Laurea Magistrale
Atmospheric Science and Technology (LMAST)

SUBJECT TITLE	Atmospheric Dynamics. Module 2: Climate modelling
TEACHER NAME(S)	Gianluca Redaelli
Teacher e-mail (s)	gianluca.redaelli@aquila.infn.it
Teacher phone	+39.0862.433054
Teacher meeting	Contact teacher by e-mail to request a meeting
Teacher office address	Coppito 1 building, ground floor, room 36, Via Vetoio, Coppito, 67100 L'Aquila
DISCIPLINE (SSD)	GEO/12
Semester (1-4)	3-4 (third-fourth) at Coppito, L'Aquila
Credits (CFU/ECTS)	6
Lecture hours (h)	56
Prerequisite and learning activity	Basic knowledge of general physics and mathematical analysis and a good background in atmospheric physics and dynamics.
Teaching language and method	English. Lectures, seminars, numerical exercises, homework.
Assessment method	Written homework and final oral exam
SUBJECT WEBSITE	

OBJECTIVES

The climate modelling module illustrates the fundamentals of atmospheric climate as part of the coupled system atmosphere-ocean. This module provides the scientific basis of the climate modelling and for the understanding of the observed and forecasted climate

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

On successful completion of this course, the student should:

- have knowledge of climate at global and regional scales.
- have knowledge and understanding of climate models and their applications
- being able to make informed judgments and choices on the suitability of model approximations and on the applications of the climate models.
- being able to communicate the results of their studies in the course with seminars
- being able to continue learning in this field by keeping on track with the scientific literature

PROGRAM CONTENT

- BASIC OF GLOBAL CLIMATE. Components and phenomena in the climate system. General circulation of the atmosphere and the ocean. Physical processes in the climate system.
- CLIMATE DYNAMICS. Paleoclimate and present-day climate. Climate variability, equilibria, sensitivity, tipping points, forcing and feedbacks. Patterns and indices of Climate Variability. Greenhouse warming.
- CLIMATE MODELING. Model's design and application. Hierarchy and evolution of climate models. Principal climate model equations. Energy Balance Models. Coupled models. Climate models and climate change. Climate model scenarios for global warming

REFERENCES AND MATERIAL

- McGuffie K, Henderson-Sellers A., A climate Modelling Primer, Wiley-Blackwell, 2014
- Neelin J. D., Climate Change and Climate Modelling, Cambridge University Press, 2010
- Wallace J. and P. Hobbs, Atmospheric Science: An introductory survey, Academic Press, 2006
- The Oceanography course Team: Ocean Circulation I, The Open University and Pergamon Press, 1991
- Teacher-provided material and exercises