UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Mathematical Analysis II

2122-2-E3001Q040

Aims

The course has the following targets:

1. Knowledge of the topics (differential and integral calculus in several variables, curves and surfaces, differential forms, sequences and series of functions, ordinary differential equations, metric and functional spaces);
2. Development of criticism;
3. Problem solving.

Contents

Differential calculus in several variables, integral calculus in several variables,sequences and series of functions, curves and surfaces, differential forms, ordinary differential equations, metric and functional spaces.

Detailed program

- Metric spaces: metrics, neighborhoods, open and closed sets, topology associated to a metric space, density, continuity, completeness and compactness.
- Normed spaces: definition of norm, Banach spaces.
- Differential calculus in several variables: partial derivatives, differentiable functions, chain rule, higher order derivatives, Taylor's formula, maxima and minima of functions of several variables.

- Integral calculus in several variables: Lebesgue integral, integrability of continuous functions,

evaluation of multiple integrals by repeated lower dimensional integration, change of variables, polar coordinates in 2 and 3 dimensions, application to area and volume.

- Curves, surfaces, differential forms: curves and surfaces, length of curves, area of surfaces, Implicit Function Theorem, constrained minimization, Lagrange multipliers, differential forms, closed and exact differential forms, Gauss-Green's Theorem, Stokes' Theorem.

- Sequences and series of functions: metric and normed spaces, Cauchy sequences, point-wise and uniform convergence of sequences and series of functions, completeness of the space of continuous functions with the uniform norm, power series, Fourier series.

- Ordinary differential equations: the Cauchy problem, reduction of an equation of order n to asystem of n equations of the first order, the Banach Contraction Theorem and the existence/uniqueness of solutions to differential equations, linear differential equations, first order equations, separation of variables, linear and exact equations. Linear systems. Linear systems with constant coefficients, the exponential of a linear transformation, linear differential equations of higher order with constant coefficients. Maximal solutions. Qualitative study of solutions.

Prerequisites

The contents of the Mathematics courses of the first year will be required.

Teaching form

- Lessons (64 hours)
- Tutorials (48 hours)

Textbook and teaching resource

- E. Giusti: *Analisi matematica 2*, terza edizione, Bollati Boringhieri.

Other books:

- P. Marcellini, C. Sbordone: Esercitazioni di Matematica, secondo volume, parte prima e seconda.
- N. Fusco, P. Marcellini, C. Sbordone: Analisi Matematica due, Liguori Editore.

- E. Giusti: Esercizi e complementi di analisi matematica 2, Bollati Boringhieri.

- G. De Marco: Analisi Due, Zanichelli Decibel.
- G. De Marco, C. Mariconda: Esercizi di Analisi Due, Zanichelli Decibel.

- C. D. Pagani, S. Salsa: Analisi matematica 2, Zanichelli.

- V. Barutello, M. Conti, D.L. Ferrario, S. Terracini, G, Verzini: *Analisi 1 e 2.* Apogeo.

Semester

Second year, first semester.

Assessment method

The exam consists in a written part (mandatory) and in an oral one (optional).

The written exam is divided into two parts. The first part is composed by multiple choice questions. The second part of the written exam consists in the resolution of some exercises and contains also questions related to the theory.

Office hours

By appointment.