Numerical Methods for Economics

Code:2ECON04 **Acronym:**MN

Keywords	
Classification	Keyword
OFICIAL	Mathematics
CNAEF	Mathematics

Instance: 2019/2020 - 1S

Active?Yes
Responsible unit: Agrupamento Científico de Matemática e Sistemas de Informação
Course/CS Responsible: Master in Economics

Cycles of Study/Courses

Acronym	No. of Students	Study Plan	Curricular Years	Credits UCN	Credits ECTS	Contact hours	Total Time
ME	9	Bologna Syllabus	1	-	7,5	56	202,5

Teaching Staff - Responsibilities

Teacher	Responsibility
José Abilio de Oliveira Matos	

Teaching - Hours

Theoretical and practical :3,00

Type	Teacher	Classes	Hour
Theoretical and practical	Totals	2	6,00
	José Abilio de Oliveira Matos		3,00
	Paulo José Abreu Beleza de Vasconcelos		3,00

Teaching language

Português/English (horários/schedules ME1 Português; ME3 English)

Objectives

This course deals with numerical methods for the solution of economic problems using a computer.

Emphasis will be on intuition and applicability conditions of methods and not on their deductibility and computer implementation.

The objectives of the course are:

- to provide students with the numerical and computational techniques necessary for the implementation and resolution of economic problems in a computer;
- to provide students with the tools required to run economical and financial simulations;
- for students to acquire awareness of the potential of this approach to solve large dimensional problems (or problems without a closed solution) as well as to point out the limitations of finite precision arithmetic.

Learning outcomes and competences

- Solve economic models by using computational numerical methods.
- Analyse economic models to identify the mathematical building blocks behind the model.
- Test for the most adequate numerical methods to tackle the mathematical building blocks from the economic models.
- Build algorithms to solve economic models.
- Adapt existing computer codes to solve new problems.
- Test computationally and discuss shock effects on the economic problems.
- Develop critical capacities in the analysis of data and simulations results.
- Summarize the advantages and limitations of finite precision arithmetic.

Working method

B-learning

Program

1. Introduction to MATLAB /OCTAVE.
2. Data analysis: finantial markets.
3. Finite precision arithmetic.
4. Linear Systems of equations: supply-demand models, IS-LM model, Mundell-Fleming model.
5. Systems of nonlinear equations: AS-AD model.
6. Eigenvalues and eigenvectors: dynamic IS-LM and AS-AD, duopoly, stability of dynamic systems.
7. Interpolation and least squares: compound interest rate.
8. Optimization: portfolio optimization.
9. Difference and differential equations: discrete dynamics of supply and demand models, with and without rational expectations, Solow and Ramsey-Cass-Koopmans models.
10. Stochastic simulation, Cramér–Lundberg (risk analysis).

Mandatory literature

Afonso, Óscar João Atanázio; Computational economics. ISBN: 978-1-138-85966-1
Moler, Cleve B.; Numerical computing with MATLAB. ISBN: 0-89871-560-1

Complementary Bibliography

Hendrick, David A.; Computational economics. ISBN: 0-691-12549-X
Judd, Kenneth L; Numerical methods in economics. ISBN: 0-262-10071-1

Teaching methods and learning activities

The course is organized in lab sessions, based on modules. The teaching methodology in each module is structured as follows:

- description of the problem to solve;
- identification with explanation of the appropriate numerical methods for their resolution;
- examples of application in economics;
- exercises and simulation (sedimentation and knowledge exploitation).

Software

R
Jupyter
Python
OCTAVE
MATLAB

Evaluation Type

Distributed evaluation without final exam

Assessment Components

Designation	Weight (%)
Teste	30,00
Trabalho laboratorial	70,00
Total:	**100,00**

Amount of time allocated to each course unit

Designation	Time (hours)
Estudo autónomo	27,00

Frequência das aulas	39,00
Trabalho laboratorial	12,00
Total:	**78,00**

Eligibility for exams

Evaluation will be based on the achievement of:

i. 2 projects held during the semester;
ii. 2 short assessments.

Calculation formula of final grade

35% P1 + 35% P2 + 15% SA1 + 15% SA2 where: P - Project and SA - Short-Assessment.