
*MASTER IN INTERNATIONAL TRADE, FINANCE AND DEVELOPMENT REVIEW
COURSE IN MATHEMATICS, STATISTICS AND COMPUTATIONAL TOOLS*

2014-2015 ACADEMIC YEAR

INSTRUCTOR

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COURSE DESCRIPTION

This course is designed to refresh your memory on a number of mathematical concepts and statistical tools that are needed for the courses, such as constrained optimization, regression analysis and dynamical systems. You will also learn how to use MATLAB and STATA. Classes are scheduled from Monday, September 8th through Monday, September 22nd the mornings (10 -13 hrs.) and afternoons (15-17 hrs.) sessions, for a total of 50 hours. Exercises (with solutions) will be provided for you for practice. There will be a compulsory final exam on September 23rd.

REFERENCES

Given the diverse nature of this course, we will draw from a number of different references as we move along. I have starred those that you will definitely have to take a look at. The following list is subject to modifications.

Analysis Review:

*Martin J. Osborne, Mathematical methods for economic theory: a tutorial (2007),
<http://www.economics.utoronto.ca/osborne/MathTutorial/index.html>

Lawrence Blume and Carl P. Simon (1994), "Mathematics For Economists", W.W. Norton and Co., New York, London.

Probability and Statistics Review:

*James H. Stock and Mark W. Watson, Introduction to Econometrics - 2nd Edition (2007), Prentice Hall. (Chapters 1-5)
Woolridge, Jeffrey M., "Introductory Econometrics" Ed.4 (2009), South-Western

Computational Tools

Attaway, Sotrmay, "Matlab: A Practical Introduction to Programming and Problem Solving, Ed.2 (2012), Elsevier Inc.
*Franco-Pereira, Alba M. , An introductory course in MATLAB: MATLAB for beginners (2010),
http://webs.uvigo.es/alba.franco/eng/Tutorial_completo.pdf

Interactive Matlab Course, 2012-2013, Eindhoven University of Technology
<http://www.imc.tue.nl/Downloads/IMCpdf.pdf>

COURSE OUTLINE

1. Review of Analysis and Linear Algebra (19h)

1.1. Basics of Analysis (4h)

- Limits
- Continuity
- Differentiation
- Taylor's Rule
- Integration
- Total and Partial derivatives
- Implicit Function Theorem
- Concave and Convex Functions
- Homogenous Functions

1.2. Optimization (5h)

- Unconstrained Maximization
- Necessary Conditions for an Interior Extrema
- Sufficient Conditions for a Local Extrema
- Equality Constraints and Lagrange Multiplier Method
- Envelope Theorem
- Inequality Constraints and Kuhn-Tucker Method

1.3 Difference Equations (2hrs)

- First Order Difference Equation
- Second Order Difference Equation

1.4 Differential Equations (3h)

- Basics
- First Order Differential Equations
- Phase Diagrams, Saddle Paths and Stability
- Economic Applications

1.5 Linear Algebra (5hrs)

- Vector Spaces and Linear Transformations
- Matrix Operations
- Determinants and Invertible Matrices
- Eigenvalues and Eigenvectors
- Applications (time permitting)

2. Review of Probability and Statistics (15h)

2.1. Review of Probability (8h)

- Random Variables and Probability Distributions
- Expected Values, Mean and Variance
- Two Random Variables
 - o Joint and Marginal Distributions
 - o Conditional Distributions
 - o Bayes' Theorem
 - o The Law of Iterated Expectations

- o Independence
- o Covariance and Correlation
- o The Mean and Variance of Sums of Random Variables
- Random Sampling
- Large-Sample Approximations
 - o Convergence in Probability and Convergence in Distribution
 - o Law of Large Numbers
 - o Central Limit Theorem

2.2 Review of Statistics (4h)

- Properties of Estimators
 - o Unbiasedness, Consistency and Efficiency
- Hypothesis Testing
- The t-statistic and the p-value
- Confidence Intervals

2.3 Regression Analysis (3hrs)

- Ordinary Least Squares
- Properties of Estimators
- Maximum Likelihood

3. Computational Tools (16h)

MATLAB (6hrs)

- Basics: Command window, m-files, scripts, help menu
- Creating arrays
- For, If and While commands
- Functions
- Symbolic Toolbox

STATA (10h)

- Menu vs. Command vs. do files
- Creating empty datasets and copying/pasting data
- Importing data.
- Describing data
- Manipulating data
 - o Manipulating variables
 - o Sorting
 - o Recoding and Grouping
 - o Labelling variables and values
- Logical expressions
- Basic Statistical Routines
 - o Mean, Standard Deviation, Correlation
 - o t-tests
 - o Performing OLS with one variable and interpreting the results
 - o Post-estimation Commands
- Graphing
 - o Line graphs
 - o Scatterplots