

# APPLIED BUSINESS MATHEMATICS

**IE University**

Professor: **ANTONIO GARCIA ROMERO**

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Degree course: FIRST

Semester: 1º

Category: BASIC

Number of credits: 5.0

Language: English

## PREREQUISITES

Basic elements of algebra (pre-calculus) such as operations with powers (including negative and fractional powers) and fractions. Factorization, solving basic equations, working with inequalities and absolute values. It is also recommended to have a basic knowledge of elementary functions (polynomial, rational, power, exponential and logarithmic). A good knowledge of MS-EXCEL® is highly recommendable.

## SUBJECT DESCRIPTION

People often think of Mathematics as a collection of different axioms and theorems, which build a complete theoretical system but have few connections (or no connections at all) with real life problems. Fortunately, this conception of Mathematics, or at least of what we could call “applied mathematics in social sciences,” has changed over the last decades. From this new point of view, one must think of Mathematics, not as a subject but as a collection of tools that are needed in any rigorous and complete analysis of complex problems in different contexts such as the economy, business, society or public policies.

We are living the birth of the fourth industrial revolution in light of some extraordinary technological advances. Simultaneous to this significant upheaval are an arrangement of financial, geopolitical and demographic drivers of progress, each interacting in multiple directions and intensifying one another. This challenging scenario opens new opportunities for those professionals capable of managing and analyzing such complex situations.

A recently published report from the World Economic Forum states that to be able to solve complex problems is going to be the most valuable skill for coming years. A lack of proficiency in mathematics is the primary limitation to improving the power of abstraction which is a crucial requirement for complex problem-solving. Students following this course will learn useful tools to analyze economic, and management problems.

## OBJECTIVES AND SKILLS

The objective of this course is to provide the student with the quantitative tools required to analyze the economic, business, or political problems. At the end of the term, students will take with them a good knowledge of relevant tools and methods. They will be able to know when and how to use them.

With an entirely practical approach, students will be guided through a new approach to Math learning. We aim to engage both poets and quants.

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Why should you learn Math? Math is critical to:

- Address economic problems through abstract models.
- State and solve formal models.
- Use the tools required to analyze economic and business problems.

What are the key learnings of this course?

- Discover the multiple applications of matrix algebra to real-life problems. Economic analysis, cryptography, 3D graph animation.
- Know when and how to use a specific function to model some real phenomena. For example, logarithms are essential to model some real phenomena such as a pandemic.
- Use derivatives for finding essential information for decision making. Elasticities, MRS, maximizing revenues, and profit, or minimizing costs.
- Connect math tools with economic policy or management decisions. Marginal products of labor, and capital.
- Use Math in real-life scenarios by adding constraints to any problem. How to deal with budget constraints, scheduling workers.
- Perform a dynamic analysis by using integration and differential equations. Consumer and producer surplus.
- Interpret everything. Math is a language. You must be able to translate a real-life problem to Math as well as interpreting the results.

How are you going to learn the above issues?

- Algebra is tedious but necessary. First, you need to understand the essentials.
- Do not worry; I am aware we live in the 21st century. You will use computers for many things in this course.
- Playing is an excellent approach to learn. You will work in balanced groups, and participate in solving some cases.

## **METHODOLOGY**

Liquid learning is a pedagogical approach that combines face to face sessions with asynchronous activities. It is expected students work ahead of each synchronous session (i.e., watching the video(s) for each session, or reading the corresponding book chapter). During most of the face-to-face meetings, the professor will ask questions that will allow students to get class participation points (up to 20% of the final grade). After each synchronous session, students are encouraged to solve homework problems. The homework exercises will be available on IE Campus (MyLab Math section). In the case of asynchronous sessions, students will have to prepare themselves by using either the book or the video (or both). Afterward, they should complete their homework that will be available online (Section MyLab Math on IE Campus).

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Be aware that by doing the homework exercises ahead of the deadlines, you may get up to 20% of your final grade (see Section 6 for more details).

Teaching methodology	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	24.0 %	30 hours
Discussions	4.0 %	5 hours
Exercises	16.0 %	20 hours
Group work	32.0 %	40 hours
Other individual studying	24.0 %	30 hours
TOTAL	100.0 %	125 hours

## EVALUATION CRITERIA

Your final grade in the course will be based on both individual and group work of different characteristics that will be weighted in the following way:

Criteria	Percentage	Comments
Class Participation	20 %	Face to Face Sessions
Homework	20 %	MyLab Math
Mid-Term Exam	20 %	Session #13
Final Exam	40 %	Session #30

#### **A. CLASS PARTICIPATION**

It will be worth 20% of the overall grade - students are expected to come prepared and participate actively (and voluntarily) during lectures. Your class grade will be based also on attendance, punctuality, participation, and class conduct – there may be a penalty if you create a disruption, talk excessively, or use electronic devices.

#### **B. MIDTERM**

The mid-term exam will take place on Session #13, and it is worth 20% of the overall grade. This one is an open-book exam that will be deployed through IE Campus, and it will take 30 minutes. At the beginning of the semester, you will be informed about the detailed exam characteristics (i.e., number of questions, type of response, etc.).

#### **C. HOMEWORK**

There is a problem set (homework) assigned for each session. Each problem set will be graded after the deadline. At the end of the semester, your overall "Homework" grade is worth 20% of the final grade, and it will be the arithmetic mean of all the problem sets' marks, excluding the worst three scores.

#### **C. FINAL EXAM**

It is worth 40% of the overall grade. **You need to score at least 3.5 on the final exam** to pass the overall course, even if you have already passed the course through the other course assessments. This one is an open-book exam that will be deployed through IE Campus, and it will take 60 minutes. At the beginning of the semester, you will be informed about the detailed exam characteristics (i.e., number of questions, type of response, etc.).

- Sobresaliente/Outstanding: 9.0-10.0 (A to A+)

Consistently produces work of the highest quality and craft; exhibits notable progress and development over the course of the semester; meets all course objectives at highest level; attendance is near-perfect, and contributions to course discussions are extremely valuable.

- Notable: 7.0-8.9 (B to B+)

Completes all assignments with work of above-average quality and craft; exhibits significant progress and development; meets most course objectives; attendance and participation are very good.

- Aprobado: 6.0-7.0 (C to C+)

Completes all assignments with work of acceptable quality and craft; exhibits some progress and development; meets a majority of course objectives. Attendance and participation are acceptable.

- Aprobado: 5.0-6.0 (D)  
Assignments are delivered but are incomplete and/or of low quality and craft; exhibits little progress and development; meets few course objectives. Attendance and participation are poor, but absences do not total more than 30%.
- Suspenso: 0-4.9 (F)  
Work is incomplete, missing, or does not meet course objectives. Attendance and participation are poor.
- Automatic Failure/Suspenso: 0 (F)  
Please note that a student who misses 30% or more of the scheduled sessions receives an automatic 0.0, and loses his or her right to the second “convocatoria.”

## PROFESSOR BIO

Professor: **ANTONIO GARCIA ROMERO**

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**Antonio García Romero, Full-Time (Assistant) Professor, Area of Operations.  
IE Business School**

### ACADEMIC BACKGROUND

- Ph.D. in Economics and Business Administration, Universidad Autónoma de Madrid, Spain, 2002
- Master in Management of Innovation, Universidad Carlos III de Madrid, Spain, 1993
- BSc. in Theoretical Physics, Universidad de Granada, Spain, 1991

### ACADEMIC EXPERIENCE

- Assistant Professor. Area of Operations and Decision Sciences, IE Business School, Spain, 2015-Present
- Coordinator of Mathematics, IE University, 2014-present
- Adjunct Professor. IE University, 2013-2015
- Adjunct Professor. Dept. Economics, U. Carlos III de Madrid, Spain, 1998-2003 and 2008-2013
- Adjunct Professor. U. Europea de Madrid, Spain, 2005-2007
- Adjunct Professor. UOC, Spain, 2000-2003 **BUSINESS EXPERIENCE**

- Consultant in Healthcare Innovation, 2013-present
- Head of Biomedical Research Policy Unit, Ministry of Health, Regional Government of Madrid, Spain, 2003-2013

### LATEST PUBLICATIONS

- García-Romero, A, A. Escribano, and J.A. Tribó. 2017. The Impact of Health Research on Length of Stay in Spanish Public Hospitals. *Research Policy*, 46(3): 591-604 (FT50)
- García-Romero A, D. Santín, and G. Sicilia. 2016. Another brick in the wall. A new Ranking of Academic Journals in Economics using FDH. *Scientometrics*, 97(1): 91-101

- García-Romero A and JM. Estrada. 2014. A bibliometric analysis of plagiarism and selfplagiarism through Déjà vu. *Scientometrics*, 101(1):381-396.

### **OTHER INFORMATION**

I will be pleased to meet students either on Segovia Campus or via Zoom upon request. Please, tell me in class or preferably send me an email to the following address: [agr22@faculty.ie.edu](mailto:agr22@faculty.ie.edu) . Do not forget to specify your degree and group.

