Basic/Essential Course Information	
Course title	GENERAL RELATIVITY
Degree Course title	Physics (Magistrale)
ECTS	6
Compulsory attendance	NO
Course teaching language	ITALIAN

Teacher	Maurizio Gasperini	gasperini@ba.infn.it

ECTS Details	Disciplinary area	SSD	ECTS
	Characterizing	FIS/02	3

Time management and teaching activity type	Period	Year	Lesson type
	I° semester	2° (magistrale)	Lectures (40h) Exercises (17h)

Time management	Total hours	In-class study	Out-of-class study hours
	152	57	95

Course calendar	Starting date	Ending date
	24.09.2018	21.12.2018

Syllabus	
Prerequisites	Special relativity, classical field theory, elements of theoretical physics of the fundamental interactions.
Expected learning outcomes (according to Dublin Descriptors)	• *Knowledge and understanding* Knowledge of the Einstein theory of general relativity and of the formalism of the Riemannian geometry • *Applying knowledge and understanding* Application of the tensor calculus in a Riemannian manifold in order to describe the main relativistic gravitational effects. • *Making judgements* Ability to discuss and to compare different relativistic models of fundamental interactions. • *Transferable Communication skills* Ability to present a gravitational problem in a complete way and with an appropriate scientific language. Communication skills and ability to interact with colleagues specialized in the study of the gravitational theory • *Lifelong learning skills* Ability to approach the specialistic literature and to independently choose the method of solving a problem of relativistic gravitation.

Course contents summary	Introduction to general relativity and to the formalism of Riemannian geometry. Applications to the study of relativistic gravitational systems.
Detailed syllabus	Principle of equivalence and principle of general covariance. The local group of diffeomorphism. Tensor calculus in a Riemannan manifold. Covariant differentiation. Geometric gravity in the Newtonian limit. Geodesic motion. The Riemann curvature tensor and the Einstein equations. The weak field limit. Gravitational waves. Schwarzschild solution and black holes. The coupling to gravity of spinor fields. The gravitino (Rarita-Schwinger) field. Supersymmetry and simple examples of supergravity models.
Reference book	M. Gasperini, *Theory of Gravitational Interactions* (Second Edition, Springer International, 2017).
Notes	All chapters except Chap. 11 and the Appendices.
Teaching methods	Class lectures/exercises using blackboard.
Assessment methods	Oral colloquium including exercises and calculation tests to be performed on the blackboard.
Evaluation criteria	**- knowledge and understanding** of the basic aspects of general relativity and of the formalism of Riemannian geometry; **- ability to perform** simple calculations concerning relativistic gravitational interactions; **- ability to present and to discuss** with a professional language the geometric properties of gravity and the main differences/ analogies with the other fundamental interactions; **- ability to extend** and apply the formalism of curved space-time geometry to different sectors of physics.
Other	