

230087 - PIE - Probability and Statistics

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
 Teaching unit: 749 - MAT - Department of Mathematics
 Academic year: 2019
 Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING
 (Syllabus 2015). (Teaching unit Compulsory)
 ECTS credits: 6 Teaching languages: Catalan

Teaching staff

Coordinator: Fabrega Canudas, Jose
 Others: Miquel À. Fiol
 Josep Fàbrega
 Anna Lladó
 Gracia Sabate, Francesc Xavier

Prior skills

Calculus of one and several variables. Linear algebra.

Degree competences to which the subject contributes

Transversal:

07 AAT N2. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.

Teaching methodology

- Lectures.
- Application classes.
- Exercises.

Learning objectives of the subject

Probability theory. Random variables. Concepts and methods of Statistics.

Study load

Total learning time: 150h	Hours large group:	65h	43.33%
	Self study:	85h	56.67%

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Content

1. Basic probability theory	Learning time: 15h Theory classes: 15h
<p>Description: Combinatorics: Permutations and combinations. Random experiment, sample space, random events. Probability space. Discrete spaces, Laplace formula. Continuous spaces, Borel sigma-algebra. Independence and conditional probability. Bayes Theorem and the formula of total probability. The meaning of probability.</p>	
2. Random variable	Learning time: 13h Theory classes: 13h
<p>Description: Random variable. Cumulative distribution function. Discrete random variables, probability function. Examples of discrete variables (Bernoulli, geometrical, binomial, Poisson). Continuous random variables, density function. Examples of continuous variables (uniform, exponential, gaussian). Theorem of DeMoivre-Laplace. Conditional density. Functions of one random variable (discrete case, continuous case, special cases). Statistical parameters: Mean, variance, standard deviation. Moments and centered moments. Chebyshev's inequality . Law of large numbers.</p>	
3. Several random variables	Learning time: 14h Theory classes: 14h
<p>Description: Several random variables. Joint cumulative distribution function. Discrete case, joint probability function. Continuous case, joint density function. Examples of multidimensional variables (multinomial, uniform, gaussian). Marginal distributions. Independence of random variables. Conditional distributions. Functions of several variables. Sum of random variables: convolution theorem. Change of variables. Theorem of the mean. Covariance and correlation coefficient. Orthogonality, incorrelation and independence. Estimation of random variables. Linear estimation. Orthogonality principle.</p>	
4. Statistics I	Learning time: 13h Theory classes: 13h
<p>Description: Random variables relevant in statistics: n-dimensional Gaussian, Khi square, Student's t, Fisher's F. Central Limit Theorem. Populations and samples. Descriptive statistics (histograms, boxplots, scatterplots). Statistical samples: distribution and parameters. Estimation of parameters: method of the moments and method of maximum likelihood. Confidence intervals (for the mean, for the variance, for proportions, for comparing populations). Test of statistical hypotheses. P-Values.</p>	

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5. Statistics II

Learning time: 10h

Theory classes: 10h

Description:

Fitting lines. Regression in one and several variables. Method of the least squares, orthogonality principle. Linear models. ANOVA. Non parametric tests. Bayesian statistics.

Qualification system

Parcial exams: 40%

Final exam: 60%

Bibliography

Basic:

Leon-Garcia, A. Probability, statistics and random processes for electrical engineering. 3rd ed. Upper Saddle River, NJ: Pearson Education, 2009. ISBN 9780137155606.

Ross, S.M. Introduction to probability and statistics for engineers and scientists. 5th ed. Oxford: Academic Press, 2014. ISBN 9780123948113.