QUANTITATIVE TECHNIQUES IN ECONOMICS

Course title – Intitulé du cours	Quantitative Techniques In Economics
Level / Semester – Niveau /semestre	M2 / S2
School – Composante	Ecole d'Economie de Toulouse
Teacher – Enseignant responsable	KANKANAMGE Sumudu
Other teacher(s) - Autre(s) enseignant(s)	COLLARD Fabrice
Lecture Hours – Volume Horaire CM	30
TA Hours – Volume horaire TD	
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's Objectives – Objectifs du cours :

This class aims at introducing students to standard computational techniques which are now commonly used to solve and evaluate quantitatively economic models. While many 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. The course will cover global solution techniques, and will show students how to deal with models featuring occasionally binding constraints.

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 computer knowledge.

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 Matlab and C. Although the basic knowledge of Matlab or C is an advantage, this is not a pre-requisite as it will be covered in class. 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)

Session planning – Planification des séances :

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 … This part 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.

2. **Parameterized Expectations Algorithm:**

   The PEA method offers a simple way to solve a rational expectations model by parameterizing the expectation function rather than a particular variable. This approach is a parametric approach which relies on simulations of the model to obtain information about its solution. We will show how to implement this method and will also draw the connection to estimation techniques.

3. **Spectral method:**

   Spectral methods are another class of parametric solution method that aims at providing with a global solution of the model, provided this solution is smooth. We will cover both collocation and Galerkin techniques.

4. **Incomplete markets/heterogeneous agents models:**

   This last part of the class will give an example of application of these techniques that deals explicitly with heterogeneity. Two models will be covered, the Aiyagari model, that only features idiosyncratic heterogeneity, and the Krusell and Smith model that adds aggregate shocks to it.