5th ICCCSC - Doctoral Courses

Course 1: Laboratory-based education and hands-on experience on LC3 Concrete Technology

Monday, 2nd February 2026

Venue: Department of Civil Engineering, University of Cape Town, New Engineering Building, Upper Campus, Rondebosch

Purpose

The course is designed to provide participants with a comprehensive understanding of LC3 (Limestone Calcined Clay Cement) concrete technology, combining foundational knowledge with hands-on laboratory experience. Its objective is to equip learners with both the theoretical principles and the practical skills required to design, produce, test, and evaluate LC3 concretes for modern engineering applications.

Scope

The course begins with an introduction to LC3 materials and concrete mix design, highlighting considerations specific to LC3 systems. Laboratory components include the production and testing of fresh LC3 concrete across various workability and performance classes, such as conventional mixes, pumpable concretes, SCC, and high-strength concretes. The scope also includes investigation of mechanical and durability properties, with laboratory demonstrations of key durability tests (Durability Indicators and penetrability properties, carbonation, chloride ingress, ASR, and corrosion monitoring), as well as mechanical behaviour such as strength, creep, and shrinkage.

Structure

The course is structured as a blended programme of classroom instruction and hands-on laboratory sessions:

1. **Classroom Sessions**
    - Introduction to LC3 concrete technology
    - Principles of LC3-specific mix design
    - Mechanical and durability performance of LC3 concretes
2. **Laboratory Sessions**
    - Fresh concrete production and testing
    - Manufacturing of concrete elements
    - Durability testing and monitoring
    - Mechanical testing

The overall structure emphasises the practical application of theoretical knowledge, ensuring participants gain real, hands-on experience with LC3 concrete systems.

Timetable

Time	Topic	Speakers
8:30 - 9:00	*Welcome coffee*	
9:00 - 9:45	Introduction to LC3 concrete technology	Shashank Bishnoi
9:45 – 10:30	Principles of concrete mix design and particular aspects to consider for LC3 concrete	
10:30 - 11:00	*Coffee break*	
11:00 – 13:00	Laboratory session: Fresh concrete production and testing, element manufacture (concrete of conventional workability and strength, pumpable concrete, SCC, high strength concrete)	Shashank Bishnoi
13:00 – 13:45	*Lunch*	
13:45 - 15:00	Mechanical and durability properties of LC3 concrete; principles and prediction	Shashank Bishnoi & Hans Beushausen
15:00 - 15:15	*Coffee break*	
15:15 - 17:00	Laboratory session: Concrete durability testing and monitoring (Durability Index testing, carbonation and chloride ingress, ASR, rebar corrosion testing and monitoring); Mechanical properties (strength, creep, shrinkage)	Hans Beushausen, Areej Gamieldien, Joanitta Ndawula

Course 2: LC3 Technology, Properties, Application

Tuesday, 3rd February 2026

Venue: UCT Graduate School of Business Conference Centre, 9 Portswood Rd, Victoria & Alfred Waterfront, Cape Town

Purpose

The purpose of this course is to provide participants with a comprehensive understanding of LC3 (Limestone Calcined Clay Cement) technology, from raw materials and processing to performance, sustainability, and economic considerations. The course aims to build a strong conceptual foundation that enables participants to understand how LC3 is produced, how it performs, and why it represents a viable low-carbon alternative in cement and concrete technology.

Scope

The course begins with the motivation for LC3 technology and the geological and mineralogical aspects of suitable clays. It extends to clay calcination, material testing, LC3 production processes, and cement chemistry and hydration. The scope also includes mechanical and durability performance of LC3-based concrete, life cycle assessment (LCA), and economic implications of LC3 implementation.

- **Introductory and Materials Science Sessions**
  - Why LC3 technology is needed
  - Clay composition, geology, calcination, and testing
- **Production and Cement Chemistry Sessions**
  - LC3 production processes
  - Workability and hydration behaviour
- **Performance and Sustainability Sessions**
  - Mechanical properties
  - Durability
  - Life Cycle Assessment (LCA)
- **Economic Considerations**
  - Cost and economic evaluation of LC3

The overall structure ensures a coherent flow from fundamental principles to applied and strategic considerations.

Timetable

Time	Topic	Speakers
8:30 - 9:00	*Welcome coffee*	
9:00 - 9:30	Why LC3 Technology	Karen Scrivener
9:30 – 10:10	Clay composition and geology	Fernando Martirena
10:10-10:50	Clay calcination and testing	Mehnaz Dhar
10:50 - 11:05	*Coffee break*	
11:05 - 11:45	LC3 and its production	FM & SB
11:45 – 12:15	Workability	Shashank Bishnoi
12:15 – 12:55	Hydration	Karen Scrivener
13:00 – 14:00	*Lunch*	
14:00 - 14:30	Mechanical properties	Shashank Bishnoi
14:30 - 15:30	Durability	FM & SB
15:30 – 16:00	LCA	Sofía Sánchez Berriel
16:00 - 16:20	*Coffee break*	
16:20 - 16:50	Economy	Laurent Grimmeissen
16:50 - 17:30	Free discussion	All participants