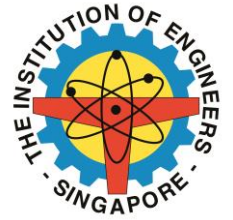


# Concrete Inspection & Repair Series

## – 48<sup>th</sup> Run (Virtual Classroom)

**\*\* Supported by UTAP Credit\*\***



IES Academy Virtual

### Introduction

Reinforced concrete is still commonly used for building and construction in Singapore and around the world. Sustainability considerations in recent years have resulted in an increased focus on the repair and refurbishment of all types of concrete structures rather than demolition and redevelopment. Furthermore, defects are now more evident in buildings constructed during the boom years of economic growth when buildings are erected at a very fast pace.

Resident Engineers (REs) and Resident Technical Officers (RTO) are the first line of defense to prevent concrete defects as they are directly involved in supervision of concreting works, they may be involved in development projects requiring addition and alteration of existing buildings in conjunction with new developments.

This series of programme will provide the participant with the technical knowledge on the causes of structural and non-structural defects in concrete, their remedies, repairs and the preventive maintenance needed to upkeep these structures.

### Objectives

The specific objectives of Module 1 on Corrosion of Steel in Concrete and Concrete Defects are to familiarize the participants with how corrosion of steel reinforcement occurs in concrete. Participants will also understand other types of concrete defects and how to reduce the formation of these defects.

The specific objectives of Module 2 on Structural Inspection and Repair Techniques are to familiarize the participants with the common repair and strengthening methods for concrete structures with defects. Participants will also understand the procedure for structural investigation and effects of fires on reinforced concrete structures.

### Pre-requisites

Prior to attending this course, you should:

- Have a PC / laptop / tablet / smart phone with built-in or external webcam.
- Installed the Zoom client.
- Have Wi-Fi / high speed internet connection available.
- Receive an email with a link for you to submit a registration for webinar 1 week prior to the commencement.
- Receive an email with a link and password for you to join the webinar session after your registration is successful.

### Details

**Date** : 12<sup>th</sup> Jun 2023, (Monday)

**Time** : 12.30pm – 7.00pm

**Duration**: 6 hours

**Delivery Mode**: Zoom Webinar

**CPD** : 6 STU (Structural) **To be Confirm**  
5 PDU (PEB) (CEng) **To be Confirm**

**Course Fee (Include GST)**:  
**IES Member: \$223.57**  
**Non-member: \$262.43**

E-certificate of Attendance will be awarded to **Paid** participants who have completed course survey with **100% Attendance**.

### Target Audience

Resident Engineers (RE)  
Resident Technical Officers (RTO)

### **IES Academy@Jurong East**

80 Jurong East Street 21, #04-10  
Devan Nair Institute for Employment  
and Employability  
Singapore 609607

Contact Person: Jerine Peh (Ms)  
DID: 6460 4237 | Main Line: 6463 9211  
E-mail: [jerine.peh@iesnet.org.sg](mailto:jerine.peh@iesnet.org.sg)

## **Speaker Profile**

ER. Teo Ee Huat graduated from Nanyang Technological University with a B.ENG (Civil) degree in 1996 and has since completed his MSc in Civil Engineering (NUS) and MSc in International Construction Management (NTU). He is actively involved in education and has completed his M.E.D with University of Western Australia in 2010. He is a Singapore registered Professional Engineer and Qualified Erosion Control Professional. He is currently serving as the Co-Chairman of Qualified Erosion Control Professional Panel, IES and has trained Professional Engineers as Qualified Erosion Control Professionals and also trained construction site supervisors in implementation, inspection and maintenance of Earth Control Measures. He has written papers in International journals on issues related to Construction Management and other issues.

## **COURSE OUTLINES:**

### **COURSE SCHEDULE**

<b>Timing:</b>	<b>Topics</b>
12.30pm	Course Introduction
1.00pm	Corrosion of steel in reinforced concrete
2.00pm	Break
2.15pm	Defects in hardened concrete / Chemical attack on concrete/cracks
2.45pm	Strength testing
3.15pm	Test associated with durability / Chemical Analysis
4.00pm	Break
4.15pm	Structural Inspection
5.15pm	Repair & Strengthening Methods
6.15pm	Fire-damaged Structures
7.00pm	End of Programme

**COURSE OUTLINE**

<b>CONCRETE DEFECTS</b>	<b>CONCRETE TESTING TECHNIQUES</b>
<p>Corrosion of steel in reinforced concrete 2 stages corrosion process</p> <ul style="list-style-type: none"> <li>• Carbonation process</li> <li>• Chloride transport and attack mechanism</li> </ul> <p>Defects in hardened concrete</p> <ul style="list-style-type: none"> <li>• Honeycombing</li> <li>• Surface blowholes</li> <li>• Segregation and grout loss</li> <li>• Rusting and lack of cover</li> </ul> <p>Chemical attack on concrete</p> <ul style="list-style-type: none"> <li>• Acid attack</li> <li>• Sulphate attack</li> <li>• Alkali-aggregate reaction</li> </ul> <p>Cracks</p> <ul style="list-style-type: none"> <li>• Structural cracks</li> <li>• Non-structural cracks</li> </ul>	<p>Strength testing</p> <ul style="list-style-type: none"> <li>• Core testing</li> <li>• Surface hardness test (rebound hammer)</li> <li>• Ultrasonic pulse velocity test</li> <li>• Penetration resistance test</li> </ul> <p>Test associated with durability</p> <ul style="list-style-type: none"> <li>• Cover measurement</li> <li>• Half-cell potential meter</li> <li>• Carbonation test</li> <li>• Permeability test</li> </ul> <p>Chemical Analysis</p> <ul style="list-style-type: none"> <li>• Cement type</li> <li>• Cement content</li> <li>• Chloride content</li> <li>• Sulphate content</li> </ul>
<b>STRUCTURAL INSPECTION AND REPAIR TECHNIQUES</b>	
<ol style="list-style-type: none"> <li>1. Objective for appraisal of structures</li> <li>2. Inspection process</li> <li>3. Recording of results</li> </ol> <p>REPAIR &amp; STRENGTHENING METHODS</p> <ul style="list-style-type: none"> <li>• Requirements of repair system</li> <li>• Repair materials</li> <li>• Methods of repair</li> <li>• Sealing cracks</li> <li>• Steel plate bonding</li> <li>• Bonding with composite materials</li> </ul> <p>FIRE-DAMAGED STRUCTURES</p> <ul style="list-style-type: none"> <li>• Effects of fire</li> <li>• Assessment of fire-damaged structures</li> <li>• Recommendations</li> </ul>	

## REGISTRATION FORM

### CONCRETE INSPECTION & REPAIR SERIES 48th RUN \*Supported by UTAP Credit\*

Date: 12<sup>th</sup> Jun 2023 (Monday)

Time: 12.30pm to 7.00pm (6 hours)

Venue: Zoom Webinar

CPD Programme: 6 STU (Structural) / 6 PDU (PEB) (CEng) – To be Confirmed

Fees (inclusive of GST): **IES Member Rate - \$223.57**

**Non-Member Rate - \$262.43**

Registration Closing Date: 2<sup>nd</sup> June 2023 (Friday) / Till Class is full (Whichever comes first)

Course Coordinator: (Ms) Jerine Peh | Direct: 6460 4247 | jerine.peh@iesnet.org.sg

Participant's Details					
Name (as per NRIC in BLOCK Letters):		NRIC / FIN:		Gender:	M / F
<input type="checkbox"/> Singapore Pink Identification Card	<input type="checkbox"/> Singapore Blue Identification Card	<input type="checkbox"/> FIN/Work Permit/SAF 11B	Date of Birth:		
Address (For Invoice):					
			Postal:		
Mobile:		Contact:		Fax:	
Email (For sending confirmation email):					
Company Name:		UEN No:		Designation:	
Please indicate:	<input type="checkbox"/> IES Member Membership No:	<input type="checkbox"/> Non-Member	<input type="checkbox"/> PE/RE/RTO/Safety Officer No:		
	<input type="checkbox"/> Tick here if sponsored by company		<input type="checkbox"/> Tick here if Self-Sponsor		
Contact Person (For Company Sponsor Only)					
Name:		Designation:			
Mailing Address (For invoice):		Tel:		Fax:	
Email:					
Payment:	Bank / Cheque No:				Amount: \$
<ul style="list-style-type: none"><li>Cheques should be crossed 'A/C payee only' and made payable to '<b>IES Academy Pte Ltd</b>', with the <b>Title of The Event indicated clearly written on the back of the cheques</b>, and submitted with the duly completed registration forms to Attn: Jerine Peh (Ms) <b>IES Academy@Jurong East</b> Devan Nair Institute for Employment and Employability, 80 Jurong East Street 21, #04-10 Singapore 609607</li><li>E-Certificate of Attendance will be issued to participant with 100% attendance with Full payment made.</li></ul>					
<b>Acceptance of Terms &amp; Conditions for Registration of IES Academy Courses / Events</b> I have read, deemed understood and accept the Terms & Conditions of IES Academy courses and events.					
Name:					
Signature:				Date:	

## **TERMS & CONDITIONS COURSE REGISTRATION**

### **Registration**

Any registration, whether on-line or fax will be on a ***first-come-first-served basis*** and will only be confirmed upon receipt of full payment by IES Academy Pte Ltd unless otherwise invoice to company.

All registrations must be submitted with duly completed registration form.

### **Closing Date & Payment**

The closing date of the event will be 1 week prior to event commencement date or earlier.

### **Confirmation of Registration**

Confirmation of registration will be given at least 1 week before the commencement date via email. ***If you do not receive the said confirmation email, you are required to contact IESA at 6463 9211 during office hours.***

IESA reserves the right to allow only confirmed registrants to attend the Event.

### **Withdrawals/Refunds of Fees**

Written notice ***at least 1 week in advance*** before the commencement of the event

Full course fee shall be refunded subjected to **4.5% transaction charge**.

➤ **NO** refund otherwise.

No show of participant would not be accepted as a valid reason for withdrawal/refund.

One time replacement is allowed only if written notice is received by us at least 1 week before the commencement of the event. However, when an IES member is replaced by a non-member, the participant has to pay the difference in the relevant fees.

### **Cancellation/Postponement**

Changes in Venue, Dates, Time and Speakers for the Events can occur due to unforeseen circumstances. IES reserves the full rights to cancel or postpone the Event under such circumstances without prior reasons. Every effort, however, will be made to inform the participants or contact person of any cancellation or postponement.

Fees will be refunded in FULL if any Event is cancelled by IESA.

**UTAP (Union Training Assistance Programme)** is an individual skills upgrading account especially for NTUC members. As a member, you enjoy UTAP funding at 50% of the unfunded course fee capped at \$250 every year.

Please visit [here](#) for more information on UTAP claim.

**SkillsFuture Credit (SFC)** "All Singaporeans aged 25 and above can use their \$500 SkillsFuture Credit from the government to pay for a wide range of approved skills-related courses. Visit the SkillsFuture Credit website ([www.skillsfuture.sg/credit](http://www.skillsfuture.sg/credit)) to choose from the courses available on the SkillsFuture Credit course directory."

Please click [here](#) for more information on SFC & UTAP claim.

### **PERSONAL DATA PROTECTION ACT**

I consent to the processing by Institution of Engineers, Singapore of personal data, including sensitive personal data as defined in the Data Protection Act 2014, about me for the proper purposes of Institution of Engineers, Singapore (IES). I undertake to observe the provisions of the Data Protection Act 2014 in relation to any personal data I may myself hold and process as a Members of Institution of Engineers, Singapore, and I agree to indemnify Institution of Engineers, Singapore from liability for any claims or damages that may arise from the processing of this data. For more information kindly refer to: [www.ies.org.sg/PDPA](http://www.ies.org.sg/PDPA).

### **Enquiries**

For further enquiries, please contact IESA general office at Tel: 6463 9211.