INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE
2A & 2B, Raja S.C. Mullick Road, Jadavpur, Kolkata-700032, India

Open Thesis Colloquium

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School of Physical Sciences

Title:	**Some Aspects Of The Phenomenology Of Physics Beyond The Standard Model At The LHC In The Light Of Dark matter And Neutrino Mass Issues**
Speaker:	**Nivedita Ghosh, School of Physical Sciences, IACS**
Date:	**February 3, 2020 (Monday)**
Time:	**16:00 hours**
Venue:	**Physics Seminar Room- C-406, 3rd Floor, Centenary Building, IACS**
Abstract:	A 125 GeV scalar, with a striking resemblance to the Higgs boson proposed in the Standard Model(SM) of particle physics has been observed at the Large Hadron Collider(LHC). In spite of being a very successful phenomenological theory, the SM, however, has some drawbacks, such as it can neither provide neutrino masses, nor has the place for a viable Dark Matter candidate. In this thesis, we consider simple Beyond SM extension(BSM) than can alleviate these problems. In first part of the thesis, we have taken into account simple triplet scalar extensions of the SM, which is well-motivated new physics scenario(Type-II seesaw) to solve neutrino mass problem and can also solve the vacuum stability problem up to a very high scale, namely PLANCK scale. We examine the model prediction at the current and future high luminosity run of the LHC for the scalar masses and mixing angles fixed at such high-scale valid region. We then extend the Type-II seesaw model with another complex triplet scalar that enables one to have the Type II seesaw mechanism operative consistently with texture zero neutrino mass matrices. This framework predicts additional doubly charged, singly charged and neutral scalar Higgses leading to a unique collider signature of this scenario. We then add one complex and one real triplet scalar to the SM allows for a large triplet vacuum expectation value (vev) with a custodial symmetric scalar potential. This manifestly leads to large charged Higgs coupling to SM fermions thus enhancing the detection probability of the model at the hadron collider. In the last part of the thesis, in the context of a left-right symmetric model, we introduce one full generation of vectorlike lepton doublets (both left- and right-handed) together with their mirror doublets, out of which the lightest vectorlike neutrino in the model is right-handed, and can serve as the dark matter candidate. We also find that the relic density as well as the direct and indirect DM detection bounds are satisfied for a large range of the parameter space of the model. In accordance with the parameter space, we then explore the possibility of detecting signals of the model at both the LHC and the ILC.

All are cordially invited to attend the colloquium