UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Galaxies and Dynamics (blended)

2122-1-F5802Q005

Aims

Knowledge of the structure of galaxies. Comprehension of the fundaments of the dynamics of complex stellar systems. Analytical and numerical derivation of gravitational potentials generated by mass distributions. Distribution function analysis for highly-symmetric systems. Understanding of the dynamical secular processes driving the evolution of galaxies and other stellar structures. Knowledge and usage of numerical simulation techniques.

Contents

Galactic dynamics. Introduction to N-body numerical simulations. Introduction to the physics of galaxy clusters.

Detailed program

Introduction to galactic dynamics. The two body problem. Introduction to direct N-body codes. Potential theory. Simulation of the collapse of a homogeneous sphere. Introduction to galaxies: morphology and dynamics. Introduction to tree-codes, Orbits in spherical and axisymmetric potentials. Introduction to the Toomre parameter and simulation of a stellar disc fragmentation. Introduction to the distribution function. Collisionless Boltzmann equation. Jeans and virial equations. Jeans theorem. Derivation of the distribution functions for spherically symmetric systems. Simulation of a Plummer sphere in equilibrium. Relaxation processes. Two-body relaxation time. Dynamical friction. Introduction to the physics of galaxy clusters.

Prerequisites

Undergraduate degree in physics

Teaching form

Blended learning

Textbook and teaching resource

Galactic Dynamics - Binney & Tremaine – Princeton series in Astrophysics. Videos and articles on the e-learning page of the course

Semester

First semester

Assessment method

Oral exam. The oral will focus on a specific topic of galactic dynamics previously agreed between the student and the professor.

Office hours

Monday from 16 to 18