UCLouvain

lstat2320

2021

Design of experiment.

5.00 credits	22.5 h + 7.5 h	Q2

Teacher(s)	Bogaert Patrick ;Govaerts Bernadette ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	- Experimental cycle and strategies - Linear regression as a tool to analyse the results of a designed experiment - Problem formalisation and qualities of an experimental design - Factorial designs and derivatives - Designs for the estimation of response surfaces - Optimal designs - Experimental design as viewed by Taguchi - Designs for mixture experiments - Simultaneous optimisation of several responses - Simplex and EVOP methodology to optimise one response
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 At the end of the course, the student will be awared of the interest of using a methodology to design experiments that provides a maximum information at the lower cost. He will gain knowledge on different possible classes of experimental designs and on the statistical methods available to analyse experiment results.
Evaluation methods	The course exam grade is based on: 1. Mandatory completion of assignments during the quadrennium. 2. Participation in several quizzes during the term. 3. A written exam on the course content ("theory" and methodological exercises). 4. For the students who follow the complete course: the realization of an applied project (by groups of 2 students) + an oral exam and discussion of the work (by group) 5. For students taking the LSTAT2320A part of the course only: a JMP test in the computer room For students taking the full course, the exam counts for 12/20, the work (+ oral exam) for 6/20, the quizzes and homework for 2/20. For students taking Partim A, the exam counts for 14/20, the JMP test for 4/20, the quizzes and homework for 2/20.
Teaching methods	Lectures (22.5h) • Methods presentation on the basis of real-life situations. • Formal but intuitive discussion of theoretical concepts and formulae for most methods. • Interpretation of software outputs and use of the JMP software in class. • Interactive lectures: students are encouraged to participate during the course. Computer labs (15h) • Case studies on JMP, methodological exercises, and JMP Output interpretation. Homework and projects • The student is invited to prepare each week an exercise, a quiz or a small project in order to apply and integrate course content.
Content	The themes discussed in this course are : • Experimental cycle and strategies • Linear regression as a tool to analyze the results of a designed experiment • Simultaneous optimization of several responses • Problem formalization and qualities of an experimental design • Screening designs • Factorial designs and derivatives • Designs for the estimation of response surfaces • Optimal designs • Designs for mixture experiments • Blocking. • Designs for the estimation of variance components.
Inline resources	See the Moodle site: : https://moodleucl.uclouvain.be/mod/page/view.php?id=537330

Bibliography	• Box G. et Draper N. et H. Smith [1987], Empirical Model-Building and Response Surfaces, Wiley, New York • Khuri A. et Cornell J., [1996], Response surfaces : designs and analyses, Marcel Dekker. • Myers R.H., Douglas C. Montgomery [2002], Response Surface Methodology: Process and Product Optimization Using Designed Experiments. Wiley • Et beaucoup d'autres possibles...
Other infos	Prerequistes Basis courses in statistics. Course in linear models. Evaluation: For all: written test on the course content and practical work. For those who follow the partim B: elaboration of a personal applied (in groups of 1 or 2) with oral discussion of work. Reference : Box G. et Draper N. et H. Smith [1987], Empirical Model-Building and Response Surfaces, Wiley, New York Khuri A. et Cornell J., [1987], Response surfaces : designs and analyses, Marcel Dekker. Myers R.H., Douglas C. Montgomery [1995], Response Surface Methodology: Process and Product Optimization Using Designed Experiments. Wiley
Faculty or entity in charge	LSBA

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Statistics: General	STAT2M	5		
Master [120] in Agricultural Bioengineering	BIRA2M	5		
Master [120] in Environmental Bioengineering	BIRE2M	5		
Master [120] in Statistics: Biostatistics	BSTA2M	5		
Master [120] in Biomedical Engineering	GBIO2M	5		
Approfondissement en statistique et sciences des données	APPSTAT	5		
Minor in Statistics, Actuarial Sciences and Data Sciences	MINSTAT	5		
Master [120] in Chemistry and Bioindustries	BIRC2M	5		
Certificat d'université : Statistique et sciences des données (15/30 crédits)	STAT2FC	5		
Master [120] in Data Science : Statistic	DATS2M	5		