# Laurea Magistrale
# Atmospheric Science and Technology (LMAST)

| SUBJECT TITLE | |
|---|---|
| **TEACHER NAME(S)** | Valentina Colaiuda, Barbara Tomassetti |
| *Teacher e-mail (s)* | valentina.colaiuda@univaq.it; barbara.tomassetti@aquila.infn.it |
| *Teacher phone* | +39 0862 433043/433024 |
| *Teacher meeting* | Monday 3-5 p.m., Friday 11-13 am or as per appointment by mail or telephone |
| *Teacher office address* | CETEMPS c/ edificio "Ricamo", via Vetoio snc, 67100 L'Aquila |
| **DISCIPLINE (SSD)** | FIS/06 |
| *Semester (1-4)* | 3 |
| *Credits (CFU/ECTS)* | 6 |
| *Lecture hours (h)* | 60 |
| *Prerequisite and learning activity* | Fundamentals of Physics and Algebra. Computer programming |
| *Teaching language and method* | English , Lectures and Laboratory training |
| *Assessment method* | Test and Oral examination |
| **SUBJECT WEBSITE** | http://cetemps.aquila.infn.it/modellistica-idrologica/ |

**OBJECTIVES**

The hydrometeorological physics course is aiming at giving a holistic knowledge of meteorological and hydrological processes. The aim of the course is to highlight causes and effects of hydro-meteorological disasters with a special focus on the data driven approaches of forecasting. It involves the measurement, analysis and modelling of atmospheric and land surface processes tied to the hydrological cycle. The space and time distribution of observed (rain gauges, radar and satellite measurements) and forecasted precipitation is analysed in all scales. River flow information is also gathered and described. The course lays out a deep understanding of ground, surface, and atmospheric forms of water and prepare the participant for its application in hydrology and extreme weather events forecasting

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

After the successful completion of this module, the student should be able to:
-Understand fundamentals of Hydro-meteorological processes;
-Use of techniques of spatial interpolation of rainfall and temperature;
-Analyse observed data;
-Use different data sources as input for a hydrological model;
-Forecast flood events (pluvial, fluvial, flash and coastal flood);
-Design a coupled hydro-meteorological forecast system;
-Map hydro-meteorological variables in a GIS environment.

**PROGRAM CONTENT**

FUNDAMENTALS: introduction to hydro-meteorological processes: evaporation and transpiration, rainfall-runoff, infiltration and snow melting. Topographical effects on precipitation distribution.
OBSERVED DATA: introduction to the problems of observed data representation and treatment for hydrological purposes. Analysis and interpretation of database collections (homogeneization and filtering techniques). Measurements and Instrumentation. Model calibration.
HYDROLOGICAL AND METEOROLOGICAL MODELING: intoduction to hydro-meteorological operational chain. Real-time hydrological forecast systems and nowcasting.
COLLECTION LABORATORY: using a distributed hydrological model to analyse different case studies
GRAPHICAL REPRESENTATION IN HYDROLOGY: mapping hydrological outputs.
CLIMATIC VARIATIONS AND THE HYDROLOGICAL CYCLE: climatic variability driving the variability observed in hydrology

**REFERENCES AND MATERIAL**


- Collier C. G., Hydrometeorology, Wiley, 2016.
- Bronstert A., J. Carrera, P. Kabat, S. Lutkemeier, Coupled Models for the Hydrological Cycle, Springer, 2012.
- Wanielista M., R. Kersten and R. Eaglin, Hydrology Water Quantity and Quality Control, Wiley & Sons, 1997
- Material supplied by the teacher