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Departmental Seminar

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Seminar Title : A novel mathematical model to predict the deformation behavior of materials at sub-zero temperature  
Speaker : Dr. Srinivas Behera (Ec: 1231410)  
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Venue : Seminar Hall – ME001  
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Abstract : Understanding the plasticity of materials at low temperatures has been hindered by the limitations in conducting in-situ experiments under such conditions. The materials exhibit behavior inconsistent with fundamental deformation laws in this temperature range, emphasizing the crucial importance of any information regarding material behavior for the scientific community. Deformation induced defects play a significant role in dictating the deformation mechanisms, ultimately influencing material properties. Experimental in-situ monitoring of defect formation and growth in materials at sub-zero temperatures poses a considerable challenge. To address this challenge, a mathematical approach has been developed to elucidate the generation and interactions of defects in materials at sub-zero temperatures. The model provides predictions for dislocation cluster velocity and acceleration values during deformation, offering insights into the microstructural changes that, in turn, explain the mechanical properties. The sub-zero temperature deformation experiments were conducted in a controlled environment at 200K. Validation of the model outputs was performed using techniques such as Transmission Electron Microscopy (TEM), X-ray Diffraction (XRD), and others.