

## 390450 - ASTAT - Advanced Statistics

Coordinating unit:	390 - ESAB - Barcelona School of Agricultural Engineering
Teaching unit:	749 - MAT - Department of Mathematics
Academic year:	2019
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 AGRONOMIC SCIENCE ENGINEERING (Syllabus 2018). (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 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.



## 390450 - ASTAT - Advanced Statistics

### Study load

Total learning time: 150h	Hours medium group:	60h	40.00%
	Self study:	90h	60.00%

## 390450 - ASTAT - Advanced Statistics

### Content

<p>(ENG) INTRODUCTION TO MULTIVARIATE ANALYSIS</p>	<p>Learning time: 68h Theory classes: 20h Laboratory classes: 8h Self study : 40h</p>
<p>Description:</p> <ol style="list-style-type: none"> <li>1.1. The analysis of variance: with a single factor; with two factors.</li> <li>1.2. Relationships between sets of variables: multiple linear regression.</li> <li>1.3. Ordination, or dimension reduction, techniques: principal components analysis.</li> <li>1.4. Grouping data techniques: cluster analysis.</li> </ol> <p>Related activities: Activities 1, 2, 3, 4.</p>	
<p>(ENG) TWO-LEVEL FACTORIAL DESIGNS</p>	<p>Learning time: 41h Theory classes: 10h Laboratory classes: 6h Self study : 25h</p>
<p>Description:</p> <ol style="list-style-type: none"> <li>2.1. Introduction to two-level factorial designs (2k). Calculation of effects. Determination of the significance of effects.</li> <li>2.2. Introduction to two-level fractional factorial designs. Defining relation. Calculation of effects. Determination of the significance of effects.</li> </ol> <p>Related activities: Activities 1, 2, 3, 4.</p>	
<p>(ENG) RESPONSE SURFACE METHODS AND DESIGNS</p>	<p>Learning time: 41h Theory classes: 10h Laboratory classes: 6h Self study : 25h</p>
<p>Description:</p> <ol style="list-style-type: none"> <li>3.1. Introduction to response surface methodology. The method of steepest ascent. Designs for fitting first-order and second-order models.</li> <li>3.2. Central composite designs.</li> <li>3.3. Contour plots and canonical analysis.</li> </ol> <p>Related activities: Activities 1, 2, 3, 4.</p>	



## 390450 - ASTAT - Advanced Statistics

### 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

## 390450 - ASTAT - Advanced Statistics

### Bibliography

#### Basic:

Granato, D.; Ares, G. Mathematical and statistical methods in food science and technology. Wiley-Blackwell, 2014. ISBN 9781118433683.

Montgomery, Douglas C. Design and analysis of experiments. 3a ed. New York: John Wiley & Sons, 1991. ISBN 0471520004.

Box, George E. P.; Hunter, J. Stuart; Hunter, William Gordon. Statistics for experimenters : design, innovation, and discovery. 2nd ed. Hoboken: John Wiley & Sons, 2005. ISBN 0471718130.

Hair, Joseph F. Multivariate data analysis : a global perspective. 7th ed. Upper Saddle River, N.J. [etc.]: Pearson, 2010. ISBN 9780135153093.

#### Complementary:

Hicks, Charles R; Turner, Kenneth V. Fundamental concepts in the design of experiments. 5a ed. New York: Oxford University Press, 1993. ISBN 0195122739.

Moore, David S.; McCabe, George P.; Craig, Bruce A. Introduction to the practice of statistics. 7a ed. New York: W.H. Freeman, 2012. ISBN 9781429286640.

Myers, Raymond H.; Anderson-Cook, Christine M.; Montgomery, Douglas C. Response surface methodology : process and product optimization using designed experiments. 3rd ed. Hoboken: Wiley, 2009. ISBN 9780470174463.

Daniel, Wayne W. Biostatistics : basic concepts and methodology for the health sciences. 10th ed., International student version. Hoboken, NJ: John Wiley & Sons, 2014. ISBN 9781118362204.