Laurea Magistrale
Atmospheric Science and Technology (LMAST)

SUBJECT TITLE	Statistical Mechanics
TEACHER NAME(S)	Simone Paganelli, Guglielmo Lacorata
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Teacher meeting	Contact the teachers
Teacher office address	Univ. dell'Aquila, DSFC Via Vetoio, 67010 L'Aquila
DISCIPLINE (SSD)	FIS/02 – Theoretical Physics
Semester (1-4) and location	1 (first), Rome, Via Eudossiana 18 (S. Peter in chain site)
Credits (CFU/ECTS)	6
Lecture hours (h)	60
Prerequisite and learning activity	Classical Mechanics, Probability
Teaching language and method	English & lectures, exercises and homework
Assessment method	Oral examination
SUBJECT WEBSITE	N/A

OBJECTIVES

Understanding the basic concepts of:
-Statistical Mechanics
-Stochastic Processes
-Probability
-Non Linear dynamics

OUTCOMES (Dublin descriptors: knowledge, understanding, explain, skill, ability)

After the successful completion of this module, the student should be able to:
-know the fundamentals of Statistical Mechanics;
-know the concept of probability and distribution function;
-analyse the characteristics of stochastic and deterministic models;
-know the concept of forecast error and predictability of the future state of a system.

PROGRAM CONTENT

INTRODUCTION TO STATISTICAL MECHANICS: Basic assumptions. Statistical ensembles. Equilibrium properties.
PROBABILITY: Probability distribution functions. Concept of Entropy.
STOCHASTIC PROCESSES. Markov chains. Fokker-Planck equation. Stochastic differential equations.
DYNAMICAL SYSTEMS: Conservative and dissipative systems. Nonlinearity and chaos. Diffusion and Mixing.
TURBULENCE: Phenomenology. Notions of Kolmogorov's K41 theory. Overview of 2D and 3D turbulence.

REFERENCES AND MATERIAL

-G. Boffetta e A. Vulpiani Probabilità in Fisica (Springer- Verlag Italia, 2012).
-U. Frisch Turbulence: The Legacy of A. N. Kolmogorov (Cambridge University Press, 1995).
-E. Ott Chaos in dynamical systems (Cambridge Univ. Press, 2002).
-N.G. van Kampen Stochastic processes in physics and chemistry (North-Holland, 1992).
-Class notes provided by the Teachers