COURSE DETAILS

"ANALISI MATEMATICA II"

SSD MAT/05

DEGREE PROGRAMME: BACHELOR DEGREE IN COMPUTER ENGINEERING

ACADEMIC YEAR: 2023-2024

GENERAL INFORMATION – TEACHER REFERENCES

TEACHER: MULTIPLE STUDY COURSE
PHONE:
EMAIL:

SEE THE STUDY COURSE WEBSITE

GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE (IF APPLICABLE): N.A.
MODULE (IF APPLICABLE): N.A.
CHANNEL (IF APPLICABLE): N.A.
YEAR OF THE DEGREE PROGRAMME (I, II, III): I
SEMESTER (I, II): II
CFU: 6

REQUIRED PRELIMINARY COURSES (IF MENTIONED IN THE COURSE STRUCTURE "REGOLAMENTO")

Analisi matematica I.

PREREQUISITES (IF APPLICABLE)

None.

LEARNING GOALS

Provide the fundamental concepts, in view of the applications, related to differential and integral calculus for real functions of several real variables, **and to ordinary differential equations**; to acquire conscious operational skills.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding

The student must demonstrate knowledge of the notions (definitions, statements, demonstrations if foreseen by the program) related to infinitesimal, differential and integral calculus for real functions of several real variables and the calculation tools developed, and be able to understand related topics by elaborating the acquired notions.

Applying knowledge and understanding

The student must demonstrate to be able to apply what has been learned in the resolution of verification exercises developed by the teacher, in principle related to topics such as: sequences and series of functions, limits and studies of functions of several variables, multiple integration, ordinary differential equations and Cauchy problems.

COURSE CONTENT/SYLLABUS

(0.5 CFU) Sequences and series of functions.

Punctual and uniform convergence; punctual and uniform Cauchy convergence criteria. Theorems on the continuity of the uniform limit, of passage to the limit under the sign of integral and derivative. Absolutely convergent and totally convergent series; Cauchy criteria for series; Total convergence and uniform convergence. Continuity theorems of the uniform sum of a series, of integration by series and derivation by series. Taylor series: developability and remarkable developments. Analytical functions.

(2 CFU) Differential calculus for functions of several variables.

Topology elements. Euclidean distance; Definition of around. Internal points, external points, border points. Open and closed sets; accumulation points and isolated points. Limited sets; Bolzano–Weierstrass theorem. Compactness and characterization of compacts. Convexity and connection. Functions of several variables: limits, continuity and relative properties; Weierstrass theorem. Partial derivatives; differentiability and differential theorem; directional derivatives and gradient; derivation of compound functions. Zero-gradient functions in a connected open. Higher-order derivatives and Schwarz's theorem. Lagrange's theorem. Taylor's formula of the first and second order. Relative extremes: necessary condition of the first order. Relative extremes of functions of two variables: necessary condition of the second order, sufficient condition of the second order. Search for absolute maxima and minima of continuous functions in compact sets of the plane. Relative extremes of functions of three variables: sufficient conditions. Positively homogeneous functions, Euler's theorem. Implicit functions. Local equivalence of a plane curve with a graph. Dini's theorem for equations of the type f(x,y)=0. Constrained maxima and minima of functions of two variables. Theorem on Lagrange multipliers.
Regular and generally regular curves: tangent line; oriented curves. Length of a curve, rectification of regular curves. Curvilinear abscissa The curvature of a planar curve. Curvilinear integral of a function.
Double integrals on normal domains. Integrability of continuous functions. Reduction formulas for double integrals. Change of variables in double integrals. Triple integrals; reduction formulas; change of variables. Rotation solids and Guldino's theorem.

(0.5 CFU) Curves.
Regular and generally regular curves: tangent line; oriented curves. Length of a curve, rectification of regular curves. Curvilinear abscissa The curvature of a planar curve. Curvilinear integral of a function.

(0.5 CFU) Multiple integrals.
Double integrals on normal domains. Integrability of continuous functions. Reduction formulas for double integrals. Change of variables in double integrals. Triple integrals; reduction formulas; change of variables. Rotation solids and Guldino's theorem.

(0.5 cfu) Surfaces.
Regular surfaces: tangent plane; adjustable surfaces; surfaces with edge; closed surfaces. The area of a surface. Rotation surfaces and Guldino's theorem. Surface integral of a function. Flow integrals of a vector field. Divergence theorem in R^3.

(1 CFU) Linear differential forms.
Exact differential forms and conservative fields. Curvilinear integral of a linear differential form. Criterion of integrability of differential forms. Closed differential forms. Poincaré's lemma. Radial shapes. Homogeneous shapes. Gauss-Green formulas in the plan. Divergence theorem in the plane. Stokes formula in the plan. Closed differential forms in simply connected open planes. Differential forms in space. Irrotational fields. Stokes formula in R^3. Closed differential forms in simply connected open spaces.

(1 CFU) Differential equations.
Cauchy problem for differential equations of order *n*: theorems of existence and local and global uniqueness. General integrals; particular integrals, singular integrals. Linear differential equations of order *n*: **theorem on the general integral of a** homogeneous equation, Wronsky's theorem, theorem on the general integral of a complete equation. First-order linear equations; linear equations with constant coefficients. Method of variation of constants. Separable variable equations. Equations of the form y'=f(y/x). Bernoulli equations. Equations of the form y''=f(x,y').

READINGS/BIBLIOGRAPHY
SEE THE TEACHER'S WEBSITE

TEACHING METHODS
The lessons will be frontal, and about a third of the lessons will be exercised.

EXAMINATION/EVALUATION CRITERIA

a) Exam type:

Exam type	
written and oral	X
only written	
only oral	
project discussion	
other	

In case of a written exam, questions refer to:	Multiple choice answers	X
	Open answers	X

	Numerical exercises	X

b) Evaluation pattern: