UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare
ACADEMIC YEAR	2017/2018
BACHELOR'S DEGREE (BSC)	NATURAL AND ENVIRONMENTAL SCIENCES
SUBJECT	MATHEMATICS
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50174-Discipline matematiche, informatiche e statistiche
CODE	04872
SCIENTIFIC SECTOR(S)	MAT/07
HEAD PROFESSOR(S)	SCIACCA VINCENZO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	145
COURSE ACTIVITY (Hrs)	80
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**SCIACCA VINCENZO** Thursday 15:00 18:00 Dipartimento di Matematica e Informatica, via Archirafi 34, Ufficio n° 216 (2° piano)

DOCENTE: Prof. VINCENZO SCIACCA

PREREQUISITES	Good mathematical knowledge of the groundings of Algebra, Geometry and Trigonometry developed at the high school. No formal propedeuticity with respect to other courses.
LEARNING OUTCOMES	Knowledge and Understanding: Knowledge of basic mathematics subjects (numbers, functions of one variable, differential and integral calculus, linear algebra) . Mathematical modeling: statistical analysis and deterministic models. The student gains knowledge and understanding via class attendance, participation in classrooms and individual study. Applying knowledge and understanding: Being able to read and construct the graph of a function in the plane. Given a moderate difficult real problem, being able to define the problem, to organize its study, to understand the experimental data, to make predictions about the problem based on the mathematical model. Making judgments: Depending on the data and the level of available knowledge, being able to choose the mathematical-statistical tools which are more suitable to describe and analyze a problem. To make group work experience during the exercises. Communication skills : Owning the right tools and skills for communication, in particular in order to critically expose and discuss a problem. Learning skills: Being able to understand the applicability of the tools acquired in this course to problems that will be presented in other courses.
ASSESSMENT METHODS	The final verification aims to estimate: the knowledge and the understanding of the student about the contents of the course; the competence of the student to apply this knowledge and understanding; if the student owns autonomy of judgments and suitable communication and learning skills. The final verification consists of a written test and an oral examination. In the written test the resolution of three exercises is demanded. The exercises make reference to all the objects of the program and are consistent to the examples and the discussion hours developed during the course. During the oral examination the student should correctly answer to two/three questions based on all the contents of the course. Moreover, the student should give a critical explanation of the exercises' resolution proposed in the written test. The final evaluation will be based on both the written test and the oral examination and it will be scaled according to the following conditions: a)does not possess an acceptable knowlede of the contents of the presented topics (no sufficient); b)minimal base knowledge of the contents of the course and of the technical language, most insufficient or null ability to independently apply the acquired knowledge (18-20); c)not have full mastery of the main contents of the course but possesses knowledge, satisfactory property of language, insufficient ability to independently apply the acquired knowledge (21-23); d)knowledge of base treated contents, discrete property of language, with limited ability to independently apply the competence to solve the proposed problems (24-25); e)good mastery of the contents of the course, very good property of language, good competence in problem-solving (26-29); f)optimal knowledge of the contents of the course, optimal property of language, very good analytic abilities and competence in problem solving (30-30 with honors).
EDUCATIONAL OBJECTIVES	The aim of the course is to provide the necessary tools, from one hand, in order to analyze a problem from the mathematical point of view, from the other to understand the concepts of cross-discipline and to grasp analogy of structure in different areas. The course is also an introduction to the study of statistical and deterministic mathematical models. A further aim is to provide the basic elements in order to understand whether or not the modelization can be of help in the study of a particular ecological / environmental problem. The educational objectives are achieved through the resolution of simple problems proposed during the frontal lessons and during the classrooms. The achievement of learning outcomes is done by verification tests conducted during the course and at the conclusion of the course.
TEACHING METHODS	The course is organized in frontal lessons and discussion hours. During the frontal lessons all the contents of the course will be rigorously presented and analyzed. Through the exercises the students will acquire greater understanding of the presented topics. In particular, partial written tests will be proposed during the course in order to prepare the student to the final verification.
SUGGESTED BIBLIOGRAPHY	Bramanti, Pagani, Salsa “Analisi Matematica 1. Con elementi di geometria e algebra lineare”, Zanichelli, 2014. W. Navidi, Probabilita' e Statistica per l'ingegneria e le scienze, McGraw-Hill, 2006. Salinelli E., Tomarelli F., Modelli dinamici discreti, Springer, 2005.

SYLLABUS

Hrs	Frontal teaching
4	The continuum of numbers. Elementary functions.Inequalities
6	Useful functions for applications. Limited, symmetric, monotonic, periodic, composing functions.
5	The limit of functions. Theorems on the limit of functions. Limits involving zeros and infinity. Reletionship to continuity.
5	Concept of derivative. Rules for differentiation. Derivative of elementary functions. Higher derivatives. Main theorems.
6	Mapping graph: domain, continuity, asymptotes, monotony, concavity.
3	Descriptive statistics and data sampling.
3	Descriptive measures.
3	Graphical representations (steam and leaf, boxplot, histograms)
5	Definition of probability: classical, frequentist, subjective. Probability functions: axioms and properties,
6	Discrete random variables (Bernoulli, Poisson), continuous random variables (uniform and normal distribution) and inferential distribution (Chi square, Student and Fisher)
2	Hypothesis test (null hypothesis, alternative hypothesis and statistical power)
2	Simple linear regression
6	The concept of dynamical system. Equilibria and stability. One-dimensional models describing the growth of a population: Malthus equation and logistic equation. Interacting species: predator-prey model.

Hrs	Practice
4	Sets: properties and operations
4	Limits of functions
3	Differential calculus
6	Mapping graph
3	Properties of probability
4	Random variables