UNIVERSITY OF BARI ALDO MORO

EDUCATION SCHEDULE

Department of Chemistry

Degree Course in *Environmental Sciences* A.Y. 2019/2020

Teaching	Mathematics		
SSD	MAT/05		
Year of study	1st year		
Code of Teaching	005989		
Semester	1st semester		
Lecturer	Genni Fragnelli		
Credits	8 CFU		
Semester	1st (from September 23, 2019 to January 15, 2020)		
Prerequisites	For understanding and being able to apply the main techniques which are taught in this class, one has to know **Logic**, **Set Theory** and the basic arguments in **Elementary Mathematics** such as • Elementary algebra • Analytic geometry • Trigonometry		
Formative objectives	• *Knowledge and understanding skills* The aim of this class is giving the main basic knowledges in Mathematics by studying some abstract theorems and by applying them to the study of real functions, both in one and two variables, and to the research of antiderivatives and, more in general, solutions of some linear ordinary differential equations. • *Ability to apply knowledge and understanding* Students have to apply the acquired Maths tools to Statistics and Probability and to classes in the area of Physics. More in general, the scientific method, which is developed by studying fundamental Maths methods, apply to the advanced scientific courses in ***Environmental Sciences***. • *Autonomy of judgment* Each student has to prove that he/she has sufficient autonomy of judgement and is able to apply theorems. • *Communicative Skills* Each student will be able to prove some abstract theorems and to describe the main properties of the studied Maths elements. • *Learning ability* Each student will prove to have developed learning ability and to be able to recognise which methods apply for solving different problems.		
Didactic methods	**Front Lessons**	**Exercises**	**Total**
Assisted teaching hours	54	30	84
Individual study hours	96	20	116
Credits	6	2	8
	The final examination has both an exercise test and an oral exam.		

Evaluation methods	The exercise test lasts about 2 hours and its aim is to prove that each student is able to solve exercises which require the application of different Maths tools and are similar to model tests solved at lesson. Eventually, the attending students may replace the exercise test with two mid-term evaluations. The oral exam is mandatory and its aim is to check the acquired theoretical knowledge. The passing grade is 18/30.
Program	**Background arguments** - Elements of logic and set theory. **The real and complex number systems** – The real field, its subsets **N**, **Z**, **Q** and their main properties. Intervals. Real line. The extended real number system. Cartesian coordinate system. Basic topology in **R** and in $\mathbf{R}^2$. Maximum and minimum of a set. Bounded sets from above and /or from below. Supremum and infimum of a set. The complex field and its main properties. Algebraic equations in **C**. **Real functions of one variable** – Real functions of one variable and their properties. Elementary functions. Sequences. Limits of a real function and of a sequence. Main theorems on limits and their applications. Continuity. Main theorems on continuous functions. Differentiation. Main theorems on differentiable functions and their applications. Qualitative study of a function. **Integration** – Antiderivatives and indefinite integrals. Techniques of integration. Definite integrals and their properties. Main theorems on integrals and their applications. **Real functions of several variables** - The Euclidean space $\mathbf{R}^N$. Real functions of several variables and their properties. Limits and continuity. Partial derivative of a function of two variables. **Some models of differential equations -** Separable equations. First-order linear equations. Second-order linear homogeneous ordinary differential equations with constant coefficients.
Reference texts	• E. Acerbi, G. Buttazzo, *Primo corso di Analisi Matematica,* Pitagora Ed., Bologna (1997) • G. C. Barozzi,Primo Corso di Analisi Matematica, Zanichelli Editore, Bologna (1998) • M. Bertsch, R. Dal Passo, L. Giacomelli, *Analisi Matematica,* 2ª Ed., McGraw-Hill, Milano (2011) • M. Bertsch, R. Dal Passo, *Elementi di Matematica*, Aracne Ed., Roma (2001) • M. Bianchi, E. Paproni, *Matematica per le Scienze*, Pearson Education Italia (2007) • P. Boieri, G. Chiti, *Precorso di Matematica*, Zanichelli Editore, Bologna (1994) • M. Bramanti, C.D. Pagani, S. Salsa, *Matematica. Calcolo infinitesimale e algebra lineare.* Seconda Edizione. Zanichelli Ed., Bologna (2004)

	• F. Conti, *Calcolo. Teoria e applicazioni*, McGraw-Hill, Milano (1993) • P. Marcellini, C. Sbordone, *Elementi di Analisi Matematica 1*, Liguori Ed., Napoli (2002) • P. Marcellini, C. Sbordone, *Esercitazioni di Matematica*, 1° vol. (I e II), Liguori Ed., Napoli (1998)
Extensive texts and teaching tools	Reference texts should be completed by lesson notes. Lecturer advises against using notes which are on web and are written by unknown authors.