UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Quantificare la crescita e i cambiamenti

2526-BbetweenSDG-05-01

Module description

This module aims to demonstrate how understanding quantitative information from the scientific, economic, and political worlds is essential for judging which are the most rational decisions to make for a more sustainable world. Specifically, we will discuss the importance of effective and transparent scientific communication, and how it can sometimes be consciously or unconsciously misleading. To develop the critical ability to discern meaningful quantitative information, we will discuss measurements, the verbal and graphical communication of such measurements, and we will explore the main mathematical models of growth, focusing on the difference between linear or polynomial growth models and exponential growth models. Finally, we will discuss the role of uncertainty in complex systems and how probability and statistics can help address the inherent uncertainty in such systems.

Learning goals

Understand quantitative data that quantify changes in various contexts, such as economic, climatic, ecological, epidemic, and demographic.
Know how to communicate scientific data effectively and distinguish whether such communication is misleading or not.
Understand the differences between the main growth models, particularly linear and exponential growth.
Understand how uncertainty in complex systems is intrinsic but can also be managed using statistical tools.
Acquire critical thinking skills based on scientific and quantitative evidence.

General goal

Understand and use scientific communication related to changes in economic, climatic, ecological, epidemic, and demographic contexts.

Specific skills and competences

Upon completion of the course, students will be able to:

- Use relevant indicators and metrics to analyze changes.
- Collect, interpret, and synthesize quantitative and qualitative data.
- Evaluate changes, impacts, and deviations.
- Present and communicate results through clear reports, effective visualizations, and data-driven arguments.
- Evaluate the statistical significance of observed changes.
- Use change analysis to support informed decisions in various application areas.

Sustainable Development Goals of the 2030 UN Agenda

Goal 13: Promote action at all levels to combat climate change, in particular
13.3 Enhance education, awareness-raising, and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning

Breakdown of meetings

The "meetings" will be video lessons interspersed with ongoing assessment quizzes.

The indicative breakdown of topics is as follows:

- Introduction: key concepts related to sustainability, motivation.
- Measurement: units of measurement; scientific notation; percentages and pure numbers; approximations; orders of magnitude
- Science communication: the general public's difficulties in understanding numerical communication
- Communicating numerical data verbally and graphically
- How communication can be misleading
- Quantifying growth: absolute and relative growth
- Linear growth and its characteristics
- Exponential growth and its characteristics
- Other growth models
- The role of uncertainty in complex systems: the difference between randomness and unpredictability
- The example of the coin: orobability as a measure of uncertainty
- Assessing Change: statistical tests - Part 1
- Assessing Change: statistical tests - Part 2

The underlying theme of the examples presented throughout the program will be the assessment and description of the impact of human development and climate change.

Number of participants

There is no limit to the number of participants.
The module is delivered via e-learning (via recordings and quizzes) and is available 24/7.

Language used in meetings

Italian

Delivery period of the module

March-May 2026.

Methods of assessing the outcomes of the learning process

Closed and open questions tests.

Department of affiliation of the teacher

Department of Mathematics and Applications

Sustainable Development Goals

CLIMATE ACTION