390450 - ASTAT - Advanced Statistics

Coordinating unit: 390 - ESAB - Barcelona School of Agricultural Engineering
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2018
Degree: BACHELOR'S DEGREE IN AGRICULTURAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN AGRICULTURAL, ENVIRONMENTAL AND LANDSCAPE ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: English

Teaching staff
Coordinator: 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 mathematical 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>Total learning time: 150h</th>
<th>Hours medium group: 60h</th>
<th>40.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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## Content

<table>
<thead>
<tr>
<th>(ENG) INTRODUCTION TO MULTIVARIATE ANALYSIS</th>
<th>Learning time: 68h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 20h</td>
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<tr>
<td></td>
<td>Laboratory classes: 8h</td>
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<tr>
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<td>Self study: 40h</td>
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**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.

<table>
<thead>
<tr>
<th>(ENG) TWO-LEVEL FACTORIAL DESIGNS</th>
<th>Learning time: 41h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
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<tr>
<td></td>
<td>Laboratory classes: 6h</td>
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<td>Self study: 25h</td>
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**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.

<table>
<thead>
<tr>
<th>(ENG) RESPONSE SURFACE METHODS AND DESIGNS</th>
<th>Learning time: 41h</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Theory classes: 10h</td>
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<tr>
<td></td>
<td>Laboratory classes: 6h</td>
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<tr>
<td></td>
<td>Self study: 25h</td>
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</tbody>
</table>

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

**Related activities:**
Activities 1, 2, 3, 4.
### Planning of activities

| ACTIVITY 1: LECTURES | Hours: 108h  
|                      | Theory classes: 38h  
|                      | Self study: 70h |
| ACTIVITY 2: INDIVIDUAL WRITTEN TEST | Hours: 2h  
|                      | Theory classes: 2h |
| ACTIVITY 3: PROBLEM SOLVING AND COMPUTER LABS | Hours: 20h  
|                      | Laboratory classes: 10h  
|                      | Self study: 10h |
| ACTIVITY 4: DISCUSSION OF SCIENTIFIC PAPERS AND ORAL PRESENTATIONS | Hours: 20h  
|                      | Laboratory classes: 10h  
|                      | Self study: 10h |

### Qualification system

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

### Regulations for carrying out activities

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Bibliography

Basic:

Complementary: