UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Scientific method: the fundamental concepts

2425-102R-21

Title

Scientific method. The fundamental concepts

Teacher(s)

Edoardo Datteri

Language

English

Short description

Philosophy of science is a branch of philosophy concerned with the methods and the fundamental concepts involved in scientific research. Cornerstone epistemological issues such as the distinction between science and non-science, the characteristics of a good scientific explanation, the relationship between theory and observation, the structure of scientific theories, and the nature of mind, are rarely addressed in scientific courses. However, all “good” scientists ought to reflect on them deeply. This course represents a unique opportunity, for all the Bicocca PhD students, to do that.
The course is open to PhD students in all research fields. It will cover issues pertaining to the foundations of sciences ranging from physics to the educational sciences, with an eye on the role of computer science in

understanding the world. The lessons will be centered on students and give priority to discussion. More specifically, in each lesson,

1. the lecturer will provide some definitions and epistemological considerations made in the epistemological literature and raise some questions to be discussed.
2. Then, the participants will be invited to reflect on the definitions and discuss the questions raised in the first part of the lesson, drawing from their expertise and experience.
   The lessons will be held in English. The lecturer will provide supplementary materials and texts through the e-learning platform.

May 9th, 9:00 am – 11:00 am

Title of the lesson: Science

Abstract. “Science” is the most fundamental concept in science. However, defining what science is, and what distinguishes science from other forms of knowledge acquisition, is an extremely challenging task. In this lesson, two famous yet unsuccessful attempts to solve this problem – the so-called verificationim and Popper’s falsificationism – will be critically analysed and discussed, in search of more promising solutions. The distinction between “hard” and “soft” sciences will be challenged.

May 16th, 9:00 am – 11:00 am

Title of the lesson: Theory and observation

Abstract. What is a theory, and what counts as an observation, in science? It is frequently assumed that theories are logically and conceptually distinct from observation, and especially that observation comes before theory formulation (both logically and temporally). However, the relation between the two is more complicated than this, and it may be even argued that observations somehow depend on pre-existing theories. The so-called “theory ladenness” of scientific observation (according to which observations are loaded with theory in science) will be critically discussed with the help of examples taken from the scientific literature.

May 23rd, 9:00 am – 11:00 am

Title of the lesson: Scientific explanation and understanding

Abstract. Scientific research pursues the explanation and understanding of natural phenomena. What exactly counts as a “good” explanation of a phenomenon? What objective and subjective factors determine one’s understanding of a phenomenon? Philosophers of science have produced several models of scientific explanation, which place constraints on the relationship between the phenomenon to be explained and the information provided to explain it. They include, among others, nomologico-deductive, teleological, functional, mechanistic, narrative explanations. These models of explanations will be sketched and discussed with reference to the various scientific research areas represented in the group of participants.

May 30th, 9:00 am – 11:00 am

Title of the lesson: Objectivity

Abstract. Objectivity is generally considered a cornerstone of science. Science must pursue objective investigations into nature. However, this term, "objectivity", admits of various meanings. In the last lesson of the course we will undertake a reflection on objectivity in science, taking stock of all the discussions we have carried out in the previous lessons on empiricism, scientific realism, explanation.

Target audience
PhD students from all the courses offered in Bicocca.

Participants
Min 5 Max 30

CFU / Hours

1 CFU / 8 hrs

Teaching period

09/05/2025 9:00 am -11:00 am U6.30
16/05/2025 9:00 am -11:00 am U1.03
23/05/2025 15:00 am -17:00 pm U9.13
30/05/2025 9:00 am -11:00 am U9.12

course registration on “Segreterie online”: from 14/04/2025 to 04/05/2025 **Registrations closed due to high number of participants**

Sustainable Development Goals

QUALITY EDUCATION