

Course Name: Theory of Relativity

Course Code: MAT609

Credit: 04

Special Relativity: The relativity of simultaneity, the relativistic concept of space and time, Postulates of Special theory of Relativity. Lorentz Transformations Equations, Consequences of Lorentz Transformations, Time Dilation, Lorentz Transformation form a Group, Variation of mass with Velocity, Equivalence of Mass and Energy, Transformation Formula for Momentum and Energy.

Minkowski's Space and Energy Momentum: Minkowski's Space, Space and Time Like Intervals, World Point and World Lines, Energy Momentum Four Vector, Minkowski's Equation of Motion.

General Relativity: General Relativity: Principal of covariance, Non-inertial frames of reference, Principal of equivalence, Equality of Inertial and Gravitational Masses,

Geodesic and Covariant Curvature Tensor: Differential Equation of Geodesic, Geodesic Equations from Lagrangian Equation, Geodesic Co-ordinates, Transformation Law for Christoffel Symbols, Covariant Derivative of a Covariant Vector. Riemannian Christoffel's Curvature Tensor, Covariant Curvature Tensor, Properties of Covariant Curvature Tensor, Bianchi Identity, Uniform Vector Field, Flat Space Time.

Newtonian Equation of Motion and Einstein's Law of Gravitation: Energy Momentum Tensor, Einstein Field Equation, Newtonian Equation of Motion as an Approximation of Geodesic Equations, Field Equation, Poisson's Equations as an Approximation of field Equations. Einstein's Law of Gravitation in Empty Space, Exterior Solution, Birkhoff's Theorem, Isotropic Coordinates, Planetary Orbits. Crucial Tests in Relativity, Gravitational Deflection of Light rays Schwarzschild Interior Solution.