Universitat de Lleida

DEGREE CURRICULUM

MODELING, SIMULATION AND APPLIED STATISTICS

Coordination: RIUS TORRENTO, JOSEP MARIA

Academic year 2023-24

MODELING, SIMULATION AND APPLIED STATISTICS 2023-24

Subject's general information

Subject name	MODELING, SIMULATION AND APPLIED STATISTICS
Code	102492
Semester	1st Q(SEMESTER) CONTINUED EVALUATION

Typology	Degree	Course	Character	Modality
	Bachelor's degree in Industrial Organization and Logistics Engineering	4	OPTIONAL	Attendance-based

Course number of credits (ECTS)	6

Type of activity, credits, and groups	Activity type	PRAULA	TEORIA
	Number of credits	3	3
	Number of groups	1	1

Coordination	RIUS TORRENTO, JOSEP MARIA
Department	ECONOMICS AND BUSINESS
Teaching load distribution between lectures and independent student work	60 classroom hours and 90 hours of independent work.
Important information on data processing	Consult this link for more information.
Language	Catalan and Spanish
Distribution of credits	3 theoretical credits and 3 practical credits.

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
RIUS TORRENTO, JOSEP MARIA	josep.riustorrento@udl.cat	6	

Subject's extra information

This course requires continuous work throughout the semester in order to achieve the objectives set. It requires critical thinking and capacity for abstraction.

It is recommended to visit the Virtual Campus space associated with the course frequently, since all the corresponding information is announced there and the material with which the subject will be developed will be published before the beginning of each topic.

Learning objectives

- Use the appropriate econometric terminology and recognize the data and the econometric techniques to correctly specify an econometric model.
- Estimate and validate an econometric model.
- Read adequately the information provided by an econometric model.
- Apply the results of an econometric model in decision making.
- Introduce the student to simulation methods in general and discrete events in particular.
- Show a set of simulation methods and techniques with applications in systems analysis and management.
- To highlight the advantages that simulation methods bring to the resolution of certain mathematical problems and to optimize complex systems, as well as assess the importance of good programming.
- Introduce some computer tools that can help to raise and solve practical problems of optimization using simulation techniques.

Competences

Competencias básicas

- **B02**. That students know how to apply their knowledge to their work or vocation in a professional manner and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.
- **B05**. That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

Competencias generales

- **CG3**. To synthesize basic and technological subjects, which enable them to learn new methods and theories, and provide them with versatility to adapt to new situations.
- **CG10**. To work in a multilingual and multidisciplinary environment.

Competencias específicas

- **CE18**. To acquire capacity for planning and developing new projects, products and processes.
- **CE22**. To acquire capacity to design enterprise information systems.
- **CE25**. To acquire capacity to calculate and analyze costs.
- **CE28**. To acquire capacity to design and optimize industrial plants and productive processes.
- **CE30**. To acquire capacity to supply chain management.
- **CE31**. To acquire capacity for production planning and control, maintenance program implementation and perform statistical process control.

Competencias transversales

- **CT3**. To implement new technologies and technologies of information and communication.

Subject contents

Lesson 1. Introduction to econometrics

- Objectives of econometrics
- Modeling Phases of econometric research
- Econometric methodology

Lesson 2. Linear regression model

- Basic simple and multiple linear regression model
- Hypothesis formulation of the multiple linear regression model
- Ordinary least squares estimators
- Contrasts of hypothesis in the model
- Prediction and analysis of results
- Structural permanence
- Qualitative exogenous variables. Fictional variables.

Lesson 3. Specification errors and multicollinearity

- Validation of the model
- Specification errors in the variables
- Definition, consequences and detection of multicollinearity
- Possible solutions to high multicollinearity
- Atypical and influential observations

Lesson 4. Introduction to simulation and operational research

- Simulation as systems modeling
- Relationship between optimization and simulation. Advantages and disadvantages
- Statistical simulation and simulation of discrete events. Classification

Lesson 5. The simulation

- Stages of the development of a simulation study
- Software for simulation
- Conducting simulation studies. Formulation, data collection, variability and generation of random values
- Analysis of results

Lesson 6. Approach, resolution and study of solved examples

- Stock control
- QA
- Investment analysis
- Queue models
- Budget Control
- Project control
- Sales prediction
- Portfolio control and asset valuation

Methodology

Each week the student will attend to four hours of virtual and classroom lectures. Two of them will be held in the classroom, where the theoretical contents of the subject will be presented, combined by practical examples and methods for problem solving.

As support material for the lectures, we will use slides provided to the students through the virtual campus. Also, computer software will be used to solve the problems and practical examples.

Development plan

Week	Activities	Personal Study
1	*Introduction*	
2-4	*Lectures*	4 h/week. Personal study and problems resolution
5-7	*Practical Cases*	4 h/week. Personal study and problems resolution
8	*Project Presentation*	8 hours. Preparing presentation
9	*Test*	8 hours. Test preparation
10-12	*Lectures*	4 h/week. Personal study and problems resolution
13-14	*Practical Cases*	4 h/week. Personal study and problems resolution
15	*Project Presentation*	8 hours. Preparing presentation
16-18	*Tutorship*	

19	*Recovery*	

Evaluation

Acr.	Evaluation Activities	Weigh	Minimum rate	Groupal	Mandatori	Recoverable
P1	*Project and talk*	15%	NO	NO	YES	NO
T1	*Test*	25%	NO	NO	YES	NO
PRA1	Practical cases 1	20%	NO	NO	YES	NO
PRA2	Practical cases 2	20%	NO	NO	YES	NO
FinalScore = 0,25*T1 + 0,25*P1 + 0,25*PRA1 + 0,25*PRA2						

Bibliography

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PULIDO, A. (1983). Modelos Econométricos. Ed. Pirámide

STOCK, J. ; WATSON, M (2012). Introducción a la Econometria. Ed. Pearson

BROOKS, R., ROBINSON, S. (2001) Simulation. Ed Palgrave.

HILLIER F. S., LIEBERMAN G.J. (2010) Introducción a la Investigación de Operaciones, 9ª ed. McGraw-Hill

LAW, A. M., KELTON, W. D. (2000): Simulation Modeling & Analysis. McGraw-Hill.

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