UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Calculus II

2223-2-E4102B009

Learning objectives

This course mainly aims at providing a rigorous introduction to Fourier series and to the differential and integral calculus of functions of d variables, with an emphasis on the case of very large n.

Knowledge and understanding
This course provides knowledge and understanding of:
Problems where Fourier Analysis plays a role
Regularity of functions of several variables: properties and applications
Nature and properties of multiple integrals which are relevant in Statistics

Ability to apply knowledge and understanding

At the end of the course and of their personal work the students will be able to:

Apply differential calculus in several variables to maxima/minima problems, e.g. linear regression
Use integral calculus in several variables to study mean value problems.
Understand the peculiarity of several geometric and probabilistic problems when the dimension of the space is very large
The course provides a solid background of Fourier series and differential and integral calculus in several variables, needed in every working environment. Moreover such a background is absolutely necessary for the completion of statistical studies.

Contents

Complex numbers and Fourier series.
Differential calculus on R^n.

Integral calculus on R^n.

Detailed program

Complex numbers. Fourier series
Differential calculus on R^n.
Partial derivatives and differentiability.
Maxima and minima (with or without constraint), Lagrange multipliers.
Taylor expansion, Hessian matrix. Linear regression.
Convex functions
Integral calculus on R^n.
Changes of variables.
Improper integrals.
Integration of radial functions on R^n.

Prerequisites

Differential and integral calculus in one variable. Linear Algebra.

Teaching methods

Face-to-face lessons

Assessment methods

Written and (compulsory) oral exam.

No midterm exam.

The result of the written exam below grade 15 precludes the admission to the corresponding oral exam.

The written exam consists of math exercises concerning the content of the course.

The aim of the written exam is to check the ability to solve calculus problems in a correct and detailed way, and to show math skills and ability of reasoning and applying the tools provided during the course. The students are not allowed to consult books or personal notes during the written exam and they are not allowed to use calculators. The student can bring with him an A4 sheet where the things he considers important are noted. It is essential that the paper is handwritten by the student himself.
The oral exam gives a definitely better understanding of how the students master the topics of the course. The oral exam consists partly of a written test concerning the theory of the course, checks knowledge and understanding of the proofs of the theorems presented during the course, as well as the ability to introduce and discuss definitions and computational techniques. The solutions of few exercises can be part of the oral exam, depending on the outcome of the written exam.

Textbooks and Reading Materials

Textbooks:
M. Bramanti, C. Pagani, S. Salsa, Analisi Matematica 2, Zanichelli.
M. Bramanti, Esercizi di Calcolo Infinitesimale e Algebra Lineare, Seconda Edizione, Progetto Leonardo, Esculapio.
S.Salsa, A.Squellati: Esercizi di Analisi Matematica II, Zanichelli

Reading Materials

Enrico Giusti: Analisi Matematica 2 Bollati Boringhieri

A. Bacciotti; F. Ricci: Lezioni di Analisi Matematica 2 Ed. Levrotto & Bella /Torino

C.Pagani; S.Salsa: Analisi Matematica 2 Ed. Zanichelli

Semester

First semester (from October to November).

Teaching language

Italian

Sustainable Development Goals

GENDER EQUALITY