



PERSONA CIÈNCIA EMPRESA

UNIVERSITAT RAMON LLULL

COURSE: STATISTICS

SUBJECT MATTER: Statistics and Numerical Methods for Engineers

MODULE: Specific Technology

PROGRAM: Degree in Chemical Engineering

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GENERAL CHARACTERISTICS

Type: Basic Formation, Compulsory, Elective

Final Degree Project, Internship

Duration: Semestral

Semester/s: 4

Number of ECTS credits: 6

Language/s: Spanish

DESCRIPTION

SHORT DESCRIPTION AND JUSTIFICATION

Statistics consists of the use of methods to collect, analyze and interpret data. This implies the quantification of chemical phenomena that present a certain experimental variability; To understand, control, model and predict this variability it is useful to have practical knowledge of Statistics.

The subject is organized around three parts: data description, distribution models and inference techniques. These constitute the basic foundations that the student must acquire and then apply them, when necessary, in other subjects of the degree and later in their professional context.

The concepts and techniques presented in the classroom are worked with the help of real practical examples adapted for their resolution both individually and as a team. Some commonly used statistical programs are used to process the data.

COMPETENCES

- Ability to understand and apply the necessary basic scientific knowledge in Statistics to the practice of chemical engineering. (→E2, CB1)
- Ability to identify, formulate and solve chemical and engineering problems where the use of statistical techniques is necessary. (→ E7, CB2)
- Ability to transmit information, ideas, problems and solutions to a specialized and non-specialized public (→ CB4)
- Ability to pose, model mathematically, perform statistical analysis and solve computationally experiments and problems that arise in chemical engineering. (→ TE5)

PREREQUISITES

According to the program planning and academic regulations.



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CONTENTS

1. Introduction and main concepts
Variability. Measurement scales. Data organization.
2. Descriptive statistics
Statistical tables and graphs.
3. Distributions and probability
General definitions and presentation of models
4. Discrete random variables and Probability distributions.
Definitions and models (binomial, Poisson)
5. Continuous random variables and Probability distributions.
Definitions and models (normal, t, chi-square, F)
6. Estimation of parameters
7. Test of Hypotheses for a single sample and for two samples
Inference for a single sample (mean, variance and distribution model). Comparison of two samples (variances, means).
8. Analysis of variance
Comparison of more than two samples (variances, means).
9. Regression models
Correlation coefficient. Linear regression. Hypothesis testing.

METHODOLOGY

LEARNING ACTIVITIES

Learning Activities	Hours	ECTS Credits	Competences
Lectures	32	1,2	E2, CB1, CB4, TE5
Case and Problem-Solving Sessions	26	1,0	E2, CB1, E7, CB2, CB4, TE5
Seminars	-	-	
Practical & Lab Work	-	-	
Presentations	-	-	
Personal study	95	3,5	E2, CB1, E7, CB2, TE5
Assessment Tasks (Exams, Continuous Assessment...)	9	0,3	E2, CB1, E7, CB2, CB4, TE5
TOTAL	162	6	

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TEACHING METHODOLOGY

The sessions combine theoretical discussion with exercises, problems and cases; some of the exercises are corrected immediately in the classroom, while others are proposed as personal study activities or homework. Students can consult their doubts during the following classes or in office hours

Periodically, students do assessment activities to become aware of their progress in acquiring knowledge and abilities of the subject. Some of these assessments are performed without notice, in order that students take the subject up to date, but those that have more weight in the final grade is made on reasonable notice, according to the schedule announced earlier and course.

For personal study, students must be supported by the notes obtained in class, supplemented with the consultation of any of the books that are available in the library of IQS. Students are encouraged to practice exercises from recommended books.

ASSESSMENT

ASSESSMENT METHODS

Assessment Methods	Weight	Competences
Final Exam	40%	E2, CB1 E7, CB2, TE5
Midterm Exam/s	30%	E2, CB1 E7, CB2, TE5
Follow-up Activities	30%	E2, CB1 E7, CB2, CB4, TE5
Reports and Presentations	-	
Lab or Field Work	-	
Projects	-	
Host Student Evaluation	-	
Participation	-	

LEARNING OUTCOMES

- Students must demonstrate that they understand basic concepts and know how to use the basic statistical techniques that are the subject contents (→E2, CB1, TE5).
- Students must demonstrate that they are able to identify, formulate and solve chemical and engineering problems where the use of statistical techniques is necessary. (→ E2, CB1, E7, CB2, TE5)
- Students must demonstrate that must demonstrate their ability to present the correct application of the statistical techniques applied to the situations of Chemical



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Engineering and state the conclusions in a reasonable and correct way. (→ E7, CB2, CB4, TE5)

QUALIFICATION

The rating of the course will be calculated using three methods of evaluation: Final Exam (A), three exams (B) and Activities in class (C) and weighing their notes in accordance with the assigned weights (see table evaluation methods.) The final grade (NF) is obtained by applying the formula: $NC = (0.3 C + 0.3 B + 0.4 A)$ and the condition: IF (A and B and C) ≥ 2.5 THEN $NF=NC$ ELSE $NF=NC/2$.

ASSESSMENT OF THE COMPETENCES

Each of the three skills will be evaluated using the answers to certain questions of the evaluation methods A and B2. This will be three basic types of questions: 1) Concepts and practical exercises (E2, CB1), 2) problems such as those made in class to assess E7 and CB2 and 3) problems for which the solution can be inferred from what done in class, but that involve new or different situation, to assess the competences CB4-TE5. The indicator used in each case is the mean score obtained in the corresponding question type.

BIBLIOGRAPHY

- D.C. Montgomery, G.C. Runger. Probabilidad y Estadística aplicadas a la Ingeniería 2ª Ed. Limusa-Wiley, México. (2004). ISBN: 968-18-5915-6
- W. Navidi, Estadística para ingenieros y científicos. McGraw Hill, México. (2006). ISBN: 970-10-5629-9
- R.E. Walpole, R.H. Myers, S.L. Myers. Probabilidad y Estadística para ingenieros. 6ª Edición. Prentice Hall Hispanoamericana. México (2012).

DOCUMENT HISTORY

PREVIOUS REVISIONS

NA

CURRENT REVISION

February 24, 2019, Dra. Laura Fernández Ruano