Course guide
390450 - ASTAT - Advanced Statistics

Unit in charge: Barcelona School of Agri-Food and Biosystems Engineering
Teaching unit: 749 - MAT - Department of Mathematics.
Degree: BACHELOR’S DEGREE IN AGRICULTURAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR’S DEGREE IN AGRICULTURAL, ENVIRONMENTAL AND LANDSCAPE ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR’S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR’S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR’S DEGREE IN AGRONOMIC SCIENCE ENGINEERING (Syllabus 2018). (Optional subject).
Academic year: 2023
ECTS Credits: 6.0
Languages: English

LECTURER

Coordinating lecturer: MONICA BLANCO ABELLAN
Others:

REQUIREMENTS

Students should have passed the course STATISTICS (Q3).

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Ability to solve mathematic problems in an engineering context . Ability to apply the knowledge of statistics and optimization.

TEACHING METHODOLOGY

A combination of lectures, problem solving and computer labs sessions, and discussion of scientific papers and oral presentations.

LEARNING OBJECTIVES OF THE SUBJECT

1. To analyse large sets of variables by means of multivariate techniques.
2. To design and analyse experiments to improve the quality of a process.
3. To identify the significant effects and interactions in factorial designs.
4. To analyse the work conditions to obtain the best possible answer using the techniques of response surface.
5. To connect and use old statistical knowledge to develop new concepts and techniques.
6. To get acquainted with a number of statistical software packages to carry out multivariate analysis and experimental designs.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>60,0</td>
<td>40.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
## CONTENTS

### (ENG) INTRODUCTION TO MULTIVARIATE ANALYSIS

**Description:**
1.1. The analysis of variance: with a single factor; with two factors.
1.2. Relationships between sets of variables: multiple linear regression.
1.3. Ordination, or dimension reduction, techniques: principal components analysis.
1.4. Grouping data techniques: cluster analysis.

**Related activities:**
Activities 1, 2, 3, 4.

**Full-or-part-time:** 68h
- Theory classes: 20h
- Laboratory classes: 8h
- Self study : 40h

### (ENG) TWO-LEVEL FACTORIAL DESIGNS

**Description:**
2.1. Introduction to two-level factorial designs (2k). Calculation of effects. Determination of the significance of effects.
2.2. Introduction to two-level fractional factorial designs. Defining relation. Calculation of effects. Determination of the significance of effects.

**Related activities:**
Activities 1, 2, 3, 4.

**Full-or-part-time:** 41h
- Theory classes: 10h
- Laboratory classes: 6h
- Self study : 25h

### (ENG) RESPONSE SURFACE METHODS AND DESIGNS

**Description:**
3.2. Central composite designs.
3.3. Contour plots and canonical analysis.

**Related activities:**
Activities 1, 2, 3, 4.

**Full-or-part-time:** 41h
- Theory classes: 10h
- Laboratory classes: 6h
- Self study : 25h
## ACTIVITIES

### ACTIVITY 1: LECTURES

**Full-or-part-time:** 108h  
Theory classes: 38h  
Self study: 70h

### ACTIVITY 2: INDIVIDUAL WRITTEN TEST

**Full-or-part-time:** 2h  
Theory classes: 2h

### ACTIVITY 3: PROBLEM SOLVING AND COMPUTER LABS

**Full-or-part-time:** 20h  
Laboratory classes: 10h  
Self study: 10h

### ACTIVITY 4: DISCUSSION OF SCIENTIFIC PAPERS AND ORAL PRESENTATIONS

**Full-or-part-time:** 20h  
Laboratory classes: 10h  
Self study: 10h

## GRADING SYSTEM

Final Grade = 0.5 * Coursework (activities 3 and 4) + 0.2 * Mid-Term Exam + 0.3 * Final Exam

## EXAMINATION RULES

.

## BIBLIOGRAPHY

### Basic:

### Complementary:
- Myers, Raymond H.; Anderson-Cook, Christine M.; Montgomery, Douglas C.. Response surface methodology : process and product