

## Faculty of Economic, Social and Political Sciences



### ECON3340 Dynamical Methods in Economics

[30h]

**Teacher(s):** Raouf Boucekkine, Pierre Dehez  
**Language:** English  
**Level:** Third cycle

#### Aims

This course is designed to provide the principal mathematical tools needed to properly handle the dynamic problems arising in economic modelling. Through a large set of applications to several economic disciplines (principally macroeconomics and finance), it is also aimed at discussing and clarifying the concepts and methods' foundations as they are traditionally used in economics in order to come out with a unified rigorous approach to dynamic economic systems.

#### Main themes

The course surveys and discusses a wide range of solution and stability methods on either discrete or continuous time deterministic and stochastic systems. It starts with differential and difference equations and then extends the analysis to systems of equations. Stochastic difference equations and systems are also studied. Existence and uniqueness theorems are stated for each class of systems. Stability and bifurcation methods are developed along the way. The last part of the course is devoted to the three branches of dynamic optimization (calculus of variations, optimal control and dynamic programming) with several economic applications.

#### Content and teaching methods

The course includes two main parts:

- I. Introduction to dynamic systems and methods
  - Differential and difference equations
  - Differential and difference systems
  - Stability methods: Linearization versus Lyapunov methods
  - Bifurcations and dynamics
  - Stochastic difference equations and systems
- II. Dynamic optimization
  - Calculus of variations
  - Optimal control
  - Dynamic programming

#### Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Prerequisite : Undergraduate mathematics courses

Evaluation : Written closed book exam

Support : Gondolfo S., Economic Dynamics, Springer-Verlag, 1988

Chiang A., Elements of Dynamic Optimization, McGraw-Hill, 1992.

#### Programmes in which this activity is taught

**ECGE3DA/EC** Diplôme d'études approfondies en économie et gestion - Master of Arts in Economics (sciences économiques)

**Other credits in programs**

**ECGE3DA/EC**      Diplôme d'études approfondies en économie et gestion - Master(3.5 credits)  
of Arts in Economics (sciences économiques)