# LBIRA2101A

*2015-2016*

# Biométrie: analyse de la variance

| 3.0 credits | 22.0 h + 10.0 h | 1q |
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| Teacher(s) : | Draye Xavier ; Govaerts Bernadette ; El Ghouch Anouar ; |
| Language : | Français |
| Place of the course | Louvain-la-Neuve |
| Inline resources: | iCampus |
| Prerequisites : | Introduction to probability and statistics (typ. courses LBIR1203 and LBIR1204) |
| Main themes : | Quantitative data analysis methods in bioengineering ' Variance analysis with one and more classification factors, crossed or nested ' Generalised linear models (classification and regression factors) ' Random effect and mixed models ' Least square and maximum likelihood methods ' Analysis of categorical datas |
| Aims : | a. Contribution of this activity to the program learning outcomes<br>M1.3, M2.1, M2.3, M3.5, M4.4, M6.5<br><br>b. Learning outcome specifics for this activity<br>At the end of the course, the student facing a given experimental problem is able (using SAS) :<br>' to choose and write the equation of the statistical model suited to the experiment and posed questions<br>' to estimate the model parameters using, if required, different estimation methods<br>' to assess the quality of the estimated model, determine the statistically significant effects and to modify the model accordingly<br>' to interprete the effects of factors on the response variable using simple tests, contrasts and graphs in order to answer the questions of the study<br>' to use the fitted model to perform predictions<br>' to explain important concepts using in his own terms : different types of linear models (fixed / random / mixed, crossed / nested), underlying hypotheses, estimation methods (least-squares / maximum likelihood, restricted maximum likelihood), tests construction (t-tests, F tests for nested models, expectation of means squares, likelihood ratio')<br>' to write the SAS code to estimate a given model<br>' to interprete precisely all results from a SAS output and be able, for every number in the output, to identify and explain the underlying concept and to tell how the number has been computed and how it should be interpreted in the context of the study.<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 : | Written exam with methodological questions and exercices méthodologiques, case studies, SAS code writing. Allowed material: 20 pages summary (10 pages resto/verso). |
| Teaching methods : | Course in auditorium<br>Introduction course to data importation in SAS<br>Practical courses prepared by the students, with a test half way during the semester |
| Content : | Table of content<br><br>Introduction<br>Models for a quantitative response and one fixed factor<br>' Linear model with one quantitative factor<br>' Polynomial and non linear model<br>' Variance analysis with one fixed factor<br>Linear models for one quantitative response and two fixed factors<br>' Variance analysis with two crossed fixed factors<br>' Multiple linear regression<br>' Covariancer analysis and general linear model<br>Variance components models<br>' Variance analysis with one random factor<br>' Estimation of random effects and variance components<br>Mixed linear models<br>' Formulation of random effects and structure of the covariance matrix<br>' Analysis of common mixed models in biology (genetics, experimental design)<br>' Analysis of longitudinal data<br>' Covariance analysis in mixed models<br>Models for categorical data (not included in LBIRA2101A)<br>' Contingency tables |

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| | ' Logistic regression<br>' Generalised linear models |
| Bibliography : | Mandatory<br>' Powerpoint slides (theory and example) (online i-campus)<br>' Exercices (sur le site web)<br><br>Recommended reading<br>' SAS/STAT documentation (PROC GLM et PROC MIXED) |
| Faculty or entity in charge: | AGRO |

## Programmes / formations proposant cette unité d'enseignement (UE)

| Intitulé du programme | Sigle | Credits | Prerequis | Acquis d'apprentissage |
|---|---|---|---|---|
| Master [120] in Chemistry and Bioindustries | BIRC2M | 3 | - | |
| Master [120] in Environmental Bioengineering | BIRE2M | 3 | - | |
| Master [120] in Forests and Natural Areas Engineering | BIRF2M | 3 | - | |