Faculty of Economic, Social and Political Sciences

ECGE1214   Mathematics in Economics and Management

[30h+15h exercises] 4 credits

Teacher(s):	Paul Henrard
Language:	French
Level:	First cycle

Aims

This third Mathematics course follows on from the Mathematics and Logic, and Mathematics and Analysis courses, and is devoted mainly to algebra and matrix calculus, linear programming and difference and differential equations. The course has two main objectives:
- students should learn how to use the apparatus of Mathematics (which implies acquiring a whole body of knowledge). This means they should develop a reasonable ability to manipulate the notions studied in class, notions which are fundamental in the quantitative models and methods used in the Social Sciences.
- Students should acquire formalised and rigorous methods of reasoning (a more demanding goal and one which requires an ability to apply mathematical modelling skills)

Main themes

The teaching focuses on modelling skills and on solving applications and problems in Economic, Political and Social Science through the use of mathematical methods and formal logic. It aims to equip students with a systematic approach to problem analysis and solution, prompting them to ask questions such as: how can this problem be expressed in quantitative terms, which model correctly represents the question put? which are the most useful instruments to use? Have the application conditions been adhered to? How can the tools be used to solve the problem, how can the model be solved? What is the answer to the question first put (in the context of the initial question, not in terms of mathematical abstraction or logic)?
Part 1: Linear algebra.
Linear independence, bases. Eigen values and vectors. Quadratic forms. Diagonalisation.
Part 2: Analysis and Optimisation of multi-variable functions
Implicit function theorem, higher order partial derivatives, Hessien matrix. Free optimisation and optimisation with constraints (equalities and inequalities): necessary and sufficient conditions of optimality, local extremes, comparative statics and envelope theorem.
Part 3: Introduction to linear programming.
Modelling and mathematical formulation of decision-making and optimization problems. Primal simplex, dual simplex, economic interpretation of the dual, sensitivity Analysis.
Each topic is discussed using examples and illustrations from Economic and Management Science.

Content and teaching methods

The course comprises:
- lectures (the teacher defines the concepts, demonstrates results, and illustrates them using concrete applications),
- practical exercise sessions (the teacher gives students applications/problems to solve and suggestions possible means of solving them),
- active student participation through reading, independent problem solving, case reports, tests

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Course entry requirements: Students should have taken the Mathematics and Logic and Mathematics and Analysis courses.
Evaluation: The evaluation takes into account the reports submitted during the course, the results of the tests and the results of a written examination.

Other credits in programs

ECGE12BA	Deuxième année de bachelier en sciences économiques et de gestion	(4 credits)	Mandatory
STAT21MS	Première année du master en statistique, orientation générale, à finalité spécialisée	(4 credits)	
STAT21MS/DM	Première année du master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(4 credits)	
STAT21MS/EA	Première année du master en statistique, orientation générale, à finalité sécialisée (économie et assurance)	(4 credits)	
STAT21MS/MM	Première année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(4 credits)	
STAT21MS/MS	Première année du master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(4 credits)	
STAT21MS/ST	Première année du master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(4 credits)	
STAT22MS	Deuxième année du master en statistique, orientation générale, à finalité spécialisée	(4 credits)	
STAT22MS/DM	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(4 credits)	
STAT22MS/EA	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (économie et assurance)	(4 credits)	
STAT22MS/MM	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(4 credits)	
STAT22MS/MS	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(4 credits)	
STAT22MS/ST	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(4 credits)	
STAT2MS	Master en statistique, orientation générale, à finalité spécialisée	(4 credits)	
STAT2MS/DM	Master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(4 credits)	
STAT2MS/EA	Master en statistique, orientation générale, à finalité spécialisée (économie et assurance)	(4 credits)	
STAT2MS/MM	Master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(4 credits)	
STAT2MS/MS	Master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(4 credits)	
STAT2MS/ST	Master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(4 credits)	