National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Geotechnical Properties of Enzyme-Induced Carbonate Precipitation Treated Ash Beds
Speaker	: Saragadam Hemavamsikrishna (Rollno : 922ce5002)
Supervisor	: Suresh Prasad Singh
Venue	: Civil Engineering Department Seminar Room
Date and Time	: 18 Aug 2025 (11.15 am)
Abstract	: Enzyme-Induced Carbonate Precipitation (EICP) is becoming a sustainable bio-cementation technology with great potential for reusing industrial byproducts like fly ash and pond ash. By using enzymes to create a cement-like calcium carbonate (CaCO3) matrix, EICP can turn these waste materials into stable, engineered geomaterials. This provides a low-carbon alternative to ordinary Portland cement. However, moving from laboratory tests to reliable field applications is challenged by a key knowledge gap. Most studies concentrate on the final compressive strength of small, uniform samples, but the factors that affect achieving a practical improvement depth in larger applications are still not well understood. This study aims to fill this gap by systematically examining how key operational factors influence the depth of EICP treatment in compacted coal ash. The main goal is to clarify the relationship between two main variables: urease enzyme concentration and the total treatment time, and how these affect the depth of effective cementation. Laboratory experiments were carried out to establish the best calcium carbonate ($CaCO_3$) precipitation with urease enzyme and calcium chloride ($CaCl_2$) and to assess Enzyme-Induced Calcium Carbonate Precipitation (EICP) impact on unconfined compressive strength (UCS) of sand. High Calcium Carbonate ($CaCO_3$) precipitate formed at 3g/L of urease enzyme, 1M Urea and 0.67M $CaCl_2$. Results indicate that optimized EICP produces efficient $CaCO_3$ precipitation and significant UCS improvement, consistent very well with trends observed in the literature.