LECTURE 1 : GENERAL RELATIVITY

- SPACETIME AND GEOMETRY : AN INTRODUCTION TO GENERAL RELATIVITY
  BY SEAN M. CARROL

- OVERVIEW
  - Special Relativity and Minkowski Space → $M = \mathbb{R}^4$ paired with Minkowski metric $\langle v, w \rangle = v^\mu w^\nu \eta_{\mu\nu}$
  - TENSOR CALCULATION, the musical morphisms
  - Energy, Momentum, 4-vectors and Physics
  - Lagrangian formalism & Classical field theory
  - Manifolds : calculus on curved space (Chapter 2) → $g = g_{\mu\nu}\, dx^\mu \otimes dx^\nu$
  - CURVATURE (Chapter 3) — covariant derivative, parallel transport, geodesics → $\frac{d^2x^\mu}{d\lambda^2} + \Gamma^\mu_{\rho\sigma} \frac{dx^\rho}{d\lambda} \frac{dx^\sigma}{d\lambda} = 0$, Riemann curvature tensor
  - GRAVITATION (Chapter 4) : Einstein's field eq^{n}s and their properties → $R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} = 8\pi G T_{\mu\nu}$
    - Equivalence principle
    - alternate theories
  - Schwarzschild Solution : properties, singularities, Black Holes (Chapter 5)
  - GRAVITATIONAL RADIATION (Chapter 7) : - linearized gravity
    - gauge conditions
    - gravitational waves
  - COSMOLOGY (Chapter 8) : - maximally symmetric universes
    - Robertson-Walker metrics
    - dark matter, cosmological constant ...
    - inflation

- Additional Resources :
  - MTW
  - Weinberg
  - Lawson
  - Wald
  - Dynamics & Relativity by McComb
  - Schutz
  - Resnik } SR
  - Rindler }