Last update: 10-07-2017

820076 - AEAE - Advanced Statistics and Applications in Engineering

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

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

Others: PABLO BUENESTADO CABALLERO

Opening hours

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

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

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

INFERENCE BASED ON ONE SAMPLE

Learning time: 40h

Theory classes: 8h
Laboratory classes: 8h
Self study : 24h

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

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.

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.

INFERENCE BASED ON TWO SAMPLES

Learning time: 30h

Theory classes: 6h
Laboratory classes: 6h
Self study : 18h

Description:
Inference two population means.
Analysis of data pairs.
Inference proportions.
Inference two variances.

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

Specific objectives:
Enable the student to make decisions for cases with 2 samples.

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ADJUST MODELS. MULTIPLE LINEAR REGRESSION.	Learning time: 30h Theory classes: 6h Laboratory classes: 6h Self study : 18h

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.

Related activities:
Practice of Linear modeling for two variables
Practice of multiple linear modeling

Specific objectives:
Modeling linear relationship between two variables.
Learn the technique of linear modeling of several variables.

ANALYSIS OF VARIANCE	Learning time: 30h Theory classes: 6h Laboratory classes: 6h Self study : 18h

Description:
Learn to perform analysis of variance pruebas of hypotheses.
ANOVA of a single factor.
ANOVA formulation.
ANOVA with two or three factors.

Related activities:
Practice of analysis of variance of a factor
Practice of analysis of variance of two factors
Practice of ANOVA of three factors

Specific objectives:
Using the ANOVA technique for making decisions with a factor.
Using ANOVA applied to engineering problems with 2 or 3 factors.

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STATISTICAL QUALITY CONTROL	Learning time: 20h Theory classes: 4h Laboratory classes: 4h Self study : 12h

Description:
Apply statistical quality control to make decisions.
Knowing the useful graphical control.
Learning to use acceptance sampling.

Related activities:
Practice control charts
Practice of Acceptance sampling

Specific objectives:
Train students in the use of different techniques that help make decisions for statistical quality control.

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. Mèxico [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.