INTRODUCTION

Course description: The aim of this course is to provide the basic tools of Differential and Integral Calculus which are necessary in order to succeed in the following courses that you are studying in the degrees of Economics, Management and Business Administration.

- **Degrees**:
  - *Grado en Administración y Dirección de Empresa bilingüe* + Data Analytics Program (Ab+DA)
  - *Grado en Administración y Dirección de Empresa bilingüe* + Finance & Accounting Program (Ab+FA)
- **Module:** *III. Métodos Cuantitativos* **/ Course**: *III.1. Métodos Cuantitativos*
- **ECTS**: 6 (150 working hours)
- **Year:** 1st **/ Semester**: 1st
- **Type**: Basic
- **Instructors**:
  - Asier Aguilera Bravo (aaguilera@unav.es) - responsible
  - María Castillo Latorre (mclatorre@unav.es) - classes held in Spanish
- **Language:** English
- **Lecture schedule and rooms**:

   The use of electronic devices (cell phones, laptops, tablets, etc.) is NOT ALLOWED during class time.

- *Ab+DA*
  - Tuesdays, 10:00 - 12:00, room B1 - Amigos Building
  - Thursdays, 12:00 - 14:00, room 14 - Amigos Building
  - Fridays, 10:00 - 12:00, room B1- Amigos Building
- *Ab+FA*
  - Mondays, 15:30 - 17:30, room 08 - Amigos Building
  - Tuesdays, 10:00 - 12:00, room B1 - Amigos Building
  - Fridays, 10:00 - 12:00, room B1 - Amigos Building

COMPETENCIES

Basic Competences

BC1 - Students must demonstrate that they possess and understand knowledge in an area of study based on a general secondary school education whose content often comes from advanced textbooks, but also includes cutting-edge knowledge in this field of study.

General Competences

GC4 - To use independent critical reasoning on relevant topics in economics and business.

Universidad de Navarra

PROGRAM

0- Introduction

0.1 Intervals andabsolute value.

0.2 Inequalities. Systems of inequalities.

0.3 Linear and nonlinear systems of equations.

1- Sums

1.1 Summationnotation. Rules for sums.

1.2 Applications: Newton'sBinomial Formula and Price Indices.

1.3 Double sums.

2- Functions of one variable

2.1 Basic definitions:notation, domain, and range.

2.2 Linear functions. Economicmodels: supply, demand, and equilibrium point.

2.3 Quadraticfunctions. Economic models: quadratic optimization.

2.4 Polynomials. Factoring(remainder theorem, Ruffini). Polynomial division. Rational functions.

2.5 Power functions.

2.6 Exponential andlogarithmic functions. Different bases. Properties. Equations. Models: population growth and compound interest.

3- Properties of functions

3.1 Shifting graphs. Newfunctions from old ones. Composite functions.

3.2 Inverse functions.

4- Derivatives I

4.1 Definition of aderivative. Geometric interpretation: slopes of curves, tangents, andderivatives. Applications: increasing and decreasing functions, rates of change.

4.2 Limits: basic rules.

4.3 Rules for differentiation.

4.4 Chain rule.

4.5 Higher-order derivatives.

5- Derivatives II

5.1 Implicit differentiation.

5.2 Differentiating the inverse.

5.3 Approximations: linearand polynomial. Differentials. Taylor's formula.

5.4 Continuity. Intermediate value theorem.

5.5 Limits: asymptotes,indeterminate forms, L'Hôpital's rule.

6- Integrals

6.1 Indefinite integrals: rules.

6.2 Definite integrals: properties. Areas.

6.3 Economic applications:consumer and producer surplus.

6.4 Integration by parts.

6.5 Integration bysubstitution. Rational integrals.

6.6 Improperintegrals: infinite intervals of integration, integrals of unbounded functions (optional).

7- Single-variable optimization

7.1 Simple tests forextreme points.

7.2 Economic examples.

7.3 The extreme value theorem.

7.4 Local extremepoints. First and second derivative tests.

7.5 Inflection points.Concavity and convexity.

EDUCATIONAL ACTIVITIES

The course includes different face-to-face and non face-to-face activities.

Face-to-face activities

- Theoretical/practical classes: 26 hours. The professor will explain the theoretical concepts their possible applications to Economics and Business in a plenary session. Students will be able to complete these explanations by reading the recommended bibliography for the course and using other resources.
- Problem solving classes: 52 hours. Every week some exercises and problems corresponding to the theoretical class will be discussed and solved in a group session.
- Exams (midterm and final exams) and other tests: 6 hours. Apart from a midterm and a final exam, some surprise tests will be held. Dates for the final exams will be fixed by the Faculty and will be published in due course.

Total face-to-face activities: 84 hours

Non face-to-face activities

- Work out of exercises: 22 hours. For each chapter, students are expected to work out the exercises from the corresponding problem set to strengthen the knowledge on the topic.
- Personal study: 44 hours. The number of hours of personal study may vary in accordance to the student's background on mathematics.

Total non face-to-face activities: 66 hours.

Students are expected to attend **all** classes and devote the due time for personal study to master the program of the subject and be prepared for all the tests and exams programmed through the semester. The professors will be available to clarify doubts from the students, as detailed in the section of *Office Hours*.

ASSESSMENT

(*****) The value of academic integrity is an important part of the education of our students. The sanctions that could affect the assessment of this subject are included in the University Regulation regarding Academic Discipline and the Summary of the Honesty Policy .

The final mark of this course will be the weighted average of the following:

ORDINARY EVALUATION (December)

- **Test:** 20% Date: 29th September
- **Midterm exam:** 20% Date: 27th October
- **Final exam:** 60% (it is necessary to obtain in this final exam at least 5 out of 10 points in order to take into account the rest of the grades and pass) Date: 12th December
- **+ Bonus:** 10% (5% attendance and participation, 5% control exercises)

EXTRA-ORDINARY EVALUATION (June)

- **Test:** 10% (corresponding to the ordinary evaluation)
- **Midterm exam:** 20% (corresponding to the ordinary evaluation)
- **Final exam:** 70% (it is necessary to obtain in this final exam at least 5 out of 10 points in order to take into account the rest of the grades and pass) Date: 13th June

- **+ Bonus:** 10% (5% attendance and participation, 5% control exercises)

OFFICE HOURS

Dr Asier Aguilera Bravo (aaguilera@unav.es)

- Office 4020 (4th floor-tower) Amigos Building
- Hours: **A previous appointment by e-mail is required.**
  - Mondays and Fridays, from 12:00 to 13:00
  - Tuesdays, from 14:00 to 15:00

Dra María Castillo Latorre (mclatorre@unav.es)

- Office 2280 (2nd floor-corridor) Amigos Building
- Hours: **A previous appointment by e-mail is required.**
  - Mondays and Tuesdays, from 17:30 to 19:00

BIBLIOGRAPHY AND RESOURCES

Basic bibliography:

- Sydsaeter, K., Hammond, P., Strom, A. (2012). *Essential Mathematics for Economic Analysis.* 5th Edition. Pearson. Find it in the Library

Additional bibliography:

- Chiang, A. and Wainwright, K. (2005). *Fundamental methods of Mathematical Economics.* 4th Edition. McGraw Hill. Find it in the Library
- Larson, R. and Edwards, B.H. (2011). *Calculus.* 9th Edition. McGraw Hill. Find it in the Library
- Sydsaeter, K., Hammond, P. y Cravajal, A. (2012). *Matemáticas para el análisis económico.* 2ª edición. Pearson. Find it in the Library (versión electrónica) Find it in the Library (versión impresa)