projectors. QR factorization and Gram-Schmidt Orthogonalization. Cholesky Factorization. Iterative methods in the Krylov subspace. Conjugate Gradient, GMRES, ARNOLDI. Problems. Solution of nonlinear algebraic systems. Newton's method, Chord method. Newton's GMRES. Applications to Scientific Machine Learning: Gaussian Process Regression.		
Learning objectives: The course provides fundamental methodologies of numerical analysis, that constitute the basis for the numerical solution of many problems in science and engineering. Such methods provide also the basis of scientific machine learning. The course contains frontal lessons, computer laboratory and seminars.		
Pre-requisites: Linear Algebra **Is a pre-requisite for: Numerical Methods**		
Types of examinations and other tests: 3-4 Problem Sets. Final Oral Examination		