Università degli Studi della Basilicata

DIPARTIMENTO DI MATEMATICA, INFORMATICA ED ECONOMIA

ACCADEMIC YEAR: 2017–18

COURSE: General Mathematics

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

TEACHER: Prof. Paolo Vitolo – Co-teacher Prof. Antonio Azzollini

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phone: 0971-205882 (Vitolo); 0971-205856 (Az | mobile (optional):

Language: Italian

ECTS: (lessons and tutorials/practice) 6	n. of hours: (lessons and tutorials/practice) 48	Campus: Potenza Dept./School: DiMIE Program: Business Economics degree	Semester: Primo

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES:

The course provides the basics of Mathematical Analysis by dealing with functions, continuity and limits, derivability, function graphs, and integration.

The main goal of the course is to provide students with the basics to deal with function graphs study. The main knowledge provided will be:

- basics of real numbers and functions
- properties of real functions of one real variable: relative and absolute maximum and minimum, monotonicity, convexity, inflection points.
- definitions and theorems on continuous functions and limits
- definitions and theorems on derivatives
- determining the graph of a real function of one real variable
- definition, property, and calculation of indefinite and definite integrals

PRE-REQUIREMENTS:

It is required the math skills normally acquired in secondary school. In particular:

- basics of analytical geometry (Cartesian coordinates in the plane, equation of the straight line);
- know how to solve first and second degree equations as well as first-degree disequations and systems of first-degree disequations.

SYLLABUS:

Real numbers and functions

The language and some basic notions of the set theory. Real numbers. Intervals and neighbourhoods. Definition of function. Invertible functions. Elementary functions and their graphs. Bounded functions. Monotonic functions.

Continuity and Limits

Continuity at a point. Continuous functions. Intermediate value theorem. Theorem on existence of zeros. Weierstrass theorem. Definition of limit of a function. Limit Comparison Theorem. Calculation of limits. Indefinite forms. Some fundamental limits. Asymptotes of a function.

Derivatives

Definition of derivative at a point. Calculation of the derivative of elementary functions. Definition of derived function. Theorems on calculation of derivatives. Geometric meaning of the derivative.

Derivative theorems

Intervals of monotonicity of a derivable function. Relative maximum and minimum. Fermat theorem. Rolle theorem. Lagrange theorem. De L'Hopital Theorem. Intervals of concavity and convexity of a twice derivable function. Inflection points.

Graphs of functions

Representation of the graph of a function on a Cartesian plane.

Integration

Indefinite and definite integral. Integral mean theorem. The fundamental theorem of integral calculus. Primitive of a function. Definition of indefinite integral. Immediate Integrals. Integration by parts and by substitution.

TEACHING METHODS:
Theoretical lectures with examples.
Exercises in the classroom.

EVALUATION METHODS:
The purpose of the examination is to verify the level of achievement of the above mentioned educational goals.
The examination consists of a written test, with a subsequent brief oral interview for the confirmation of the vote.
The test time is 2 hours and 30 minutes. In order to pass the written test and be admitted to the oral interview it is necessary to acquire at least 18 points out of 30.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL:
Textbooks:
- A. Guerraggio, Matematica, Pearson ed. 2009;
- P. Marcellini, C. Sbordone, Esercitazioni di Matematica, Volume 1 parte prima (1995), Liguori Editore, Napoli;
- P. Marcellini, C. Sbordone, Esercitazioni di Matematica, Volume 1 parte seconda (1995), Liguori Editore, Napoli.

On-line material:
Some notes provided by the teacher.

INTERACTION WITH STUDENTS:
• Weekly office hours. Prof. Vitolo: Wednesday from 15:30 to 17:30; Prof. Azzollini: Thursday from 15 to 17.
• E-mail messages.
• Updated information about the course on the teacher's webpage.
• It is also planned to use Twitter.

EXAMINATION SESSIONS (FORECAST)[1]
February 6, 2018
February 21, 2018
April 10, 2018 (off course students only)
May 15, 2018
July 10, 2018
September 11, 2018
November 12, 2018

SEMINARS BY EXTERNAL EXPERTS YES ☐ NO ☑

FURTHER INFORMATION:

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