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ACADEMIC YEAR: 2019/2020

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COURSE: **Mathematical Methods for Economics**

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TYPE OF EDUCATIONAL ACTIVITY: (Basic, Characterizing, Affine, Free choice, Other) **Basic**

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TEACHER: **Marién Abreu**

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phone: **+39-0971205850**

mobile (optional):

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Language: **Italiano**

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ECTS: (lessons e  
tutorials/practice) **6**

n. of hours: (lessons e  
tutorials/practice) **48**

Campus: **Potenza**  
Dept./School: **DiMIE**  
Program: **Business economics**

Semester: **First**

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#### EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

**\*Knowledge and understanding:** The general educational goal is to provide the students with the knowledge on the main mathematical tools frequently used in economic disciplines: elements of abstract algebra, several variable differential calculus, linear programming optimization and mathematical finance.

**\*Applying knowledge and understanding:** The students should develop the ability of using the mathematical methods provided in the course to apply them to solve problems in economical, business and finance contexts.

**\*Making judgments:** Students should develop the ability to identify the appropriate mathematical methods to tackle evaluation and choice problems in economical, business and finance contexts. Also, they should be able to evaluate the limits of the available modeling instruments and then choose the most appropriate ones for specific means.

**\*Communication skills:** Students should be able to communicate in mathematical terms both verbally and written, with the appropriate notation. Such language should also be used to motivate the chosen method to solve theoretical problems and their economical applications.

**\*Learning skills:** The students should be able to learn the contents of the course, and also to compare and apply them to other courses in the degree program. Also, the students should be able exercise and to gain further insight into the contents of the course form the suggested reference.

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#### PRE-REQUIREMENTS

The arguments studied in the "General Mathematics" course, in particular the fundamental concepts of differential calculus of functions of a real variable and their applications.

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#### SYLLABUS

##### **Introduction to the mathematical models for economics: (3 h)**

Functions and mathematical models. Linear models: cost, revenue and profit functions; supply and demand functions; variations over time.

##### **Linear models and linear algebra (21 h)**

Number sets, matrices and matrix operations: properties and applications. Determinant and inverse matrix. Vectors, vector spaces and matrix rank. Linear equation systems: Cramer and Rouché-Capelli theorems; Gauss and Gauss-Jordan algorithms. Geometric interpretation of linear equation systems solutions. Linear functions. Linear algebra applications: input-output systems and Leontief's models.

##### **Linear programming (7 h)**

Graphic method and simplex method. Optimization: resource allocation, maximizing profit, minimizing cost.

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**Mathematical finance basis (5 h)**

Arithmetic and geometric progression sums. Simple and compound interest. Income, loans and bonds.

**Applications to economic problems (3 h)**

Linear algebra applications: investments, market projections and Markov chains.

**Differential calculus on multivariate real functions (10 h)**

Domain, graph and level curves. Partial derivatives, tangent plane and differentiability. Multivariate function maxima and minima: free and constrained extrema. Implicit functions. Method of Lagrange multipliers. Taylor's formula.

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TEACHING METHODS

The course consists of 48 hours of theoretical lessons in which multimedia material is often used to present the contents. Both the theoretical and the practical applications of the discipline will be presented during the lessons. Moreover, the students will be exposed to examples where the methods studied during the course are directly applied to economical analysis. The students are encouraged to participate actively during the lessons with questions and observations. Classroom tutorials will be an integral part of the lessons.

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EVALUATION METHODS

Final written and/or oral examination. The purpose of the exam is to verify the degree of accomplishment of the expected learning outcomes described above. The mandatory written test has three parts, each corresponding to one of the main arguments of the course. If it is possible to infer from the written exam that the theoretical knowledge of the student is sufficient (achievement of at least 6 point for each part), then the final mark corresponds to that of the written exam without a further oral examination (although the contents of written exam might need to be discussed in front of the teacher prior to registration). If, on the contrary, there are theoretical shortages (less than 6 points in at least one of the parts), but the total mark is greater than or equal to 18, then the student will be admitted to an oral examination and the final mark will be the outcome of such evaluation. Part of the written exam might take place on the e-learning platform (to be defined).

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TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

**References:**

- S. Waner - S. R. Costenoble, Strumenti quantitativi per la gestione aziendale, Apogeo, 2006.
  - A. Guerraggio, Matematica, Pearson, 2009.
  - L. Peccati - S. Salsa - A. Squellati, Matematica per l'economia e l'azienda, Egea, 2004.
  - K. Sydsaeter - P. Hammond - A. Strom, Metodi matematici per l'analisi economica e finanziaria, Pearson, 2015.
  - Class notes available at the teacher's web-site (see above link)
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INTERACTION WITH STUDENTS

At the beginning of the course, the teacher will describe the goals, the program and the evaluation methods. At that time, a list of the students who intend to follow the course will be gathered, requesting the students to contact the teacher from their institutional email address, providing their name, surname,

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and student ID. The teacher will post class notes weekly on the web-site (see above link) .

**Office hours:** Tuesday and Wednesday from 11:30 to 12:30 at the teacher's office (3D-219). Otherwise, the teacher will be available for contact via email and/or by appointment.

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EXAMINATION SESSIONS (FORECAST)<sup>1</sup>

07/02/2020, 24/02/2020, 15/05/2020, 13/07/2020, 14/09/2020, 20/11/2020

20/03/2020 (riservato ai fuori corso)

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SEMINARS BY EXTERNAL EXPERTS    YES     NO

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FURTHER INFORMATION

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<sup>1</sup> Subject to possible changes: check the web site of the Teacher or the Department/School for updates.