ECGE1111 Mathematics and Analysis

[30h+30h exercises] 5 credits

Teacher(s): Raouf Boucekkine, Yves Félix
Language: French
Level: First cycle

Aims

This second Mathematics course follows on from the Mathematics and Logic course. The course's main focus is the study of real and multi-variable functions and optimization problems with or without constraints. 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 resolution so that they spontaneously go through a list of 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 : Real Functions with a real variable: review and extension
Higher order derivatives. Linear approximations (differential) and polynomials (Taylor model). Convexity. Integration.
Part 2 : Introduction to matrix calculus
Matrices. Matrix operations, product and composite, scaling, companion matrices. Linear system resolution, level, indetermination. Determinant. Inverse, Vectors. Right angles and planes in R^2 et R^3.
Part 3 : Introduction to functions of complex variables
Functions of two variables, representation, level (isoquants). Partial derivatives, multi-variable functions , economics applications. Comparative statics tools: chain derivation rule, partial elasticity and substitution, Differentials. Optimisation without constraint: optimal conditions and multi-variable optimisation.
All these topics are taught using examples and illustrations from Economic Science and Management.

Content and teaching methods

The course is made up of :
- lectures (where the teacher defines the concepts, demonstrates the results and illustrates them with a concrete application),
- practical exercise sessions (where the teacher puts applications and problems to the students and suggest possible ways of solving them),
- work carried out by the student in the form of reading, independent problem-solving, reports on case resolutions and tests

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

Course entry requirements: students must have completed the Mathematics and Logic course
Evaluation: Evaluation is both by continuous assessment (reports on case resolutions, test results) and by written exam.

Programmes in which this activity is taught

STAT2MS	Master en statistique, orientation générale, à finalité spécialisée	

Other credits in programs

ECGE11BA	Première année de bachelier en sciences économiques et de gestion	(5 credits)	Mandatory
STAT21MS	Première année du master en statistique, orientation générale, à finalité spécialisée	(5 credits)	
STAT21MS/DM	Première année du master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(5 credits)	
STAT21MS/EA	Première année du master en statistique, orientation générale, à finalité sécialisée (économie et assurance)	(5 credits)	
STAT21MS/MM	Première année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(5 credits)	
STAT21MS/MS	Première année du master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(5 credits)	
STAT21MS/ST	Première année du master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(5 credits)	
STAT22MS	Deuxième année du master en statistique, orientation générale, à finalité spécialisée	(5 credits)	
STAT22MS/DM	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(5 credits)	
STAT22MS/EA	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (économie et assurance)	(5 credits)	
STAT22MS/MM	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(5 credits)	
STAT22MS/MS	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(5 credits)	
STAT22MS/ST	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(5 credits)	
STAT2MS	Master en statistique, orientation générale, à finalité spécialisée	(3 credits)	
STAT2MS/DM	Master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(5 credits)	
STAT2MS/EA	Master en statistique, orientation générale, à finalité spécialisée (économie et assurance)	(5 credits)	
STAT2MS/MM	Master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(5 credits)	
STAT2MS/MS	Master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(5 credits)	
STAT2MS/ST	Master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(5 credits)	