

General information	
Academic subject	GENERAL RELATIVITY
Degree course	Physics (Magistrale)
Academic Year	SECOND
European Credit Transfer and Accumulation System (ECTS)	6
Language	ENGLISH
Academic calendar (starting and ending date)	last week of September 2021 – second week of December 2021
Attendance	

Professor/ Lecturer	
Name and Surname	MAURIZIO GASPERINI
E-mail	gasperini@ba.infn.it
Telephone	080 – 544 3465
Department and address	Dipartimento di Fisica – Università di Bari
Virtual headquarters	<a href="http://www.ba.infn.it/~gasperin/academic.html">http://www.ba.infn.it/~gasperin/academic.html</a>
Tutoring (time and day)	tuesday and wednesday , 15-17

Syllabus	
Learning Objectives	Introduction to general relativity and to the formalism of Riemannian geometry. Applications to the study of relativistic gravitational systems.
Course prerequisites	Special relativity, classical field theory, elements of theoretical physics of the fundamental interactions.
Contents	Principle of equivalence and principle of general covariance. The local group of diffeomorphism. Tensor calculus in a Riemannian 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.
Books and bibliography	M. Gasperini, <i>Theory of Gravitational Interactions</i> (Second Edition, Springer International, 2017).
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
152	57		95
ECTS			
	6		
Teaching strategy			
Class lectures/exercises using blackboard.			
Expected learning outcomes			

<b>Knowledge and understanding on:</b>	Knowledge of the Einstein theory of general relativity and of the formalism of the Riemannian geometry
<b>Applying knowledge and understanding on:</b>	Application of the tensor calculus in a Riemannian manifold in order to describe the main relativistic gravitational effects.
<b>Soft skills</b>	<ul style="list-style-type: none"> <li>• <i>Making informed judgments and choices</i> Ability to discuss and to compare different relativistic models of fundamental interactions.</li> <li>• <i>Communicating knowledge and understanding</i> 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</li> <li>• <i>Capacities to continue learning</i> Ability to approach the specialistic literature and to independently choose the method of solving a problem of relativistic gravitation.</li> </ul>

<b>Assessment and feedback</b>	
Methods of assessment	Oral colloquium including exercises and calculation tests to be performed on the blackboard.
Evaluation criteria	<ul style="list-style-type: none"> <li>• <i>Knowledge and understanding</i> knowledge and understanding of the basic aspects of general relativity and of the formalism of Riemannian geometry</li> <li>• <i>Applying knowledge and understanding</i> ability to perform simple calculations concerning relativistic gravitational interactions;</li> <li>• <i>Autonomy of judgment</i> ability to discuss the main differences/ analogies with the other fundamental interactions;</li> <li>• <i>Communicating knowledge and understanding</i> ability to present and to discuss with a professional language the geometric properties of gravity;</li> <li>• <i>Communication skills</i> ability to access the specialistic literature</li> <li>• <i>Capacities to continue learning</i> ability to extend and apply the formalism of curved space-time geometry to different sectors of physics</li> </ul>
Criteria for assessment and attribution of the final mark	<i>Numerical rating from 0 to 30 attributed on the ground of the evaluation criteria listed above.</i>
<b>Additional information</b>	