

**COURSE DATA****Data Subject**

Code	43784
Name	Stochastic processes
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2024 - 2025

Study (s)

Degree	Center	Acad. Period
2171 - Master's Degree in Actuarial and Financial Sciences	Faculty of Economics	1 Second term

Subject-matter

Degree	Subject-matter	Character
2171 - Master's Degree in Actuarial and Financial Sciences	4 - Non-life insurance	Obligatory

Coordination

Name	Department
MORILLAS JURADO, FRANCISCO GABRIEL	110 - Applied Economics

SUMMARY

The Stochastic Processes subject is located in the second semester of the first year. Its integration responds to the formative importance of the module within the syllabus as it serves to develop the technical and methodological bases on which part of the subsequent processes will be based, which the student will acquire in other subjects. In this line, the contents of the subject are linked to part of the contents taught in some of the subjects of subjects III (Finance and Introduction to Insurance), VI (Risk Control and Solvency) and IX (Optional Itineraries).

The subject is professionally useful as part of the contents and, above all, the skills acquired are directly applicable in professional practice. Thus, for example, the aim is for the student to acquire skills in how to obtain precise results of the modelling of the number of claims, the amount of these, the total claims rate, etc. in order to be able to apply them in pricing processes, claims provision by means of theoretical and simulation techniques. In particular, the contents taught include: association and dependence between risk variables, stochastic processes, Markov chains, stationary processes, Poisson and diffusion processes, Brownian movement, temporal beings; so that they can be applied to particular cases of extreme value



theory, risk quantification or pricing.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

In order to make the best use of the subject, the student should know and know how to use the usual contents of introductory mathematics courses (descriptive statistics, representation of functions, differential and integral calculus) and intermediate level statistics (probability models, statistical inference) classically taught in social science studies. In addition, it is desirable that the student possesses basic skills related to the use of software.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

2171 - Master's Degree in Actuarial and Financial Sciences

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Ser capaces de construir modelos adecuados al entorno económico empresarial a partir de las posibilidades que ofrecen las modernas tecnologías de la información y de la computación.
- Saber tomar decisiones relacionadas con los riesgos evaluables económicamente.
- Comprender y ser capaces de desarrollar las técnicas matemáticas y estadísticas que resultan relevantes para el trabajo actuarial: modelos de supervivencia, siniestralidad, tarificación, previsión y solvencia.
- Poseer un amplio conocimiento de los procesos estocásticos y ser capaces de utilizarlos en modelos financieros y actuariales.
- Ser capaces de aplicar los criterios y principios de planificación y control actuarial, necesarios para el correcto funcionamiento de las operaciones que, en cada momento, ofrezcan las entidades de seguros, financieras o cualesquiera otras que impliquen transferencia y cobertura de riesgos.



LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

1. Use the concept of stochastic process to represent and evaluate real situations.
2. Use numerical simulation in the context of Stochastic Processes to reduce uncertainty in prediction.
3. Control the technical risk of insurance companies.
4. Generate and interpret predictions by means of multivariate models.
5. Choose and apply stochastic models for the determination of technical provisions in non-life insurance branches.
6. Know the criteria for calculating premiums, analyse existing pricing systems and favour the design of new products.
7. Apply the principles of statistical inference to select the loss distributions that best fit the claims.
8. Know the actuarial valuation criteria in non-life insurance, as well as elaborate and apply the technical bases.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	15,00	100
Classroom practices	15,00	100
Attendance at events and external activities	2,00	0
Development of individual work	15,00	0
Study and independent work	15,00	0
Preparation of evaluation activities	5,00	0
Preparation of practical classes and problem	3,00	0
Resolution of case studies	5,00	0
TOTAL	75,00	

TEACHING METHODOLOGY

During the course, the contents of the programme will be worked on, combining theoretical content with exercises and practical cases and various tasks will be proposed that the student must hand in in the manner and on the date specified throughout the course.

For this purpose, all available resources (blackboard, transparencies, projector, computer, etc.) will be used in each case and depending on the needs, and which are considered most appropriate for the correct achievement of the proposed objectives.

In general, the classes of the theoretical part will be reduced as far as possible and will be taught using the lecture-participatory methodology, in which the teacher will highlight the fundamental aspects of each subject and will guide the study through the relevant bibliography. At the same time, and given the theoretical-practical nature of this subject, the student will have a desktop PC or similar to validate the results presented in class, so that he/she will be able to study the subject in depth.



The practical classes will consist of posing questions and exercises of an applied nature in the statistical, economic, financial and actuarial field, which the student will have to solve, proceeding, where appropriate, to the relevant modelling and discussion of the solution.

The practical classes may be carried out with computer support, so that the student can have an updated view of the use of the packages and techniques, which are increasingly used in the field of statistics, economics, finance and actuarial studies.

EVALUATION

For the assessment of competences in this subject, a procedure similar to the rest of the subjects in the Master's programme is used.

This may consist of all or part of the following elements:

A final exam, which may consist of theoretical questions, problems and/or real cases.

An evaluation of the practical activities carried out by the student, based on: the preparation of papers/memorials and/or oral presentations - with defence of the positions developed by the students.

Continuous assessment will be based on face-to-face training activities and on the student's participation and involvement in the teaching-learning process. In particular, an independent assessment will be carried out for each of the elements set out.

The percentage distribution of these will be agreed at the beginning of each course jointly by those responsible for each subject, taking into account the comments and indications of the students.

REFERENCES

Basic

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Additional

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- Rolski, T., Schmidli, H. Schmidt, V. y Teugels, J. (2000). Stochastic Processes for Insurance and Finance, Wiley and Sons.
- Bases de información complementarias para el seguimiento del COVID:
 - a. Instituto Nacional de Estadística [en línea] <http://www.ine.es>.
 - b. Secretaría General de Sanidad [en línea] https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_84_COVID-19.pdf.
 - c. Instituto de Salud Carlos III [En línea] <https://www.isciii.es/>.
 - d. Center for Systems Science and Engineering (CSSE) (Universidad Johns Hopkins) [En línea] <https://coronavirus.jhu.edu/map.html>.
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