Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: Numerical Analysis				
TEACHER: Concetta Laurita				
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Language: Italian				
ECTS: 6	n. of hours: 54	Academic year: 2014/15	Campus: Potenza	Semester: I

TOPICS
Errors and computer arithmetic.
Numerical methods for the solution of linear system.
Approximation of functions.
Numerical integration.
Numerical differentiation.
Numerical methods for the solution of ODE.

TEACHING METHODS (please tick one or more options)
X Theoretical lessons
□ Tutorials in classroom
X Tutorials in laboratory
□ Project works
□ Technical visits
Other activities (please specify) _____

TEXTBOOKS
G. Monegato, Fondamenti di Calcolo Numerico, CLUT (Torino)
A. Quarteroni, R. Sacco, F. Saleri, Matematica Numerica, Springer

ON-LINE EDUCATIONAL MATERIAL
web address:

LEARNING OUTCOMES
To know the main numerical methods applied in different contexts. To be able to choose between antagonists methods for solving a specific problem (eg, comparing the order of convergence, stability of algorithms, computational cost). To achieve a good level in programming algorithms, for example, in Matlab, in order to apply the studied numerical methods. To be able to read the numerical results provided by the machine.

REQUIREMENTS
The knowledge of the arguments from Calculus and Linear Algebra, basics of computer science and Matlab programming fundamentals.

EVALUATION METHODS (please tick one or more options)
□ Intermediate verifications
□ Written examination
□ Discussion of a project work
X Practical test
X Oral examination
Other methods (please specify) _____

DETAILED CONTENT
Errors and computer arithmetic
Single and double precision. Absolute and relative error. Machine precision. Conditioning of a problem and

algorithm stability. Numerical cancellation.

Numerical methods for linear systems

Condition number. Back and forward substitution. Gauss elimination, pivoting. LU factorization. Cholesky factorization. Iterative methods: Jacobi and Gauss-Seidel methods with convergence study.

Approximation of functions

Algebraic polynomial approximation by Lagrange interpolation. Interpolation by piecewise polynomial functions. Spline functions.

Numerical integration

Quadrature formulas. Stability, convergence, degree of accuracy, error estimation. Newton-Cotes quadrature rules. The trigonometric quadrature formula.

Numerical differentiation

Finite difference methods. Differentiation using interpolation.

Numerical methods for the solution of ODE

The Initial Value Problem. Onestep and multistep methods. Runge-Kutta methods. Predictor-corrector methods.

Practical implementation of the studied algorithms in Matlab.

SEMINARS BY EXTERNAL EXPERTS YES NOX

FURTHER INFORMATION