Report on Five Days of Self Sponsored Online Short-Term Course "Sustainable and Durable Green Concrete-Future and Applications" held from 18-22 December 2023 in CED, NITJ

Theme of the STC

The Civil Engineering Department has organized a Five Day Self-Sponsored Online Short-Term Course (STC) on the topic **"Sustainable and Durable Green Concrete-Future and Applications" held from 18-22 December 2023**. The course was designed to disseminate the knowledge in the domain of Civil Engineering in general and role of Civil Engineers with respect to construction techniques in particular. The main objective of the course was to demonstrate the latest trends, case studies, field challenges and related remedies in different fields of civil engineering.

Scientists, Academicians, Research Scholars and Masters Students from academia of reputed NITs and IITs as well as scientific organizations participated in this online STC. The program was designed in such a way to achieve the set objectives of the course in stipulated period of five days and to make the participants benefitted at the end.

The STC was enlightened by Professors from esteemed universities like as Trinity College Dublin, Ireland and IIT's India.

Following themes were covered under this phase:

1. Sustainable and durable green concrete: what we know and what we don't know
2. Assessing structural and environmental of fly ash amended cement mixes.
3. Service life of reinforced concrete: challenges under rapidly degrading durability exposures
4. Sustainability parameters for alternate binders
5. Sustainable technology how to measure it
6. Recycled aggregate concrete composites
7. Integrating mechanistic roadway designs with lifecycle assessment: moving towards achieving sustainability in roadway technology
8. Durability design for sustainable concrete structures
9. Sustainability in concrete utilization and issues in mix design
10. Use of Fly ash in concrete: Pros and cons.

Itinerary of the STC

First day:

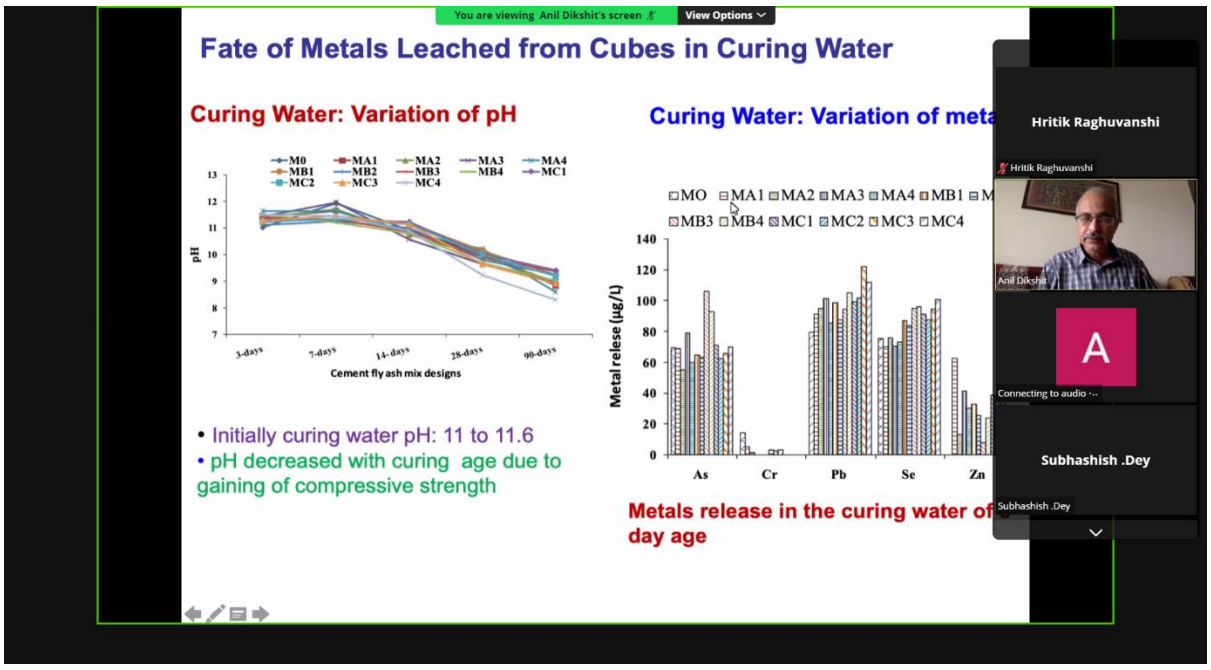
On the first day, the Online STC was inaugurated by the Prof Roger P West, Trinity college Dublin, Ireland as its chief guest. The organising team of the STC, Prof (HAG) S P Singh and

Dr Navdeep Singh were present. As the Inaugural Speaker, Prof Roger P West, Trinity college Dublin, Ireland was felicitated by the organising team.

Dr Navdeep Singh briefly introduced the key objectives and themes of this Self-Sponsored One Week Online Short-Term Course. He also briefly introduced the eminent speakers and offered warm welcome to the participants. Dr S P Singh also graced the inauguration with his valuable insights on the need of familiarising the young students, academicians, research scholars with the recent advancements and challenges faced in construction of civil engineering structures.

After inauguration Prof Roger P West, Trinity college Dublin, delivered expert lecture on the topic ‘Sustainable and durable green concrete: what we know what we don’t know’. He showcased the Material Composition, Reduced Carbon Emissions, Enhanced Durability, Waste Utilization. He briefly discussed The field of sustainable concrete continues to progress, with ongoing research focusing on refining formulations, optimizing production processes, and assessing long-term performance to create a more sustainable and durable built environment.

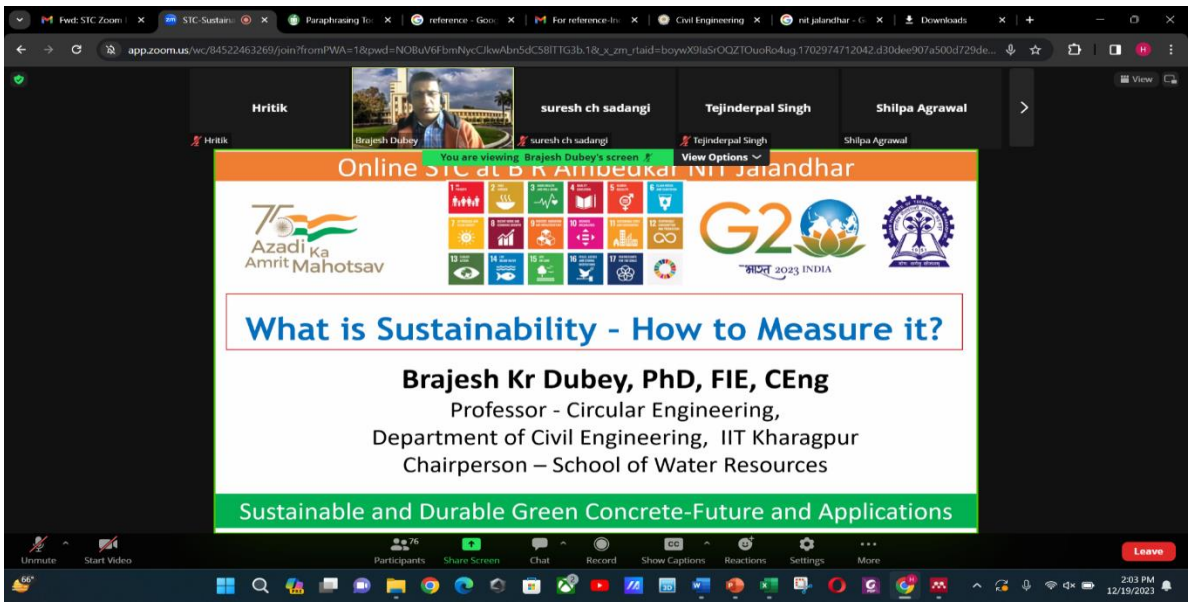
In the afternoon session, Anil Dikshit, Indian Institute of Technology Bombay, India delivered lecture on the topic ‘Assessing structural and environmental of fly ash amended cement mixes. The incorporation of fly ash in cement mixes brings about a transformation in both structural and environmental aspects. Structurally, fly ash, a byproduct of coal combustion, enhances the overall durability and strength of the cement matrix. Its fine particles fill the gaps between cement grains, contributing to denser concrete and reducing permeability. This results in improved resistance to chemical attacks, such as sulfate and chloride penetration, ultimately extending the lifespan of structures.



Second day:

In the first session of day two, Prof Brajesh K Dubey, Indian Institute of Technology Kharagpur, India talked on the one of the most trending topics of concrete technology 'Sustainable technology-how to measure it' A lot of participants appreciated and acknowledged the efforts and the knowledge shared by Prof Brajesh K Dubey.

He covered the basic Life Cycle Assessment (LCA) is a comprehensive method assessing the environmental impact of a product or process across its entire life cycle. It evaluates resource use, emissions, and potential environmental impacts, offering insights to make informed decisions for sustainability and eco-friendly improvements. LCA aids in identifying hotspots, guiding improvements, and promoting more environmentally conscious choices in various industries.

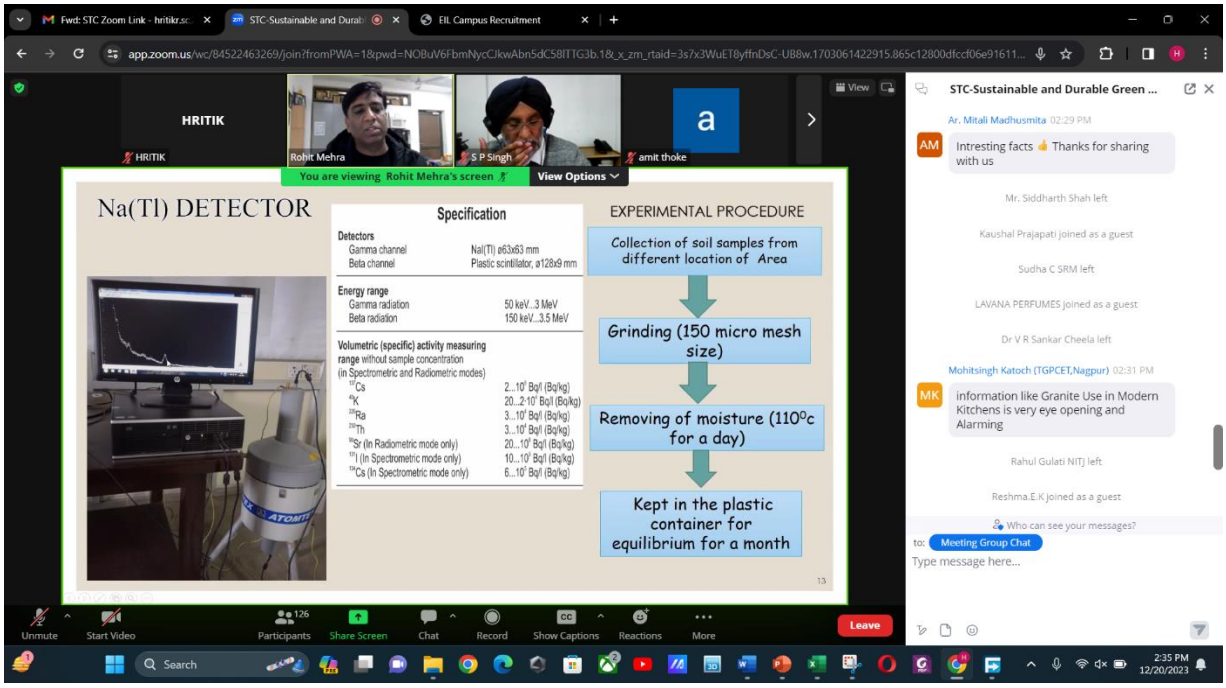


In the second session of day two, Prof Bhupinder Singh, Indian Institute of Technology Roorkee, India talked about the 'Sustainability parameters for alternate binders. He brilliantly highlighted the concepts of alternate binding materials in cement concrete like fly ash, Silica fume, GGBFS etc. material and its impact on mechanical, micro structure and durability properties of concrete.

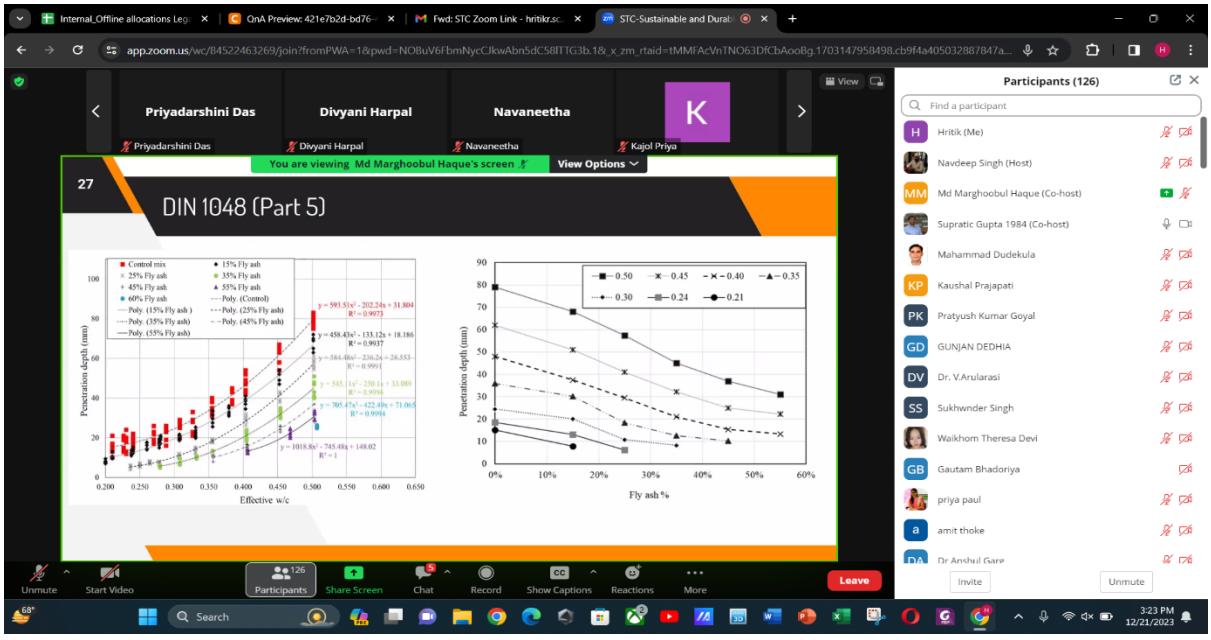
Third day:

In first session of day three was honoured by Prof Rohit Mehra, BR Ambedkar NIT Jalandhar, Punjab who talked about the 'Fly Ash in concreter: Pros and Cons'. Prof Rohit Mehra explain about Fly ash, a byproduct of coal combustion in power plants, presents several advantages and drawbacks when incorporated into concrete production. On the positive side, its inclusion enhances the workability of concrete while fortifying its long-term strength and durability. This supplementary material reduces the heat generated during hydration, curbing potential cracking issues, and holds environmental appeal by cutting down on cement use, subsequently lowering CO_2 emissions and offering a cost-effective alternative. However, challenges emerge,

including slower initial strength gain, variability in properties, and the need for stringent quality control measures. Environmental and regulatory concerns also linger regarding the potential risks associated with heavy metals in fly ash and compliance with specific usage guidelines. Balancing these factors is crucial for maximizing the benefits while mitigating the associated risks when utilizing fly ash in concrete.

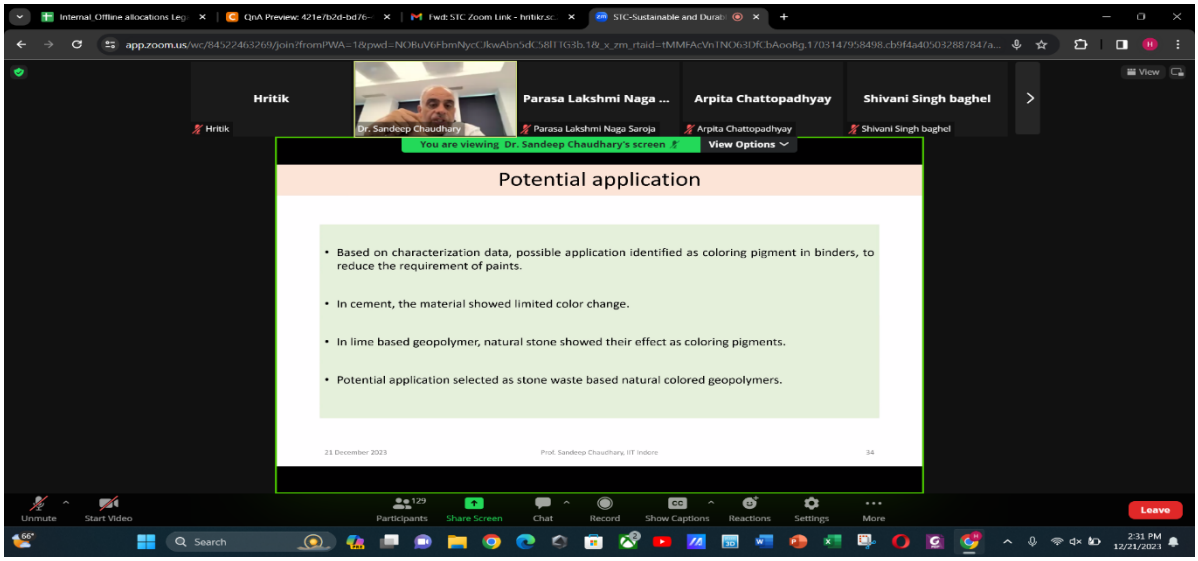


The second session was illuminated by the presence of an eminent speaker, Prof Dinakar Pasla, Indian Institute of Technology Bhubaneswar, India. Prof Dinakar Pasla delivered lecture on 'Recycled aggregate concrete composites. Prof Dinakar Pasla covered use of recycled aggregate in concrete and mortar various types of treatment for recycled aggregate composites for increasing the performance of recycled aggregate in concrete and mortar.

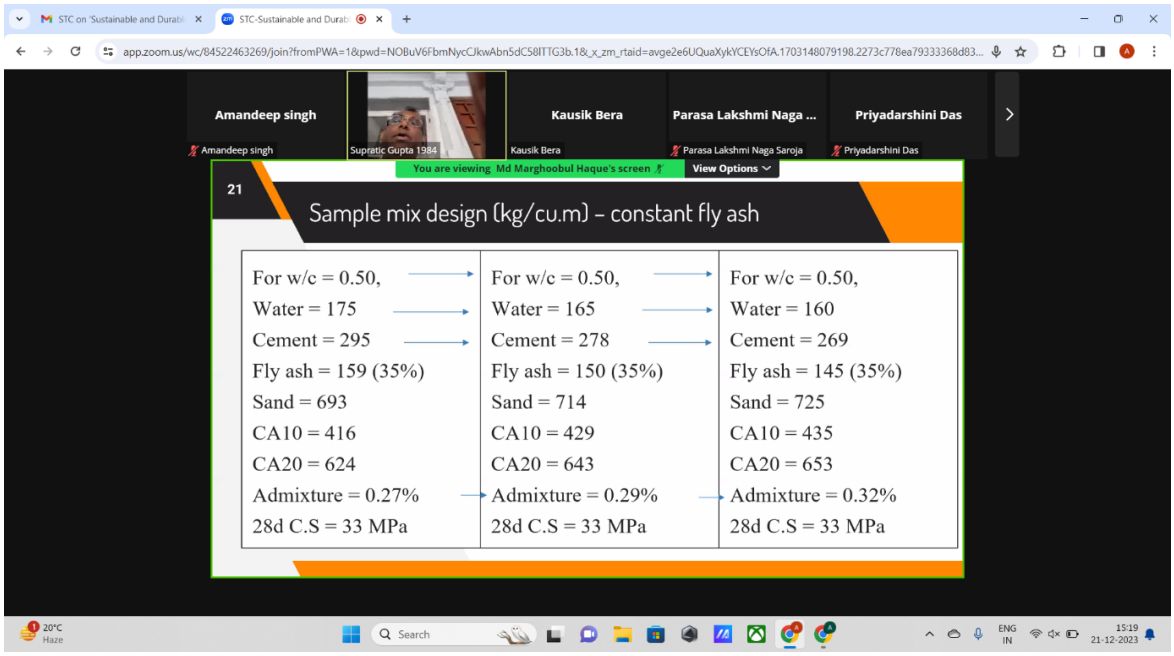


Fourth day:

In the first session of fourth day, Prof Sandeep Chaudhary, Indian Institute of Technology, Indore, delivered lecture on ‘Sustainable building products: laboratory to market’. Prof Sandeep Chaudhary deeply explain about the replacement of natural sand with tyre rubber as fine aggregate. Waste rubber tire as fine aggregates can be an economical and sustainable alternative to river sand. Waste rubber tire as partial replacement of fine aggregate in the form of rubber ash and rubber ash with rubber fibers (combined form) with three w/c ratios. Workability, compressive strength, flexural strength, density, water absorption, abrasion resistance, carbonation depth, static modulus of elasticity, dynamic modulus of elasticity and chloride ion penetration of rubber ash concrete.

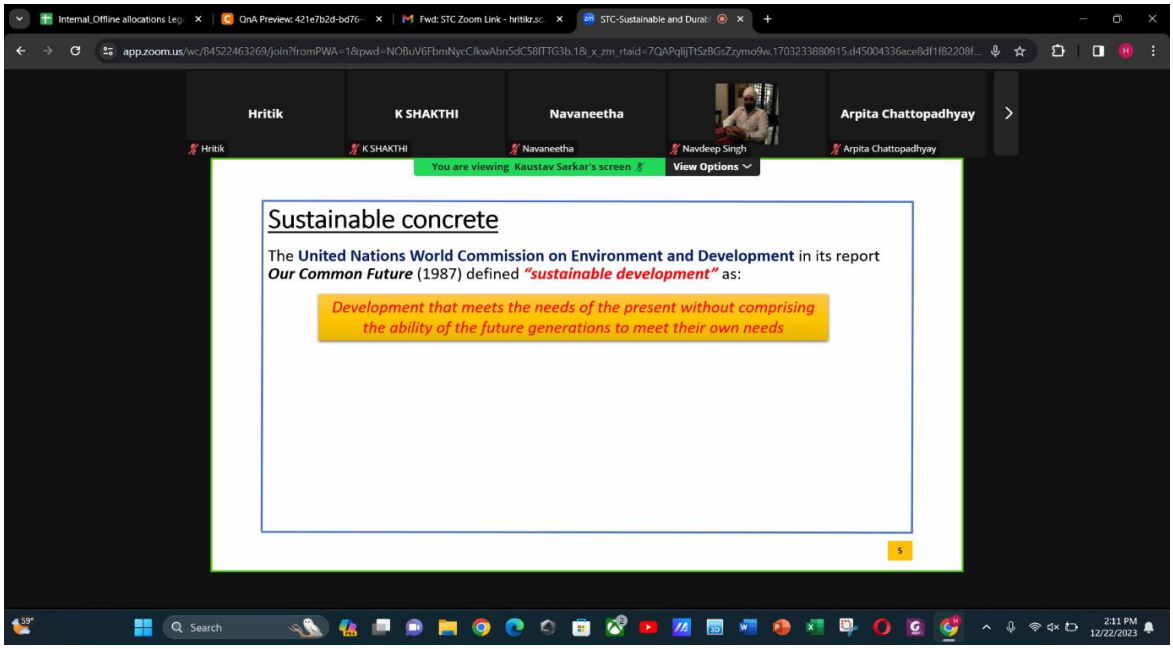


The second session marked the lecture on ‘Sustainability in concrete utilization and issue in mix design’ by Prof Supratic Gupta, Indian Institute of Technology Delhi, India. Prof Supratic Gupta delivered lecture on critical realm of sustainability within concrete utilization, with a specific focus on mix design. One of the primary concerns highlighted was the environmental impact linked to traditional cement production, notably its significant contribution to carbon dioxide emissions. To address this pressing issue, we explored various avenues, such as the integration of alternative materials like fly ash, slag, and silica fume, aiming to partially substitute cement and reduce its ecological footprints.



Fifth day:

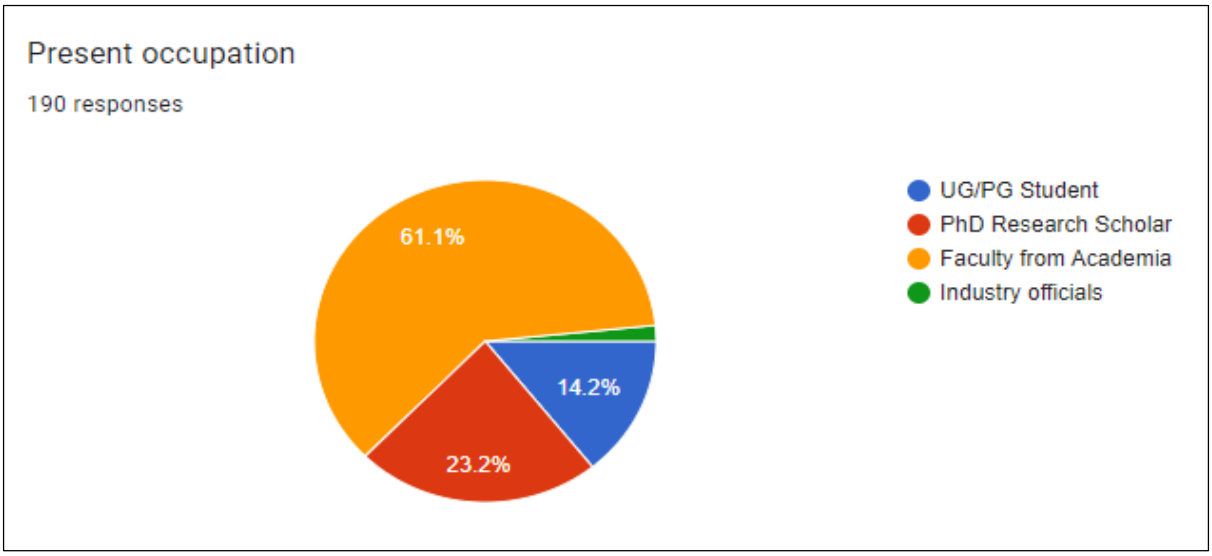
In the first session, Prof Kaustav Sarkar, Indian Institute of Technology, Mandi, delivered lecture on ‘Durability design for sustainable concrete structure’. Prof Kaustav Sarkar demonstrated the durable and sustainable concrete structures hinges on a holistic approach that considers material quality, construction practices, and ongoing maintenance. It begins with selecting high-quality materials and employing precise mix designs to optimize strength while minimizing vulnerability to cracking and degradation. Thoughtful construction practices, including proper curing and reinforcement techniques, further bolster resilience. Protective coatings and sealants shield against environmental elements, enhancing longevity.



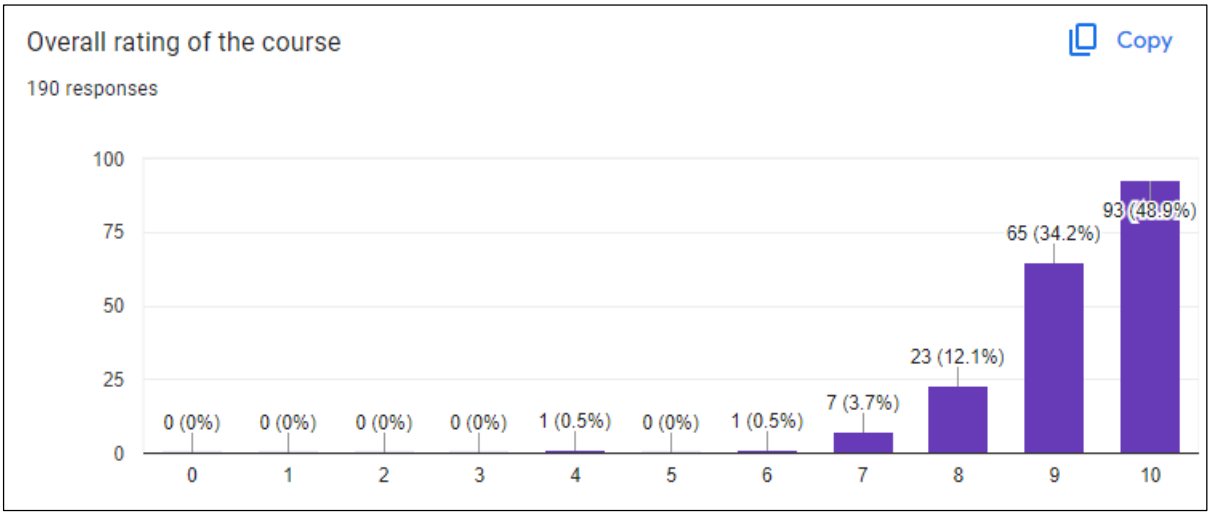
In the closing session Prof B Krishna Prapoorna, Indian Institute of Technology Tirupati, India, delivered lecture on 'Integrating mechanistic roadway designs with lifecycle assessment: moving towards achieving sustainability in roadway technology'. Prof B Krishna Prapoorna discussed Integrating mechanistic roadway designs with lifecycle assessment represents a pivotal step towards achieving sustainability in roadway technology. the principles of mechanistic engineering with the holistic evaluation of a roadway's environmental impact across its entire lifespan, this approach allows us to not only create durable and efficient road systems but also to mitigate their environmental footprint.

Participant's Feedback

a) Background of the Participants



b) Feedback



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