Quantitative Techniques in Economics

Course title - Intitulé du cours	Quantitative Techniques in Economics
Level / Semester - Niveau /semestre	Mres (Deeqa) / S1
School - Composante	Ecole d'Economie de Toulouse
Teacher - Enseignant responsable	COLLARD FABRICE
Other teacher(s) - Autre(s) enseignant(s)	KANKANAMGE SUMUDU
Other teacher(s) - Autre(s) enseignant(s)	
Other teacher(s) - Autre(s) enseignant(s)	
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Other teacher(s) - Autre(s) enseignant(s)	
Lecture Hours - Volume Horaire CM	30
TA Hours - Volume horaire TD	
TP Hours - Volume horaire TP	
Course Language - Langue du cours	Anglais
TA and/or TP Language - Langue des TD et/ou TP	Anglais

Teaching staff contacts - Coordonnées de l'équipe pédagogique :

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Sumudu Kankanamge: kankanamge.sumudu@gmail.com

meeting by appointment. Meeting will take place online

Course's Objectives - Objectifs du cours :

This class is designed to introduce students to standard computational techniques that are now a prerequisite in solving and evaluating modern quantitative economic models. The course will cover global solution techniques, and will show students how to deal with models featuring occasionally binding constraints. While a number of examples used in this course will be drawn from the field of macroeconomics, most techniques can also be used to solve, simulate and evaluate models from other fields.

Lectures will cover:

1. **Applied dynamic programming:** Dynamic programming is a very powerful tool that allows to formulate and solve, in a relatively simple way, models featuring non-linearities, shocks, binding constraints, potential discontinuities, etc. This part of the class will introduce the student to these techniques and will also show under what conditions they can be used. We will cover value iteration techniques, policy functions iterations, endogenous grid methods, iteration on Euler equations, both in the deterministic and the stochastic case. In passing some attention will be given to non-linear solvers and numerical optimization techniques.
2. **Incomplete markets/heterogeneous agents models:** The last part of the class will explore techniques that explicitly deals with heterogeneity. Starting from a seminal model with idiosyncratic heterogeneity, the techniques seen in the first part of the class will be extended to deal with distribution dynamics, transition dynamics, models with discrete-continuous choices and aggregate dynamics.

By the end of this course, students should be able to

1. Set up a model,
2. Select and implement the relevant technique to obtain a numerical solution to the model,
3. Simulate the model, and hence generate relevant quantities for the question at stake.

Prerequisites - Pré requis :

Basic optimization theory

Practical information about the sessions - Modalités pratiques de gestion du cours :

The class will be computer intensive and students are required to have a laptop or at least a laptop per two students. The computer language will mainly be Julia (no prior knowledge of the language is assumed nor requested). Necessary (free) software will be distributed in class.

Grading system - Modalités d'évaluation :

The final grade for this part of the class will be a small home project. Additionally, there will be a few (non graded) weekly/bi-weekly assignments.

Bibliography/references - Bibliographie/références :

- *Numerical Methods in Economics,* by Kenneth L. Judd (Pearson Addison Wesley, 2nd edition, 2008),
- *Dynamic General Equilibrium Modeling,* by Heer and Maussner (Springer, 2009),
- *Recursive macroeconomic theory,* by Ljungqvist and Sargent (MIT Press, 2004),
- *Computational methods for the study of dynamic economies,* by Marimon and Scott (OUP, 2001),
- *Dynamic economics,* by Adda and Cooper (MIT Press, 2003),
- *Recursive methods in economic dynamics,* by Stokey and Lucas (Harvard U. Press, 1989)

Distance learning – Enseignement à distance :

In case of lockdown, the lectures will take place online.