DEGREE CURRICULUM

DESIGN AND ANALYSIS OF EXPERIMENTS

Coordination: VOLTAS VELASCO, JORDI

Academic year 2023-24

DESIGN AND ANALYSIS OF EXPERIMENTS 2023-24

Subject's general information

<table>
<tr><td>Subject name</td><td>DESIGN AND ANALYSIS OF EXPERIMENTS</td></tr>
<tr><td>Code</td><td>11370</td></tr>
<tr><td>Semester</td><td>2nd Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Erasmus Mundus Master's Programme in Mediterranean Forestry and Natural Resources Management (MEDFOR)</td><td>1</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>5</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>4</td><td>1</td></tr>
<tr><td>Number of groups</td><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>VOLTAS VELASCO, JORDI</td></tr>
<tr><td>Department</td><td>AGRICULTURAL AND FOREST SCIENCES AND ENGINEERING</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>50% - 50 %</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Distribution of credits</td><td>1. Basic experimental design in Forestry (1.8 ECTS)
2. Checking the assumptions: homogeneity, normality and independence (0.8 ECTS)
3. Linear regression models (1 ECTS)
4. General linear models (1.4 ECTS)</td></tr>
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DESIGN AND ANALYSIS OF EXPERIMENTS 2023-24

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
SHESTAKOVA , TATIANA	tatiana.shestakova@udl.cat	1,4	
VOLTAS VELASCO, JORDI	jordi.voltas@udl.cat	3,6	

Learning objectives

To learn basic concepts of inferential statistics useful in design and analysis of experiments in forestry. To become familiar with a number of widely used experimental designs in relation to the objectives of the study. To understand the application of General Linear Models (GLM) in forestry, including fixed and mixed models. To provide an overview of a number of analytical methods based on the application of GLM theory (linear and multinlinear regression) and of alternative designs and analyses of particular interest in forestry. To apply basic techniques of multivariate analysis.

Subject contents

1 Basic Experimental Design in Forestry

- 1.1 The principles of Experimental Design
- 1.2 Completely Randomized and Randomized Block Designs
- 1.3 Factorial Treatment Structure
- 1.4 Mean Comparisons Tests and Contrasts
- 1.5 Integrated examples

2 Checking the assumptions

- 2.1 Homogeneity of variance
- 2.2 Normality and independence of the residuals
- 2.3 Transformations
- 2.4 Integrated examples

3 Linear regression and multivariate models

- 3.1 Simple Linear Regression
- 3.2 Polynomial Regressions
- 3.3. Principal Comoponent Analysis
- 3.4 Cluster Analysis

4 General Linear Models

- 4.1 Models with factorial and nested treatments
- 4.2 Random and Fixed Treatment Factors
- 4.3 Introduction to Linear Mixed Models
- 4.4 Split-Plot and Other Stratified Designs
- 4.5 Integrated examples

Methodology

Computing: JMP version 14. Your registration includes a free copy of JMP.

Homework: Homework will be assigned in a weekly basis and will be due the following week. The homework count for 50% of the grade. Please see the homework policy below.

Homework policy: Homework solutions must be the result of your own work. This will improve your performance in the exams. You may use:

- Textbooks, course handouts and notes from lectures

- Discussion with the instructors

- Voluntary, mutual and cooperative discussion with other students in the class.

Homework will be posted in Campus Virtual. It will be usually available weekly and the instructor will warn every time a new homework is assigned. It will be due and handed exactly one week after the assignment.

Exams: There will be one midterm exam worth 20% and a final exam worth 30%. Please see the exam policy below.

Exam policy: Your exam solutions must be your own work. The final exam is cumulative. Acceptable resources are:

- JMP statistical software

- Handouts and class notes

Development plan

Previous knowledge on statistics:

Measures of central tendency (mean, median, mode) and dispersion (variance, standard deviation, coefficient of variation)

Chi-square distribution, Normal distribution and departures from normality (skewness, kurtosis)

Comparison of two sample means: Student's t distribution, Student's t-test

Evaluation

There will be the following four blocks of evaluation:

Block 1: midterm exam worth 20% of the final grade (minimum qualfication = 3.5)

Block 2: final exam worth 30% of the final grade (minimum qualfication = 3.5)

Block 3: Homework exercises of Units 1 and 2 worth 25% of the final grade

Block 4 Homework exercises of Units 3 and 4 worth 25% of the final grade

In case the minimum qualification of either block 1 or 2 is not achieved, then there will be an extraordinary exam for the purpose of achieving a minimum grade.

The attendance to classes is not compulsory, but systematic lack of attendance will be pensalised with up to one point in the final grade (over 10)

In case a student is interested in the alternative evaluation, there will be a final exam computing 75% of the final grade (the remaining 25% being the result of the qualifications of the homework, which will be required on an individual (not group) basis).

Bibliography

- Gómez KA & Gómez AA (1984) Statistical procedures for agricultural research. Wiley. [519.2:63 GOM]

- Jayaraman K (1999) A statistical manual for forestry research. FAO (available in pdf version, posted in Campus Virtual)

- Little TM, Hills FJ (1978) Agricultural experimentation: design and analysis. Wiley. [519.2:63 LIT]

- Montgomery DC (2009). Design and analysis of experiments. Wiley. [519.2 MON]

- Steel RGD & Torrie JH (1980) Principles and procedures of statistics: a Biometrical approach. McGraw-Hill. [519.2 STE]