
COURSE: Calculus

ACADEMIC YEAR: 2019-2020

TYPE OF EDUCATIONAL ACTIVITY: basic

TEACHER: Angelica Malaspina

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website:

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mobile (optional):

Language: italian

ECTS: 8 (lessons e
tutorials/practice)n. of hours: 72 (lessons e
tutorials/practice)Campus: **Potenza**
Dept./School: **Dipartimento di
Scienze**
Program: Geological SciencesSemester: 1^
(date)

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Mathematics is the first teaching in mathematics area and it deal with functions, limits, derivatives, complex numbers, series, integrals, .

Principal knowledge are:

basics on real numbers and functions, real functions: maximum, minimum, monotony, convexity, flexes, definitions and theorems on limits and continuous functions, derivatives, the study of the graph of a function, complex numbers, convergence of series, integrals, elementary algebraic operations on matrices.

Principal abilities are:

calculus of limits, calculus of derivatives and integrals, find the graph of a function.

PRE-REQUIREMENTS

The main items required are good background in elementary algebra, goniometry and analytic geometry.

SYLLABUS

(12 hours) Number sets.

Real numbers - Basic elements of topology . Complex numbers: definition, operations, geometric representation, De Moivre formula.

(6 hours) Functions.

Elementary functions and their graph - Bounded functions - Monotone functions Invertible functions.

(12 hours) Sequences and limits.

Definition of sequence Definition of limit - The squeeze Theorem - Computation of elementary limits - Indeterminate forms - Limits of extra interest .

(12 hours) Limit of functions and continuity

Asymptotes - Continuity at a point - Continuous functions - The middle value theorem - Theorem of zeros for continuous functions - The Weierstrass Theorem.

(10 hours) Derivatives

Derivative at a point - Computation of elementary functions derivative - The derivative function - Theorems on the calculus of derivatives - Geometric interpretation of the derivative Monotony intervals of a derivable function - Local maxima and minima - Fermat Theorem - The RolleTheorem and its geometric interpretation - Lagrange Theorem and geometric interpretation

-Cauchy Theorem - De L'Hopital Theorem and application in solving some type of indeterminate forms - Concavity and convexity intervals for a twice derivable function - Flex points representation of the Graph of a function.

(6 hours) Series.

Definition of series. Geometric series and harmonic series. Properties of series; non-negatives terms, absolute convergence. Convergence tests.

(8 hours) Integrals.

Riemann integrals and properties. Fundamental theorem of calculus. Integration by substitution. Integrations by parts.

(6 hours) Matrices.

Definition and basic operations: addition, scalar multiplication and transposition, matrix multiplication.

Determinant. Invertible matrix and its inverse. System of linear equations

TEACHING METHODS

The course includes 52 hours divided in

- 40 hours of frontal lectures. The main theorems are shown and examples and applications are provided.

- 12 hours of blackboard exercises are proposed.

EVALUATION METHODS

Either Intermediate verifications, or written examination, oral examination (optional).

The aim of examination is to verify the level of the achievement of the above educational goals. The final test consists of a written examination which requires both numerical exercises and theoretical ones. The time for the written examination is two and a half hours. In order to overcome the exam it is necessary to achieve at least 18/30. The student that wants to improve the grade may require to do also an oral examination.

The student that achieves 16/30 or 17/30 to the written examination, has to do also an oral examination in order to overcome the final test. There will also be two optional tests the overcoming of which "exempt" students from the oral test. In these tests are included both the exercises and the questions related to theoretical knowledge. Each test is overcome with 16/30 and the final grade is the average grade of all two tests.

Partial written examination after the first half of the course and partial written examination at the end of the course. Oral examination.

Use of calculators is admitted. Use of notebooks, tablets, smartphones and books is forbidden.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- Analisi Matematica 1, M. Bramanti, C.D. Pagani, S. Salsa, Zanichelli (2014).

- Esercizi di Analisi Matematica (vol 1), S. Salsa, A. Squellati (2011).

Teacher's handouts/slides downloadable from the e-learning platform: <https://elearning.unibas.it/>

INTERACTION WITH STUDENTS

Monday from 11:30 to 12:30 and Thursday from 11:30 to 13:30

next to the office n. 11 of the Department of Mathematics, Informatics and Economics.

Students can also contact the teacher by sending an email to angelica.malaspina@unibas.it

or <https://elearning.unibas.it/>

EXAMINATION SESSIONS (FORECAST)¹

Written examination dates:

18/02/2020, 05/03/2020, 04/06/2020, 07/07/2020, 16/09/2020, 01/10/2020, 10/12/2020

Oral examination dates will be fixed a week after of every written examination.

It is mandatory to book in each examination on site <https://unibas.esse3.cineca.it/Home.do>

¹Subject to possible changes: check the web site of the Teacher or the Department/School for updates.

The dates of the intermediate exams will be fixed during the course (probably the first one is expected in early December and the second one at the end of the course).

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION
