Probability

Academic Year: (2021 / 2022) **Review date: 01-09-2021**

Department assigned to the subject: Statistics Department

Coordinating teacher: ARRIBAS GIL, ANA

Type: Basic Core ECTS Credits : 6.0

Year : 2 Semester : 2

Branch of knowledge: Social Sciences and Law

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Differential Calculus (1st year, 1st term), Integral Calculus (1st year, 2nd term), Vector Calculus (1st year, 2nd term), Integration and Measure (2nd year, 1st term)

OBJECTIVES

1. Knowing the theoretical foundations and calculus rules of Probability Theory.
2. Resolution of problems of Probabilistic Nature.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Probability and random phenomena.
1.1 Random phenomena, sample space, events.
1.2 Axioms of Probability and elementary properties.
1.3 Conditional probability and independence.
1.4 Total probability rule and Bayes¿ formula.

2. Random variables.
2.1 Definition of random variable.
2.2 Expectation, characteristic features, and moments of a random variable.
2.3 Discrete probability models.
2.4 Continuous probability models.
2.5 Transformations of random variables.

3. Jointly distributed random variables
3.1 Definition of random vector, joint, marginal, and conditional distributions.
3.2 Independent random variables.
3.3 Some multivariate distribution models.
3.4 Transformations.

4. Properties of the expectation.
4.1 Expectations of transformation of random variables.
4.2 Covariance, variance of sums, and correlation.
4.3 Conditional expectation.
4.4 Moment generating functions.

5. Limit Theorems.
5.1 Chebyshev¿s inequality.
5.2 Convergence in probability, the Weak Law of Large Numbers.
5.3 Almost sure convergence, the Strong Law of Large Numbers.
5.4 Convergence in distribution, the Central Limit Theorem.

LEARNING ACTIVITIES AND METHODOLOGY

THEORETICAL-PRACTICAL CLASSES. [44 hours with 100% classroom instruction, 1.76 ECTS]
Knowledge and concepts students must acquire. Student receive course notes and will have basic reference texts to facilitate following the classes and carrying out follow up work. Students partake in exercises to resolve practical problems and participate in workshops and evaluation tests, all geared towards acquiring the necessary capabilities.

TUTORING SESSIONS. [4 hours of tutoring with 100% on-site attendance, 0.16 ECTS]
Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher.

STUDENT INDIVIDUAL WORK OR GROUP WORK [98 hours with 0 % on-site, 3.92 ECTS]

FINAL EXAM. [4 hours with 100% on site, 0.16 ECTS]
Global assessment of knowledge, skills and capacities acquired throughout the course.

METHODOLOGIES

THEORY CLASS. Classroom presentations by the teacher with IT and audiovisual support in which the subject's main concepts are developed, while providing material and bibliography to complement student learning.

PRACTICAL CLASS. Resolution of practical cases and problem, posed by the teacher, and carried out individually or in a group.

TUTORING SESSIONS. Individualized attendance (individual tutoring sessions) or in-group (group tutoring sessions) for students with a teacher as tutor.

LABORATORY PRACTICAL SESSIONS. Applied/experimental learning/teaching in workshops and laboratories under the tutor's supervision.

ASSESSMENT SYSTEM

SE1 - FINAL EXAM. [40 %]
Global assessment of knowledge, skills and capacities acquired throughout the course.

SE2 - CONTINUOUS EVALUATION. [60 %]
Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course.

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- Jeffrey S. Rosenthal A First Look at Rigorous Probability Theory, .World Scientific Publishing, 2006
- Rohatgi, V.K. and Ehsanes Saleh, A.K.Md. An Introduction to Probability and Statistics, Wiley, 2001
- Sheldon M. Ross A First Course in Probability, Prentice Hall, 2010

ADDITIONAL BIBLIOGRAPHY

- Feller, W. An Introduction to Probability Theory and Its Applications, vol.1, Wiley, 1968