COURSE: Advanced Calculus (second module of Numerical Analisys and Advanced Calculus)

ACADEMIC YEAR: 2019 - 2020

TYPE OF EDUCATIONAL ACTIVITY: Basic

TEACHER: LEONESSA Vita

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Language: Italian

ECTS: 6	n. of hours: 48	Campus: Potenza Dept.: DiMIE Program: Scienze e Tecnologie Informatiche

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The teaching of Advanced Calculus is the second module of Numerical Analysis and Advanced Calculus.
It is a basic teaching.

Main knowledge are:

- line integrals of the first and second kind;
- multiple integrals;
- surface integrals;
- Fourier series and transforms.

Main skills are:

- solve line integrals of first and second kind, multiple integrals and surface integrals;
- compute Fourier series and transoform
- use methods and concepts illustrated in order to solve exercises and problems linked with other characterizing courses.

PRE-REQUIREMENTS

It is necessary to know the following arguments of Calculus:

- integration of function of 1 variable;
- lines and conic curves in the real plane;
- vector and topological structure of the real euclidean plane and space;
- differential calculus for functions of 1 and more variables.

SYLLABUS

- Vector-valued functions (2 hours). Limit, continuity and differentiability. Jacobian.
- Curves and line integrals of first kind (8 hours). Curves: definition and examples.. Line integrals.

Changement of variables. Exercises.

• Multiple integrals (16 hours). Double and triple integrals: definitions and properties. Example and exercises.

• Differential forms and line integrals of second kind (8 hours). Differential forms: definition, properties. Closed and exact differential forms. Green's formulas. Divergence theorem. Stokes theorem. Applications.

• Surface and surface integrals (6 hours). Surface: definition and examples. Surface integrals. Divergence and Stokes theorems. Applications.

• Fourier series and transform (8 hours). Fourier series: definition and examples. Fourier transform; definition, properties and examples. Principal transforms.

TEACHING METHODS
The course consists in 48 hours of theoretical lessons and exercises.

EVALUATION METHODS
The aim of the examination is to test the level of achievement of the educational goals mentioned for both modules.

The examination is composed of a written session divided into two parts:

• a written and practical one with computer use (n. 3 quetsions for which the student has to chose the most appropriate algorithms to solve the problems, calculate solutions and comment critically the obtained results) on all matters treated in the first module;

• a written one in which it is required at least 2 of 3 exercises on all topics covered in the second module.

The schedule time for this test is 3 hours. The students that obtained at least 16/30 are admitted to the oral exam. The exam is passed if the final assessment (aritmethic average of the marks of the written and oral exam) is at least 18/30.

There will be also 4 intermediate tests throughout the year, two for each module. Each intermediate test is passed with al least 16/30. For each test the schedule time is 2 hours. Each intermediate test can be repeated one time. The final assessment will be given by the average of the four test + 2 bonus points.

The results of intermediate tests, together with the ascertained frequency of at least 6 laboratories (for the first module) and of al least 6 exercise lessons (for the second module), exempts the student from the oral test. For the students aiming at improving their score, an oral session is possible, but not obligatory.

If a student passes the intermediate tests related to only one module, during the final examination he may ask to be excused on the topics related to that module. In this case, the final assessment will consist in the average of the vote gained during the intermediates tests (without bonus points) and the vote acquired during the examination on arguments treated of the failed module by means of the intermediate tests.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- Lecture notes available on the course web site informatica.unibas.it/moodle.
- M. Bertsch, R. Dal Passo, L. Giacomelli, ANALISI MATEMATICA, McGraw-Hill, 2011.
- P. Marcellini, C. Sbordone, Esercitazioni di Matematica, Liguori Editore.

INTERACTION WITH STUDENTS

Educational goals, syllabus and evaluation methods are described at the beginning of the course. During the teaching all lecture notes will be available on the course web site.

Office hours: Monday 10:30-11:30, Tuesday 10:30-11:30, next to the office n. n. 3D236 of the Department of Mathematics, Computer Science and Economics.

It can be possible to contact the professor also by e-mail.

News of every kind are available on the FORUM session of the course web site.

EXAMINATION SESSIONS (FORECAST)[1]

24/02/2020, 04/05/2020, 29/06/2020, 20/07/2020, 14/09/2020, 18/12/2020

SEMINARS BY EXTERNAL EXPERTS YES □ NO □ x

FURTHER INFORMATION

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