UCLouvain

becge1132

2023

Descriptive Statistics and probability

4.00 credits	30.0 h + 22.5 h	Q2

Teacher(s)	Uyttendaele Nathan ;
Language :	French
Place of the course	Bruxelles Saint-Louis
Learning outcomes	**At the end of this learning unit, the student is able to :** The fundamental purpose of statistics is to derive results from a sample that are valid for the entire population. This inductive approach is called "Statistical Inference". In a preliminary stage, the sample must be simplified by representing it, without losing too much information, by means of graphs and tables that are as adequate as possible and reducing it to a few numbers that describe it. This is the role of Descriptive Statistics which constitutes the first part of the course. In order to go beyond the simple description of the sample and to draw valid conclusions about the underlying population, one must make additional hypotheses about the way in which the sample data were generated; this is the role of Probability Theory, which provides this indispensable tool for any inferential approach. This inductive approach introduces uncertainty; probability theory also allows us to attach a measure of reliability to any inferential conclusion. The second part of the course will therefore be an introduction to probability. The aim of the first part of the course is to familiarize students with the first tools of Descriptive Statistics; tools which they are confronted with on a daily basis, if only because of the media, which makes great use of them. Inaddition to its interest in describing a state of affairs or a sample, Descriptive Statistics provides an easy introduction to Probability Theory. The second part of the course aims at introducing the probabilistic reasoning mode. At the end of this course, students should be sufficiently comfortable in understanding and manipulating Descriptive Statistics and Probability (simple) to be able to take the Applied Statistics course in BLOC2; Descriptive Statistics and Probability are the first steps and are treated as such.
Evaluation methods	A mock test will be organized in May. It will allow students to identify their strengths and weaknesses in Descriptive Statistics and Probability. This mock exam will not only familiarize students with an online assessment on Moodle but will also prepare them for the assessments organized in the course in June and/or August. Students who score 12 points or more on the mock exam will be eligible to receive 1 bonus point on their June and/or August exams. No mock exams will be given during the summer before the last session in August. The certification evaluation will take place in June and August, either in person or online on Moodle; you will be informed very quickly whether you will take the in-person or remote exam on Moodle. If the exam is to be held on Moodle, it will be based on integrated questions as in the May mock exam; these integrated questions on Moodle allow for an exam that is as close as possible to the in-person exams. Whether it is organized face-to-face or remotely on Moodle, this type of exam allows us to assess the student's mastery of the technical and computational aspects of the course, his or her rigor in this area, his or her ability to interpret the results obtained and to evaluate his or her reasoning. Such an evaluation questions not only the understanding of the course acquired by the student (understanding its concepts and their applications in exercises and knowing how to interpret the results) but also requires the ability to go a little beyond the material seen in the course and in the practical work, by his own means. In other words, it is a matter of making the effort to appropriate the course material in order to use it. The June and/or August evaluation will in no way be an exact replica of the mock exam. It is not enough to just concentrate on the mock exam and on the practical exercises and hope to discover the same (or almost the same) on the exam; this is totally insufficient. During the evaluations, students will be able to use a form, the statistical tables and their calculator (not alpha-numeric). Whenever possible, such an online assessment on Moodle will be done in the computer lab at Saint Louis University with the student's computer. If a student does not have such equipment, they may request it from the University. Remark: This course outline may evolve, as the course progresses, according to the dynamics with the students and from year to year according to the improvements made to the course and the practical exercises.

Teaching methods	The lecture and the practical work are given in person; however, the course and the practical work will also be the subject of video clips, exchange of documents with detailed solutions of the practical work, Question/ Answer sessions on Teams and exchanges on the Moodle digital platform to which the students are obliged to subscribe. Communications and instructions for the course and the tutorials will be sent to students by email via announcements sent from Moodle. Each week, videos corresponding to the week's course will be sent via Moodle. Watching the videos of the week before the lecture and before the lab effectively prepares you for the lecture and the lab and allowsyou to take full advantage of them; that is to say, watching these videos in advance eliminates the need to cumulate the effort of noting what is said in the lecture and/or the lab with that of understanding it. a) The lecture is a systematic introduction to the methodological foundations of Descriptive Statistics and the theoretical foundations of Probability; it is accompanied by examples chosen mainly from the field of economics and management and intended to illustrate this theory. A particular effort is made throughout the course, the practical exercises and also the videos of the course to involve the students in the elaboration and discovery of the new concepts and their applications. Students are expected to participate actively in the course, in the practical exercises, in the Q/R sessions or by watching a video, in order to be able to take full advantage of the practical work that completes the lecture and to be, from the outset, involved in a research process. b) The practical work, taught by Mrs. Véronique Tissot and Mr. Jérôme Dollinger and Ilyass Zeamari, in charge of the practical work (TPs), is based on a collection of exercises that are constantly evolving. The assistants who supervise this course will agree on a set of dynamic hybrid pedagogical devices, that is to say, in face-to-face and remote learning; videos, Q&A sessions on Teams, solutionnaires for the proposed exercises, etc. These different devices will be organized according to a chronology designed to put students to work from the beginning of the course. c) An active and participative attitude in the course and in the practical work as well as participation in the Q&A sessions are essential; the chances of success depend on it. It is absolutely essential that students get into the rhythm of the course from the beginning of the semester by participating each week in the lecture and the practical exercises and even by anticipating the lecture and the practical exercises by watching the video clips as they are provided. Each student must therefore devote sufficient personal study time to ensure that he/she understands and appropriates the material, with the help of the lecture, the course slides and the pedagogical devices relating to the practical exercises, not forgetting the video clips. At the end of the semester, the period preceding the exam should not be a period of discovery but rather a period of revision of a previously understood and acquired subject. The personal work expected is in no way rote memorization. What will be evaluated at the exam is not the student's ability to reproduce, but rather his or her in-depth understanding of the concepts and explanatory mechanisms and his or her ability to use them wisely. Other reference books, available at the University Library or online, are offered to students as a complement for their more or less formalized aspect and/or for their panoply of exercises, solved or not.
Content	Introduction: (Chapter 1). First Part: Descriptive Statistics: (Chapter 2). 1) Frequency distributions and Charts; 2) Distribution center; 3) Dispersion of a distribution; 4) Linear Transformation; Second Part: Theory of Probability 5) Probabilities: Frequency approach, Axiomatic approach and symmetric Probabilities, Conditional Probabilities (Chapter 3); 6) Probability Distributions: discrete case (Bernoulli, Binomial, Uniform, Poisson, Geometric and Hypergeometric distribution theories); Density Functions: continuous case (Uniform, Normal and Exponential distribution theories) Random Variable Functions, Mathematic Expectation (Chapter 4); 7) Random Variables Coupling (discrete case): Joint, Marginal and Conditional distributions and their moments, Covariance, Correlation and Linear Combination of two random variables (Chapter 5).
Bibliography	- Comte M. et J. Gaden, Statistiques et Probabilités pour les sciences économiques et sociales, Collection Mayor, PUF, 1ère édition, 2000. - Wackerly D. D., Mendenhall W and R.L. Scheaffer, Mathematical Statistics with Applications, Duxbury Press, 7th ed., 2008. - Mendenhall W, Beaver R. J. and B. M. Beaver, Introduction to Probability and Statistics, Duxbury Press, 14 ed. 2012. - Ross S. M., Initiations aux Probabilités, traduction de la 4ème édition américaine, Collection : Enseignement des Mathématiques, Presses polytechniques et universitaires normandes. - Ross S., A first course in Probability, Pearson International Edition, 9th ed., 2013. ISBN-10: 1292024925. - Wonnacott T. H. and R. J. Wonnacott, Statistique: Economie - Gestion - Sciences - Médecine (avec exercises d'application), Paris, Economica, 4ème ed. 2000. - Howell D. C., Statistique en Sciences Humaines (M. Rogier, traduction française), Edition Deboeck, 2008. - Bouget D. et A. Viénot, Traitement de l'Information : Statistique et Probabilités, Edition Vuibert, 1998. Il existe une panoplie de livres en français comme en anglais qui reprennent cette matière de base de la statistique et qui sont assortis d'exercices résolus ou non. Certains se trouvent à la bibliothèque ESPO de l'université. De plus, Internet regorge de cours de statistique, plus ou moins poussés, et de documents expliquant des concepts ou des chapitres de ce cours. Une série de vidéos sur YouTube, intitulées « La Statistique expliquée à mon chat » du Statisticien Nathan Uytthendael, permettent une approche aussi sérieuse que ludique de certains concepts statistiques. À certaines occasions, elles seront utilisées au cours-même. - Dehon C., J.-J. Droesbeke et C. Vermandele, Eléments de Statistique, Edition Ellipses Marketing, Collectio

Other infos	A syllabus, an exercise book, a form, statistical tables, additional references.
Faculty or entity in charge	ESPB

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Bachelor in Economics and Management	ECGB1BA	4		
Bachelor in Economics and Management (French-English)	ECAB1BA	4		
Bachelor in Economics and Management (French-Dutch-English)	ECTB1BA	4		