SESP1112 Mathematics and Logic

[30h+15h exercises] 3 credits

Teacher(s): Etienne Loute, Yves Pochet
Language: French
Level: First cycle

Aims

This first Mathematics course is devoted mainly to the study of mathematical modelling, real numbers, plane geometry and the real functions of a real variable. 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)
Another function of this course is to bring all students up to the same level, as not all students acquire the same amount of knowledge at secondary school. For some students, this will involve revising their Mathematics skills within the specific context of the Social Sciences, for the others, it will involve bringing their general Maths skills up to scratch.
The course teaches mathematical formalisation in the Economic, Political and Social Sciences.
The teaching focuses on modelling skills and on resolving 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 problem-solving, 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 tools 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)?

Main themes

Part 1: Mathematical modelling.
Formalisation and mathematical modelling.
Part 2: Sets, Relations and Elements of formal logic
Sets. Operations on sets. Number sets. Relations. Typology and properties of relations. Propositions. Logical operators. Tautologies, contradictions, logical implication. logical equivalence. quantifiers. theorems and methods of demonstration.
Part 3: Plane Geometry and Charts
Right angles. Equations and Inequations. Function graphs.
Part 4: Real functions of a real variable, elements of analysis.
Function. Limits. Continuity. Derivatives. Derivative applications. Function optimisation of a variable.
Power, polynomial and exponential functions and logarithms.

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 resolution reports and tests

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

Course entry requirements: The course does not have any entry requirements other than the knowledge acquired during a Mathematics programme of at least 4 hours per week in the final years of secondary school.
Evaluation: The evaluation takes into account the resolution reports submitted during the course, the results of the tests and the results of a written examination.

Other credits in programs

ECGE11BA	Première année de bachelier en sciences économiques et de gestion	(3 credits)	Mandatory
HUSO11BA	Première année de bachelier en sciences humaines et sociales	(3 credits)	
SOCA11BA	Première année de bachelier en sociologie et anthropologie	(3 credits)	
SPOL11BA	Première année de bachelier en sciences politiques	(3 credits)	
STAT21MS/DM	Première année du master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(3 credits)	
STAT21MS/EA	Première année du master en statistique, orientation générale, à finalité sécialisée (économie et assurance)	(3 credits)	
STAT21MS/MM	Première année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(3 credits)	
STAT21MS/MS	Première année du master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(3 credits)	
STAT21MS/ST	Première année du master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(3 credits)	
STAT22MS/DM	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(3 credits)	
STAT22MS/EA	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (économie et assurance)	(3 credits)	
STAT22MS/MM	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(3 credits)	
STAT22MS/MS	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(3 credits)	
STAT22MS/ST	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(3 credits)	