COURSE DESCRIPTION
MATHEMATICS II
2ND YEAR 2ND SEMESTER
DEGREE: BUSINESS ADMINISTRATION
IN-CLASS TEACHING
ACADEMIC YEAR: 2020/2021
SCHOOL OF BUSINESS AND ECONOMICS
1. COURSE IDENTIFICATION

1.- COURSE:

Name: Mathematics II
Code: b202-13266
Year(s) course is taught: Second
Semester (s) when the course is taught: Second
Type: Compulsory
ECTS: 6
Hours ECTS: 30
Language: English and Spanish
In-class teaching
Degree(s) in which the course is taught: Business Management
School of Business and Economics

2.- ORGANIZATION OF THE COURSE:

Department: Applied Mathematics and Statistics
Area of knowledge: Applied Mathematics

2. LECTURERS OF THE COURSE

1.-LECTURERS:

<table>
<thead>
<tr>
<th>Instructor in charge</th>
<th>CONTACT DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Pablo Arés Gastesi</td>
</tr>
<tr>
<td>Phone (ext):</td>
<td>91 456 63 00 ext 15366</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:pablo.aresgastesi@ceu.es">pablo.aresgastesi@ceu.es</a></td>
</tr>
<tr>
<td>Office:</td>
<td>0.04 B</td>
</tr>
</tbody>
</table>

Lecturer(s)

| Name:                     | Luis Ángel Calvo Pascual |
| Phone (ext):              | 91 456 6300 ext. 15360 |
| Email:                    | luis.calvopascual@ceu.es |
| Office:                   | 0.04 B |

| Name:                     | Pablo Arés Gastesi |
| Phone (ext):              | 91 456 6300 ext. 15366 |
| Email:                    | pablo.aresgastesi@ceu.es |
| Office:                   | 0.04 B |
2.- TUTORIALS:

For any queries students can contact lecturers by e-mail, phone or visiting their office during the teacher’s tutorial times published on the students’ Virtual Campus.

3. COURSE DESCRIPTION

Considering the instrumental value of Mathematics for the students, the aim of the course is to reinforce the previously acquired knowledge of the students, and to introduce them to new techniques of Differential Calculus in several variables, Integral Calculus, Dynamical Systems (continuous and discrete) and Game Theory.

4. SKILLS

1. SKILLS

<table>
<thead>
<tr>
<th>Code</th>
<th>Basic and General Skills</th>
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<tbody>
<tr>
<td>BS1</td>
<td>Students should have demonstrated that they have gained knowledge of and understand an area of study at a level beyond secondary education that, even though based on advanced text books, it also includes aspects that are acquired from knowledge deriving from the state-of-the-art of the field of study.</td>
</tr>
<tr>
<td>BS2</td>
<td>Students should know how to apply their knowledge to their work or vocation in a professional manner and should have the skills that are usually demonstrated by compiling and defending arguments and resolving problems within their area of study.</td>
</tr>
<tr>
<td>GS1</td>
<td>Capacity for analytical and critical thinking</td>
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<table>
<thead>
<tr>
<th>Code</th>
<th>Specific Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS1</td>
<td>Knowledge and capacity to interpret and use fundamental economic concepts (Economic Theory), context and institutional factors (Economic Structure and History) and tools (mathematics) in making business decisions.</td>
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</table>

2.- LEARNING OUTCOMES:

<table>
<thead>
<tr>
<th>Learning outcomes</th>
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<tbody>
<tr>
<td>Learning how to apply mathematical tools in the solution of economic and business problems.</td>
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</table>

5. EDUCATIONAL ACTIVITIES
1. DISTRIBUTION OF STUDENTS` ASSIGNMENT:

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>On-campus hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF2</td>
<td>Seminar</td>
<td>31</td>
</tr>
<tr>
<td>AF4</td>
<td>Individual Practices</td>
<td>31</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>62</td>
</tr>
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2. EDUCATIONAL ACTIVITIES:

<table>
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<tr>
<th>Educational Activity</th>
<th>DEFINITION</th>
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<tbody>
<tr>
<td>EA2 seminar</td>
<td>Educational activity focused especially on the competence of the students to develop the learning skills enabling them to assimilate content acquired beforehand, while relating economic concepts and those of similar and/or auxiliary disciplines and different theoretical and methodological approaches. Students study each subject in depth to a large extent independently. This educational activity is also centred on encouraging students to acquire the skills necessary to communicate their conclusions – and the understanding and underlying reasons supporting them – to both the specialist and non-specialist public clearly and unequivocally. Priority is given to the participation of students and their sharing of the reasoned interpretation of knowledge and the sources of their fields of study, all of which is coordinated by the professor.</td>
</tr>
<tr>
<td>EA4 practice</td>
<td>Educational activity focused especially on the competence of the students to collect, manipulate and process relevant data and variables for economic, statistical, financial, accounting and tax analyses. Priority is placed on students undertaking activities that involve the application of theoretical and/or technical knowledge acquired, which may be done individually or in a group, depending on the subject and the skills to be acquired.</td>
</tr>
<tr>
<td>EA0 independent work</td>
<td>Educational activity whereby students independently manage their own learning by the study of the course material.</td>
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6. ASSESSMENT OF LEARNING

1. CLASS ATTENDANCE:
To be eligible for examination by continuous assessment students must attend at least 75% of scheduled class time (attendance sheets will be used). As students may be absent 25% of the classes, no attenuating circumstances will be accepted for absences.

2.- ASSESSMENT SYSTEM AND CRITERIA:

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS4</td>
<td>Written or computer-based examination on exercises, problems, cases, and so forth.</td>
<td>80</td>
</tr>
<tr>
<td>AS9</td>
<td>Submission of exercises</td>
<td>20</td>
</tr>
</tbody>
</table>

ORDINARY EVALUATION

Continual evaluation will be done considering the following criteria:

1. Problems, exercises, reports, etc. The weight of these activities will be 10% of the final grade.
2. Problems solved by computer software. The weight of this activity will be 10% of the final grade.
3. Two examinations, each counting 20% of the final grade.

A final, comprehensive examination, with questions from all topics in the syllabus. The weight of this exam will be 40% of the final grade. In order to pass the course, the students should get a minimum grade of 3 over 10 in this examination.

EXTRAORDINARY EVALUATION

Students who fall the ordinary evaluation must make the final examination of the extraordinary call, which will cover all topics in the syllabus. The criteria of assessment for the ordinary evaluation will not be considered in the extraordinary evaluation, and the grade of the student will be based solely on the result of the extraordinary examination.

7. COURSE SYLLABUS

1.- COURSE SYLLABUS:

THEORETICAL:

TOPIC 1: ADVANCED APPLICATIONS OF DIFFERENTIATION IN SEVERAL VARIABLES

1.1. Advanced optimization: Khun-Tucker theorem
1.2. Economic applications.

TOPIC 2: INTEGRATION

2.1. Riemann integral functions.
2.2. The Fundamental Theorem of Calculus.
2.3. Antiderivatives.
2.4. Economic applications of integration.

TOPIC 3: DYNAMICAL SYSTEMS

3.2. Discrete dynamical systems: difference equations.
3.3. Economic applications.

TOPIC 4: GAME THEORY

4.1. Two-person zero-sum games.
4.3. Nash equilibrium. Prisoner’s dilemma.
4.4. Economic applications.

PRACTICAL:
At the end of each theoretical block, a series of practical exercises will be carried out. The teacher shall solve some exercises with the participation of the students. The students must solve some problems given as homework and hand them back to the teacher. Such homework, as well as other complementary and support documentation, will be available in the Students Portal.

8. BIBLIOGRAPHY

1.- BASIC BIBLIOGRAPHY:

CHIANG, A.C. and WAINWRIGHT, K. (2013): Fundamental methods in Mathematical Economics, Tata Mgraw Hill

2.- ADDITIONAL BIBLIOGRAPHY:


3.- WEB RESOURCES:

- Wolfram Alpha: www.wolframalpha.com
- Geogebra: www.geogebra.com
- Linear Algebra: http://joshua.smcvt.edu/linealgebra
- Cálculo: http://www.math.wisc.edu/~keisler/calcl.html
- Asociación Española de Profesores Universitarios de Matemáticas para la Economía y la Empresa, ASEPUMA: www.asepuma.org
- Divulgamat: www.divulgamat.es
- Real Sociedad Matemática Española: www.rsme.es
- Mathematical Association of America: www.maa.org
- American Mathematica Society: www.asm.org
9. ATTITUDE IN THE CLASSROOM

1. REGULATIONS

Students must behave in accordance with the Faculty and University regulations. This includes both attending class punctually and on a regular basis and displaying a participative attitude in class whilst at the same time carrying out the academic tasks and exercises set by the teacher.

Any infringement of Academic Integrity (plagiarism, misuse of electronic devices in the classroom; mobile telephones, tablets or computers or misuse of unauthorized information during examinations) as well as signing registers for absent classmates will result in the loss of entitlement to Continuous Evaluation and any other disciplinary action which may be applicable. The teaching unit will decide on the disciplinary action to be applied in each individual case.

10. EXCEPTIONAL MEASURES

Should an exceptional situation occur which prevents continuing with face-to-face teaching under the conditions previously established to this end, the University will take appropriate decisions and adopt the necessary measures to guarantee the acquisition of skills and attainment of learning outcomes as established in this Course Unit Guide. This will be done in accordance with the teaching coordination mechanisms included the Internal Quality Assurance System of each degree.