National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Exploring the Gravitational Collapse Limits of Unstable Anisotropic Neutron Stars
Speaker	: Sayantan Ghosh (Rollno : 522ph6002)
Supervisor	: Dr. Bharat Kumar
Venue	: MC126
Date and Time	: 04 Sep 2024 (9:30 AM)
Abstract	: Neutron stars (NSs) provide a unique platform for probing the complexities of high-energy and compact-object physics due to their extreme density. While traditionally modelled as isotropic bodies, a more realistic approach to studying NS stability and gravitational collapse requires considering local pressure anisotropy within the star. We explore the implications of such anisotropy using the BL model to describe the internal structure of NSs. We go beyond pure hadronic equations of state (EOSs) by also examining Hadron-Quark phase transition (HQPT) EOSs, given that quarks in the core can significantly affect the star's stability. By applying radial perturbations, we assess the stability of anisotropic NSs against radial oscillations, identifying those with imaginary eigenfrequencies as unstable and prone to gravitational collapse, eventually leading to the formation of black holes (BHs). To understand the collapse dynamics, we treat the interiors of these unstable, anisotropic NSs as non-ideal fluids within a non-adiabatic background. We investigate the temporal evolution of critical properties such as mass, density, heat flux, and anisotropy. Additionally, we propose an innovative detection method for high-energy gravitational collapse events, offering valuable insights into the NS's properties before its collapse. This talk will provide a comprehensive overview of these findings, contributing to our understanding of the extreme physics governing NS stability and collapse.