Program of the course ED Carnot Pasteur 2025 / 2026

[D3]-General Relativity

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- monday 12-19-26 january 02-09 february 13h30 to 15h30
- thursday 15-22-29 january 05-12 february 13h30 to 15h30

The bulk of the course will focus on basic aspects of General Relativity, namely :

1. Minkowski spacetime: special relativity, proper time, metric, causal structure and conformal compactification, energy-momentum tensor.
2. Geometry of curved spacetimes: manifolds, tensor fields, Lie derivative, covariant derivatives, Levi-Civita connection, curvature, geodesics.
3. Einstein's field equations: (heuristic) derivation, Lovelock theorem, linearized gravity, Newtonian limit.
4. Particular solutions of Einstein's equations: Schwarzschild black hole, cosmological solutions, and their singularities.

Time-permitting, we will explore the concept of spacetime singularity in more depth, by reviewing more advanced notions such as: congruences of curves, the Raychaudhuri equation, energy conditions, and singularity theorems.