UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Astrophysics of Gravitational Waves

2122-1-F5802Q008

Aims

Acquire basic knowledge in the field of gravitational waves, which have recently been confirmed as an extraordinary tool for understanding the universe and the objects that populate it.

Contents

Detailed program

1- Theory of gravitational wave emission

2- Gravitational wave signals from binary systems

3- Astrophysics of gravitational wave sources

- stellar mass binaries (white dwarfs, neutron stars, black holes)

5- Bayesian data analysis of gravitational wave signals

- signal to noise ratio

Prerequisites

None, besides the basic classes of the bachelor.

It is advised to take this class after Relativistic Astrophysics. Some of the concepts developed during the course will be easier to understand if the students have attended the General Relativity course. I stress, however, that this is not a needed prerequisite, as the course will be largely self-contained.

Teaching form

42 hours of frontal lectures, mostly at the blackboard, occasionally with the support of slides

Textbook and teaching resource

Supporting material will be uploaded on e-learing during the course of the semester, in any case here follows an (incomplete) list of useful references.

Valeria Ferrari lecture notes (will be uploaded on e-learning).

2-gravitational wave signals from binaries

S. Phinney, "A Practical Theorem on Gravitational Wave Backgrounds": https://arxiv.org/abs/astro-ph/0108028
A. Sesana, "Gravitational wave emission from binary supermassive black holes": https://arxiv.org/abs/1307.4086

Michele Maggiore: "Gravitational Waves". Book 2, 2018

3-Gravitational wave detection

Perrodin & Sesana, "Radio Pulsars: Testing Gravity and Detecting Gravitational Waves": https://arxiv.org/abs/1709.02816

Michele Maggiore: "Gravitational Waves". Book 2, 2018

Semester

Second semester

Assessment method

Oral examination. The student will first be asked to elaborate on a topic of his choice for about 15-20 minutes. In the rest of the exam, the lecturer will ask other questions covering any of the topics treated during class.

There will be no intermediate examinations nor marked homework.

Office hours

Open office hour, just send an email to book an appointment.