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: 2022   ECTS Credits: 6.0   Languages: English

LECTURER

Coordinating lecturer: MONICA BLANCO ABELLAN

Others: MARTA GINOVART GISBERT

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>Hours medium group</td>
<td>60,0</td>
<td>40.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
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</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