UCLouvain

linge1113

2023

Probability

4.00 credits	30.0 h + 15.0 h	Q2

Teacher(s)	Segers Johan ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	The course covers traditional aspects of the probability theory but examines the concepts from the point of view of their use in statistical analysis. The probability model is described, as are the basic properties of probabilities. Then experiments are considered where the feature of interest can be modelled by a random variable (discreet, continuous, uni- and multivariate). The analysis of the random variable functions is presented and justified by its use in the analysis of statistic sampling distributions. The importance of the Central Limit Theorem is also highlighted.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 The course introduces students to the method of probabilistic reasoning and statistical analysis. These methods are useful in all fields of science which make use of random and/or experimental data (human, technical, medical and natural sciences). Particular emphasis will be laid on equipping students with the tools for studying Management Science and Economic and Management Science. By the end of the course, students should be able to understand and model the random aspects of certain simple experiments and calculate the probabilities of events of interest. They should also be able to apply these models to more complex real situations and to describe these phenomena by means of suitable random variables (uni - and multivariate). Students will also be shown how to study the properties of random variable functions and how these concepts lend themselves to application within the framework of the statistical analysis (sampling).
Evaluation methods	• Written exam (on paper or on a computer). Exercises (multiple choice and/or numerical and/or open questions). • An optional test (with exercises in multiple choice and/or numerical and/or open questions) covering exercises on the first part of the course material takes place during the course itself (if the sanitary situation allows it). Students performing well on the test can skip a number of questions at the exam.
Teaching methods	• Lectures: the teacher introduces the concepts through an application and then presents the abstract form • Exercise sessions: the teacher gives students problems to solve and encourages them to look for the solutions themselves
Content	• Introduction to statistics • The probability model: calculating probabilities, conditional probabilities, combinatorics • Discrete random variables, including the binomial, geometric and Poisson distributions • Continuous random variables, including the uniform, exponential and normal distributions • Discrete and continuous random vectors: marginal, conditional and joint distributions; correlation • Transformations of random variables: order statistics, sums • Random sampling and the central limit theorem: empirical mean and variance, approximation of the binomial distribution by the normal one
Inline resources	A list of formulas, additional exercises, solutions of exercises covered in the tutorials, and links to some useful websites are available on the MoodleUCL course page.
Faculty or entity in charge	ESPO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Data Science : Statistic	DATS2M	4		
Bachelor : Business Engineering	INGE1BA	4		
Minor in Statistics, Actuarial Sciences and Data Sciences	MINSTAT	4		