



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Laboratory of Data Analysis

2324-1-F5802Q001

Aims

Provide core knowledge and skills for planning and conducting a scientific investigation in astrophysics in the field of galaxy formation and evolution using observations and theoretical models.

Contents

By the end of the course, the students will be able to measure and quantify the fundamental variables associated with the different components of galaxies using experimental data. Using these datasets and by developing models, the students will be able to characterize the physical mechanisms that regulate the formation and evolution of galaxies as a function, e.g., of their environment and epoch of observation. On the practice side, the students will be able to formulate testable scientific questions, plan and test scientific experiment based on observed datasets and present results in written and oral form.

Detailed program

In order to reach the learning goals stated above, the course is structured through a series of inquiry activities divided into two broad parts. In the first part, the activities will focus on the characterization of the physical quantities associated to galaxies as derived through optical data (spectroscopy, photometry). In the second part, the students will use datasets obtained from large surveys (SDSS, 3DHST) in order to characterize in a statistical way the relations between these variables as a function of epoch, environment and other variables that are not present in the original datasets. These relations will then be used to build simple theoretical models of galaxy formation and evolution that will be then tested with the data and compared to the recent scientific literature.

Prerequisites

The course is geared towards students in the physical sciences with no particular prerequisites on previous classes or study background. The only prerequisites necessary for this class are: i) motivation, ii) curiosity, iii) willingness to actively participate.

Students particularly interested in a more in depth understanding of how astrophysical data are acquired and reduced are encouraged to follow the "Laboratory of data acquisition" offered in the first semester.

Students interested in deepening their understanding of the formation of the structures associated with galaxies on large scales and interested on the scientific practice aspects used in this laboratory are encouraged to follow the course "Cosmic Structure Formation" offered in the first semester.

Teaching form

Introductory workshops on elements of galaxy formation and evolution, formulating a valid scientific question, structuring a scientific investigation, report writing. Hands-on sessions to conduct the analysis of observational data. The workshops are designed through inquiry activities lead by the students themselves and facilitated by the instructors. During these activities, the students will be able to choose their own investigation path, develop their own material and, finally, share their findings with their peers in a equitable and inclusive environment.

All activities will be conducted in English.

Textbook and teaching resource

Material will include: i) power point and black-board presentations, ii) material developed in the laboratory during the activities by the students, iii) research papers and reviews, iv) extracts from books (provided during the laboratory when necessary).

Semester

Second semester.

Assessment method

Short written report on the laboratory investigation and oral exam on the written report and introductory laboratory workshops. The final assessment evaluates both scientific content on the formation and evolution of galaxies and scientific practices learned during the laboratory. In particular, the following practices will be evaluated: i) generating and refining scientific questions, ii) finding relevant physical variables in scientific problems, iii) making testable predictions, iv) making relevant assumptions, v) reducing complex problems in smaller units, vi) effectively sharing and communicating the results.

Office hours

By appointment (via email).

Sustainable Development Goals

QUALITY EDUCATION | GENDER EQUALITY | INDUSTRY, INNOVATION AND INFRASTRUCTURE
