

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	453 - Degree in Mathematics
ECTS	6.0
Course	3
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info**1.1.Recommendations to take this course****1.2.Activities and key dates for the course****2.Initiation****2.1.Learning outcomes that define the subject****2.2.Introduction****3.Context and competences****3.1.Goals****3.2.Context and meaning of the subject in the degree****3.3.Competences****3.4.Importance of learning outcomes****4.Evaluation****5.Activities and resources****5.1.General methodological presentation**

We propose a learning process based on critical reflection of concepts. In order to achieve these objectives, problem based learning is used. The aim of these learning processes is to encourage management of documentary sources, reflection on previously learned theoretical aspects, and structuring a logical discourse from the problem statement to its resolution.

5.2.Learning activities

Lectures: they will be based on a participative learning-teaching approach, promoting the interaction with students.

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Small group classes : Problems and exercises will be worked in small group classes. Additional exercises will be provided for student personal work.

Depending on the time availability, some seminars or computer lab classes will be held to complement the contents developed in class.

Office hours . Students will have tutorials with the teacher on a schedule to be agreed jointly.

Personal work . Individual study will allow to consolidate the concepts explained in class as well as learn and properly apply the techniques studied. They should handle literature, in addition to class notes. It should also dedicate a significant part of their time to solving the proposed exercises.

5.3.Program

Part 1. Probability and one-dimensional discrete variables. A Review

PROBABILITY SPACE

1. Probability space. Introduction. Definition. Properties.
2. Some calculus of probability models. Classic Model. Finite Model. Discrete Model. Geometric Model.
3. Stochastic dependence and independence. Conditional probability. Stochastic independence. The Bayes Theorem.

DISCRETE RANDOM VARIABLES

4. Discrete random variables. Definition. Probability distribution. Cumulative distribution function.
5. Moments of a discrete random variable. Moments. Chebyshev inequality. Other measures of central tendency.
6. Some models of discrete random variables. Uniform. Bernoulli. Binomial. Geometric. Negative Binomial.

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Hipergeometric. Poisson.

Part 2. Continuous random variables and random vectors

ONE-DIMENSIONAL RANDOM VARIABLES

7. General random variables. Definition. Cumulative distribution function. Types of random variables. Transforms of random variables.

8. Moments of a discrete random variable. Moments. Chebyshev inequality.

9. Some models of continuous random variables. Uniform. Triangular. Exponential. Normal. Gamma. Beta. Chi-square.

10. Mixed random variables. Definition. Cumulative distribution function. Moments.

RANDOM VECTORS

11. General random vectors. Definition. Cumulative distribution function. Transforms of random vectors. Types of random vectors.

12. Discrete random vectors. Probability distributions: joint, marginal, condicional. Independent random variables.

13. Continuous random vectors. Probability distributions: joint, marginal, condicional. Independent random variables. Diferentiable transform of a continuous random vector aleatorio.

14. Moments and properties of random vectors. Moments. Moment generating functions. Reproductive property.

15. Correlation and least mean square principle. Correlation coefficient. Schwarz's inequality. Functional relationships between two random variables and the least mean square principle.

16. Some multivariate probability distributions. Multinomial distribution and Multivariate Normal distribution.

Bloque 3. Stochastic convergence, Law of large numbers and Central limit theorem.

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17. Convergence of sequences of random variables. Convergence in probability. Almost sure convergence.

Convergence in distribution. Convergence in the L_p -norm. Properties and relationships between the types of convergence.

18. Laws of Large Numbers. Weak laws of large numbers. Strong laws of large numbers. Central limit theorem for independent and identically distributed random variables. General central limit theorem.

5.4.Planning and scheduling

The classroom teaching activities will be held according to the schedule established and published by the Science Faculty before the start of the course.

5.5.Bibliography and recommended resources

Grimmett, Geoffrey. One thousand exercises in probability / Geoffrey R. Grimmett and David R. Stirzaker . - 1st ed., reprinted Oxford : Oxford University Press, 2003

Lasala, Pilar. Problemas resueltos de cálculo de probabilidades / Pilar Lasal Calleja Zaragoza : Prensas Universitarias de Zaragoza, 1996

Rohatgi, Vijay K.. An introduction to probability theory and statistics / Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh . 3rd ed. New York [etc.] : John Wiley, cop. 1976.

Vélez Ibarrola, Ricardo. Cálculo de Probabilidades 2 / Ricardo Vélez Ibarrola . - [1ª ed.] Madrid : Ediciones Académicas, 2004

Vélez Ibarrola, Ricardo. Cálculo de probabilidades I / Ricardo Vélez Ibarrola, Víctor Hernández Morales . - [1a.ed.] Madrid : UNED, 1995

Bibliography of the current academic year is updated and available at <http://psfunizar7.unizar.es/br13/eBuscar.php?tipo=a>

The course is available in Moodle at the University of Zaragoza website. Thus, students can obtain information on the subject, notes, bibliography, supplementary material, problem sheets, etc.