

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

Code	35943
Name	Financial mathematics
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1315 - Degree in Finance and Accounting	Faculty of Economics	2	First term

Subject-matter

Degree	Subject-matter	Character
1315 - Degree in Finance and Accounting	14 - Financial mathematics	Obligatory

Coordination

Name	Department
CLIMENT SERRANO, SALVADOR	113 - Financial and Actuarial Economics

SUMMARY

The main objective of this subject is to provide students with a solid and generic framework to analyse complex financial transactions. On completion of this course the student should be able to quantify the financial variables in any particular transaction and take the appropriate decisions based on the measurement of the cost and return on the transaction for the borrower and the lender, respectively.

This generic aim can be expressed through the following particular goals:

- To obtain an overview of the scope of Financial Mathematics.
- To master the fundamental concepts of Financial Mathematics.
- To accurately apply the standard valuation model in financial mathematics for the analysis of the most usual financial transactions.
- To develop skills to be applied in the analysis of new financial transactions that could come out in the financial markets.



This course is part of the FINANCE module. This is a mandatory subject of 6 ECTS (150 hours). The contents will be the basis for the development of the other disciplines that make up this module, namely: Fundamentals of Corporate Finance, Financial Markets and Instruments, Banking and Insurance.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

No prior knowledge is required.

OUTCOMES

1315 - Degree in Finance and Accounting

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LEARNING OUTCOMES

1. Basic knowledge for the identification and use of mathematical techniques specific to the financial assessment.
2. Ability to correctly interpret financial information extracted from applications and cases in the financial world.
3. Ability to apply analytical techniques for the valuation of debt instruments and quantify their exposure to changes in interest rates.

DESCRIPTION OF CONTENTS

1. Fundamentals

- 1.1 Introduction.
- 1.2 Simple interest and simple discount.



2. Theory of compound interest

- 2.1 Compound interest rule.
- 2.2 Accumulation and discount factors.
- 2.3 Effective and nominal interest rates.

3. Financial value of payments: introduction to annuities

- 3.1 Financial value of a set of payments. Financial addition.
- 3.2 Annuities. Financial value of an annuity.
- 3.3 Valuing constant annuities.
- 3.4 Valuing annuities varying in geometric progression.

4. Complex annuities

- 4.1 Valuing annuities payable monthly.
- 4.2 Other complex annuities.

5. Financial transaction: financial equivalence and outstanding balance

- 5.1 Definition and classification.
- 5.2 General approach.
- 5.3 Outstanding balance. Concept, calculation methods and evolution.

6. Cost and return: effective rates

- 6.1 Effective rate of a pure financial transaction.
- 6.2 Effective rate of a financial transaction with additional terms and conditions.
- 6.3 A.P.R.(T.A.E. in the Spanish case).

7. Amortization of a debt: general analysis

- 7.1 Definition.
- 7.2 Financial equivalence.
- 7.3 Outstanding balance.
- 7.4 Total payment decomposition.
- 7.5 Other variables and relationships.
- 7.6 Dynamics of the main variables. Amortization schedule.

**8. Loans with predetermined rates**

- 8.1 Bullet loan.
- 8.2 Level-payment fixed-rate loan.
- 8.3 Constant principal repayments loan.
- 8.4 Other loans: loans with fractional interest payments.

9. Adjustable-rate loans

- 9.1 Adjustable-rate amortization transactions
- 9.2 Adjustable -rate loans.
- 9.3 Other adjustable-rate loans with fixed term: known principal repayments.

10. Bonds

- 10.1 Bonds issue: concept and types.
- 10.2 Financial analysis of a bond.
- 10.3 Rate of return.
- 10.4 Bond's market value.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Computer classroom practice	15,00	100
Classroom practices	15,00	100
Study and independent work	30,00	0
Readings supplementary material	15,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	15,00	0
TOTAL	150,00	

TEACHING METHODOLOGY

This course includes two hours of theory classes (lecture) and two hours of practical classes per week, one of them held in the computer lab so that the total amount is four hours of class each week. Students will be split into two groups of normal classroom practice and two practice groups in the computer rooms.

Practical classes will consist of solving exercises, real case studies, class presentations and discussions of readings. The material for the development of theoretical and practical classes will be available to



students in the Virtual Classroom (www.aulavirtual.uv.es) in advance. Students are reminded that attendance is compulsory in all classroom activities in this subject.

Students are expected to participate actively in class, both in practice and in theory. Moreover, students should arrive early enough at the beginning of the class and with the mobile phone off. They are not allowed to use the phone during class, neither to speak nor write text messages. Also, students should refrain from speaking continuously with peers in class. Obviously, there can (and should) be comments and questions regarding the content of the class, but they should be directed to the lecturer.

Additionally, students are encouraged to use the lecturer's tutoring schedule through the course and to discuss any doubts or clarification needs.

Methodology in this subject is both self-study and working-in-groups oriented in lectures and, especially, in practice sessions (example classes). Specifically, the methodology to be used is as follows:

For the lectures, students should previously read the notes available in the course's Virtual Classroom and the required text included in the bibliography. After the reading, students should write down the main doubts/questions arisen in the interpretation of the material. The lecturer will combine during the lecture his/her explanations with the active participation of the students (they should raise their doubts, try to help their classmates, and participate in discussions in group about the most controversial concepts). The objective is to improve the autonomous capacity of the students (individual work at home previous to the lecture) as well as their ability to work in groups, to argue and defend ideas (debate groups), and their oral and written communication skills.

Example classes, in turn, will be carried out combining two different strategies. On the one hand, the lecturer will solve standard problems in the classroom in order for students to learn to identify the key aspects of the corresponding approach in each unit. On the other hand, students will have to solve analogous problems, sometimes in the classroom, and usually as a part of their homework. Some solved problems might have to be handed in, and this would be part of the continuous assessment. Similarly, in the practical classes in the computer lab the lecturer will solve a problem types in the computer and raise similar exercises to be solved by students. These problems would be tasks to be handed in through "Aula Virtual".

An important element of learning is the lecturer's personal tutorials. Doubts and any questions that might arise during the teaching-learning process will be individually answered. Therefore, students are encouraged to use them regularly.

EVALUATION

The course grade will be based on: 1) The final examination marks (up to 70% of the final grade). The final exam will be administered according to the official schedule and it will include questions and problems regarding both theory and practice (exercises). 2) The remaining 30% can be obtained through activities developed by the student during the term, such as: problem solving, periodic assessment tests, and any other type of continuous assessment tasks. The final grade will be given by the sum of the previous concepts. Nonetheless, in order to get a passing grade at the end of the term, the student must pass the final exam (answer at least 50% of the exam questions correctly), which is compulsory. In case of failing the exam, the maximum grade that the student can obtain as the sum of all the items will be 4.5



marks. For the second examination call, the same criteria of evaluation and weighting as for the first call will be used. Those students who are evaluated on the second call will maintain the grade obtained in section 2 above, and they will not be allowed to complete any tasks or homework that had not been previously considered for the first call. Exams will be regulated by Article 13 on examination fraud of the “Reglament d’avaluació i qualificació de la Universitat de València per a títols de grau i màster, ACGUV 108/2017”. Additionally, all the assessment tasks and homework will be subject to the regulation on plagiarism detailed in Article 15.2 of the same “Reglament”. Any possible change of the date and/or hour of a final exam will be administered under the terms and conditions established by Article 9.2 of the above-mentioned “Reglament”.

REFERENCES

Basic

- Navarro, E. (2019): Matemáticas de las operaciones financieras. Ediciones Pirámide. Madrid.
- Zima, P. and R.L. Brown (1996): Schaums outline of theory and practice of Mathematics of Finance, 2nd Edition. McGraw-Hill, New York.

Additional

- Baquero, M.J. y Maestro, M.L. (2003): Problemas Resueltos de Matemática de las Operaciones Financieras. Editorial AC. Madrid.
- De Pablo, A. (1998): Matemáticas de las operaciones financieras, Tomos I y II, Tercera Edición, Editorial UNED. Madrid.
- Meneu, V., Jordá, M.P. y Barreira, M.T. (1994): Operaciones financieras en el mercado español. Editorial Ariel Economía. Barcelona.
- Navarro, E. y Nave, J.M. (2001): Fundamentos de Matemáticas Financieras. Antoni Bosch Editor. Barcelona.
- Dalton, B. (2008): Financial products: an introduction using mathematics and Excel, Cambridge University Press.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

In relation to the Teaching Methodology and the Assessment (sections 8 and 9 of the academic guide): In those groups in which is required due to the number of enrolled students, the theory class will be conducted online while the practical classes will be taught face-to-face.



If, due to the evolution of the pandemic, any lectures could not be given face-to-face, neither in the theory groups nor in the practical ones by indication of the competent educational administration following the recommendations of the health authorities, all teaching would be carried out online using the tools available from the University of Valencia.

In this situation, the weighting of the continuous assessment with respect to the final grade would be strengthened to the detriment of the weighting of the exam. In that case, the final weight of the continuous evaluation, never less than 30%, would depend on the moment in which this circumstance occurred.

Likewise, if the final exam could not be face-to-face, it would be replaced, either by an online exam to be carried out through the Virtual Classroom of the University of Valencia or by a final project, as agreed in each degree.

All the details corresponding to the matters indicated above - new weighting of the continuous evaluation and of the exam, as well as the format of the latter - will be duly reported in the event of the aforementioned circumstance.