

GENERAL THEORY OF RELATIVITY AND COSMOLOGY

Introduction to tensor analysis (from vector to tensors)

- Energy momentum tensor - covariances
- Riemann space and curvature
- Covariant and Lie derivatives
- Geodesic trajectories

Einstein's field equations

- Schwarzschild, and Kerr solutions
- Black holes Physics
- Gravitational waves

Relativistic and Newtonian Cosmology

- Friedmann Robertson Walker metric
- Redshift - Expansion of the universe
- Hubble parameter - Cosmic distances
- Luminous and Dark matter
- Friedmann models

Cosmic acceleration

- The kinematics of the Universe (from deceleration to acceleration)
- Observational evidence of cosmic acceleration
- Introduction to dark energy
- Nature of dark energy
- dark energy models

Introduction to early Universe:

- The Big Bang
- Inflation and Cosmic Horizon
- Vacuum energy, scalar fields and topological defects
- Baryogenesis and Nucleosynthesis
- Thermal history of the Universe

Cosmic Microwave Background radiation

Brane-world cosmological models