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# Numerical Analysis A

## Finalità

Finalità (massimo 400 caratteri)

introduction to some methods and algorithms of Numerical Analysis, useful in the context of Mathematics applied to Engineering problems.

## Programma

### Numerical linear algebra

Condition number of linear systems. Triangular system solution. Gaussian Elimination. Pivoting technique. Gaussian decomposition and PA=LU factorization.. Determinant and inversion of a square non-singular matrix. Algorithms for tridiagonal matrices. Positive definite matrices. Cholesky factorization. Iterative methods. Jacobi method : algorithm and convergence conditions.

### Data fitting and functions approximation

Polynomial interpolation. Lagrange and Newton forms of the interpolating polynomial. Hermite interpolation. Polynomial interpolation error. Conditioning of polynomial interpolation: Lebesgue function and constant. Piece-wise polynomial interpolation. Linear and cubic splines interpolation Convergence results. Trigonometric interpolation. Least squares approximation.

### Numerical solution of non-linear equations

Conditioning of a non-linear equation. Bisection method: algorithm and convergence result. Newton's method. Local convergence result. Rate of convergence. Stop tests. Other linearization techniques.

### Numerical integration

Interpolatory numerical integration. Degree of precision. Closed Newton-Cotes formulas. Quadrature error. Iterated quadrature formulas. Convergence results.

### Numerical methods for Ordinary Differential Equations

One-step explicit methods. Runge-Kutta methods. Convergence results. Estimate of local truncation error and choice of integrating step.

## Attività d'esercitazione

Exercises, complements and numerical applications

## Modalità d'esame

Written exam

## Testi consigliati

G. MONEGATO, Fondamenti di Calcolo Numerico, CLUT, 1998

A. QUARTERONI, R. SACCO, F. SALERI, Matematica Numerica, SPRINGER,1998

G. NALDI, L. PARESCHI, G. RUSSO, Introduzione al Calcolo Scientifico. Metodi e applicazioni con Matlab, MC GRAW-HILL, 2001

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