ANNAMACHARYA UNIVERSITY, RAJAMPET

Annamayya District, Andhra Pradesh-516126-India,

CIVIL ENGINEERING DEPARTMENT

ACTIVITY REPORT

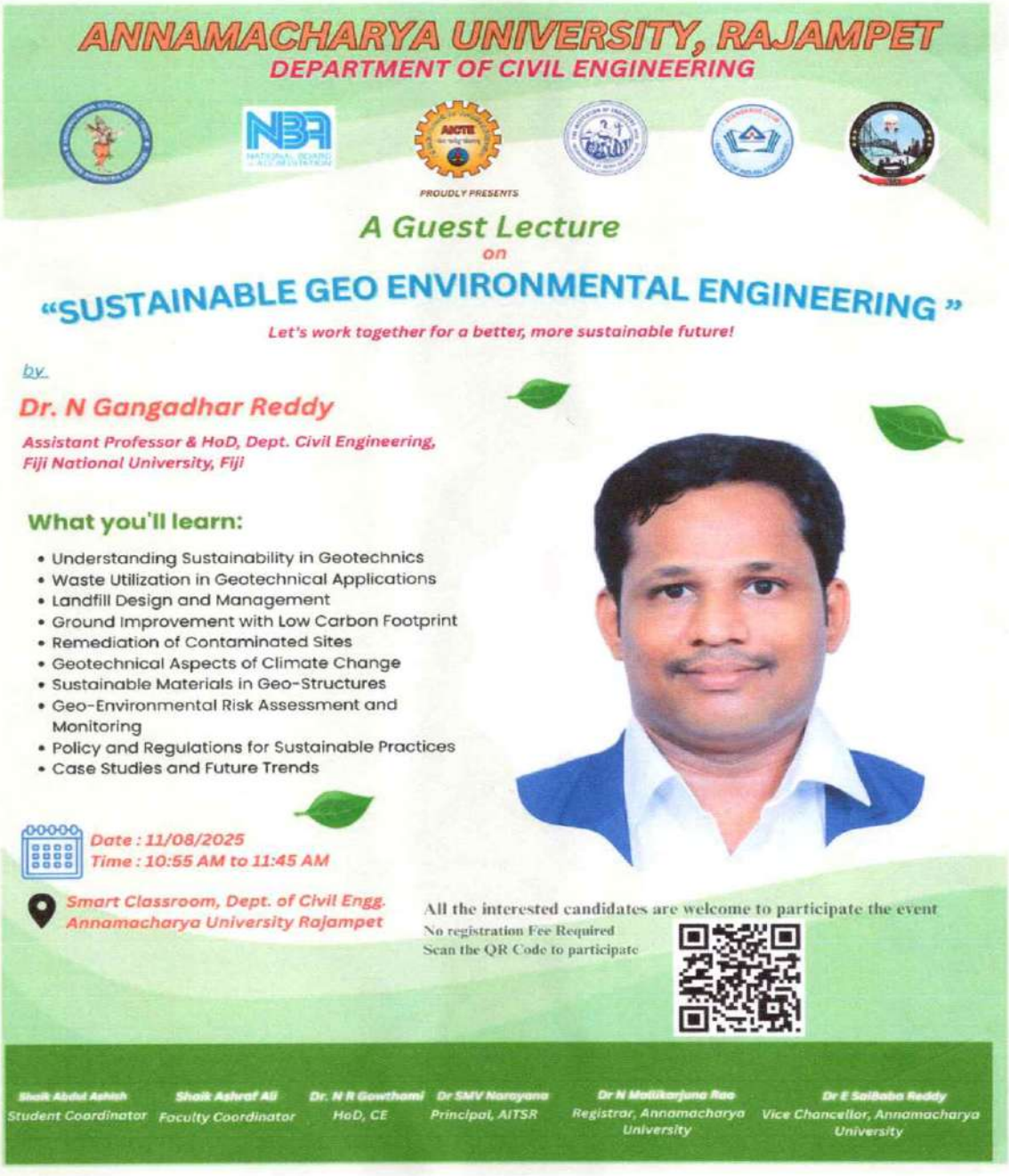
Name of the Activity: Guest Lecture on "Sustainable Geo Environmental Engineering"

Alumni Name : **Dr. N. Gangadhar Reddy,**

Designation : **Assistant Professor & Head of Department, Civil Engineering, Fiji National University, Fiji**

Date of the Program: 11th August 2025, 10:55 AM – 11:45 AM

Venue : **Smart Classroom, Dept. of Civil Engineering, AITSR**



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The Department of Civil Engineering at Annamacharya University, in association with the IEI Student Chapter and BIS Club, conducted a guest lecture on "**Sustainable Geo Environmental Engineering**", aiming to gain insights into the professional world. The initiative continues to serve as a platform for fostering meaningful interactions and bridging the gap between academic learning and industry expectations.

Objective of the Event

The primary aim of the guest lecture was to enhance the understanding of sustainable practices in the field of geo-environmental engineering, with a focus on geotechnics, environmental protection, and climate-resilient engineering solutions. The lecture was designed to provide insights into the integration of sustainability principles into geotechnical and environmental engineering applications.

Key Learning Points

1. **Understanding Sustainability in Geotechnics**
   - Explained how geotechnical engineering can adopt sustainable approaches in site selection, material use, and construction methods.
   - Highlighted the concept of "triple bottom line" – environmental, economic, and social sustainability.
2. **Waste Utilization in Geotechnical Applications**
   - Discussed reusing industrial by-products like fly ash, bottom ash, and construction debris in soil stabilization and embankments.
   - Demonstrated cost savings and environmental benefits of recycling waste.
3. **Landfill Design and Management**
   - Covered engineered landfill systems with liners, leachate collection, and gas recovery systems.
   - Emphasized sustainable waste containment to prevent soil and groundwater pollution.
4. **Ground Improvement with Low Carbon Footprint**
   - Introduced techniques like microbially induced calcite precipitation (MICP), bioenzymatic soil stabilization, and geosynthetic reinforcement.
   - Showed how traditional methods can be modified to reduce greenhouse gas emissions.
5. **Remediation of Contaminated Sites**
   - Explained in-situ and ex-situ remediation methods, including bioremediation, soil washing, and phytoremediation.
   - Cited real-life examples where contaminated industrial land was restored for public use.
6. **Geotechnical Aspects of Climate Change**
   - Discussed how rising temperatures, altered rainfall patterns, and sea-level rise impact soil stability and infrastructure.
   - Suggested adaptation strategies for coastal and flood-prone areas.
7. **Sustainable Materials in Geo-Structures**
   - Presented the use of bamboo, recycled aggregates, geopolymer concrete, and other eco-friendly materials in retaining walls, foundations, and embankments.
8. **Geo-Environmental Risk Assessment and Monitoring**
   - Covered hazard identification, probability analysis, and environmental impact assessment tools.

- Stressed the importance of continuous monitoring using sensors and GIS technology.

9. **Policy and Regulations for Sustainable Practices**
   - Outlined global and Indian regulatory frameworks for waste management, environmental protection, and sustainable construction.
   - Highlighted the role of engineers in complying with and influencing policy.
10. **Case Studies and Future Trends**
    - Presented international case studies, including landfill reclamation projects in developed countries.
    - Predicted future trends like AI-driven site monitoring, carbon-neutral construction materials, and bioengineered soil systems.

Question & Answer Session

The lecture concluded with an engaging interactive session where students and faculty participants asked questions related to the lecture topics. Some key discussions included:

- **Q1:** *How can small-scale construction projects adopt sustainable geotechnical practices without high costs?*
  Answer: Dr. Reddy suggested using locally available materials, simple recycling techniques, and passive design strategies to minimize cost and carbon footprint.
- **Q2:** *What are the most promising technologies for contaminated site remediation in India?*
  Answer: In-situ bioremediation and phytoremediation were highlighted as cost-effective and eco-friendly solutions suitable for Indian conditions.
- **Q3:** *How can engineers contribute to climate change mitigation in infrastructure projects?*
  Answer: By selecting low-carbon materials, optimizing designs to use fewer resources, and implementing renewable energy in site operations.
- **Q4:** *Are there government incentives for sustainable construction in India?*
  Answer: Dr. Reddy mentioned that certain state and central government schemes provide subsidies or recognition for projects adhering to green building and waste management standards.
- **Q5:** *What skills should students develop to excel in sustainable geo-environmental engineering?*
  Answer: Proficiency in GIS, environmental impact assessment, sustainable materials technology, and familiarity with international sustainability standards.

The interactive nature of the session encouraged participants to think critically about applying sustainability concepts in their future careers.

Significance of the Lecture

This lecture provided a rare opportunity for students to learn from an internationally experienced academician and practitioner. It bridged the gap between **theoretical classroom knowledge** and **real-world sustainable engineering solutions**, inspiring participants to integrate environmental responsibility into their professional practice.

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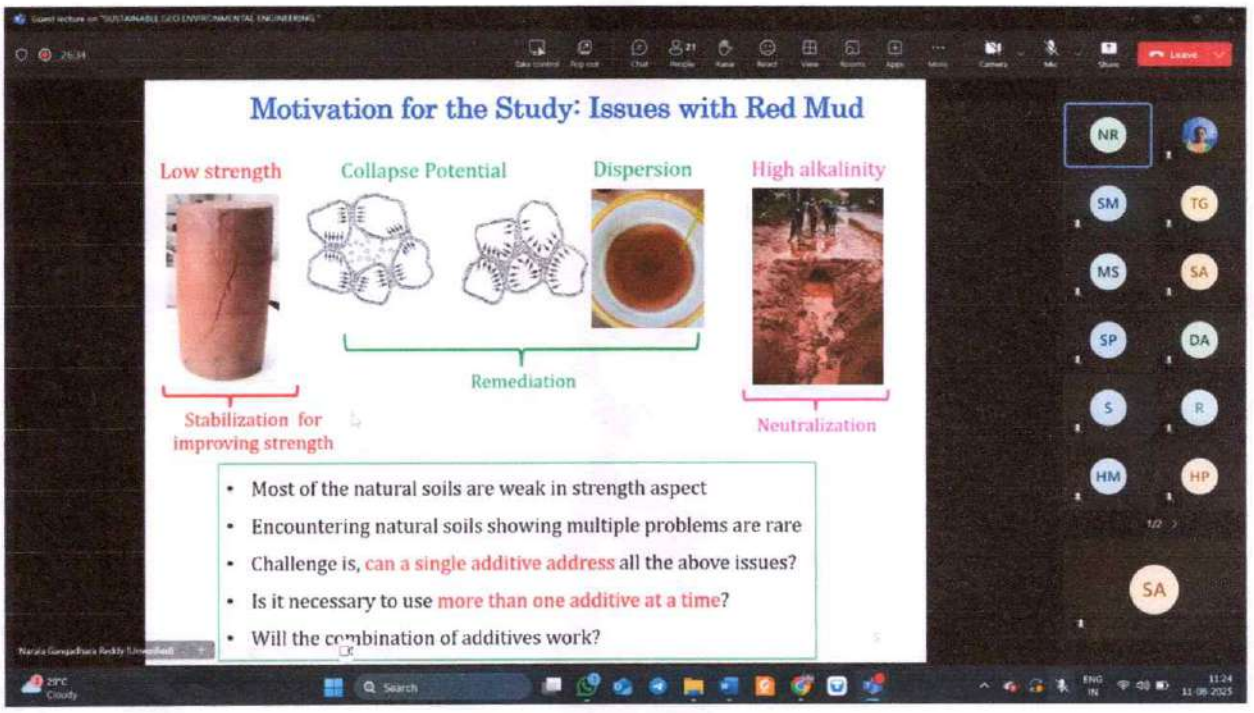

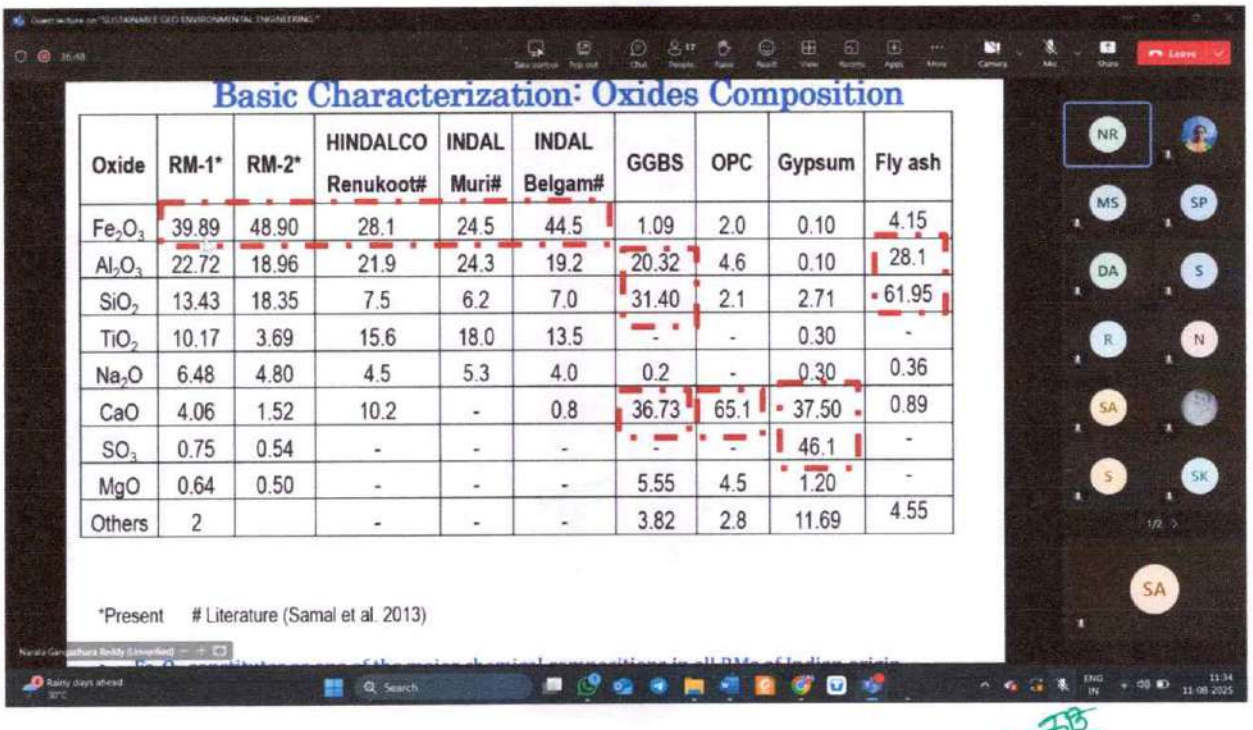

Basic Characterization: Oxides Composition

Oxide	RM-1*	RM-2*	HINDALCO Renukoot#	INDAL Muri#	INDAL Belgam#	GGBS	OPC	Gypsum	Fly ash
Fe_2O_3	39.89	48.90	28.1	24.5	44.5	1.09	2.0	0.10	4.15
Al_2O_3	22.72	18.96	21.9	24.3	19.2	20.32	4.6	0.10	28.1
SiO_2	13.43	18.35	7.5	6.2	7.0	31.40	2.1	2.71	61.95
TiO_2	10.17	3.69	15.6	18.0	13.5	-	-	0.30	-
Na_2O	6.48	4.80	4.5	5.3	4.0	0.2	-	0.30	0.36
CaO	4.06	1.52	10.2	-	0.8	36.73	65.1	37.50	0.89
SO_3	0.75	0.54	-	-	-	-	-	46.1	-
MgO	0.64	0.50	-	-	-	5.55	4.5	1.20	-
Others	2		-	-	-	3.82	2.8	11.69	4.55

*Present # Literature (Samal et al. 2013)

Faculty Coordinator

Mr. S. Ashraf Ali

Asst. Professor,
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Assistant Prof. & HoD,
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