



MODELLO SCHEDA INSEGNAMENTO

Corso di L/LM/LMCU	L
Denominazione insegnamento:	Fundamentals of Mathematics
Numero di Crediti:	9
Semestre:	the first one
Docente Titolare:	Dott.ssa Perugia Carmen
Dottorandi/assegnisti di ricerca che svolgono attività didattica a supporto del corso:	
Orario di ricevimento:	Thursday 14:00-16:00 (on appointment)
Indirizzo:	Via Port' Arsa 11

PRESENTATION OF THE COURSE

The course of Mathematical Institutions deals with:

- provide basic mathematical tools which are necessary for scientific university courses.
- read / interpret / analyze simple geological / natural processes through the use of mathematics
- Give to the student a logical-mathematical scientific setting.

KNOWLEDGES AND SKILLS

The main knowledges provided by the course will be:

- the concept of real function of one variable;
- the concepts of lower bound and upper bound for sets and functions;
- the concept of limit;
- calculation rules about limits;
- the concept of continuity of a real function of one variable;
- the concept of differentiability of a real function of one variable and calculation rules;

- the concept of Riemann integral;
- calculation rules and integral methods for the calculus of primitive functions;
- some hints about real functions of more than one real variable.

The main skills will be:

- to verify the properties of real numbers and determine particular sets of real numbers;
- to determine the lower bound and / or the upper bound of sets and functions;
- to verify the properties of real functions and recognize the main elementary functions (power, logarithm, exponential, trigonometric, ...);
- to verify the limit of real functions according to the definition;
- to calculate the limit of real functions;
- to verify the continuity property of real functions;
- to determine the derivative of real functions;
- to calculate the derivatives of high order of real functions;
- to study a real function of one real variable and draw an accurate quality graph;
- to interpret the properties of a function by its graph: recognize where the function grows or decreases and where it takes positive or negative values; identify maximum or minimum points; recognize the symmetric properties;
- to solve integration problems of elementary type;

REQUIREMENTS

Typical high school syllabus

ATTENDANCE

Although not compulsory, attendance is strongly recommended because it gives you the opportunity to access exams and / or exam simulations.

CONTENTS

- Sets theory and some hints of analytical geometry;
- concept of real function of one real variable;
- limits of functions;
- continuous functions and their properties when defined in intervals;
- differential calculus in one dimension and its application to the study of the function graph;
- some hints about the differential calculus in more than one dimension;
- Riemann integral and its properties above all with respect the calculus of the areas.

TEACHING METHODS

The course consists of 9 credits (81 hours) to be held in the first semester. It is organized with theoretical lessons, exercises and tutoring activity. For attending students, there is also the possibility to make at least two partial tests that, if passed (see section EXAMS), allow direct access to the oral exam. In order to be able to make each of these tests, you must have attended at least 2/3 of the lessons that have been held so far.

BOOKS

Textbook

P. Marcellini – C. Sbordone, Elementi di Analisi Matematica Uno, Liguori ed.

Other books

C. Sbordone – F. Sbordone, Matematica per le Scienze della Vita, EdiSES.

M. Bramanti – C. D. Pagani – S. Salsa, Analisi matematica 1, Zanichelli.

D. Benedetto – M. Degli Esposti – C. Maffei, Matematica per le scienze della vita, Casa Editrice Ambrosiana (nuova edizione).

Books with a wide set of exercises:

S. Salsa – A. Squillati, Esercizi di Matematica vol.1, Zanichelli ed.

P. Marcellini – C. Sbordone, Esercizi di Matematica vol.1 (parte I e II), Liguori ed.

A. Alvino - L. Carbone – G. Trombetti, Esercitazioni di Matematica vol. 1 (parte I e II), Liguori ed.

EXAMS

The Exam purpose is to verify an adequate level of the course's contents, both in terms of knowledge and skills. The final grade is mandatory determined by:

- a score for the written exam, possibly acquired by partial tests,
- an evaluation of the oral exam.

Foreign students can take the exam in English.

Complete written test or partial tests

In the case of partial tests, the final grade of the written exam is given by the average of the final score of each partial tests. If it is greater than or equal to 17/30, it will be the final grade of the written exam. If not, it is necessary to make the complete written test. Moreover, the final grade of the written exam, only if acquired by passing the partial tests, remains valid until the last session of the academic year (extraordinary session). Otherwise, it remains valid ONLY for that session (for example a complete written test passed in the first exam window can NOT be "preserved" until the second window).

The complete written test and the partial tests consists in the resolution of exercises to which a score is assigned proportional to their degree of difficulty so that the total is always thirty.

Oral exam

The oral exam is compulsory and aims to evaluate the theoretical knowledge of the student as well as the relevance of the answers to the questions asked, the ability to bring examples, the property of technical language and overall expressive ability.

Notes

If you pass the partial tests with a score at least equal to 17, you can make also the complete written test in order to improve your final score: in that case, the grade of the complete written test will DEFINITELY replace the one acquired with the partial tests (you cannot keep the best of the two).

EXAMS SCHEDULE

Go to the link

ENROLE FOR EXAMS

Go to the link

SYLLABUS

Argomenti	Ore	Riferimenti bibliografici	Tipologia di lezione
Review of elementary set theory	6/4	- P. Marcellini – C. Sbordone, Elementi di Analisi Matematica Uno, Liguori ed; - C. Sbordone – F. Sbordone, Matematica per le Scienze della Vita, EdiSES; - P. Marcellini – C. Sbordone, Esercitazioni di Matematica vol.1 (parte I), Liguori ed.	Lecture/exercise
Real functions of one variable	8/8	- P. Marcellini – C. Sbordone, Elementi di Analisi Matematica Uno, Liguori ed; - C. Sbordone – F. Sbordone, Matematica per le Scienze della Vita, EdiSES; - P. Marcellini – C. Sbordone, Esercitazioni di Matematica vol.1 (parte I), Liguori ed.	Lecture/exercise
Limits of real functions of one variable	6/10	- P. Marcellini – C. Sbordone, Elementi di Analisi Matematica Uno, Liguori ed; - P. Marcellini – C. Sbordone, Esercitazioni di Matematica vol.1 (parte I), Liguori ed; - A. Alvino - L. Carbone – G. Trombetti, Esercitazioni di Matematica vol. 1 (parte I), Liguori ed.	Lecture/exercise
Continuous real functions and related theorems.	2	- P. Marcellini – C. Sbordone, Elementi di Analisi Matematica Uno, Liguori ed; - C. Sbordone – F. Sbordone, Matematica per le Scienze della Vita, EdiSES.	Lecture

<p>Differential calculus for real functions of one variable and related theorems. Fermat theorem, Rolle theorem, Lagrange theorem and its corollaries, De L' Hôpital theorem. Taylor expansion.</p>	<p>9/10</p>	<p>- P. Marcellini – C. Sbordone, Elementi di Analisi Matematica Uno, Liguori ed; - P. Marcellini – C. Sbordone, Esercitazioni di Matematica vol.1 (parte I e II), Liguori ed; - A. Alvino - L. Carbone – G. Trombetti, Esercitazioni di Matematica vol. 1 (parte I e II), Liguori ed.</p>	<p>Lecture/exercise</p>
<p>Some hints about real functions of several variables. Gradient and directional derivative. High order derivatives. Rotor and divergence.</p>	<p>2/2</p>	<p>- P. Marcellini – C. Sbordone, Elementi di Analisi Matematica Uno, Liguori ed.</p>	<p>Lecture/exercise</p>
<p>Riemann integral for functions of one variable and related theorems. Definition and properties. The mean value theorem. Primitive of a function: definition and its characterization. The fundamental theorem of integral calculus. The basic formula of integral calculus. Integration rules and methods. Use of integrals for the calculation of areas.</p>	<p>5/9</p>	<p>- P. Marcellini – C. Sbordone, Elementi di Analisi Matematica Uno, Liguori ed; - P. Marcellini – C. Sbordone, Esercitazioni di Matematica vol.1 (parte II), Liguori ed; - A. Alvino - L. Carbone – G. Trombetti, Esercitazioni di Matematica vol. 1 (parte II), Liguori ed.</p>	<p>Lecture/exercise</p>