UCLouvain

# lstat2320

*2019*

# Design of experiment.

In view of the health context linked to the spread of the coronavirus, the methods of organisation and evaluation of the learning units could be adapted in different situations; these possible new methods have been - or will be - communicated by the teachers to the students.

| 5 credits | 22.5 h + 7.5 h | Q2 |
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| 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 |
| Aims | 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.<br>- - - -<br>*The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".* |
| Evaluation methods | **Due to the COVID-19 crisis, the information in this section is particularly likely to change.**<br>The final evaluation is based on<br>• The participation in the homework.<br>• A written exam.<br>• A project.<br>• An oral discussion of the project. |
| Teaching methods | **Due to the COVID-19 crisis, the information in this section is particularly likely to change.**<br>Lectures (22.5h)<br>• Methods presentation on the basis of real-life situations.<br>• Formal but intuitive discussion of theoretical concepts and formulae for most methods.<br>• Interpretation of software outputs and use of the JMP software in class.<br>• Interactive lectures: students are encouraged to participate during the course.<br>Computer labs (15h)<br>• Case studies on JMP, methodological exercises, and JMP Output interpretation.<br>Homework and projects<br>• 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 :<br>• Experimental cycle and strategies<br>• Linear regression as a tool to analyze the results of a designed experiment<br>• Simultaneous optimization of several responses<br>• Problem formalization and qualities of an experimental design<br>• Screening designs<br>• Factorial designs and derivatives<br>• Designs for the estimation of response surfaces<br>• Optimal designs<br>• Designs for mixture experiments<br>• Blocking.<br>• Designs for the estimation of variance components. |

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| 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<br>• Khuri A. et Cornell J., [1996], Response surfaces : designs and analyses, Marcel Dekker.<br>• Myers R.H., Douglas C. Montgomery [2002], Response Surface Methodology: Process and Product Optimization Using Designed Experiments. Wiley<br>• 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 | Aims |
|---|---|---|---|---|
| Approfondissement en statistique et sciences des données | LSTAT100P | 5 | | |
| Minor in Statistics, Actuarial Sciences and Data Sciences | LSTAT100I | 5 | | |
| Master [120] in Chemistry and Bioindustries | BIRC2M | 5 | | |
| Master [120] in Biomedical Engineering | GBIO2M | 5 | | |
| Master [120] in Agricultural Bioengineering | BIRA2M | 5 | | |
| Master [120] in Data Science : Statistic | DATS2M | 5 | | |
| Master [120] in Statistic: Biostatistics | BSTA2M | 5 | | |
| Certificat d'université : Statistique et sciences des données (15/30 crédits) | STAT2FC | 5 | | |
| Master [120] in Statistic: General | STAT2M | 5 | | |
| Master [120] in Environmental Bioengineering | BIRE2M | 5 | | |