UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

DIPARTIMENTO INTERUNIVERSITARIO DI FISICA

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 2022 – second week of December 2022	
Attendance	Free	

Professor/ Lecturer	
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Department and address	*Dipartimento Interateneo di Fisica , Via Amendola 173, 70126 Bari*
Virtual headquarters (Microsoft Teams code)	
Tutoring (time and day)	In presence and online, under request

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 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.
Books and bibliography	M. Gasperini, *Theory of Gravitational Interactions* (Second Edition, Springer International, 2017). Sean Carroll, *Spacetime and Geometry: An Introduction to General Relativiy (Cambridge Univ. Press, 2019)*
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
143	55	15 hours exercises	88
ECTS			
	6		

Teaching strategy	
	Class lectures/exercises using blackboard.

Expected learning outcomes	
Knowledge and understanding on:	Knowledge of the Einstein theory of general relativity and of the formalism of the Riemannian geometry
Applying knowledge and understanding on:	Application of the tensor calculus in a Riemannian manifold in

	order to describe the main relativistic gravitational effects.
Soft skills	• *Making informed judgments and choices* Ability to discuss and to compare different relativistic models of fundamental interactions. • *Communicating knowledge and understanding* Ability to present a gravitational problem in a complete way and with an appropriate scientific language. • *Capacities to continue learning* Ability to approach the specialistic literature and to independently choose the method of solving a problem of relativistic gravitation.

Assessment and feedback	
Methods of assessment	Written exam and oral colloquium.
Evaluation criteria	• *Knowledge and understanding* knowledge and understanding of the basic aspects of general relativity and of the formalism of Riemannian geometry • *Applying knowledge and understanding* ability to perform simple calculations concerning relativistic gravitational interactions; • *Autonomy of judgment* ability to discuss the main differences/ analogies with the other fundamental interactions; • *Communicating knowledge and understanding* ability to present and to discuss with a professional language the geometric properties of gravity; • *Communication skills* ability to access the specialistic literature • *Capacities to continue learning* ability to extend and apply the formalism of curved space-time geometry to different sectors of physics ○
Criteria for assessment and attribution of the final mark	*Numerical rating from 0 to 30 attributed on the ground of the evaluation criteria listed above.*

	Additional information
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