UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Mathematical Methods and Programming

2627-1-F5603M001

Learning objectives

The course is intended for students who wish to learn mathematical techniques suitable for economic analysis. The course aims at showing students how to apply a number of mathematical skills they require for a successful study of economics. A number of economic applications and models are presented.

Specific Learning Objectives:

- Knowledge and Understanding: students will acquire a fair understanding of fundamental mathematical concepts and techniques relevant to economic analysis, including linear algebra, functions of several variables, optimization, and difference equations, as well as their applications in economic modeling;
- Applying Knowledge and Understanding: students will be able to apply mathematical tools, such as matrix algebra, differentiation, and optimization techniques, to solve economic problems, and to analyze economic models;
- Making Judgements: students are expected to develop the ability to critically evaluate the appropriateness of mathematical methods for specific economic problems, including assessing the suitability of models and their assumptions for real-world applications;
- Communication Skills: students are expected to be able to articulate mathematical reasoning and solutions to economic problems, both in written form and in contexts of economic discussions;
- Learning Skills: students will acquire the ability to independently study and apply advanced mathematical techniques to economic analysis, enabling them to pursue further studies in economics or related fields with a strong quantitative foundation

Contents

Fundamental topics in mathematical economics

Detailed program

1 - Linear Algebra
1a) Vectors, Matrices and Systems of Linear Equation
1b) Determinants and the Inverse Matrices
1c) Vector spaces
1d) Eigenvalues and eigenvectors

2 - Quadratic forms

3 - Functions of several Variables
3a) Partial differentiation
3b) Concavity and Convexity
3c) Unconstrained and Constrained Optimization for Functions of several Variables: the method of Lagrange multipliers
3d) Comparative Statics
3e) The envelope theorem

4 - Difference Equations
4a) Linear First Order Difference Equations
4b) Nonlinear First Order Difference Equations
4c) Systems of Difference Equations
4d) discrete-time dynamical models for economic analysis

Prerequisites

Basic Real Analysis and Linear Algebra.

As a textbook, students might be willing to choose: *Essential Mathematics for Economics Analysis* - Knut Sydsaeter, Peter Hammond, Arne Strom & Andrés Carvajal

This book has many editions: topics to be reviewed are:

- Essentials of Logic and Set Theory
- Algebra
- Solving Equations
- Functions of One Variable
- Properties of Functions
- Differentiation
- Derivatives in Use
- Single-Variable Optimization
- Matrix and Vector Algebra

Teaching methods

In-class lectures. No online activity is scheduled.

Assessment methods

A written exam covering lectures topics. The exam contains both theoretical questions and numerical exercises.

Textbooks and Reading Materials

Book,in digital format,

Lorenzo Peccati, Sandro Salsa, Annamaria Squellati
MATHEMATICS
Corso di International Economics - Università Milano-Bicocca

is available here:
https://www.egeaonline.it/ita/prodotti/metodi-quantitativi/mathematics.aspx

Semester

First semester

Teaching language

English

Sustainable Development Goals