# Università degli Studi della Basilicata

**DIPARTIMENTO DI MATEMATICA, INFORMATICA ED ECONOMIA**

ACCADEMIC YEAR: 2017/2018

COURSE: Mathematical Methods for Economics

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


TEACHER: Incoronata Notarangelo

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phone: +39 0971205836 | mobile (optional):


Language: Italian

| ECTS: (lessons and tutorials/practice) 6 | n. of hours: (lessons and tutorials/practice) 48 | Campus: Potenza<br>Dept./School: DiMIE<br>Program: Business economics | Semester: Primo |
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EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES:

* **Knowledge and understanding.** Knowledge of some mathematical tools often used in Economics: elements of linear algebra, differential calculus in several variables, optimization, financial mathematics.

* **Applying knowledge and understanding.** Using such mathematical tools and applying them for solving problems in Economics, Business and Finance.

* **Making judgements.** Choosing suitable mathematical methods for solving problems in Economics, Business and Finance.

* **Communication skills.** Using a proper mathematical language to express the knowledge in oral and written form. Justify the choice of the method for solving theoretical and application problems.

* **Learning skills.** Learning the contents of the course and relating them to other topics in the Program of Studies. Using the suggested books for exercises, insights and comparisons.

PRE-REQUIREMENTS:

Knowledge of the contents of the course "Matematica generale", in particular differential calculus in one variable and its applications.

SYLLABUS:

**Introduction to mathematical models for Economics** (3 h)
Functions and mathematical models. Linear and nonlinear models.

**Linear Models and Matrix Algebra** (16 h)
Vectors and linear spaces. Matrices and matrix operations: properties and applications. Conditions for nonsingularity of a matrix, rank and determinant, inverse matrix. Systems of linear equations: Cramer and Rouché-Capelli theorems. Gauss and Gauss-Jordan elimination method. Geometric interpretation of the solution of linear systems. Linear functions.

**Elements of Linear Programming** (8 h)
Graphical method. Simplex method.

**Differential Calculus for functions of two (or more) variables** (8 h)
Domain, graphic and level curves and differentiation for functions of two variables. Extreme values of a function of two variables. Unconstrained and constrained optimization. Implicit functions. Lagrange multipliers method. Taylor's formula.

**Further topics on Calculus and Financial Mathematics** (5 h)
Sum of terms of a finite arithmetic and geometric progression. Series and geometric series. Difference equations. Simple Interest. Compound Interest. Annuities, Loans and Bonds.

**Applications to Economics problems** (8 h)
Linear models: cost, revenue and profit functions, demand and supply functions, modeling change over time. Linear algebra applications: Leontief Input-Output models, investments, market projections and Markov chains. Optimization problems: resource allocation, profit maximization, cost minimization. Dynamical models: market equilibrium and equilibrium analysis.

## TEACHING METHODS:

The course consists in 48 hours of lessons.

Moreover, some hours will be devoted to an optional intermediate written test, its correction and exam simulations.

The lectures will deal with theoretical aspects of the subject, exercises resolution and some applications to economic analysis. The lecturer will provide slides and exercises at the web page of the course.

## EVALUATION METHODS:

***Written test and oral examination.***

The aim of the examination is to test the level of achievement of the previously mentioned educational goals.

The exam is divided into 2 parts:

* a written test containing theoretical and application exercises on all the topics covered in the course; the test is indended to evaluate the knowledge and unterstanding of the topics and is selective (the student who does not show sufficient knowledge of the subjects is not admitted to the oral examination). The estimated time for the test is 2 hours. During the test the use of a pocket or scientific calculator is allowed, but the use of graphic calculator, books, notes, notebook, tablet or smartphone is forbidden.

* an oral examination (to be taken during the same exam session of the written test) which will evaluate the ability to link and compare different topics of the course and will consist in the discussion of the written test, some theoretical questions and eventually short exercises. After this examination, the student will receive a final grade: in order to pass the exam this should be at least 18 out of 30; otherwise, one should repeat both the written test and the oral examination.

Students who attend the lectures may take optional intermediate written tests containig theoretical and pratical exercises on specific part of the program.

## TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL:

Slides and teaching material for exercises provided by the lecturer, avalaible in https://sites.google.com/site/inconota/MME

**Textbook:** S. Waner - S. R. Costenoble, Strumenti quantitativi per la gestione aziendale, Apogeo, 2006.

Further readings: ○ K. Sydsaeter - P. Hammond - A. Strom, Metodi matematici per l'analisi economica e finanziaria, Pearson, 2015.

○ L. Peccati - S. Salsa - A. Squellati, Matematica per l'economia e l'azienda, Egea, 2004.

○ G. Strang, Algebra lineare, Apogeo, 2013.

○ A. Guerraggio, Matematica, Pearson, 2009.

○ Alpha C. Chiang, Introduzione all'economia matematica, Bollati Boringhieri, 2002.

○ T. Yamane, Matematica per economisti, Etas Kompass, 1972

## INTERACTION WITH STUDENTS:

At the beginning of the course goals, program and evaluation method will be described.

At the end of the discussions of each topic the lecturer provides the related teaching material in the web page of the course.

**Office hours:** Thursday from 14.30 to 16.30, office n. 63/3D214 at the second floor of DiMIE.

In addition to the weakly office hours, the lecturer is avalaible to fix appointments at different hours and/or days of the week and to answer students' questions via e-mail.

## EXAMINATION SESSIONS (FORECAST)[1]

02/02/2018, 16/02/2018, 16/05/2018, 17/07/2018, 07/09/2018, 16/11/2018

06/04/2018 (reserved to students enrolled in supplementary years)

## SEMINARS BY EXTERNAL EXPERTS YES ☐ NO ☑

## FURTHER INFORMATION:

Datailed and updated information can be found in https://sites.google.com/site/inconota/teaching/MME

[1] Subject to possible changes: check the web site of the Teacher or the Department/School for updates.