Introduction to Statistical Modeling

Academic Year: (2023 / 2024)	**Review date: 24-04-2023**

Department assigned to the subject: Statistics Department

Coordinating teacher: RUIZ MORA, CARLOS

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Social Sciences and Law

OBJECTIVES

Students will acquire knowledge and skills necessary to:
1.   Define populations for a statistical study
2.   Compute point estimators and confidence intervals for population parameters
3.   Build Hypothesis about a distribution
4.   Test hypothesis about the parameters of the chosen model
5.   Evaluate how well does the model fit to reality
6.   Understand the limitations of the methods that have been studied and the conditions under which they lead to wrong conclusions
7.   Carry out the abovementioned analyses in statistical software

Students will be able to:
1.   Develop their ability to think analytically
1.   Become familiar with a statistical software
2.   Establish a framework to solve problems
3.   Develop their interactive skills
4.   Enhance their critical thinking
5.   Improve their learning skills and communication

DESCRIPTION OF CONTENTS: PROGRAMME

1.   Introduction to Statistical inference.
1.1.   Population and sample
1.2.   Random sampling
1.3.   Fundamental sampling distributions
1.4.   Point estimation of parameters
1.4.1.   Definitions
1.4.2.   Method of moments
1.4.3.   Maximum likelihood estimation

2.   Confidence intervals for a single sample
2.1.   Introduction
2.2.   CI on the mean
2.2.1.   Normal population with known variance
2.2.2.   Large sample
2.2.3.   Normal population unknown variance
2.3.   CI on the proportion
2.3.1.   Large-sample
2.4.   CI on the variance
2.4.1.   Normal population

3.   Test of hypotheses for a single sample
3.1.   Introduction
3.2.   Type I and Type II Errors
3.3.   Power of a statistical test
3.4.   P-value
3.5.   HT on the mean
3.5.1.   Normal population with known variance
3.5.2.   Large sample
3.5.3.   Normal population with unknown variance

LEARNING ACTIVITIES AND METHODOLOGY

- Lectures: introducing the theoretical concepts and developments with examples, 2.2 ECTS
- Problem solving sessions: 2.2 ECTS
- Computer (practical) sessions: 0.6 ECTS -- 4 SESSIONS
- Evaluation sessions (continuous evaluation and final exam): 1 ECTS

ASSESSMENT SYSTEM

There will be continuous evaluation by means of two partial examinations. There will be some questions about the computer sessions at those exams.

If the grade obtained at the continuous evaluation is 6 or higher, the student should not attend the final exam and his/her final grade will be the grade of the continuous evaluation.

If the grade obtained at the continuous evaluation is lower than 6, the student will have to attend the final exam. For those students, the final grade will be computed giving a 40% weight to the partial examinations, and a 60% weight to the grade at the final exam.

The grade for the students attending the extraordinary examination will be the grade obtained at such exam.

% end-of-term-examination:	0
% of continuous assessment (assigments, laboratory, practicals…):	100

BASIC BIBLIOGRAPHY

- MONTGOMERY, D.C., RUNGER, G.C. Applied Statistics and Probability for Engineers, John Wiley & Sons, 2003

- Navidi, W. Statistics for Engineers and Scientists, McGraw-Hill, 2006

- SONG, TT. Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, 2004

ADDITIONAL BIBLIOGRAPHY

- GUTTMAN, L., WILKS, S.S., HUNTER, J.S. Introductory Engineering Statistics. , Wiley. , 1992

- Newbold, P. Statistics for Business and Economics., Prentice-Hall., 1995.

- PEÑA, D. Regresión y Diseño de Experimentos., Alianza Editorial., 2002
- PEÑA, D. Fundamentos de Estadística., Alianza Editorial., 2001