

Approval date: 25/06/2024

COURSE GUIDE

Computational Statistics in Pharmacy (20411A7)

Grado (Bachelor's Degree)	Grado en Farmacia	Branch	Health Sciences
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Module	Complementos de Formación	Subject	Estadística Computacional en Farmacia
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Year of study	3 ^o	Semester	1 ^o	ECTS Credits	6	Course type	Elective course
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PREREQUISITES AND RECOMMENDATIONS

It is recommended to have taken and passed the following subjects: Biometrics
The recommended level of English is B2, never lower than B1 in MCERL.

BRIEF DESCRIPTION OF COURSE CONTENT (According to the programme's verification report)

1. Methods of statistical inference
2. Statistical experiment design I. Variance analysis.
3. Statistical experiment design II. Regression.
4. Nonparametric statistics
5. Sampling from finite population
6. Treatment of qualitative data

SKILLS**GENERAL SKILLS**

- CG03 - Saber aplicar el método científico y adquirir habilidades en el manejo de la legislación, fuentes de información, bibliografía, elaboración de protocolos y demás aspectos que se consideran necesarios para el diseño y evaluación crítica de ensayos preclínicos y clínicos.

SUBJECT-SPECIFIC SKILLS

- CE12 - Aplicar los conocimientos de Física y Matemáticas a las ciencias farmacéuticas.
- CE13 - Aplicar técnicas computacionales y de procesamiento de datos, en relación con la información referente a datos físicos, químicos y biológicos.
- CE14 - Diseñar experimentos en base a criterios estadísticos.



- CE15 - Evaluar datos científicos relacionados con los medicamentos y productos sanitarios.
- CE16 - Utilizar el análisis estadístico aplicado a las ciencias farmacéuticas.

TRANSFERABLE SKILLS

- CT02 - Capacidad de utilizar con desenvoltura las TICs

LEARNING OUTCOMES

At the end of the course it is expected that the student will be able to:

- a) Outline, resolve and interpret a statistical hypothesis and analyse a variance.
- b) Formulate, estimate and interpret a linear and nonlinear regression model
- c) Use the adequate type of sampling, calculation the corresponding sample size.
- d) Work with contingency tables for categorical data.

PLANNED LEARNING ACTIVITIES

THEORY SYLLABUS

- Unit 1: Distribution function.
 - Discrete and continuous probability distributions. Expected value and variance. Distributions in sampling: t-Student, Pearson χ^2 and Fisher-Snedecor distribution.
- Unit 2 : Random variables: Statistical inference by estimation
 - Concept and properties of an estimator. Estimation methods: maximum likelihood, mean squares, Bayes, etc. Estimation with Gaussian variables: Fisher's theorem. Estimation by means of confidence intervals. Calculation of the sample size.
- Unit 3: Statistical inference by test of hypothesis
 - Basis concepts in statistical tests. Test with the Gaussian distribution. Test with two Gaussian variables. Interpretation of the p-value.
- Unit 4: Statistical design of a experiment I: Analysis of variance
 - Linear decomposition of the variance. One factor designs: the ANOVA I model. Two factor designs: the ANOVA II model. Balanced designs with multiple observations: Interaction analysis. Designs by means of latin squares and greco-latin squares.
- Unit 5: Statistical design of a experiment I: Regression
 - Introduction. Linear simple regression model. Linear multiple regression model. Non-linear regression. Logistic and Poisson regressions.
- Unit 6: Non-parametric statistics
 - Introduction. Tests for paired variables: signs test and Rank-signs Wilcoxon test. Tests for independent variables: Mann-Withney, Kolmogorov-Smirnov and Kruskal-Wallis tests. Friedman test. Spearman's rank-correlation. Dixon and Grubbs tests for anomalous data.
- Unit 7: Treatment of qualitative data
 - Goodness adjust asymptotic test. Test of Independence for qualitative variables. Diagnostic agreement. Analysis of 2x2 contingency tables. Epidemiological applications. Area under ROC curve.



- Unit 8: Sampling on finite populations
 - Probabilistic versus intentional sampling. Simple random sampling. Stratified random sampling. Sampling by means of conglomerates. Systematic sampling.

PRACTICAL SYLLABUS

The practices will be developed in the computer room and will consist in studying the solution of case studies by means of statistics using a statistical program. The statistical knowledge to solve the cases is the theoretical content of the subject.

RECOMMENDED READING

ESSENTIAL READING

- E. Cobo, P. Muñoz y J.A. González: Bioestadística para no Estadísticos. Elsevier, Barcelona (2007).
- C.M. Cuadras: Problemas de Probabilidades y Estadística (2 vols.). EUB, Barcelona (1999).
- V. Quesada, A. Isidoro y L.A. López: Curso y Ejercicios de Estadística. Alhambra, Madrid (2000).
- F. Rius y F.J. Barón: Bioestadística. Thomson-Paraninfo, Madrid (2008).
- S.M. Ross: Introducción a la Estadística. Reverté, Barcelona (2007).
- M.L. Samuels, J.A. Witmer y A. Schaffner: Fundamentos de Estadística para las Ciencias de la Vida. Pearson, Madrid (2012).

COMPLEMENTARY READING

- D. S. Shafer, Beginning Statistics, Zhiyi Zhang Publisher: lardbucket.org (2014).
Electronic version at <https://2012books.lardbucket.org/pdfs/beginning-statistics.pdf>
- J.S. Milton: Estadística para Biología y Ciencias de la Salud. McGraw-Hill, Madrid (2001).
- A. Martín-Andrés y J.D. Luna del Castillo: Bioestadística para Ciencias de la Salud. Norma, Madrid (2005).
- C. Pérez: Estadística Práctica con Statgraphics®. Prencite Hall, Madrid (2002).

RECOMMENDED LEARNING RESOURCES/TOOLS

- The webpage of the subject in PRADO
- <https://2012books.lardbucket.org/pdfs/beginning-statistics.pdf>
- <https://wpd.ugr.es/~bioestad/>

TEACHING METHODS

- MD01 – Lección magistral/expositiva
- MD02 – Sesiones de discusión y debate
- MD03 – Resolución de problemas y estudio de casos prácticos
- MD06 – Prácticas en sala de informática
- MD10 – Realización de trabajos individuales
- MD12 – Tutorías



- MD13 - Participación en plataformas docentes

ASSESSMENT METHODS (Instruments, criteria and percentages)

ORDINARY EXAMINATION DIET

The final assessment of the subject consists of three different parts:

1. Partial and final exam: 5 points
2. Attendance and exam of the practical classes: 3 points
3. Class work: 2 points.

EXTRAORDINARY EXAMINATION DIET

This is the **resit exam** and its assessment consists of three different parts:

1. Exam of problems: 5 points
2. Exam of the practical classes: 3 points
3. Theory exam (short or multiple choice questions on concepts): 2 points.

SINGLE FINAL ASSESSMENT (evaluación única final)

Students who cannot comply with the requirements of the continuous assessment system may qualify for the single assessment system, in accordance with article 8 of the "Regulation on the Evaluation and Grading of Students of the University of Granada". Those who qualify for this type of assessment in accordance with the said regulation will have to request it to the head of the Department in the first two weeks from the date of enrollment, alleging and proving the reasons that justify not being able to follow the continuous assessment system.

The content of the subject is the one described in the syllabus aforementioned. The assessment consists of the same three parts of the resit exam and will take place on the same date as the ordinary or extraordinary exam as it corresponds.

ADDITIONAL INFORMATION

- **Students with Specific Educational Support Needs (NEAE).** In accordance with the recommendations of the CRUE and the Secretariat for Inclusion and Diversity of the University of Granada, the systems for the acquisition and evaluation of competences included in this teaching guide will be applied in this teaching guide will be applied in accordance with the principle of design for all people, facilitating learning and the demonstration of knowledge according to the needs and functional diversity of the students. The teaching methodology and assessment will be adapted to the needs and functional diversity of the students with specific educational support needs (SEN), in accordance with Article 11 of the Regulations for the Evaluation and Grading of students at the University of Granada, published in the Official Bulletin of the University of Granada no. 112 of 9 November 2016.
- **UGR Inclusion and Diversity.** In the case of students with disabilities or other specific educational support needs, the tutoring system must be adapted to their needs, in accordance with the recommendations of the tutoring system must be adapted to their needs, in accordance with the recommendations of the University's Inclusion Unit of the





University, and the Departments and Centres will proceed to establish the appropriate measures to ensure that tutorials are held in accessible places. Likewise, at the request of the lecturer, support may be requested from the competent University unit in the case of special methodological adaptations.

Información de interés para estudiantado con discapacidad y/o Necesidades Específicas de Apoyo Educativo (NEAE): [Gestión de servicios y apoyos \(https://ve.ugr.es/servicios/atencion-social/estudiantes-con-discapacidad\)](https://ve.ugr.es/servicios/atencion-social/estudiantes-con-discapacidad).

