

<p>General Relativity and Cosmology - I Graduate School - First Semester</p>
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Course outline

0. Historical Perspective

1. Special Relativity

- Theoretical and Observational formulation
- Lorentz Transformations
- Relativistic Mechanics
- Classical field theory (symmetries and conservation laws)

2. Mathematical Formulation

- Equivalence principle
- Manifolds, Tensors, affine connection, Metric
- Derivative operator, Riemann curvature, Geodesics
- Killing Vectors

3. Einstein Field Equations

- Einstein Equations
- Lagrangian formulation of GR
- Symmetries and conservation laws in GR
- Exact Solutions
[Schwarzschild (exterior solution), Tolman (interior solution), FRW Model, Vaidya solution]

4. Applications of General Relativity

- Solar System tests (bending of light, mercury perihelion advance, geodetic precession)
- Gravitational Waves

References:

1. L. D. Landau & E. M. Lifshitz: Classical Theory of Fields,
2. S. Weinberg: General Relativity and Cosmology,
3. R. d'Inverno: General Relativity,
4. B. F. Schutz: First Course in General Relativity,
5. J. L. Synge: General Theory of Relativity,
6. J. Hartle: General Relativity,
7. Notes on GR which are recent and follow modern notation:
[S. Carroll: General Relativity (available online)]