Master 1 mention Economie

2014-2015

Syllabus

Macroeconomics
Econometrics with SAS
Econometrics
Game Theory
Market Finance
Resources & Environment
Dynamic optimization
Microeconomics
Applied econometrics
Public economics
Advanced calculus
Corporate finance
Stochastic process
Numerical Optimization
Statistical Softwares - R
North-South economic relations
International economics
Applied multivariate data analysis
Topics in macroeconomy
Time series
OBJECTIVES
This course is an introduction to dynamic macroeconomic theory with applications to consumption/saving behavior, capital/investment decision, labor demand and supply, asset prices and public policy. This course makes sure that students become fluent in dynamic macroeconomic modeling.

COURSE OUTLINE
Chapter 1: Two-Period Equilibrium Models
1.1. An Exchange Economy
1.2. A Production Economy
Chapter 2: Models and Methods in Macroeconomic Dynamics
2.1. The Permanent Income Model
2.2. The Dynamic Labor Demand Model
Chapter 3: Business Cycle Models
3.1. Two Simple Business Cycle Models
3.2. RBC Models

REQUIREMENTS

BIBLIOGRAPHY

GRADING POLICY
40% for the tutorials: mid-term exam.
60% for the final exam
OBJECTIVES
Illustrate the main econometric methods learned in the Econometrics class using the SAS software.

COURSE OUTLINE
Linear regression, Statistical Properties of OLS, Hypothesis Testing and Confidence Intervals, Nonnormality and Maximum Likelihood, Heteroscedasticity and GLS, Endogeneity and IV.

REQUIREMENTS
Linear algebra, Probability, Inferential Statistics, Introduction to Econometrics

BIBLIOGRAPHY

GRADING POLICY
- Empirical Project: 100 %
- Tutorial session attendance and participation: bonus (from 0 to 2 points)
The course will be graded based on the term project. A report on the term project of no more than 2,000 words needs to be handed in for evaluation by December 5th, 2014.

In today’s world the ability to use data – to understand it, to process it, to extract value from it, to visualize it, to communicate it – becomes ever more important. This course introduces students to R, a free software environment for statistical computing based on its own programming language. Upon attending the course students will be able to:
- read in data into R,
- do descriptive statistics using R,
- plot various types of graphics with R,
- do basic regression analyses in R.

The course comprises 12 hours of teaching and 12 hours of tutorials plus a term project on which students will work during the semester.

There are no specific requirements for the course.


The course will be graded based on the term project. A report on the term project of no more than 2,000 words needs to be handed in for evaluation by December 5th, 2014.
OBJECTIVES

COURSE OUTLINE
Linear regression, Statistical Properties of OLS, Hypothesis Testing and Confidence Intervals, Nonnormality and Maximum Likelihood, Heteroscedasticity and GLS, Endogeneity and IV.

REQUIREMENTS
Linear algebra, Probability, Inferential Statistics, Introduction to Econometrics

BIBLIOGRAPHY

GRADING POLICY
Homework 15% Midterm 35% Final exam 50%
OBJECTIVES
The game theory class is an introductory course to game theory. The objective is to provide rigorous foundations to the study of games that have become an important part of modern economics.

COURSE OUTLINE
The main tools of game theory are studied in turn: from static games under complete information to dynamic games under incomplete information. The course is illustrated with economic examples and applications, such as: Bertrand and Cournot models of competition, dynamic games of competition, Hotelling model of differentiated products, bargaining games, signalling games, models of voting, collusion and repeated games, auctions, coordination games, bank runs, investment races; and so on. Students have access to a collection of problem sets with their correction. These problems are studied during the tutorials. Slides containing the theoretical material taught during the lectures is at the disposal of the students on the moodle platform. The summary of their content is the following: I Static games of complete information (Games under normal form, The notion of strict dominance, The best response correspondence and Nash equilibria in pure strategies, The mixed extension of a normal form game) ; II Dynamic games of complete information (Games under extensive form, Extensive form and normal form, Nash equilibria and backward induction, Subgame perfect Nash equilibria: Infinitely repeated games), IV Games with incomplete information.

REQUIREMENTS
There is no prerequisite, apart from the most basic mathematical tools (derivatives and basic calculus), and a taste for rigorous reasoning.

BIBLIOGRAPHY
There is no compulsory textbooks, but we would recommend:
More detailed and advanced material can be found in:
Martin Osborne and Ariel Rubinstein, “A course in Game Theory”, The MIT Press,

GRADING POLICY
Midterm exam (20%) and final exam (80%).
OBJECTIVES
The Module aims to introduce students to the fundamental techniques for understanding and valuing market risk. A subsidiary aim is to equip students with some of the skills required to study the research literature in this important area of financial economics.

By the end of the Module students will have a detailed knowledge of basic mean-variance analysis and models such as the CAPM, factor models, consumption-based asset pricing as well as some derivatives pricing.

COURSE OUTLINE
Introduction to Financial Markets and Institutions;
Market Efficiency and Empirical Results;
Utility theory and risk aversion;
Portfolio theory;
Capital Asset Pricing Model;
Consumption-based asset pricing;

REQUIREMENTS
None

BIBLIOGRAPHY
• Danthine and Donaldson Intermediate Financial Theory, Prentice Hall 2002,

A more advanced treatment of the topics covered in the Module may be found in:
• Cochrane, Asset Pricing, Princeton University Press, 2005

GRADING POLICY
Final Exam (100%), Problem Sets
OBJECTIVES
The course follows the structure of C.D Kolstad, “Environmental Economics”, Oxford University Press, 2000. It is recommended to work through this textbook.

COURSE OUTLINE
What is environmental economics?
Environmental problems and policy solutions
Social choice: How much environmental protection?
Efficiency and markets
Market failure: public bads and externalities
Property rights
Pigouvian fees
Regulating pollution
Emission fees and marketable permits
Regulation with unknown control costs
Audits enforcement and moral hazard
Risk and uncertainty
Exhaustible resources

REQUIREMENTS
Good understanding of intermediate economics.

BIBLIOGRAPHY

GRADING POLICY
Oral exam
OBJECTIVES

Chapter 1: A deterministic model in economics
- Deterministic problem of optimal growth
- Finite horizon problem
- Value function and dynamic programming

Chapter 2: Mathematical Preliminaries
- Banach space
- The contraction mapping theorem
- Correspondences

Chapter 3: Dynamic Programming
- The principle of optimality
- Optimal plan
- Bounded returns
- Existence of solution for the functional equation
- Properties and regularity of the solution
- Constant returns to scale
- Unbounded returns

REQUIREMENTS

BIBLIOGRAPHY

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**OBJECTIVES**

To present probabilistic tools which are crucial for economic modelling and finance modelling. Discrete Probability, Random Variables, Binominal Law, Density, Normal Law.

**COURSE OUTLINE**

1. State space, sigma-algebra and probability measure.
2. Random variables and distributions.
3. Integration with respect to a probability measure.
5. Independence.
7. Gaussian vectors.

**REQUIREMENTS**

**BIBLIOGRAPHY**

Probability essentials by Jacod and Protter, 2004, Universitext, Springer

**GRADING POLICY**
OBJECTIVES
The main theme of this course is to illustrate some key insights from political economy by showing them at work in some significant historical episodes. They show the various means whereby some form of restraint can be imposed on governments to make them less predatory and more pro-development. A small number of theoretical models will be discussed to highlight the main mechanisms.

COURSE OUTLINE
Part 1: Eurasia’s Early Start
1. The Geography of Food Production and Eurasia’s Head start.
3. Why Britain Rather than France in the 18th Century?
4. The East Asian Miracle in the 20th Century

Part 2: Africa’s Delayed Development
5. Migration Failures and the Mismatch of People and Opportunities
6. Interest Groups and Labor Market Distortions
7. Interest Groups and Distortions on Imports and Exports
8. Conflict and Redistribution

REQUIREMENTS
The course assumes knowledge of some material from (i) introductory microeconomics, (ii) introductory macroeconomics and (ii) introductory econometrics and statistics. Some elementary game theory is also used to derive some key concepts.

BIBLIOGRAPHY
OBJECTIVES
This course is an introduction to experimental economics and behavioral economics and its applications to Microeconomics. You will learn how experiments are conducted in economics and what we can learn from them. We will discuss and analyze experimental results in different domains. You will run your own experiment and participate in experiments by others.
By the end of the course you should have a good understanding of the topics, methods and approaches of behavioral and experimental economics. You should be able to critically analyze experimental results and be able to implement own experimental projects.

COURSE OUTLINE
week  topic
1  Introduction
2  Methodology
3  Non-parametric statistics and game theory
4  Individual decision making read: Prospect Theory: An Analysis of Decision under Risk
5  Markets + experiment by me
6  Auctions read: The Amsterdam Auction
7  Auctions – and biases + student experiments
8  Mechanism design & public goods + student experiments
9  Public and common goods + student experiments
10  Altruism and cooperation + student experiments
11  Voting and bargaining read: Altruistic punishment in humans
12  Field experiments & labor supply read: In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies

REQUIREMENTS
The course will be held in english. No specific requirements

BIBLIOGRAPHY
No book is required for this course. However you might find the following two books useful:
• "The Handbook of Experimental Economics" by John H. Kagel and Alvin E. Roth
• "Markets, Games, & Strategic Behavior" by Charles A. Holt
Lots of useful resources can be also found on the internet, e.g.:
• Al Roth’s game theory, experimental economics, and market design page: http://kuznets.fas.harvard.edu/~aroth/aroth.html
• Charles Holt webpage on experimental economics: http://people.virginia.edu/~cah2k/teaching.html
• Website by Dan Ariely: http://danariely.com/the-research/

GRADING POLICY
Your final grade will be combined from the following two course requirements:
1. You will be asked to form groups of approx. 5 students (subject to participants in class). Your group will be required to work together during the whole semester. You will have to:
   A. Prepare a small experiment together that you will run with other students as participants. This will consist of:
      i) an idea for an experiment
      ii) a question you want to answer with it
      iii) written instructions that you will give to participants
      iv) the preparation of the necessary tools for the experiment (e.g. envelopes, dice, questionnaires, etc.)

   You will have to make an appointment with me at least one week before you are planning to run your experiment, to briefly discuss what you are planning to do and to present how you are going to implement it.

   B. Summarize your results in a two page report that you will hand in to me.
      - i.e. present idea behind experiment – literature
      - predictions
      - show results graphically
      - explain how results could be analyzed statistically (given more observations)

   Note: you will receive a group grade - this grade might be adjusted individually in case of especially good or poor performance during experiment and/or presentation.
OBJECTIVES

One of the most fundamental facts about modern societies is that they depend on exchange: almost all of the things we need for our daily lives are produced not by ourselves but by others. Many of these exchanges are conducted between complete strangers. Some exchanges take place through the institution of markets, others through firms and a great variety of non-market institutions. It might seem that a disposition to “truck, barter and exchange” (in Adam Smith’s words) is so natural to human beings that it needs no further explanation, but in fact a careful study of our prehistoric past suggests that it is a profoundly unnatural thing to do, and has become a universal feature of human existence only in the relatively recent past.

This course asks four questions:

1) How has exchange with strangers become a near-universal feature of human societies when everything suggests it was a very unnatural thing for our prehistoric ancestors to do?
2) Under what circumstances do markets provide a natural and relatively efficient means of undertaking these exchanges?
3) What kinds of non-market institution provide an alternative means of undertaking these exchanges, and under what circumstances do they work naturally and efficiently?
4) How are changes in the technology of information transmission and processing changing the nature of the institutions that mediate economic exchange?

COURSE OUTLINE

The topics covered will be as follows (the timing is approximate):

Weeks 1 and 2: The psychological foundations of market exchange
Weeks 3 and 4: The evolution of markets through history
Weeks 5 and 6: Non-market institutions and their evolution through history
Weeks 7 and 8: The Coase question: the fluctuating frontiers of market and nonmarket exchange
Weeks 9 and 10: Signaling, networks and bidirectional choice
Weeks 11 and 12: The New Information Economy and the future of exchange

REQUIREMENTS

There are no formal requirements for the course, but students are expected to be present and to participate actively in class discussion. Past experience suggests it is extremely unlikely that any student can pass the exam purely by reading the presentation slides – presence in class is essential.

BIBLIOGRAPHY
GRADING POLICY

There is no textbook for the course but you will be encouraged to read very widely, in psychology, biology, anthropology, history and current affairs as well as in economics.

The objective of this course is to earn a basic knowledge on Decision Support Systems through database systems. This course allows understanding how some computer tools may help a decision maker/manager to have a global vision of what is happening within his institution or company. The course introduces software used in the domain and details the use databases as well as On-Line Analytical Processing tools (also called OLAP tools). The course is an introduction to more the complex environment of decision support systems.

**OBJECTIVES**

Introduction to decision support and decision support systems (as well as a word on pivot tables and Excel—the most used tool).

Query languages for databases (SQL). Starting with simple queries to the more complex analytical queries (application with Microsoft Access).

OLAP analytical tools, design of multidimensional databases and analytical reports (application with SAP Business Objects).

**REQUIREMENTS**

None.

Knowledge of databases and spreadsheets (Excel or Calc) may help.

**BIBLIOGRAPHY**

Ralph Kimball books such as "Kimball, Ralph; Margy Ross (2013). The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling (3rd ed.). Wiley". Note that the French version of this book is not recommended as its content is outdated (it corresponds to the 1st edition of the book).

**GRADING POLICY**

Either a project done in pairs, or a practical individual examination (40% of the final grade). This depends on the organisation of the course.

A final written exam (60% of the final grade).
OBJECTIVES
We will study the causes and consequences of firms’ strategic behavior in situations in which the assumptions behind perfect competition do not hold. Our main analytical tools will be microeconomic theory and game theory. The topics we will cover include: product differentiation, advertising, innovation, collusion and mergers. Within each topic, we will consider the impact of firms’ actions on welfare. We will also consider the motivation for and impact of competition law on these settings. Our main objective is to develop your ability to use economic models to understand a broad range of IO problems. These models, when constructed well, can be both simple and powerful. When appropriate, specific real-life examples and case studies will be discussed.

COURSE OUTLINE
The course comprises the following five chapters:
1. Product Differentiation
2. Advertising
3. R&D and Innovation
4. Collusion
5. Mergers
In Chapters 1 and 2 we consider two major sources of market power. We will try to understand how firms design their marketing mix in imperfectly competitive markets. The three key variables of the marketing mix are Price, Product and Promotion (known as the “3 P’s”).
In Chapter 3 we incorporate innovation into the picture and investigate how it interacts with competition. We will also see how firms can use innovation as a strategic weapon, either on their own or in cooperation with some of their competitors.
Chapters 4 and 5 investigate two important areas of competition policy. We will see how IO theory can help antitrust authorities in their fight against anticompetitive practices.

REQUIREMENTS
Students are expected to have basic knowledge of game theory tools and standard imperfect competition models.

BIBLIOGRAPHY

GRADING POLICY
Final exam : 100%
OBJECTIVES
The aim of this course is to expose students to the theoretical and practical skills necessary for undertaking applied work in economics and provide them with an opportunity to carry out an empirical project.

COURSE OUTLINE
The lectures part of the course is structured into an introduction that will discuss the different stages of an empirical project and five sections that will cover some applied topics in different areas of research. During the first semester, these five areas will be introduced and students will have to organize themselves in small groups to work on their empirical project. In addition to the lectures, computer laboratory tutorial sessions will be organized to give students a chance to analyze data on questions in these three fields of research.

REQUIREMENTS
Econometrics course of the first semester

BIBLIOGRAPHY
Some reading material will be handed out all along the lectures and tutorial sessions as needed.

GRADING POLICY
- Empirical Project: 70%
- Exam on lectures material: 30%
- Tutorial session attendance and participation: bonus (from 0 to 2 points, added on the exam grade)
Public economics studies the role of government in a market economy. The underlying setting is thus that of a decentralized economy in which economic decisions are coordinated by prices which in turn are determined by "free markets". In reality, the public sector typically plays a significant role in these market economies. We examine why the government has to supplement the market mechanism and how his intervention can be justified by efficiency and equity consideration. More significantly we study how policies should be designed. Which goods should be provided by the public sector? At what levels and at which prices? How should taxes and transfers be designed? Which tax instruments do we need? Do environmental considerations justify public intervention? If yes, under which form? These are some of the questions which will be dealt with.

The course provides an introduction to public economics. It is designed for advanced undergraduate students (with a good background in micro-economic theory). We shall cover a good deal of "classical" material (you need to know the foundations) but also some more recent developments. Similarly, we shall combine methodological with more applied issues.

1. Introduction: The role of the public sector in a market economy (HM ch. 1,2,4, 5 and slides)
2. Public goods (HM6 and slides)
3. Political economy (HM11)
4. Externalities (HM 8 and slides)
5. Cost benefit analysis (HM25)
6. Taxation
7. Social insurance and retirement (HM23)

The class is completed by a series of exercise sessions; participation to these sessions is required.

BIBLIOGRAPHY
The course is based on the textbook "Intermediate Public Economics" by Jean Hindricks and Gareth Myles, 2nd edition (MIT Press 2013). Additional material, including handouts (copies of slides) for some chapter are available on "Moodle".

5. Robert J. Brent, "Applied Cost-Benefit Analysis" (Edward Elgar). (Intermediate)
7. (SL) Bernard Salanie, "The Economics of Taxation" MIT Press. (Advanced)

GRADING POLICY
Grading is based on the final exam (a written test).
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<tr>
<th>Intitulé du cours</th>
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**OBJECTIVES**
This course will review mathematical methods which form an essential element of the expertise of an economist. It will provide the students a solid mathematical background for the other lectures in the TSE programme. The lecture will give theoretical, practical and numerical methods to solve differential equations and problems of calculus of variation. Applications coming from economics will be analysed (Modigliani's life cycle, optimal growth with non-renewable resources, etc.).

**COURSE OUTLINE**
1. General results on ODE
2. Resolution of first and second order ODE
3. Differential systems
4. Introduction to calculus of variation

**REQUIREMENTS**
Definition of complex numbers
Anti-derivatives of usual functions
Diagonalising matrices

**BIBLIOGRAPHY**
Differential Equations: A Dynamical Systems Approach: Ordinary Differential Equations John H. Hubbard, Beverly H. West

**GRADING POLICY**
A midterm and a final exam.
OBJECTIVES
This course develops principles of corporate finance and provides tools for financial decision making and valuation.

COURSE OUTLINE
1 Introduction
1.1. What is this about
1.2. Corporate governance

2 Financial Leverage and Capital Structure Policy
2.1. When capital structure is irrelevant
2.2. The effect of taxes
2.3. The effect of financial distress
2.4. The static trade-off theory
2.5. The pecking order theory

3. Option theory and capital structure

4. Capital budgeting and risk
4.1. Company and project costs of capital
4.2. Sensitivity analysis
4.3. Real options and decision trees

5.1. Dividends and stock repurchases
5.2. When dividend policy is irrelevant
5.3. The effect of financial market imperfections
5.4. The effect of asymmetric information

REQUIREMENTS
The course is self-contained. However, previous exposure to basic finance and microeconomics concepts is an advantage.

BIBLIOGRAPHY

GRADING POLICY
The grade will be based on a final exam (100%).
This course is an advanced probability course dealing with stochastic processes, viz. random quantities evolving along time. Such stochastic processes are useful in modelling, e.g. the price of a stock on a financial market or the surplus process for insurance companies. The aim of this course is to give a solid mathematical grounding for further studies on related topics, such as option pricing and financial mathematics, gambling theory, mathematical methods in insurance, stochastic optimization, etc...

Objectives:
To understand and manipulate fundamental key concepts and objects such as filtrations, stopping times, martingales, Markov chains and Brownian motion.
To be able to write proofs of the properties attached to these objects and solve basic exercises.

Course Outline
1. Introduction to stochastic process
   Collection of random variables, trajectories, continuous versus discrete time
   The law of a stochastic process, measurability issues
   Filtrations as modeling of “information”, Stationarity.
2. Conditional expectations and Gaussian vectors
   Conditional expectation w.r.t. a sigma field, w.r.t. a random variable, Jensen inequality. Conditional expectation as orthogonal projection, linear conditional expectation. Conditional expectation of Gaussian Vectors.
3. Martingales in discrete time
   Gambling games, sub-, super-martingales, examples, transformations, properties
   Doob’s decomposition, Stopping times, Optional stopping theorems, convergences
4. Markov chains in discrete time
   Examples, the Markov property, computation of (conditional) probabilities, transition matrices, classification of states, hitting times, absorption probabilities, recurrence and transience, invariant distribution and ergodic theorems.
5. Brownian Motion
   History, Definitions, properties, transformations of BM, Markov properties, Martingales related to the Brownian motion, applications in financial markets.
6. Applications to computations of ruin probabilities in Cramer and Lundberg’s Ruin Theory in insurance, and/or Kelly's optimal investment strategy in repeated gambles, if time permits.

Requirements
Good background on Measure theory, Lebesgue’s integration and measure-theoretic probability covered in any decent probability theory book such as Resnick’s A probability path, chapters 1-5 or Barbe & Ledoux Probabilité chap 1-4

Bibliography
Course notes will be provided. Other relevant books are:
Williams. Probability with martingales.
Resnick, A probability path.
Norris, Markov chains.
Baldi, Mazliak, Priouret, Martingales et chaînes de Markov

**GRADING POLICY**
Midterm: 40%.
Final exam: 60%.
OBJECTIVES
To learn some basic principles of numerical optimization and linear algebra.

COURSE OUTLINE

REQUIREMENTS
Linear algebra and some basic principles of analysis

BIBLIOGRAPHY
Introduction to Numerical Linear Algebra and Optimization, Philippe Ciarlet.
Analyse Numérique et Équations Différentielles, Jean-Pierre Demaillie

GRADING POLICY
One midterm (40%) and a final exam (60%).
The objective of this course is to obtain a thorough knowledge of programming in applied statistics and a mastery of the R platform used for this course. Which includes both aspects of import and processing of data in the form of different structures, the use of the basic functions of the platform, the use of graphical tools and algorithms in R for development functions in R.

**COURSE OUTLINE**

Introduction to R  
Variables and data  
Files manipulation  
Generation of regular and random sequences  
Indexing system  
Matrix computation  
Graphics  
Algorithms (data structures, control structures, iterative structures)  
Functions and packages

**REQUIREMENTS**

No specific prerequisites

**BIBLIOGRAPHY**

An Introduction to R: http://cran.r-project.org/doc/manuals/R-intro.html

**GRADING POLICY**

Examination on computer (1/3)  
Final examination (2/3)
This course blends theoretical insights with historical narratives. It shows that the North-South specialization evolved since Columbus because of the differential availability of natural resources across the globe and the unrestrained use of military might. The oil market is then shown to hit the North back, with a vengeance.

**COURSE OUTLINE**

**Part 1: History of International Trade and its Distortions**

This part uses a small number of theoretical models to understand the historical pattern of international trade in the Post-Columbus age. It shows how technical progress in sea faring and governments’ interference dominated international trade in turn, ending up in a disastrous deglobalization before WW2.

It is split into three chapters as follows:

1. Sails and Guns after Columbus
2. The Rise and Fall of Free Trade
3. The Protectionist Road to Disaster

**Part 2: The Oil Market**

This part uses some key insights from the theory of exhaustible resources to explain why the oil market plays such a fundamental part in determining the macroeconomic performance of the industrialized countries. It uses bits and pieces from various sources, but some useful background information is provided in the undernoted.

It is split into three chapters as follows:

4. The Economic Impact of Oil Shocks in the North and in the South: theory.
5. What Determines the Price of Oil?
6. A History of the Oil Market and Petrodollars

**REQUIREMENTS**

**BIBLIOGRAPHY**


GRADING POLICY
OBJECTIVES

This course focuses on international trade with imperfect competitive markets and aims to answer the questions:

• What is globalization today?
• Why is there international trade?
• What are the determinants of the international pattern of specialization?
• Are countries better off with trade than they would be in its absence?

COURSE OUTLINE

PART 1: The theories of International trade

• Chapter 1: An overview of the traditional theory
• Chapter 2: A two-way trade of identical products: the reciprocal dumping problem
• Chapter 3: A two-way trade of differentiated products: the Chamberlinian monopolistic competition market
• Chapter 4: Models of Economic geography:
  — with mobile workers
  — with intermediate goods

PART 2: Strategic behaviors

• Chapter 1: Strategic trade policies: During trade liberalization, domestic authorities may use domestic policies (social, environmental..) to provide a substitute for tariffs or quotas and this emphasizes the strategic interactions between governments.
• Chapter 2: Firms’ strategic behavior: Firms may also react during trade liberalization in order to maintain their market power by choosing different market structure or different qualities etc.

REQUIREMENTS

A strong level in microeconomics and mathematics is required.
A test on student microeconomics knowledge will be organized at the beginning of the course.

BIBLIOGRAPHY
Part 1
Chapter 3: « Scale Economies, Product Differentiation and the Pattern of Trade » P. Krugman, 1980, AER 70, 950-959
Part 2

GRADING POLICY

Oral
Presentation of papers by students along the course
At the end of the course we expect the students to master the usual multivariate data analysis methods: understand the mathematical procedures, implement these procedures with both software SAS and R and interpret the results using real data sets.

The students are supposed to have a good knowledge of univariate and bivariate exploratory data analysis and have some basic knowledge on the software SAS and R. Mastering Principal Component Analysis and Clustering methods is a plus and students who never study these methods will have to make an additional effort during the first weeks of the course.

BIBLIOGRAPHY

An introduction to Applied Multivariate Analysis with R by B. Everitt and T.Hothorn, UseR!, Springer
Data Mining with Rattle and R by G. Williams, Use R!, Springer
Moodle UT1C web sites: logiciels statistiques and Vitrine de Statistique Appliquée

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**OBJECTIVES**

Give the main econometric tools (choice of model, estimation, tests) to perform an empirical study using time series, in order to understand dynamic relations between economic variables and forecast.

**COURSE OUTLINE**

Chap 1: Regression analysis with time series  
Chap 2: Univariate time series (ARMA process ; unit root tests)  
Chap 3: Multivariate time series (VAR process).

**REQUIREMENTS**

Regression analysis (OLS, GLS methods ; tests). Maximum likelihood method.

**BIBLIOGRAPHY**

Wooldridge: “Introductory econometrics”  
Hamilton: “Time series analysis”  
Stock and Watson: “Introduction to econometrics”

**GRADING POLICY**

Exam: 100%