



GENERAL RELATIVITY	
Enrollment year	2016/2017
Academic year	2016/2017
Regulations	DM270
Academic discipline	FIS/02 (THEORETICAL PHYSICS, MATHEMATICAL MODELS AND METHODS)
Department	DEPARTMENT OF PHYSICS
Course	
Curriculum	Fisica teorica
Year of study	1°
Period	2nd semester (01/03/2017 - 16/06/2017)
ECTS	6
Lesson hours	48 lesson hours
Language	ITALIAN
Activity type	ORAL TEST
Teacher	CARFORA MAURO (titolare) - 6 ECTS
Prerequisites	MATHEMATICAL METHODS OF THEORETICAL PHYSICS (or an equivalent course in differential geometry); ELETRODYNAMICS & RELATIVITY (or an equivalent course in Special Relativity)
Learning outcomes	An advanced course in General Relativity and its applications.
Course contents	Introduction to the Physics of the gravitational field. The weak equivalence principle and the equivalence principle. Local inertial frames, gravitational field and spacetime geometry. Einstein equations. Variational derivation of Einstein equations. The Einstein-Hilbert action. The linearized theory and the Newtonian limit. Gravitational waves in the linearized theory. The Schwarzschild solution: derivation and properties. Test particles in Schwarzschild spacetime. Perihelion shift and deflection of light rays. The Schwarzschild radius. Singularities. Maximal extension of a spacetime. Rindler spacetime. The event

	horizon. Maximal extension of the Schwarzschild solution and Kruskal spacetime. Event horizons and Black Holes. Conformal compactification and Penrose diagrams. Casual properties of an asymptotically flat spacetime and the characterization of Black Holes. Kerr solution and its properties. Ergosphere and superradiance. Black hole dynamics. General relativity as a dynamical system. The Arnowitt-Deser-Misner formalism. The Einstein constraints and hyperbolic evolution. Mass and four-momentum of an isolated system. Open problems in mathematical general relativity. Relativistic cosmology. Friedmann equations and cosmological models.
Teaching methods	=
Reccomended or required readings	Robert M. Wald, General Relativity, The University of Chicago Press
Assessment methods	Oral examination.
Further information	Oral examination.
Sustainable development goals - Agenda 2030	\$lbl_legenda_sviluppo_sostenibile