COURSE DATA

DATA SUBJECT

Code: 44163
Name: Quantitative methods in economy
Cycle: Master's Degree
ECTS Credits: 5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2203 - Master's Degree in Economic Policy and Public Economics	Facultat d'Economia	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2203 - Master's Degree in Economic Policy and Public Economics	Quantitative methods in economy	COMPULSORY

COORDINATION

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SUMMARY

The subject of Quantitative Methods in Economics is structured in two parts. In the first, Mathematical methods and models, the student should be able to manage systems of equations, optimization models, ordinary differential equations and difference equations as useful tools to analyze the static equilibrium and the behavior, over time, of any economic situation. To facilitate the calculation, computer programs will be used, which will also show the usefulness of the graphic descriptions. Special emphasis will be placed on the concept of stability that, with other formalities, will be handled in several master's subjects. Likewise, it will address how to analyze several dynamic systems that occur simultaneously.

The second part is dedicated to an introduction to multilevel analysis. It is intended that the student knows a series of quantitative analysis techniques that allow him to make the most of the information sources (questionnaires, databases, etc.) and the economic models; be able to choose the most appropriate one for the resolution of a certain research problem; be able to apply it rigorously; know how to extract all the information provided and, finally, be able to effectively communicate their results.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Basic knowlegdge of mathematics ans solid knowledge of the regression model ans statistical inference.

COMPETENCES / LEARNING OUTCOMES

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Aplicar eficazmente el software de análisis estadístico avanzado.

Capacidad para preparar, redactar y exponer en público informes y proyectos sobre política económica y economía pública de manera clara y coherente, defenderlos con rigor y tolerancia y responder satisfactoriamente a críticas sobre los mismos.

Comprender y utilizar de manera rigurosa un determinado método estadístico.

Desarrollar la capacidad crítica, impulsar la inquietud y el interés investigador; buscar, ordenar, analizar y sintetizar la información económica, seleccionando aquella que resulta pertinente para la toma de decisiones en política económica.

Desarrollar la capacidad de trabajo en equipo, coordinación de tareas, liderazgo y compromiso con el grupo en el desarrollo de actividades de análisis de los problemas económicos y sus soluciones.

Integrar las nuevas tecnologías de la información y de la comunicación en su labor profesional y/o investigadora relacionada con el análisis de la intervención del estado en la economía.

Interpretar y comunicar los resultados derivados de la aplicación de un determinado método estadístico.

Saber cómo proyectar sobre problemas concretos sus conocimientos y saber resumir y extractar los argumentos y las conclusiones más relevantes para su resolución.

Saber participar en debates y discusiones, dirigirlos y coordinarlos y ser capaces de resumirlos y extraer de ellos las conclusiones más relevantes y aceptadas por la mayoría.

Ser capaz de definir, expresar y resolver de forma sistemática problemas económicos complejos.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

Tomar decisiones tanto individuales como colectivas en su labor profesional y/o investigadora relacionada con la resolución de problemas propios de la política económica y la economía pública.

Valorar la técnica de análisis cuantitativo avanzada más adecuada en función del problema económico a resolver.

DESCRIPTION OF CONTENTS

1. Introduction and static analysis

Mathematics and Economy
Statics, comparative statics and dynamics
Introduction to Mathematica
Static analysis through systems of equations
Static analysis through mathematical optimization
Exercises

2. Dynamical Analysis in discrete time

First order difference equations
Solution with Mathematica of a first order difference equation
Stationary equilibrium and dynamic stability of the equilibrium
Systems of difference equations
High order difference equations
Examples of economic models and exercises

3. Continous dynamic analysis

First order differential equations
Solution with Mathematica of a first order differential equation
Stationary equilibrium and dynamic stability of the equilibrium
Systems of differential equations
High order differential equations
Examples of economic models and exercises

4. Basic elements of multilevel analysis

The empty random intercept model
Perturbation and residual variance
Applications and interpretation

5. Models with fixed effects predictors

Model with an aggregate level predictor.
Model with a fixed-slope individual-level predictor.
Models with an aggregate predictor and a fixed-slope individual predictor

6. Models with predictors of random effects

Model with random intercept and random slope.
Application and interpretation.
Extensions of multilevel analysis

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	25,00
Seminar	25,00
Total hours	**50,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	5,00
Independent study and work	15,00
Preparation of lessons	27,50
Preparation for assessment activities	7,50
Resolution of case studies	20,00
Total hours	**75,00**

TEACHING METHODOLOGY

The master class with active participation will be the teaching-learning method used to transmit the theoretical content of the subject. This methodology will allow to take advantage of the master class and favor the participation of the students and the teacher-student interaction. The empowerment of the

participation and the discussion in the class in necessary so that the student is directly involved in the learning of the content.

When the content of the class is of a practical nature, the teacher will propose to the students practical cases (real -based on the reading and discussion of published scientific articles- or fictitious -based on a databank-) that they must solve by applying the concepts learned in theoretical classes. The practices will be developed following different teaching strategies according to the theoretical contents discussed, although fundamentally they will be based on the resolution of problems and simulation of scenarios.

Likewise, in the practical sessions the professor will propose one or several activities to be solved by the students that will cover the different subjects of the subject, with the purpose that the student acquires the competences enumerated in this academic guide. These activities will be part of the evaluation of the subject.

EVALUATION

The evaluation of the subject will distinguish the part of Mathematics and the part of Statistics. It is necessary to pass each part separately to calculate the final grade of the subject, which will be the simple mean of the final grade of each part.

The evaluation of the Mathematics part will be continuous and will consist of 2 exams taken in the classroom during the last 30 minutes of the 5th and 10th class. The exams will take the form of tasks and/or questionnaires that are sent through the virtual classroom. To obtain the final grade through continuous assessment, each exam must be passed and the simple mean of the two grades is the final grade, so the mathematics part can be passed through continuous assessment. In case of suspending any of the two exams, the final exam of both the first and the second call will serve as a recovery of the suspended part(s).

The continuous assessment of the Statistics part will take into account the resolution of practices and exercises by the student. These exercises will be aimed at writing a research report at the end of the semester. There will also be a test of objective knowledge of the subject.

REFERENCES

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