

UNIVERSITA' DEGLI STUDI MEDITERRANEA DI REGGIO CALABRIA

Subject Code	16578
Subject Name	Calculus
Professor	Giovanni Molica Bisci Assistant Professor University Mediterranea of Reggio Calabria
Department:	PAU - Heritage Architecture Urban Planning
Degree course:	Science in Architecture
Class:	L17
Type of educational activity:	Characterizing
Disciplinary Area:	Mathematics
Scientific-Disciplinary Sector:	MAT 05 – Mathematical Analysis
Compulsory preliminary exams:	No
Course Year:	First
Semester:	First and second
ECTS:	8
Hours:	80

Synthetic description:

The Course has as main objective the understanding of the principal concepts of Mathematical Analysis. The Course, trying to reconcile intuition and analytical rigor, it is proposed to provide the student with the basic knowledge and the analytical tools needed for the above quoted process of knowledge and understanding.

Acquisition of knowledge on:

Students will acquire the theoretical foundations of Mathematical Analysis and some its applications.

Evaluation method:

The acquired knowledge will be verified through written tests, to be incurred during and / or at the end of the course, and a colloquium on the more theoretical aspects. The final evaluation will take into account the degree of student learning, the skill to apply and argue the acquired knowledge.

Student's independent work

Exercises.

Detailed course program

Algebra/Trig Review - Trig Functions and Equations, Exponential Functions and Equations, Logarithm Functions and Equations.

Limits - Concepts, Definition, Computing, One-Sided Limits, Continuity, Limits Involving Infinity, L'Hospitals Rule

Derivatives - Definition, Interpretations, Derivative Formulas, Power Rule, Product Rule, Quotient Rule, Chain Rule, Higher Order Derivatives, Implicit Differentiation, Logarithmic

Differentiation, Derivatives of Trig Functions, Exponential Functions, Logarithm Functions, Inverse Trig Functions, and Hyperbolic Trig Functions.

Applications of Derivatives - Related Rates, Critical Points, Minimum and Maximum Values, Increasing/Decreasing Functions, Inflection Points, Concavity, Optimization.

Integration - Definition, Indefinite Integrals, Definite Integrals, Substitution Rule, Evaluating Definite Integrals, Fundamental Theorem of Calculus.

Integration Techniques - Integration by Parts, Integrals Involving Trig Functions, Trig Substitutions, Integration using Partial Fractions, Integrals Involving Roots, Integrals Involving Quadratics, Integration Strategy.

Applications of Integrals - Arc Length, Surface Area, Center of Mass/Centroid, Hydrostatic Pressure and Force, Probability. Parametric Equations and Polar Coordinates - Parametric Equations & Curves, Calculus with Parametric Equations (Tangents, Areas, Arc Length and Surface Area), Polar Coordinates, Calculus with Polar Coordinates (Tangents, Areas, Arc Length and Surface Area).

Sequences and Series - Sequences, Series, Convergence/Divergence of Series, Absolute Series, Integral Test, Comparison Test, Limit Comparison Test, Alternating Series Test, Ratio Test, Root Test, Estimating the Value of a Series, Power Series, Taylor Series, Binomial Series.

First Order Differential Equations - Linear Equations, Separable Equations, Exact Equations, Equilibrium Solutions, Modeling Problems.

Second Order Differential Equations - Homogeneous and Nonhomogeneous Second Order Differential Equations, Fundamental Set of Solutions, Undetermined Coefficients, Variation of Parameters, Mechanical Vibrations

Resources and main references

Textbooks

M. Bramanti, C.D. Pagani e S. Salsa, *Matematica*, Zanichelli Editore, Bologna 2004.

P. Marcellini, C. Sbordone, *Esercitazioni di Matematica, Volume I*, Liguori Editore, Napoli, 1988.