

A New Atmospheric Physics Laboratory for the Students of Casiraghi High School in Cinisello Balsamo



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High School in Cinisello Balsamo



Thanks to PNRR funding, the Giulio Casiraghi High School in Cinisello Balsamo, near Milan, has established a cutting-edge Atmospheric Physics Laboratory. Students attending the Scientific, Classical, and Linguistic tracks at this institution will now have access to a study program designed to prepare them for the future.

The Environment: A Topical Subject for Students to Understand

Today, environmental issues such as pollution and climate change are urgent concerns. For this reason, the Mathematics and Physics professors at Giulio Casiraghi High School proposed the creation of a dedicated laboratory. The goal is to provide students with a curriculum focused on environmental issues, using diverse approaches and methodologies.

The school has always been committed to environmental topics, energy savings and renewable energy. Evidence of this commitment includes energy-efficient renovations, the installation of solar panels for electricity production and numerous activities conducted in collaboration with ARPA (the Regional Environmental Protection Agency) and the adjacent Parco Nord (North Park). The school has also hosted various laboratories on environmental topics.

About twenty years ago, the institution experimented the usage of data from a weather station installed in the school courtyard for educational purposes. Students at that time enthusiastically engaged in data analysis and environmental monitoring.

The New Atmospheric Physics Laboratory

The establishment of the new Atmospheric Physics Laboratory marks a return to this successful experience, now enhanced with advanced technology. This time, the laboratory will not only focus on meteorological analysis but will also address indoor environmental conditions, a critical issue in recent years for student well-being.

The state-of-the-art equipment acquired by Giulio Casiraghi High School for the laboratory and the dedicated curriculum includes:

- **A comprehensive weather station** installed in the school courtyard to monitor atmospheric parameters such as temperature, humidity, pressure, rainfall, solar radiation, wind speed and direction, and particulate matter (PM2.5, PM10).
- **The Sphensor system** for monitoring indoor environmental parameters, such as temperature, humidity, pressure, CO2 levels, particulate matter and volatile organic compounds (VOC).
- **A cloud infrastructure** based on ENVIRO CUBE and INDOOR CUBE for data visualization and analysis.

The Educational Path: Engaging Young Minds

In the first two years of high school, the laboratory will be used for civic and environmental education, incorporating a humanistic perspective on the importance of studying and respecting the environment and its intrinsic connection to social responsibility.

Mathematical fundamentals will also be introduced, including basic statistics and data processing, from theory to practice, with data analysis from the weather station and indoor sensors. Particular emphasis will be placed on studying the sensors and data acquisition technologies to understand the methodologies that make data collection possible.

Students will have access to a cloud platform that aggregates both meteorological and Sphensor sensor data. They will be able to visualize,

analyse, generate reports and download data for further processing using Excel.

Voluntary Research: Delving Deeper

The project will not be limited to the standard curriculum. Upper-grade students will have the opportunity to engage in voluntary applied research, leveraging the school's longstanding partnerships with ARPA and Parco Nord. They will delve deeper into various aspects of environmental monitoring and may even find inspiration for their future careers.

The Atmospheric Physics Laboratory will also collaborate with other existing school laboratories, such as the communication lab. Students will participate in dissemination activities, creating videos, social media posts and content for the school's web radio to share the project with the broader community.

Best Wishes to Young Researchers

LSI LASTEM congratulates the professors of Giulio Casiraghi High School, who have proven themselves forward-thinking educators by recognizing the importance of engaging students in contemporary issues such as environmental protection, which begins with atmospheric monitoring.

We sincerely hope that our technologies will inspire young students, encouraging them to discover how insatiable curiosity, applied research and objective analysis can be valuable tools in all aspects of life.

Products used:

The following products were used in the case study.

For the weather station the following sensors and data loggers, in addition to the accessories not mentioned:

DMA672.1: temperature and air humidity sensor
DNA821: combined mechanical wind speed and direction sensor
DPA154: Class B global solar radiation sensor
DQA230.1: tipping bucket rain gauge
DQA340: soil temperature and water content sensor
PRPMA1002: particulate sensor (PM2.5, PM10)
DLALB0100: Alpha-Log data logger

MDMMB1110: ALIEM input extension module

TXCRA2200.D: router for remote communication

EXP301 and EXP820: radio signal transmitter and receiver for roof-mounted wind sensor

ENVIRO CUBE with evapotranspiration module (TURC) and air quality module: cloud software for visualisation, download and analysis of outdoor data

For the indoor monitoring system:

PRMPB0401: Sphensor sensor for temperature, humidity and air pressure

PRMPA0423: Sphensor air quality sensor (CO₂, PM, VOC)

TXMRB1100: Radio Signal Repeater

TXRGB1001: Sphensor Gateway for receiving data from sensors and sending data to the cloud

INDOOR CUBE: cloud software for visualization, download and analysis of indoor data