National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Radial Oscillation in Neutron Star
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Venue	: MC126
Date and Time	: 18 Apr 2024 (11:00 AM)
Abstract	: Neutron stars (NSs), the remnants of a supernova explosion, are very dense objects that can have densities as high as ~ 10^15 g/cm3 in their central parts. At such extreme densities/energies, we do not know how the matter behaves, which means that we know very little about what a NS looks like inside. NSs are difficult to observe directly due to their small size and faintness. To explore their interiors, advanced methods like astero-seismology are necessary, where the star's oscillations reveal insights into its structure and composition. A NS will oscillate in different modes, and with different periodicities, depending on its structure. By developing theories for the matter in its interior, i.e., by the construction of so-called equation of state (EOS) for the star, it can be computed theoretically how the NS will oscillate. Comparison with observations can then determine which theory, or model, fits the observations best, and thereby give us information about the NS's interior compositions. In the epoch of gravitational wave astronomy, radial oscillations present significant potential for not only elucidating the microphysics underlying the internal structure but also probing the stability of NSs. Our methodology commences with the consideration of families of static NSs, characterized by nucleonic, quarkyonic, and hybrid EOSs. Moreover, these NS configurations are subjected to radial perturbations to investigate their stability. Diverging from conventional literature where fluid elements are assumed to be in chemical equilibrium, we incorporate the effects of out-ofequilibrium conditions on the chemical composition of fluid elements when calculating radial modes