COURSE PRESENTATION FORM – ACADEMIC YEAR 2010/2011

COURSE NAME	**Theories and techniques of optimization**
COURSE CODE	72013 (MSc 270) - 70228 (BSc / MSc 509) – 70237 (BSc OLD)
LECTURER	Davide La Torre
TEACHING ASSISTANTS	Simone Marsiglio
TEACHING LANGUAGE	English
CREDIT POINTS	8
LECTURE HOURS	48
EXERCISE HOURS	24
TIME SPAN	27.09.2010 - 21.01.2011
TIME TABLE	See Timetable Page
OFFICE HOURS LECTURER	During the lecture time, 10:30-12:30, Faculty of CS, POS Building, piazza Domenicani 3, office 2.10
OFFICE HOURS TEACHING ASSISTANT	During the lecture time, TBD, Faculty of CS, POS Building, piazza Domenicani 3, office 2.10
PREREQUISITES	Calculus I, II and Linear Algebra.
OBJECTIVES	This course provides optimization methods and techniques for students in computer science. A wide variety of real models (in economics, engineering, finance) will be introduced and students will continuously see how the mathematics they are learning can be used. Students are expected to read the assigned material and to attempt to solve the assigned exercises and problems for each class. Lectures are aimed at clarifying concepts presented in the text, answering students' questions, and taking up some of the assigned problems. A large amount of material is covered in this course. Each class builds on preceding ones and this makes it important to understand each concept as the course proceeds. Past experience indicates that the success rate is much higher amongst students who come prepared for each class. Therefore, it is vital for students to read the assigned material on a day to day basis, to do the proposed exercises and seek clarification when needed. Students are encouraged to solve more problems than those assigned for each class and to refer to other textbooks and relevant websites. Office hours will be useful for those students requiring extra assistance.
SYLLABUS	• Vector algebra.

- Linear algebra.
- Calculus of several variables.
- The mathematical programming problem.
- Convexity.
- Classical programming.
- Linear and nonlinear programming.
- Minimization techniques.

- Introduction to ordinary differential equations.
- The control problem.
- Calculus of variations.
- Dynamic programming.
- The maximum principle.
- Optimal control theory.

- Introduction to neural networks.
- Motivation and applications.
- Artificial neuron models.
- Linear regression.
- Linear neural networks.
- Classification.
- Learning.

TEACHING FORMAT Frontal lectures and projects in teams.

ASSESSMENT

Mark allocation (for students attending the lectures):

- Project [50% of mark] +
- Final exam (oral) [50% of mark].

In case of a positive mark the project will count for all 3 regular exam sessions.

Mark allocation (for students not attending the lectures):

- Final exam (written) [100% of mark]

READING LIST

- M.D.Intriligator, Mathematical optimization and economic theory, Prentice-Hall, 1971.
- C.P.Simon, L.E.Blume, Mathematics for Economists, Norton, W. W. & Company, Inc., 1994.
- D.E.Kirk, Optimal control theory: an introduction, Dover Publications, 1998.
- H.P.Geering, Optimal control with engineering applications, Springer, 2007.
- P.Chen,S.M.N.Islam, Optimal control models in finance, Springer, 2005.
- S.P.Sethi, G.L.Thompson, Optimal control theory. Applications to management science and economics, Springer, 2006.
- K.Gurney, An introduction to neural networks, CRC Press, 1997

SOFTWARE USED

- Lindo

- Lingo
- Derive
- Maple

LEARNING OUTCOME Deep knowledge of optimization methods and techniques.

COURSE PAGE Reserve Collection