

820076 - AEAE - Advanced Statistics and Applications in Engineering

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| Coordinating unit: | 295 - EEBE - Barcelona East School of Engineering |
| Teaching unit: | 749 - MAT - Department of Mathematics |
| Academic year: | 2017 |
| Degree: | BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Optional) |
| ECTS credits: | 6 |
| Teaching languages: | Catalan, Spanish |

Teaching staff

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| Coordinator: | PABLO BUENESTADO CABALLERO email: Pablo.Buenestado@upc.edu |
| Others: | PABLO BUENESTADO CABALLERO |

Opening hours

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| Timetable: | Session 2017-2018: Tuesday 10-12 h (Small group) Thursday 11-14 h (Big group) |
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Requirements

Statistics

Degree competences to which the subject contributes

Specific:

1. Solve mathematical problems that may arise in engineering. Apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial differential equations; numerical methods; numerical algorithms; statistics and optimisation.

Transversal:

2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

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Teaching methodology

The sessions are made in the computer rooms.
Learning is based on applied engineering problems.
In each session the subject of learning is presented.
Practices are working individually or in pairs, depending on the activity.

Learning objectives of the subject

Students gain confidence to tackle problems related to the statistics and their applications in engineering.
The statistic that students learn in this course is very advanced and useful for the future of an engineer.
In recent years a large increase in jobs for engineers in the field of applied statistics is appreciated.
With this course we want to help the student to train in this area.

Study load

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| Total learning time: 150h | Hours large group: | 45h | 30.00% |
| | Hours medium group: | 0h | 0.00% |
| | Hours small group: | 15h | 10.00% |
| | Guided activities: | 0h | 0.00% |
| | Self study: | 90h | 60.00% |

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Content

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| <p>INFERENCE BASED ON ONE SAMPLE</p> | <p>Learning time: 40h Theory classes: 8h Laboratory classes: 8h Self study : 24h</p> |
| <p>Description: Initially working the usual statistical models for engineering. Analysis of different types of sampling and sampling the main elements. We review the basics of inference: Confidence intervals Hypothesis contrast</p> <p>Related activities: Practical statistical modeling. Recognizes the model from a sample. Practice simulation to estimate. Experience the mean estimate. Practice simulation for contrast. Decision making on average.</p> <p>Specific objectives: Reviewing the most useful engineering statistical models. Deepen the main concepts related to the inference based on a single sample. Learn to make decisions by estimating and contrast.</p> | |
| <p>INFERENCE BASED ON TWO SAMPLES</p> | <p>Learning time: 30h Theory classes: 6h Laboratory classes: 6h Self study : 18h</p> |
| <p>Description: Inference two population means. Analysis of data pairs. Inference proportions. Inference two variances.</p> <p>Related activities: Practice of Inference for two averages Practice of inference data pairs Practice of Inference for two proportions Practice of Inference for two variances</p> <p>Specific objectives: Enable the student to make decisions for cases with 2 samples.</p> | |

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| <p>ADJUST MODELS. MULTIPLE LINEAR REGRESSION.</p> | <p>Learning time: 30h Theory classes: 6h Laboratory classes: 6h Self study : 18h</p> |
| <p>Description: Using linear regression of two variables for modeling engineering data based on hypothesis testing. Linear model to predict values. Learn the possibilities of the linear model for nonlinear relationships. Extend the linear regression model to several variables.</p> <p>Related activities: Practice of Linear modeling for two variables Practice of multiple linear modeling</p> <p>Specific objectives: Modeling linear relationship between two variables. Learn the technique of linear modeling of several variables.</p> | |
| <p>ANALYSIS OF VARIANCE</p> | <p>Learning time: 30h Theory classes: 6h Laboratory classes: 6h Self study : 18h</p> |
| <p>Description: Learn to perform analysis of variance pruebas of hypotheses. ANOVA of a single factor. ANOVA formulation. ANOVA with two or three factors.</p> <p>Related activities: Practice of analysis of variance of a factor Practice of analysis of variance of two factors Practice of ANOVA of three factors</p> <p>Specific objectives: Using the ANOVA technique for making decisions with a factor. Using ANOVA applied to engineering problems with 2 or 3 factors.</p> | |

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| <p>STATISTICAL QUALITY CONTROL</p> | <p>Learning time: 20h Theory classes: 4h Laboratory classes: 4h Self study : 12h</p> |
| <p>Description: Apply statistical quality control to make decisions. Knowing the useful graphical control. Learning to use acceptance sampling.</p> <p>Related activities: Practice control charts Practice of Acceptance sampling</p> <p>Specific objectives: Train students in the use of different techniques that help make decisions for statistical quality control.</p> | |

Qualification system

The evaluation focuses on the delivery of individual or couple work.
The course can be done without attending the classroom.

Regulations for carrying out activities

The reports must be submitted within the deadline and with good presentation.

Bibliography

Basic:

Navidi, W. Estadística para ingenieros y científicos. México [etc.]: McGraw-Hill, 2006. ISBN 978-970-10-5629-5.

Devore, Jay L. Probabilidad y estadística para ingeniería y ciencias. 8a ed. México [etc.]: Cengage Learning, México [etc.]. ISBN 9786074816198.

Montgomery, Douglas C; Runger, George C. Applied statistics and probability for engineers. 4th ed. New York [etc.]: John Wiley & Sons, cop. 2006. ISBN 9780471745891.

Complementary:

Peña, Daniel. Análisis de datos multivariantes. cop. 2002: McGraw-Hill, Madrid [etc.]. ISBN 8448136101.