DEPARTMENTAL ELECTIVE PHY 690 M

Advanced General Relativity and Black Holes

Pre requisite: PHY 407 STR/GTR or equivalent.

Course Contents:

1. Differential Geometry and Summary of Connection, Curvature, Killing vectors and Symmetries. Energy Momentum Tensor.

2. Geodesic Congruences, Energy conditions, Frobenius Theorem and Raychuadhuri Equation.

3. Hypersurfaces, Gauss-Stokes Theorem and Gauss-Codazzi Equations. Israel Junction Conditions.

4. Lagrangian Formulation of General Relativity. Action and Einstein Field Equation.

5. Schwarzschild Black Holes, Horizon, Singularity, Eddington Finkelstein Cordinates and Kruskal Diagrams,

6. Carter-Penrose Diagrams, de-Sitter and Anti de Sitter (AdS) space time. Einstein Static Universe.

7. Reissner Nordstrom Black Holes: Horizon, Singularity, Killing Vectors and Penrose Diagrams.

8. Kerr and Kerr -Newman Black Holes: Horizon, Singularity, Killing Vectors and Penrose Diagrams.

9. Elements of Black Hole Thermodynamics. (If Time Permits)