Mathematical Statistics

Academic Year: (2020 / 2021) **Review date: 26-06-2020**

Department assigned to the subject: Department of Statistics

Coordinating teacher: JIMENEZ RECAREDO, RAUL JOSE

Type: Electives ECTS Credits : 6.0

Year : 2 Semester : 1

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

To be able to solve problems related to non parametric inference for large sample sizes.

Obtain the necessary mathematical knowledge to state, understand and formalize results related to classical statistic issues with a clear orientation towards asymptotic theory.

To be able to apply the tools and concepts that belong to the domain of Theory of Probability.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction and examples

2. Convergence of random variables
2.1. Convergence in probability.
2.2. Almost sure convergence; Borel-Cantelli lemma.
2.3. Weak convergence and Portmanteau Lemma
2.4. Uniform integrability: convergence of moments.

3. Laws of large numbers.
3.1. Simple limit theorems.
3.2. Weak law of large numbers
3.3. Convergence of series.
3.4. Strong law of large numbers.
3.5. Applications.

4. Central limit theorem and its ramifications.
4.1. Liapounov's theorem.
4.2. Lindeberg-Feller theorem.
4.3. Ramifications of the central limit theorem.
4.4. Law of the iterated logarithm.

5. Delta Method
5.1 Basic Results.
5.2 Variance-stabilizing transformations

6. U-statistics
5.1. Conditional expectation.
5.2. Hájek projection.
5.3. Applications: U-Statistics.

7. Plugging estimation
7.1. Empirical distributions and their estimators
7.2. Bootstraps

LEARNING ACTIVITIES AND METHODOLOGY

This course is organized in lectures and individual work by following scripts discussed in the classroom, which pretend to make the student understand the results of the content of the subject. There are also sessions with practical exercises. The tutorials will be accessible prior agreement throughout the duration of the course.

ASSESSMENT SYSTEM

Home works (60%). Computational applications (20%). A short research work (20%).

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

BASIC BIBLIOGRAPHY

- Durret, R. Probability: Theory and Examples., Duxbury Press, 1996..
- Van der Vaart, A. W. Asymptotic Statistics., Cambridge University Press, 1998..
- Wasserman, L. All of Statistics:a concise course in Statistical Inference., Springer-Verlag 2005..