UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2019/2020
BACHELOR'S DEGREE (BSC)	ENERGY ENGINEERING AND RENEWABLE ENERGIES
SUBJECT	NUMERICAL ANALYSIS
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10657-Attività formative affini o integrative
CODE	01746
SCIENTIFIC SECTOR(S)	MAT/08
HEAD PROFESSOR(S)	FRANCOMANO ELISA Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	144
COURSE ACTIVITY (Hrs)	81
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**FRANCOMANO ELISA** Tuesday 09:00 11:00 Ed.6- Stanza 2

DOCENTE: Prof.ssa ELISA FRANCOMANO

PREREQUISITES	To be successful in the course, a background in geometry, calculus is required.
LEARNING OUTCOMES	Knowledge and understanding at the end of the course the student will gain knowledge on the numerical and mathematical methodologies in the applied science, will be able to identify the mathematical and discrete modelling of the problem, to characterize efficient methods in problem solving and to define logical schemes for the automatic execution. The student will able to adopt the numerical tools for the error analysis, the solution of linear systems and definite integrals, approximation of functions; will be able to discern the well-conditioned of a problem, the numerical stability of the algorithm and the computational complexity. The student will be able to define and formulate efficient algorithms, to choose among the various methodologies the most suitable for the problem in use and to explain the computational results and the mathematical solver adopted. Moreover, the student will be able to design computational schemes and codes for various problems of the applied sciences. Written and oral tests to assess the knowledge of the subject.
ASSESSMENT METHODS	Written and oral tests. Grades are awarded on a scale from 18 to 30. The written test concerns the proposed contents provided during the course. The oral examination can be accessed if the written test is passed with a grade equal or more than 18/30. The final grade will be based on the following evaluation criteria: Rating votes: excellent 30/30 e lode: excellent knowledge of the topics, excellent mastery of language, good analytic capability; the student is able to apply his knowledge to solve the proposed problems. Very good 26-29: good knowledge of the subjects, full mastery of language, the student is able to apply knowledge to solve the proposed problems. Good 24-25: basic knowledge of the main topics, basic command of language, limited ability to independently apply the knowledge to the solution of the proposed problems. Satisfactory 21-23: student does not have full capabilities but has the knowledge, satisfactory command of language, poor ability to independently apply the knowledge. Sufficient 18-20: student has minimal knowledge of topics and minimal technical language, very little or no ability to independently apply the knowledge. Insufficient: student does not have an acceptable knowledge of the topics.
EDUCATIONAL OBJECTIVES	The student will gain the mathematical foundations of well-established numerical algorithms and will be able to adopt it for a wide range of scientific and engineering disciplines. The student will be able to discuss about the methodology and algorithms adopted in relation to the theory covered in the course and to critically think on the results obtained with the own software.
TEACHING METHODS	Lecturers in class and computer class work.
SUGGESTED BIBLIOGRAPHY	Materiale didattico fornito dal docente. G. Monegato, Metodi ed algoritmi per il calcolo numerico, CLUT S.C. Chapra, R.P. Canale, Numerical Methods for Engineers, McGraw-Hill

SYLLABUS

Hrs	Frontal teaching
5	The role of numerical methods in engineering problem solving. Floating point arithmetic. Truncation and round-off errors. Conditioning and numerical stability. Computational complexity.
13	Linear algebraic equations: direct and iterative methods. Algorithms and implementation skills of the proposed numerical methods.
13	Data fitting. Divided and finite difference operators. Numerical differentiation. Least square regression. Algorithms and implementation skills of the proposed numerical methods.
5	Numerical integration. Algorithms and implementation skills of the proposed numerical methods.

Hrs	Workshops
45	Matlab language. Exercises, algorithms and implementation skills of the proposed numerical methods. Case studies referred to engineering applications. Discussion of the final numerical results. Basic features of Excel.