COURSE DETAIL

OPTIMIZATION
Country Netherlands
Host Institution Maastricht University – University College Maastricht
Program(s) University College Maastricht
UCEAP Course Level Upper Division
UCEAP Subject Area(s) Statistics Mathematics
UCEAP Course Number 140
UCEAP Course Suffix
UCEAP Official Title OPTIMIZATION
UCEAP Transcript Title OPTIMIZATION
UCEAP Quarter Units 6.00
UCEAP Semester Units 4.00

Course Description

This course addresses the most important areas in optimization and studies the most common techniques. First, the optimization of unconstrained continuous functions in several variables is considered. Some notions are: partial derivatives; the gradient and the Hessian; stationary points; minima, maxima and saddle points; local and global optima. Techniques to compute optima range from analytical and algebraic techniques (i.e., solving systems of equations) to iterative and approximate numerical techniques (e.g., gradient methods and hill climbing, Newton and quasi-Newton methods, and several others). The course focuses on a selection of these. An important class of functions to consider is that of least squares criteria. Students consider both linear and nonlinear least squares problems and suitable iterative techniques to solve them. Linear least squares problems are often encountered in the context of fitting a model to measurement data. They also allow one to rephrase the problem of solving a nonlinear system of equations as an optimization problem, while the converse is possible too. Second, optimization problems subject to a given set of constraints are addressed. A well-known such class consists of linear optimization functions subject to linear equality or inequality constraints: the class of linear programs. The problem of fitting a linear model to measurement data using the criterion of least absolute deviations can be reformulated as a linear program. Several methods are available to solve such problems, including active set methods and the simplex algorithm, but also interior point methods and primal-dual methods. The Kuhn-Tucker conditions for optimality are discussed. For the optimization of nonlinear functions subject to nonlinear constraints, the course addresses the Lagrange multiplier method. To demonstrate the various optimization problems and solution techniques, the course provides many examples and exercises. To demonstrate the wide range of applicability, these are taken from different fields of science and engineering. To become acquainted with optimization techniques, one computer class is organized in which the basics of the software package Matlab are presented. Prerequisites for this course are calculus and linear algebra.

Language(s) of Instruction

English

Host Institution Course Number
SCI3003

Host Institution Course Title
OPTIMIZATION

Host Institution Course Details
https://www.maastrichtuniversity.nl/file/course-catalogue-2025-2026pdf

Host Institution Campus
University College Maastricht

Host Institution Faculty
University College Maastricht

Host Institution Degree

Host Institution Department
Science

Course Last Reviewed
2025-2026

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