



Teaching Guide

| Identifying Data | | | | |
|----------------------------|---|---------------|----------------------|----------------|
| Subject (*) | Statistics | Code | 2023/24 730G03008 | |
| Study programme | Grao en Enxeñaría Mecánica | | | |
| Descriptors | | | | |
| Cycle | Period | Year | Type | Credits |
| Graduate | 2nd four-month period | First | Basic training | 6 |
| Language | Spanish | | | |
| Teaching method | Face-to-face | | | |
| Prerequisites | | | | |
| Department | Análise Económica e Administración de EmpresasEconomíaEmpresaMatemáticas | | | |
| Coordinador | Ríos Prado, Rosa | E-mail | rosa.rios@udc.es | |
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| Web | | | | |
| General description | This subject teaches the concepts of Statistics applied to Industrial Engineering | | | |

Study programme competences

| Code | Study programme competences |
|------|--|
| A1 | FB1 - Capacidade para a resolución dos problemas matemáticos que poidan formularse na enxeñaría. Aptitude para aplicar os coñecementos sobre: álgebra lineal; xeometría; xeometría diferencial; cálculo diferencial e integral; ecuacións diferenciais e en derivadas parciais; métodos numéricos; algorítmica numérica; estatística e optimización. |
| B2 | CB02 - Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo |
| B3 | CB03 - Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitiren xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética |
| B4 | CB04 - Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como leigo |
| B5 | CB05 - Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprenderen estudos posteriores cun alto grao de autonomía |
| B6 | B3 - Ser capaz de concibir, deseñar ou poñer en práctica e adoptar un proceso substancial de investigación con rigor científico para resolver calquera problema formulado, así como de comunicar as súas conclusións ?e os coñecementos e razóns últimas que as sustentan? a un público tanto especializados como leigo dun xeito claro e sen ambigüidades |
| B7 | B5 - Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas |
| C1 | C3 - Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida. |
| C4 | C6 - Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse. |

Learning outcomes

| Learning outcomes | Study programme competences | | |
|--|-----------------------------|----------------------------------|----------|
| Be able to solve the mathematical problems of Statistics that can be applied in engineering. | A1 | B2 B3 B4 B5 B6 B7 | C1 C4 |

Contents

| Topic | Sub-topic |
|-------|-----------|
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| The following topics develop the contents established in the tab of the Verification Memory that are: | Statistics |
| Introduction to Statistics | Introduction Random phenomena. Statistical inference. Stages of a statistical investigation. Problems. |
| 2. Exploratory data analysis. | Descriptive statistics. Tabulation of a sample with repetitive data: frequency table. Histogram Cumulative diagram Tabulation of a sample with non-repetitive data: frequency table. Measures of central tendency. Measures of dispersion. Other measures of dispersion. Measures of form. Diagram of boxes and whiskers. Analysis of the stability of the relative frequencies. Problems. |
| 3. Probability. | Sample space. Operations with success. Counting techniques Fundamental properties of the frequencies. Axioms of the probabilities. Probability function. Properties deduced from the axioms. Definition of probability according to Laplace. Probability conditioned. Product theorem Total probability theorem. Bayes theorem. Dependence and independence of events. Problems. |
| 4. Random variables. | Random variable. Discrete random variable: characteristics. Continuous random variable: characteristics. Tchebycheff's theorem. Characteristic function Transformation of random variables. Problems. |
| 5. Discrete random variables and probability distributions. | Introducción. Pruebas de Bernoulli. Distribución binomial. Distribución geométrica. Distribución hipergeométrica. Distribución de Poisson. Aproximación de distribuciones. Problemas. |
| 6. Continuous random variables and probability distributions. | Introducción. Distribución uniforme. Distribuciones Erlang y gamma. Distribución exponencial. Distribución de Weibull. Distribución normal. Gráficos de probabilidad. Problemas. |
| 7. Joint probability distributions. | Distribuciones de probabilidad conjuntas. Función de distribución conjunta. Distribuciones marginales. Variable aleatoria bidimensional discreta. Variable aleatoria bidimensional continua. Variables aleatorias independientes. Variable aleatoria n dimensional. Esperanza matemática. Teoremas de adición. Transformación de variables aleatorias. Teorema central de límite. Problemas. |
| 8. Statistical inference. | Statistical sampling. Distributions associated with a sampling process. Distribution of the sample mean. The statistical variance sample. Chi-square distribution of Pearson. Simple random sampling of a normal distribution. Student's t distribution. Student's reason F distribution of Snedecor. Problems. |
| 9. Point estimation of parameters. | Estimation by points. Centered estimators. Consistent estimators Sufficiency. Criterion of Neyman-Fisher. Methods of obtaining estimators. Problems. |
| 10. Statistical intervals for a single sample. | Confidence intervals. Confidence interval for the mean of a normal population with known variance. Confidence interval for the mean of a normal population with unknown variance. Confidence interval for the variance of a normal population. Confidence interval for the proportion of a population. Problems. |
| 11. Test of hypotheses for a single sample. | Contrast of statistical hypothesis. Unilateral and bilateral contrasts. P values in contrast to hypotheses. Connection between hypothesis contrasts and confidence intervals. General procedure for hypothesis contrasts. Test of the mean of a normal population with known variance. Test of the mean of a normal population with unknown variance. Contrast of the variance and standard deviation of a normal distribution. Contrast of the proportion of a population. Contrast of goodness of fit. Contrast with contingency tables. Problems. |
| 12. Regression. | Association between random variables. Regression analysis. Quadratic minimum linear regression. Problems. |



| Methodologies / tests | Competencies | Ordinary class hours | Student's personal work hours | Total hours |
|---------------------------------|-------------------------------|----------------------|-------------------------------|-------------|
| Guest lecture / keynote speech | A1 B2 B3 B4 B5 B6 B7 C1 C4 | 25 | 45 | 70 |
| Problem solving | A1 B2 B3 B4 B5 B6 B7 C1 C4 | 20 | 20 | 40 |
| ICT practicals | A1 B2 B3 B4 B5 B6 B7 C1 C4 | 12 | 18 | 30 |
| Mixed objective/subjective test | A1 B2 B3 B4 B5 B6 B7 C1 C4 | 3 | 6 | 9 |
| Personalized attention | | 1 | 0 | 1 |

(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

| Methodologies | |
|---------------------------------|--|
| Methodologies | Description |
| Guest lecture / keynote speech | Lectures about the course topics. |
| Problem solving | Solving exercises and statistical problems encountered in engineering. |
| ICT practicals | Resolution of practical cases of statistical problems by Excel. |
| Mixed objective/subjective test | Midterm exam: chapters 1 to 6. |

| Personalized attention | |
|---|---|
| Methodologies | Description |
| ICT practicals Mixed objective/subjective test | The personalized attention will be made in the tutorials. |

| Assessment | | | |
|---------------------------------|-------------------------------|--|---------------|
| Methodologies | Competencies | Description | Qualification |
| ICT practicals | A1 B2 B3 B4 B5 B6 B7 C1 C4 | Evaluation of case studies solved in small groups. | 30 |
| Mixed objective/subjective test | A1 B2 B3 B4 B5 B6 B7 C1 C4 | Exams on the topics of the subject. | 70 |

| Assessment comments |
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