VNIVERSITAT⁑ D̸ VALÈNCIA

COURSE DATA

Data Subject

Code	34166
Name	Probability
Cycle	Grade
ECTS Credits	6.0
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Faculty of Mathematics	3	First term

Subject-matter

Degree	Subject-matter	Character
1107 - Degree in Mathematics	10 - Probability and statistics	Obligatory

Coordination

Name	Department
ARMERO CERVERA, MARIA CARMEN	130 - Statistics and Operational Research
IÑIGUEZ HERNANDEZ, MARIA DEL CARMEN	130 - Statistics and Operational Research

SUMMARY

Probability is the part of Mathematics that deals with the formal study of the situations with uncertainty. Underlies many of the statistical procedures and stochastic simulation. Its study is essential for the understanding of statistical techniques and is, in fact, its foundation.

The main objectives of this subject are:

- To familiarize the student with the formalization of randomized experiments by probability distributions.
- To introduce the concepts of random event and probability of the event.
- To study the concepts of random variable and random vector and their characteristics.
- To learn about conditional and marginal moments and their characteristics.

- To show how to solve probability problems by using R.
- To simulate random variables and random vectors by using R.
- To know the main probability distributions and to approach the random processes involved in the scientific studies in other disciplines.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Necessary: Análisis Matemático I , convenient: Análisis Matemático II

OUTCOMES

1107 - Degree in Mathematics

- Possess and understand the mathematical knowledge.

- Apply the knowledge in the professional world.

- Argue logically in decision-making.

- Reason logically and identify errors in the procedures.

- Capacity of abstraction and modeling.

- Participate in the implementation of software and learn mathematical software.

LEARNING OUTCOMES

- To express variability through probability distributions.
- To formulate the possibility of occurrence of an event in probabilistic terms.
- To obtain probabilities of distributions using computer applications.
- To calculate probabilities of random vectors over simple geometric regions.

DESCRIPTION OF CONTENTS

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1. Experiment and probability

1.1. - Random Experiment.
1.2. - Random event and sigma-algebra.
1.3. - Measure of probability. Probability space.
1.4. - Basic properties of probability.

2. Conditional probability and independence.

2.1.- Conditional Probability.
2.2.- Independent Events.
2.3.- Law of total probability and Bayes' Theorem.

3. Random variables

3.1.- Random variable: definition and properties.
3.2.- Discrete and continuous distributions of random variables.
3.3.- Cumulative distribution function.
3.4.- Expectation, variance and standard deviation. Other moments.
3.5.- Function of a random variable.
3.6.- Simulation random variables.

4. Special distributions.

4.1.- Binomial distribution.
4.2.- Hypergeometric distribution.
4.3.- Poisson distribution.
4.4.- Negative binomial distribution.
4.5.- Exponential, gamma and beta distributions.
4.6.- Normal distribution and derived distributions (Student t test, chi- square, Fisher's F).

5. Random vectors.

5.1. Random vector. Definition and properties.
5.2. Continuous and marginal distributions.
5.3. Conditional distribution. Independence of variables.
5.4. Expectation, variance, covariance and correlation.
5.5. Functions of random vectors.

6. Convergence of sequences of random variables.

6.1. - Weak convergence in probability and almost sure.

6.2. - Weak and strong law of large numbers.

6.3. - Central limit theorem.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	37,50	100
Computer classroom practice	22,50	100
Other activities	7,50	100
Development of group work	5,00	0
Development of individual work	5,00	0
Study and independent work	10,00	0
Readings supplementary material	2,50	0
Preparation of evaluation activities	20,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	150,00	

TEACHING METHODOLOGY

Theoretical activities. Exposition of the concepts with the enrollment of the student by solving punctual questions.

Practical activities. Learning by solving problems, exercises and lab work in which competences will be acquired on the different aspects of the subject. These activities will be developed individually or in small groups, will be carried out in the computer room (practical classes) or at the classroom (seminars).

EVALUATION

The evaluation of the subject will be as follows:

- A 10% (1 points) from practical tasks.

- A 10% (1 points) from seminar tasks.

- An 80% (8 points) of the final exam.

Note: To reach a minimum of 40% of both (practical tasks and exam) will be required to pass the course.

REFERENCES

Basic

- Referència b1: J. K. Blitzstein and J. Hwang. Introduction to Probability. CRC Press (2015). http://proquest.safaribooksonline.com/9781466575578?uicode=valencia

  Referencia b2: M. H. DeGroot and M. J Schervish. Probability and Statistics. Fourth Ed. Addison Wesley (2012).

  Referencia b3: K. Baclawski. Introduction to probability with R. Chapman & Hall (2010).

Additional

- Referència c1:G.R. Grimmett and D.R. Stirzaker.One Thousand Exercises in Probability.Oxford University Press (2001).

  Referència c2: S. M. Ross. Introduction to Probability Models. Ninth Edition. Academic Press. (2007).

  Referència c3: L. Ugarte, A. Militino y A. Arnholt. Probability and statistics with R. Second ed Chapman & Hall (2016).

  Referència c4: D. Rumsey. Probability for Dummies.Wiley. (2006).

  Referència c5: G. Ayala y F. Montes. Probabilidad. Notas de clase (2017).

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available