

نسبیت عام پیشرفته

Advanced General Relativity,

General relativity (GR) is a basic theory for the research in (early universe) cosmology and High energy physics. This theory is located in the frontline of the research for the quantum gravity, compact objects (Neutron star, white dwarf and black holes) astrophysics, gravitational perturbation for large scale structures and the gravitational waves.

General relativity's courses usually are presented as GR1, GR2 and sometime along with the Gravitational waves and Compact objects as the graduate courses in universities. In this course, it is assumed that the students are familiar to the basics concepts of general relativity although we introduce the general relativity in the beginning.

In this course we mainly follow the structure of the "**A Relativist's Toolkit: The Mathematics of Black-Hole Mechanics**" textbook by Eric Poisson, but some topics will be discussed from:

- General Relativity by Robert M. Wald
- Gravitational Waves Volume 1: Theory and Experiments by Michele Maggiore
- The Mathematical Theory of Black Holes by S. Chandrasekhar
- General relativity by Norbert Straumann.

The main chapters of this course are:

- Introduction of GR
- Coordinate, geodesics and relativistic kinematics
- Hypersurface and spacetime foliation
- Weak field gravity and Gravitational waves
- Lagrangian and Hamiltonian formalism in GR
- Black hole solutions, Thermodynamics laws and Penrose diagrams

Besides exercises, there are some special topics as project works which should be presented by students at the end of term.

The course time will be at 11:30 to 13:30 on **Sunday** and **Tuesday** at School Of Astronomy.

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