

SUBJECT TEACHING GUIDE

G766 - STATISTICS

Degree in Chemical Engineering

Academic year 2022-2023

| 1. IDENTIFYING DATA | | | | | |
|----------------------------------|---|------------------|--------------------|------------------|--------------|
| Degree | Degree in Chemical Engineering | | | Type and Year | Core. Year 2 |
| Faculty | School of Industrial Engineering and Telecommunications | | | | |
| Discipline | Subject Area: Mathematics Basic Training Module | | | | |
| Course unit title and code | G766 - STATISTICS | | | | |
| Number of ECTS credits allocated | 6 | Term | Semester based (1) | | |
| Web | https://moodle.unican.es/ | | | | |
| Language of instruction | Spanish | English Friendly | Yes | Mode of delivery | Face-to-face |

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| Department | DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION |
| Name of lecturer | MARIA DOLORES FRIAS DOMINGUEZ |
| E-mail | mariadolores.frias@unican.es |
| Office | E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 1. DESPACHO PROFESORES (1046) |
| Other lecturers | CARMEN MARIA SORDO GARCIA |

3.1 LEARNING OUTCOMES

- Summarize a set of observations using tables, statistics and graphics.
- Compute probabilities in real problems.
- Identify random variables in real situations.
- Identify the most common probability distributions in real problems.
- Know and apply the basics properties of the punctual estimators and confidence intervals.
- Model simple optimization problems related to engineering.
- Identify the proper methodologies to solve optimization problems.
- Perform a statistical quality control in engineering.
- Develop computational skills to address problems in a context of applications in Engineering.
- Ability to solve statistical problems that may arise in engineering

4. OBJECTIVES

- Train students thoroughly in statistical methods to be used in particular problems.
- Teach students to apply statistical, optimization and statistical quality control methods and data analysis techniques in practical engineering problems.
- Instill in our students a proper use of statistical software to solve scientific problems in engineering.

6. COURSE ORGANIZATION

CONTENTS

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| 1 | Part I: |
| 1.1 | DESCRIPTIVE STATISTICS: Population and sample. Tables, statistics and graphics. |
| 1.2 | REGRESSION: Bidimensional data. Lineal regression, exponential and potential models. Model quality. |
| 2 | Part II |
| 2.1 | PROBABILITY AND RANDOM VARIABLE: Probability definition and properties. Independence. Conditional probability and Bayes theorem. Random variables. probability mass function, probability density function and cumulative distribution function. |
| 2.2 | COMMON PROBABILITY DISTRIBUTIONS: Bernoulli, Binomial, Negative Binomial, Geometric, Poisson, Exponential, Gamma, Uniform, Normal. |
| 3 | Part III |
| 3.1 | INFERENCE: Introduction. Inference of proportion, mean and variance. |
| 3.2 | HYPOTHESIS TESTING: Introduction. Hypothesis testing of proportion, mean and variance. |
| 4 | Part IV |
| 4.1 | STATISTICAL QUALITY CONTROL: Introduction. Shewhart control chart. |
| 4.2 | OPTIMIZATION. Introduction. Lineal models. Transport problem. |

7. ASSESSMENT METHODS AND CRITERIA

| Description | Type | Final Eval. | Reassessn | % |
|--|-----------------------|-------------|-----------|---------------|
| Practical exams. | Laboratory evaluation | No | No | 23,00 |
| Writing exam Part I | Written exam | No | Yes | 11,00 |
| Writing exam Part II | Written exam | No | Yes | 18,00 |
| Writing exam Part III | Written exam | No | Yes | 20,00 |
| Writing exam Part IV | Written exam | Yes | Yes | 11,00 |
| Seminars and other activities | Others | No | No | 17,00 |
| TOTAL | | | | 100,00 |
| Observations | | | | |
| <p>In the extra exam call, students are only allow to repeat the failed theoretical exams. Marks obtained along the year will be valid until the extra call. The final mark for the extra call will be the weighted average of the different evaluation methodologies indicated in this guide performed during the academic year. The sum of the resulting marks from the writing exams should be more than 25% of the total mark of the subject to pass the subject.</p> | | | | |
| Observations for part-time students | | | | |
| <p>The subject can be followed from Moodle. If required at the beginning of the academic year, part-time students can do writing exams together the day fixed for the final exam. Practical exams will take place as for the rest of the students to ensure the same evaluation of knowledge and competence. Works and seminars proposed along the course can be done individually and submitted electronically .</p> | | | | |

8. BIBLIOGRAPHY AND TEACHING MATERIALS

| BASIC |
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| Luceño, A.; González, F.J. 2003. "Métodos Estadísticos para Medir, Describir y Controlar la Variabilidad". Santander: Universidad de Cantabria. ISBN: 978-84-8102-750-1. http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=214714 |
| Cobo, A. 1995. "Optimización Matemática". Santander: Departamento de Matemáticas y Ciencias de la Computación. ISBN: 84-605-2187-7. http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=124088 |
| Cohen, Y.; Cohen, J.Y. 2008. "Statistics and data with R: an applied approach through examples". Chichester:: John Wiley & Sons. ISBN: 978-0-470-75805-2. http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=292113 |