COURSE DESCRIPTION
CALCULUS 1

SSD: ANALISI MATEMATICA (MAT/05)

DEGREE PROGRAMME: ARCHITETTURA (N14)
ACADEMIC YEAR 2022/2023

COURSE DESCRIPTION

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GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE: 01281 - ANALISI MATEMATICA I E GEOMETRIA
MODULE: 12980 - ANALISI MATEMATICA 1
CHANNEL: 01 Cognome A - Z
YEAR OF THE DEGREE PROGRAMME: I
PERIOD IN WHICH THE COURSE IS DELIVERED: SEMESTER I
CFU: 8

REQUIRED PRELIMINARY COURSES

No one

PREREQUISITES

Good knowledge of mathematics as scheduled in programs of all upper secondary schools.

LEARNING GOALS

The main objective of the course is the acquisition, by the student, of the logical-mathematical skills necessary to face future professional problems. From the point of view of contents, the course aims to provide the mathematical foundations necessary for the study of the scientific subjects of the master's degree course in architecture and their applications. The acquired training must allow students to be able to perform simple calculations, to be able to solve simple equations, inequalities, linear systems; to be able to carry out the study of real functions of a real variable and, finally, to be able to solve geometric questions potentially useful for the development

of design skills.
The course represents a module of Calculus 1 and Geometry course, which in fact consists of the following modules:
1. Calculus 1 (MAT / 05 - 8 CFU);
2. Geometry (MAT / 03 - 3 CFU).

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding

The student must show knowledge and understanding of basic elements of Mathematics and the mathematical language. The educational path of the course aims to provide students with the knowledge and basic methodological tools necessary for strengthening logical, inductive and deductive reasoning skills.

Applying knowledge and understanding

The student will have to show that he is able to use mathematical tools for the formalization of problems and the construction of simple mathematical models. The student must acquire the operational skills necessary to apply the study of the real functions of a real variable, the methods of solving equations, inequalities and linear systems and the knowledge of vectors and matrices both to theoretical-practical questions and to applicative problems of geometric nature.

COURSE CONTENT/SYLLABUS

REAL NUMBERS: Set theory - Natural, integer, rational, real numbers - Maximum, minimum, upper bound, lower bound. Exercises.

REAL FUNCTIONS: Cartesian functions and representation - Invertible functions - Monotone functions - Linear functions - Absolute value function - Power, root, exponential, logarithm functions - Trigonometric functions and their inverses. Exercises.

INEQUALITIES, DOMAIN OF A FUNCTION: First degree equation and inequality - Second degree equation and inequality - Rational inequalities - Exponential and logarithmic inequalities - Domain of a function. Exercises.

LIMITS OF FUNCTIONS AND CONTINUOUS FUNCTIONS: Definitions - Examples and properties of function limits - Continuous functions - Discontinuity - Some theorems on continuous functions: sign permanence theorem (with proof), existence of intermediate values theorem (with proof), theorem of the existence of zeros, Weierstrass theorem. Exercises.

DERIVATIVES: Definition of derivative - Every derivable function in x is continuous in x (proof) - Operations with derivatives: derivative of the sum, product and ratio - Derivation rule of compound functions - Derivatives of elementary functions (proof for the function constant, for the power function with natural exponent) - Higher order derivatives - Geometric meaning of the derivative. Exercises.

APPLICATIONS OF THE DERIVATIVES: Increasing and decreasing functions - Relative maximum and minimum - Concavity and inflection point - Asymptotes and symmetry - Absolute

maximum and minimum - Rolle's theorem (with proof) and Lagrange's theorem (with proof) - Monotony criterion - Forms indeterminate and L 'Hôpital theorem - Study of the graph of a function.

INTEGRALS: Primitive functions - Indefinite integrals - Definite integrals - Fundamental theorem of Calculus - Exercises.

READINGS/BIBLIOGRAPHY

1. P. Marcellini, C. Sbordone, Elementi di Calcolo, Liguori Editore.
2. P. Marcellini, C. Sbordone, Esercitazioni di matematica, I Volume (parte prima e parte seconda), Liguori Editore.

TEACHING METHODS OF THE COURSE (OR MODULE)

The teacher will use lectures for about 70% of the total hours and exercises, to deepen theoretical aspects, for about 30% of the total hours.

EXAMINATION/EVALUATION CRITERIA

a) Exam type

- [x] Written
- [x] Oral
- [ ] Project discussion
- [ ] Other

In case of a written exam, questions refer to

- [x] Multiple choice answers
- [x] Open answers
- [x] Numerical exercises

b) Evaluation pattern