



Faculty of Business Science and Tourism

GENERAL SPECIFICATIONS

ACADEMIC YEAR 2023-2024

DEGREE IN FINANCE AND ACCOUNTING

Subject Data

Name:

ESTADÍSTICA ACTUARIAL

English name:

ACTUARIAL STATISTICS

Code:

858610317 / 859110329

Type:

Elective

Hours:

	Total	In class	Out class
Time distribution	75	22,5	52,5

ECTS:

Standard group	Small groups			
	Classroom	Lab	Practices	Computer classroom
2.4				0.6

Departments:

Economics

Knowledge areas:

Quantitative methods for economics and business

Year:

4th

Semester

2nd

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TEACHING STAFF

Name:	E-mail:	Telephone
David Castilla Espino (Coordinator)	david.castilla@dehie.uhu.es	959 217 868
Ramón Jiménez Toribio	toribio@uhu.es	959 217 871

Others Data (Tutoring, schedule...)

Group	Day and time	Dates
T1- II	Tuesday and Thursday, from 17:30 to 19:30	Large (18 hours) and small (4.5 hours) groups dates and timetable available on the Moodle site for the course.

Prof.: Dr. David Castilla Espino (coordinator).

Department: Economics

Office: 62 (Faculty of Business Science and Tourism)

Office hours: <http://goo.gl/F3z3K>

First semester				
Monday	Tuesday	Wednesday	Thursday	Friday
	10:30-14:30	15:30-17:30		
Second semester				
Monday	Tuesday	Wednesday	Thursday	Friday
	10:30-13:30 16:30-19:30			

Prof.: Dr. Ramón Jiménez Toribio

Department: Economics

Office: 63 (Faculty of Business Science and Tourism)

Office hours: <http://goo.gl/dH7sB4>

First semester				
Monday	Tuesday	Wednesday	Thursday	Friday
		17:30-19:30		9:30-13:30
Second semester				
Monday	Tuesday	Wednesday	Thursday	Friday
		10:30-12:30		9:30-13:30

SPECIFIC INFORMATION OF THE COURSE

I. Contents description:

I.1 In English:

- Actuarial Phenomena and its modelling.
- Biometrics. Survival analysis. Biometric structures. Biometric functions. Probable and expected life. Life expectance. Estimation of the probability of dying.
- Models related to the distribution of the number of claims. Poisson law. Truncated distribution. Generalized distribution. Poly-a-Eggenberger law. Negative binomial distribution.
- Models related to the distribution of the density of claims: log-normal law, Pareto law, Burr Law, Exponential law: different cases; and Beta law.
- Stochastic processes: stationary stochastic process and Harkov chains; and Markov process.

I.2 In Spanish:

- Fenómenos actuariales y su modelización.
- Biometría. Teoría de la supervivencia. Estructuras biométricas. Funciones biométricas. Vida media y vida probable. La esperanza de vida. Estimación de la probabilidad de muerte.
- Modelos relacionados con la distribución del número de siniestros: ley de Poisson, distribución truncada, distribución generalizada, ley de Poly-a-Eggenberger; y ley binomial negativa.
- Modelos relacionados con la distribución de la cuantía de un siniestro: ley logarítmico-normal, ley de Pareto, ley de Burr, ley Exponencial: distintos casos; y ley Beta.
- Procesos estocásticos: Procesos estocásticos estacionarios y cadenas de Harkov. Procesos de Markov.

2. Background:

2.1 Situation within the Degree:

It is an elective subject of the last year of the Degree in Finance and Accounting. It provides basic knowledge in Statistics.

2.2 Recommendations

To have knowledge of Statistical Inference and Econometrics.

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3. Objectives (as result of teaching):

GENERAL OBJECTIVES

On completion of this course students should be able to:

- analyze descriptive statistics and inferential behavior of random variables within the framework of Business and Economics.
- demonstrate an understanding of the statistical methods of dependence and interdependence.
- apply critical thinking to the use and analysis of actuarial statistical methods.

SPECIFIC OBJECTIVES

After studying this course students should be able to:

- model the behaviour of the main biometric variables - survival, force mortality,...- in terms of their statistical characteristics.
- demonstrate knowledge of the main stochastic methods applied to the actuarial sector, in particular to life insurance.
- identify actuarial phenomena as a particular case of economic phenomena.
- show an understanding of when and how to apply alternative statistical techniques to different actuarial case studies.
- apply solutions provided by Probability Theory to risk and uncertainty in different actuarial case studies.

4. Skills to be acquired

4.1 Specific Skills:

4.2 General, Basic or Transversal Skills:

- (CG1) Develop knowledge, instrumental and attitudinal skills in the context of Finance and Accounting.
- (TC1) Be completely fluent in Spanish, mastering the different styles and the specific languages required to develop and communicate the acquired knowledge in the scientific and academic environment.
- (TC2) Develop a critical attitude, being able to analyse and synthesize.
- (TC3) Develop an attitude of inquiry that permanently enables to review and deepen in the knowledge.
- (TC4) Acquire Computer and Information Skills (CI2) and apply them working.
- (TC6) To promote, respect and safeguard human rights, democratic values, social equality and environmental sustainability, without discrimination on the basis of birth, race, sex, religion, opinion or other personal or social circumstances.

5. Training Activities and Teaching Methods

5.1 Training Activities:

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- Theoretical/practical classes about the contents of the syllabus.
- Supervised activities by lecturers: seminars, conferences, development of assignments, debates, group tutorials, assessment/self-assessment activities.
- Individual / autonomous work of the student.

5.2 Teaching Methods:

- Face-to-face theoretical classes.
- Face-to-face practical classes.
- Autonomous supervised work of the student.
- Assessment tests.
- Tutorials.

5.3 Development and Justification:

Methodology	Activity	Description	No. of hours
Face-to-face classes about theoretical and practical contents of the course.	Theoretical classes (Big groups)	Lectures by teachers, in which the participation of students in the classroom (discussions) is encouraged. Foundations and theoretical approaches Presentation and discussion of reports by students	18
	Practical classes (Small groups)	Problems and case studies: approaches and solutions to specific problems related to the subject. Development of IT skills for subject-specific software.	4.5
Individual / autonomous work of the student	Individual preparation of essays on theory and practical applications (following tutor's suggestions). Autonomous study of subject contents.	Documentation. Background reading, eg articles. Use of IT. Problem solving and case-study preparation. Theoretical (concepts and principles) and practical contents of the subject. Students independently explore topics not covered by lectures.	52.5

All the necessary material to follow the theoretical and practical classes will be available on the online (distance) learning platform, Moodle (<https://moodle.uhu.es/>). The page will contain information about the contents of the subject, the work plan, the schedule of lectures and practicals, as well as interesting links about the subject.

Lectures will make use of the whiteboard (traditional and electronic version), computer presentations and supplementary material provided by the lecturer (photocopies, electronic files, etc.). The practical classes will focus on applying the content addressed in the lectures, with an emphasis on solving problems, the limitations and advantages of the techniques studied, and critical analysis of the results obtained. These practical sessions will be interactive and the participation of students will be taken into account when assessing to the extent to which learning has taken place.

For practical classes there will be computers available in the computer classrooms at the Faculty.

6. Detailed Contents**PART I. PROBABILITY DISTRIBUTIONS FOR LIFE INSURANCE: THEORY OF SURVIVAL****UNIT 1. BIOMETRICS / BIostatISTICS**

- 1.1. Basic assumptions of the biometric model
- 1.2. Biometric variables. Cumulative distribution function
- 1.3. Probability of survival and mortality
- 1.4. Force of mortality / failure intensity / failure rate / hazard intensity
- 1.5. Residual life, life expectancy, probable life

UNIT 2. LIFE TABLES

- 2.1. Biometric structures. Quiquet's theory
- 2.2. Biometric Laws: De Moivre, Gompertz, Makeham
- 2.3. Life tables. Construction.
- 2.4. Survival of several heads
- 2.5. Dynamic study of mortality

PART II. PROBABILITY DISTRIBUTIONS FOR NON-LIFE INSURANCE: RISK**UNIT 3. DISTRIBUTIONS FOR CLAIMS**

- 3.1. Distributions for the number of claims
 - 3.1.1. Poisson distribution
 - 3.1.2. Hypergeometric distribution
 - 3.1.3. Polya-Eggenberger distribution
 - 3.1.4. Other distributions
- 3.2. Distributions for the amount of a claim
 - 3.2.1. Log-Normal distribution
 - 3.2.2. Pareto distribution
 - 3.2.3. Burr distribution
 - 3.2.4. Gamma distribution
 - 3.2.5. Other distributions

UNIT 4. DISTRIBUTION OF TOTAL LOSS OR DAMAGE

- 4.1. Distribution of total damage
- 4.2. Getting the distribution of accidents
- 4.3. Simulation of accidents

PART III. STOCHASTIC PROCESSES AND ACTUARIAL AND FINANCIAL APPLICATIONS**UNIT 5. INTRODUCTION TO STOCHASTIC PROCESSES**

- 5.1. Concept and types
- 5.2. Distribution of a stochastic process. Stationarity
- 5.3. Markov chains. Transition matrix
- 5.4. Markov processes

UNIT 6. OTHER STOCHASTIC PROCESSES

- 6.1. Birth and death processes
- 6.2. Processes with absorbing states
- 6.3. Population models
- 6.4. Poisson processes
- 6.5. Models of number of claims and valuations
- 6.6. Other processes: branching, renewal, diffusion
- 6.7. Financial valuation models

7. Bibliography

7.1 Basic Bibliography:

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- Batten, R.W. (1978), "Mortality table construction", Ed. Prentice Hall, Nueva Jersey.
- Bühlmann, H. (1996), "Mathematical Methods in Risk Theory", Ed. Springer, Nueva York.
- Haberman, S. y Sibbett, T.A. (1995), "Life Insurance Mathematics", Ed. William Pickering, London.
- López M. y López, J. (1996), "Estadística para actuarios", Ed. MAPFRE, Madrid.
- Mateos-Aparicio, G., (1995), "Métodos Estadísticos para actuarios", Edit. Complutense,
- Pressat, R. (1981), "Demografía Estadística", Ed. Ariel, Barcelona.
- Pressat, R. (1993), "El Análisis Demográfico: conceptos, métodos, resultados", Ed. Fondo de Cultura Económica, Madrid.
- Sarabia, J. M. et al., (2007), "Estadística actuarial. Teoría y aplicaciones", Pearson.
- Shryock, H., Siegel, J. et al., (1976), "Studies in Population. The Methods and Materials of Demography", Academic Press, London.
- Vegas, A. (1981), "Estadística. Aplicaciones Econométricas y actuariales", Ed. Pirámide, Madrid

7.2 Additional Bibliography:

SPECIFIC REFERENCES

- Bowers, N.L. et al. (1997), "Actuarial Mathematics, The Society of Actuaries", Illinois, USA.
- Bühlmann, H. (1996), "Mathematical Methods in Risk Theory", Ed. Springer, Nueva York.
- Gil, J.A., Heras, A. y Vilar, J.L. (1999), "Matemática de los seguros de vida", Ed. MAPFRE, Madrid

OTHER ONLINE SOURCES OF INFORMATION

- Population Analysis for Policies & Programmes: papp.iussp.org
- Sociedad Española de Biometría: www.biometricsociety.net

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8. Systems and Assessment Criteria

8.1 System for Assessment:

- Written/oral exam.
- Continuous assessment.

8.2 Assessment Criteria and Marks:

8.2.1 Examinations Convocatory I

Assessment form	Description	Criterium	Weight on the final mark
Written exam	Individual theoretical and practical test, in which the theoretical, practical and methodological knowledge will be assessed	<ul style="list-style-type: none"> • Ability to solve problems and apply the theoretical contents to practice. • Ability to summarise. • Knowledge and understanding of the contents. • Absence of errors. • Appropriate use of concepts and terminology. • Internal coherence of the exercise and between it and all the knowledge. • Correctness in the use of spelling, grammar and syntax. • Ability to interrelate theories, models and concepts. • Precision and accuracy of the answers. • Capacity of students to plan, develop and present an empirical work on different facets of the subject. • Oral and written communication ability of the student. • Ability to use software and information-communication technologies. • Use of the educational media of the University of Huelva available to students. 	Theoretical contents (15%) Problem solving and application of econometrics to finance (35%)
Continuous assessment	Continuous assessment can consist of: <ul style="list-style-type: none"> • Writing and oral tests. • Empirical works on different aspects of the subject and their presentation. • Different types of practical assignments. • Active participation in seminars, workshops or other activities related to course contents. • Other activities and test that allow to get learning objectives of the course. 	<ul style="list-style-type: none"> • Ability to solve problems and apply the theoretical contents to practice. • Ability to summarise. • Knowledge and understanding of the contents. • Absence of errors. • Appropriate use of concepts and terminology. • Internal coherence of the exercise and between it and all the knowledge. • Correctness in the use of spelling, grammar and syntax. • Ability to interrelate theories, models and concepts. • Precision and accuracy of the answers. • Capacity of students to plan, develop and present an empirical work on different facets of the subject. • Oral and written communication ability of the student. • Ability to use software and information-communication technologies. 	50%

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- Use of the educational media of the University of Huelva available to students.

The set of evaluation activities shall be subject to the Policy of Evaluation for undergraduate and postgraduate degrees at the Universidad de Huelva (the Governing Council of March 13, 2019): http://www.uhu.es/sec.general/Normativa/Textos_Pagina_Normativa/Normativa_2019/Rgto_evaluacion_grado_mofs_ccgg_l9_03_13.pdf

Rating system

The rating system used in this subject is in accordance with that set out in article 5 of Royal Decree 1125/2003, of September 5, which establishes the European credit system and the grading system for official university degrees and which is valid in all Spain. Results obtained by the student in each subject of the curriculum will be graded according to the following numerical scale from 0 to 10, with one decimal place, to which may be added the corresponding qualitative rating:

- 0.0 to 4.9: D. Fail (Suspendo)
- 5.0 to 6.9: Grade C (Aprobado)
- 7.0 to 8.9: Grade B (Notable)
- 9.0-10: Grade A (Sobresaliente)

The weighted average of the marks obtained by the student in the different types of assessment described in the previous table must be at least 5 in order to pass the subject. In those cases in which more than one activity is evaluated for a specific type of assessment, all of them will be weighted proportional to the contents assessed.

The written exams that evaluate the theoretical and practical contents can be passed throughout the course by means of periodic exams if the lecturers consider it appropriate. For these purposes, for the calculation of the average, all periodic tests will be weighted proportional to the contents assessed. In the case of a pass, they will substitute the final written exam in relation to the same content.

A practical application will be used by software in the computer classroom as a complement to the written exam and in substitution of the continuous evaluation and/or course work, in the resit exams that are listed below:

- Resit exam if continuous evaluation has not been passed.
- Resit exam in the following academic year, for students who choose a final single evaluation.
- Resit exam to complete a degree.
- Resit exam for students on mobility programmes.
- Final appeal exam by special dispensation.

The student must prove the acquisition of all the skills related to the practical application by software in the computer room and must obtain a minimum grade of 3 to be able to pass the subject in which it will have a weight equivalent to the tests of continuous evaluation and/or course work shown in the previous table (50%).

The evaluation criteria used in the different activities will correspond in general with the competences related in this guide and, in particular, they are specified with no intention to be exhaustive in the following list:

- Ability to solve problems and apply the theoretical contents to practice.
- Ability to summarise.
- Knowledge and understanding of the contents.
- Absence of errors.
- Appropriate use of concepts and terminology.
- Internal coherence of the exercise and between it and all the knowledge.
- Correctness in the use of spelling, grammar and syntax.
- Ability to interrelate theories, models and concepts.
- Precision and accuracy of the answers.
- Capacity of students to plan, develop and present an empirical work on different facets of the subject.
- Oral and written communication ability of the student.
- Ability to use software and information-communication technologies.
- Use of the educational media of the University of Huelva available to students.

Those students who have a B (Notable) final grade in the subject may request to increase their final grade to the coordinator of the subject. This will be done in writing to the Secretary Office of the Department. In this case, the teacher will suggest to the student an individual activity for that purpose. If the mark for this activity is equal to or greater than 5 on a numerical scale from 0 to 10, up to 2 points can be added to the student's final grade depending on the mark obtained in the activity up to a maximum grade of 10.

The mention "honors" will be awarded to students who have obtained a mark equal to or greater than 9.0. The number of mentions "honors" may not exceed 5% of the students registered in a subject in the same academic year, unless the number of students registered is less than 20, in which case, a single "honors" may be awarded.

For the calculation of the maximum number of honors, the number of students will be rounded up to the next highest number and students from the University of Huelva who are studying at another university within the framework of a national or international mobility programme will not be considered for the calculation. These students' grades at the destination university will be recognised, regardless of whether the quota has been completed with students who take the subject at the University of Huelva.

When there is more than one student who meets the requirements to obtain the mention "honors" and the maximum number

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of mentions “honors” has been reached, the mention “honors” will be awarded to the one with the highest final grade. In those cases in which the students who opt for the mention “honors” have the same final grade, the lecturer will suggest an activity consisting of the preparation of an essay or individual work to those students so that a mention “honors” will be awarded to the student who has the highest score in this activity on a numerical scale from 0 to 10.

The student who decides not to take the written exam will be included in the record with the notation of Absent (No presentado).

Students have the right to take 2 out of 3 ordinary examinations. These exams have a maximum duration of three hours and must allow to evaluate 100% of the subject.

8.2.1 Examinations Convocatory I

It will consist of a written exam according to the characteristics and weights described in the table presented at the beginning of this section. The mark of this exam will be computed by means of the weighted average of the grade obtained in continuous assessment and written exam, unless the student has opted for the final single evaluation test according to what is established in the Policy of Evaluation for undergraduate and postgraduate degrees at the Universidad de Huelva (the Governing Council of March 13, 2019). Students will pass the subject if they obtain a grade of at least 5 in the weighted average of different means of evaluation.

8.2.2 Examinations Convocatory II

It will consist of a written exam according to the characteristics and weights described in the previous section. The mark of this exam will be determined by means of the weighted average of the grade obtained in continuous assessment and the written exam, provided that the student has passed continuous assessment and unless he has opted for the final single evaluation test as stated in the Policy of Evaluation for undergraduate and postgraduate degrees at the Universidad de Huelva (the Governing Council of March 13, 2019). Students will pass the subject if they obtain a grade of at least 5 in the weighted average of different means of evaluation. If students did not attain a grade of unless 3 in the continuous assessment, the tests of this examination will have the same structure as those for the final single evaluation test.

8.2.3 Examinations Convocatory III

Ordinary examination III or resit exam in the following academic year. The tests of this examination will have the same structure as those for the final single evaluation test.

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8.2.4 Extraordinary Convocatory

Students will be able to take part in the following examination: resit exam to complete the degree, repit exam for students of mobility programmes and final appeal exam by special dispensation with the conditions established in the Policy of Evaluation for undergraduate and postgraduate degrees at the Universidad de Huelva (the Governing Council of March 13, 2019) and upon request to the Secretary of the Faculty of Business Studies and Tourism or to the Chancellor in the case of the final appeal exam by special dispensation considering the deadlines established for that purpose. The tests of these exams will have the same structure that the ones for the final single evaluation.

8.3 Single Final Evaluation:

Students will be able to benefit from the final single evaluation when they send an email from their email account of the University of Huelva to the lecturer in the first two weeks of the subject or in the two weeks following enrollment if it has occurred after the beginning of the subject according to the Policy of Evaluation for undergraduate and postgraduate degrees at the Universidad de Huelva. This will imply the express waiver of the continuous evaluation and students will not be able to change to the other system. Nonetheless, in exceptional and duly justified cases, students will be able to apply for the final single evaluation outside the aforementioned deadlines, under the same administrative procedure.

The final single evaluation is carried out in a single academic act and will have a maximum duration of 3 hours. The final single evaluation will consist of a written exam with the characteristics and weights shown above and a practical application using software in computer rooms whose weight will be 50% (equivalent to the weight of continuous assessment and/or course work). It will be that the weighted average of both tests is equal to or greater than 5/10 to pass 100% of the subject.