Optimization

Course title – Intitulé du cours	Optimization
Level / Semester – Niveau /semestre	M2/S1
School – Composante	Ecole d'Economie de Toulouse
Teacher – Enseignant responsable	David Martimort, Thomas Mariotti
Other teacher(s) – Autre(s) enseignant(s)	Liam Lods
Lecture Hours – Volume Horaire CM	30
TA Hours – Volume horaire TD	15
TP Hours – Volume horaire TP	
Course Language – Langue du cours	English
TA and/or TP Language – Langue des TD et/ou TP	English

Teaching staff contacts – Coordonnées de l'équipe pédagogique :
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Course Objectives – Objectifs du cours :
The goal of these series of lectures is to provide M2 students and future PhD with a solid background in Optimization. In particular, the course will emphasize
rigorous methodologies, namely: importance of proofs, assumption checking, heuristics (``ideas genesis"). Such tasks become easier when the notions at stake are associated to concrete situations, that is why we shall, whenever possible, attach to each introduced notion geometrical ideas or concrete examples.\\
The outline of the course given below is quite ambitious in terms of length. It corresponds to an ideal situation in which most of the students are
already familiar with elementary concepts of Calculus/Analysis such as: closed/compacts sets, continuity, convexity etc... In other words, some mathematical maturity
from the students will help them to better appreciate the course and will allow us to go further.

Prerequisites – Pré requis :
The outline of the course given above is quite ambitious in terms of length. It corresponds to an ideal situation in which most of the students are already familiar with elementary concepts of Calculus/Analysis such as: closed/compacts sets, continuity, convexity, etc. In other words, some mathematical maturity from the students will help them to better appreciate the course and will allow us to go further.
A background in elementary linear algebra and calculus is strongly advised

Grading system – Modalités d'évaluation :
Questions and discussions on the lectures are highly encouraged

Bibliography/references – Bibliographie/références :
– Borwein, J., Lewis, A.S., "Convex Analysis and Nonlinear Optimization", Springer-Verlag 2000.
– Jahn, J. "Introduction to the Theory of Nonlinear Optimization", Springer-Verlag 2006.
– Luenberger, D. "Optimization by Vector Space Methods", Wiley 1969.
Hiriart-Urruty, J.-B, Lemar´echal, C., "Fundamentals of Convex Analysis", Springer-Verlag, 2001.
– Rockafellar, R.T., "Convex Analysis", Princeton University Press, 1970. – Sundaram, R. K. "A First Course in Optimization Theory". Cambridge University Press, Cambridge, 1996..
Fixed point theory
– Border, K.C., "Fixed point theorems with applications to economics and game theory", Cambridge

University Press, 1985. (A ”must” for fixed-point like results)
Calculus of variations and Optimal control
– Gelfand I.M. and Fomin S.V., “Calculus of variations and Optimal control”, Dover publications, 1963.
– * Clarke, Frank H. Optimization and nonsmooth analysis. Canadian Mathematical Society Series of Monographs and Advanced Texts. A Wiley-Interscience Publication. John Wiley & Sons, Inc., New York, 1983. xiii+308 pp.
– Dacorogna, B., “Introduction to the calculus of variations”. Translated from the 1992 French original. Second edition. Imperial College Press, London, 2009. xiv+285 pp.
– • Demange, G., Rochet, J.-C, “M´ethodes math´ematiques de la finance”, Economica, 1992.
– Evans, L.C, (Berkeley), Online course on Optimal Control at:
http://math.berkeley.edu/ evans/control.course.pdf
– • Luenberger, D. G. “Optimization by vector space methods”. John Wiley & Sons, Inc., New YorkLondon-Sydney 1969 xvii+326 pp
– • Liberzon, D., Calculus of Variations and Optimal Control Theory: A Concise Introduction, Princeton university press, 2012.
Session planning – Planification des séances
There will be a two-hours final exam which is meant to check fundamental knowledge and basic proficiencies. More difficult questions requiring some originality or ingenuity will be also included, they represent between 20% and 30% of the total mark.