National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Stability design of urban tunnelling under shallow depth and mixed ground conditions using geotechnical and numerical modelling studies
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Venue	: Seminar Hall, Department of Mining Engineering
Date and Time	: 22 May 2025 (4:00 PM)
Abstract	: Stability design of urban tunnelling under shallow depth and mixed ground conditions is critical to ensuring the safety, efficiency, and durability of underground infrastructure. Integrated geotechnical and numerical approaches are required to ensure safety and performance of machines under the soil, rock and mixed ground conditions. Implementation of Tunnel Boring Machines (TBMs) in such conditions encounters a number of challenges posed by varying surface and subsurface conditions, impacting tunnel stability and excavation performance. Traditional empirical models often fall short in capturing the dynamic interaction between TBM operational parameters and geological variability. This study proposes an integrated, data-driven framework for modeling, predicting, and optimizing TBM performance in such heterogeneous ground conditions in the context of an Indian metro. Three objectives are identified with help of relevant literature reviews and field study to address the challenges. Firstly, need to understand and evaluate TBM&rsquos performance across varying geological conditions through a mathematical relationship considering operational parameters like thrust, cutterhead torque, and rotation speed. The performance relationships developed on the basis of field study during urban tunnelling demonstrated valuable insights into TBM and different ground interactions and found to be instrumental in decisions related to tunnel face pressure control, ground response anticipation, and the design of appropriate lining support systems. Secondly, TBM induced ground vibration by predicting Peak Particle Velocity (PPV) using supervised machine learning algorithms can be useful for identifying zones prone to vibration-induced instability, thereby guiding reinforcement design and construction sequencing. Thirdly, assessment of behaviour different ground conditions through numerical modeling study incorporating geotechnical parameters will be helpful for better ground control in advance during the urban tunnelling. A comprehensive study through geotechnical, numerical modeling, and ground monitoring during actual tunnelling operation is required for a suitable stability design under shallow depth and mixed conditions for an urban tunnelling.