

# Postgraduate Course Optimization (MSc)

## Instructor Information

José Ignacio Ronda Prieto

**E-mail:** joseignacio.ronda@upm.es

**Work Phone:** +34 91 3367354

## Course Information

### Course Description

Course on the fundamental techniques for continuous function optimization with a practical approach.

### Prerequisites

Basic linear algebra

Basic calculus

Working knowledge of MATLAB

### Course Goal

To be able to employ the basic techniques for the optimization of continuous functions with constraints.

### Summary of intended course outcomes

The course intends to provide a solid grounding in the fundamentals of the methods of optimization functions of continuous variables, with emphasis in the case of convex functions and restrictions, covering both analytical and algorithmic aspects.

## Syllabus

### Introduction

Taxonomy of optimization problems  
Overview of optimization techniques  
Revision of linear algebra

### Optimization without constraints

Basic analytical results  
Least-squares problems  
Application: filter design, signal restoration  
Numerical algorithms: First and second order methods

### Convex optimization problems

Convex functions and sets  
Linear programming  
Applications: approximation with non-Euclidean norms, compressive sensing

### Optimization with constraints

Analytical tools: Kuhn-Tucker conditions, Lagrangian duality  
Applications: rate-distortion optimization, channel use optimization  
Numerical methods: Interior point methods

## Textbook

S. Boyd, L. Vanderberghe, Convex Optimization, Cambridge Univ. Press. 2004  
J. Nocedal, S. Wright, Numerical Optimization, Springer, 1999.

## Student Assessment Criteria

Final Exam	60%
Project	30%