Universidad Europea

1. BASIC INFORMATION

Course	Mathematics
Degree program	Global Bachelor's Degree in International Business
School	Social Sciences and Communication
Year	First course
ECTS	6
Credit type	Basic
Language(s)	English
Delivery mode	On-Campus
Semester	First semester
Academic year	2019/2020
Coordinating professor	Javier Martínez Martínez

2. PRESENTATION

This is a first-semester freshman mathematics course which covers a variety of fundamental topics, including what is commonly known as Calculus of one and several variables, Linear Algebra, and Linear Programming. Its primary objectives are to help students develop a good understanding of fundamental mathematical concepts, and to improve their problem-solving skills. This will provide them with many useful mathematical tools required in economic analysis and widely used in subsequent subjects of their degree program.

The course content is divided in four main Learning Units:

- Unit 1. Calculus of functions of one variable. Fundamentals of financial mathematics.
- Unit 2. Multivariable Calculus.
- Unit 3. Linear Algebra. Systems of linear equations and matrix algebra.
- Unit 4. Constrained optimization problems

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies / Basic skills:

- CB1/BS1: Students must demonstrate a deep knowledge and understanding of a field of study that is based on secondary education and that, whilst supported by advanced textbooks, involves acquaintance with the vanguard of their area of study.
- CB2/BS2: Students must apply their knowledge to their work and vocation in a professional way and must demonstrate their skills in sustaining arguments and solving problems within their field of study.
- CB3/BS3: Students must be able to gather data, usually within their field of study, interpret it and make judgments and considerations on relevant social, scientific or ethical issues.
- CB4/BS4: Students must be able to convey information, together with ideas, problems and solutions to a specialized or non-specialized audience.
- CB5/BS5: Students must have developed the necessary learning skills so as to undertake subsequent studies with autonomy.

Cross-curricular competencies / Cross disciplinary skills:

- CT1/CS1. Self-learning skills: The ability to choose the most effective strategies for controlling our own learning environment and acting autonomously throughout the learning process.
- CT4/CS4. Analysis and synthesis skills: Being able to break down complex situations into their constituent parts, and also to assess other alternatives and approaches in order to find the best solutions. Synthesis seeks to reduce complexity in order to facilitate understanding and/or problem solving.
- CT5/CS5. Capacity to apply knowledge: Being able to use knowledge acquired in academic contexts in situations that resemble as closely as possible the reality of the chosen future profession.
- CT8/CS8. Information management: The ability to find, select, analyze and integrate information from different sources.
- CT13/CS13. Problem solving: The ability to resolve a confusing issue or a complicated situation that stands in the way of achieving a goal and where there is no predefined solution.
- CT17/CS17. Teamwork: The ability to actively participate and cooperate with other people, areas and/or organizations to achieve common goals.

Specific competencies / specific skills:

- CE8/SS8: Capacity to use the management tools available in the area of administration and finance, in the context of international business.

- CE10/SS10: Ability to use the tools available in the area of production management including planning, sales forecasting, inventory management and quality control of the production process.

- CE20/SS20: Ability to use the mathematical tools and basic methods of calculation, algebra and programming necessary to solve economic problems.

Learning outcomes

Upon successful completion of the course, the student will be able to:

- LO1: Understand basic terms and concepts related to linear algebra, differential calculus and financial mathematics.

- LO2: Analyze and work out problems related to linear algebra, differential calculus and financial mathematics, which demonstrate an understanding of the theoretical concepts.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB1, CB2, CB4, CB5, CT1, CT4, CT5, CT17, CE8, CE10.	**LO1**: Understand basic terms and concepts related to linear algebra, differential calculus and financial mathematics.
CB1,CB2, CB3, CB4, CB5, CT1, CT4, CT5, CT17, CE8, CE10, CE20.	**LO2**: Analyze and work out problems related to linear algebra, differential calculus and financial mathematics, which demonstrate an understanding of the theoretical concepts

4. CONTENTS

Learning Unit 1: Calculus of functions of one variable. Fundamentals of financial mathematics

- 1.1 Elementary functions. Domain and range.

- 1.2 Limits and continuity.

- 1.3 The derivative. Function analysis.

- 1.4 Functions in Economy.

- 1.5 Optimization problems.

- 1.6 Integration.

Learning Unit 2: Multivariable Calculus..

- 2.1 Partial derivatives.
- 2.2 Optimization problems.
- 2.3 Optimization with equality constraints: substitution and Lagrange multipliers method.

Learning Unit 3: Linear Algebra. Systems of linear equations and matrix algebra.

- 3.1 Matrices and determinants.
- 3.2 Systems of linear equations.
- 3.3 Applications to Finance and Economics.

Learning Unit 4. Constrained optimization problems

- 4.1 Introduction to Linear Programming.
- 4.2 Formulation and graphical resolution of mathematical problems.

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:
- Face to face sessions.
- Case studies.
- Cooperative Learning.
- Problem Based Learning (PBL)

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning Activity	Number of hours
A1: Instructor-led lectures	40 h
A2: Problem solving sessions	35 h
A3: Case study analysis	15 h
A10: Group and collaborative activities and projects	20 h
A13: Feedback and assessment	10 h

A14: Tutoring hours	10 h	
A7: Self-study	20 h	
TOTAL	**150 h**	

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Assessable activity	Assessment criteria	Weight (%)
Activity 1: Face-to face sessions	The student must meet the University's minimum attendance policy requirement (75%). Attendance must be properly recorded by the GRP system.	Met / Not met
Activity 2: Working sessions and homework assignments	Working sessions and homework assignments will be communicated in advance by the instructor. Students will be asked to solve problems for a better understanding of the contents of the subject. The assignments will be graded from 0 to 10, according to the following points: o Neatness. o Delivered on due time. o Completion rate (all/some/none of the exercises were completed) o Accuracy (all/some/none of the exercises were correct) o Understanding and reasoning (the exercise solutions are correctly formulated and all/some/none of the steps are correctly explained) Students are expected to attend all working sessions –which will be announced in advance- except when precluded by illness or emergencies, to be attested by a health care provider . If a student's absence is unexcused, the session will be averaged as zero.	30 %

Activity 3: Group Project	Students will have to prepare a group project that will be based on a selected application of Mathematics to Economy and Business. A poster and a short oral presentation to explain the basic concepts and mathematical tools associated to the proposed topic will be required. Further details will be given on the Campus Virtual. General and specific skills (planification, communication skills, mathematical content) will be graded according to a rubric.	20%
Activity 4: Assessment examinations	There will be two midterm tests during the course: • First midterm: Units 1 and 2. • Second midterm: Units 3 and 4. The grade is obtained taking into account: • Appropriate hypotheses have been considered. • The complete set of equations to solve the problem are formulated. • Correct results are obtained and explained according to the chosen hypothesis. • Results are analyzed and conclusions are outlined. A final exam will take place in the last week of the course. It will be equally divided into two parts: first and second midterm. Its weight is 50% of the final course grade. Those students that obtained a grade above 5 in any of the midterms will keep that grade for the corresponding score on midterm content in the final exam and won't have to answer that part.	50%

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

To pass the course in the first exam period you should.

- Obtain a minimum mark of 4 out of 10 in *each of* the tests (Activity 4).

- Obtain a weighted average grade above 5.0 points.

In those cases where the first requirement is not satisfied but the weighted average grade is above 5, the official grade that will appear will be at most 4.

7.2. Second exam period

To pass the course in the second exam period, the student must deliver the activities that were not successfully completed in the first exam period.

New activities of similar dificulty and length will be proposed in this second exam period. The same weights and requirements of the normal assessment period still apply. In particular, to pass the course In the second exam period, students should:

- Obtain a minimum mark of 4 out of 10 in *each* module and *each* test.

- Obtain a weighted average grade above 5.0 points.

8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assesable activities	Learning Unit	Deadline	Weight
Activity 2: Working sessions and individual assigments	U1	Weeks 1-5	30%
	U2	Weeks 6-7	
	U3	Weeks 9-13	
	U4	Weeks 14-17	
Activity 3: Group project	U1,U2,U3,U4	Weeks 1-12 Oral presentation and Project Deadline : Week 12-13	20%
Activity 4: Assessment examinations	First midterm: U1,U2	Week 9	25%+25% =50%
	Second midterm: U3	Week 14	
	Final exam: U1,U2,U3,U4	Week 17	

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

9. BIBLIOGRAPHY

- DAVID, C.L. *Linear Algebra and its Applications.* Addison Wesley, 2006.

- LARSON R., HOSTETLER R. P., EDWARDS B.H. *Calculus of a single variable.* Brooks Cole, 2009.

- BALBÁS, A., et al. *Análisis matemático para la economía (Tomos I y II):* Editorial AC, 1988.

- BALBÁS, A., et. al. *Programación matemática.* Editorial AC, 1990.

- BORBOLLA, R: *Optimización, cuestiones, ejercicios y aplicaciones a la economía.* Prentice Hall, 2000.

- SYDSAETER,K, HAMMOND, P. *Essential Mathematics for Economic Analysis,* 4th Edition. 2012.

10. DIVERSITY MANAGEMENT UNIT

Students with specific learning support needs:

Curricular adaptations and adjustments for students with specific learning support needs, in order to guarantee equal opportunities, will be overseen by the Diversity Management Unit (UAD: Unidad de Atención a la Diversidad).

It is compulsory for this Unit to issue a curricular adaptation/adjustment report, and therefore students with specific learning support needs should contact the Unit at unidad.diversidad@universidadeuropea.es at the beginning of each semester.