ORGANISED BY TUNNELLING AND UNDERGROUND SPACE TECHNICAL DIVISION (TUSTD), IEM

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HALF DAY SEMINAR ON

TUNNEL INSPECTION FOR REHABILITATION WORKS

DATE : 25 JUNE 2026
TIME : 9.00 AM - 1.00 PM
VENUE: HYBRID (PHYSICAL + ONLINE EVENT)
PHYSICAL VENUE - MALAKOFF AUDITORIUM

Ir. Assoc. Prof. Dr. Rini Asnida Abdullah

Ir. Assoc. Prof. Ts. Dr. Muhd Norhasri Muhd Sidek

Sr. Dr. Khairulazhar bin Zainuddin

Ts. Dr. Mohd Nur Asmawisham bin Alel

HYBRID Fees Platform

BEM Approved CPD Hours : 4
Ref. No. : IEM26/HQ/149/S

GRADE	ONLINE PARTICIPANTS FEE (NON HRDF CLAIMABLE)	PHYSICAL PARTICIPANTS FEE (NON - HRDF CLAIMABLE)	PHYSICAL PARTICIPANTS FEE (HRDF CLAIMABLE)
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APPROVED DURATION:
11/05/2026 - 12/05/2027
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SYNOPSIS

Tunnels often require intervention to address degradation caused by water ingress, structural deterioration, and the need for modernisation. Tunnels generally suffer from environmental wear & tear and changing safety standards frequently require improvements in tunnel design and equipment. As part of the holistic tunnel's rehabilitation works, tunnel inspection is a critical process ensuring structural integrity and safety by identifying defects like cracks, water ingress, corrosion in tunnel linings, etc., which is largely driven by the need for maintenance in aging tunnel infrastructure. This half-day seminar on Tunnel Inspection for Rehabilitation will focus on the key components and techniques for tunnel inspection, which generally combine traditional visual inspection with advanced technologies to assess structural performance, detect deterioration, ensure safety, and ultimately prevent structural failures.

PROGRAMME

Time	Description	Speaker
8:30am – 8:50am	Registration & Light Refreshment	
8:50am – 9:00am	Welcoming Address	
	PART 1	
9:00am – 10:00am	Advancing Smart Tunnel Asset Management by Tunnel Lining Inspection System (TuLIS)	Ir. Assoc. Prof. Dr. Rini Asnida binti Abdullah, Deputy Chairman of IEM-TUSTD
10.00 am - 11.00 am	NDT Application for Tunnel Inspection and Rectification	Ir. Assoc. Prof. Ts. Dr. Muhd Norhasri Muhd Sidek, Associate Professor and Researcher at Institute for Infrastructure Engineering and Sustainable Management (IIESM), UiTM Malaysia
11:00am – 11:15am	Morning Tea Break	
	PART 2	
11.15 am - 12.15 pm	Advanced Imaging Techniques for Tunnel Inspection	Sr. Dr. Khairulazhar bin Zainuddin, Senior Lecturer UiTM Arau
12.15 pm - 1.15 pm	Integrated Real-Time Monitoring of Tunnel Infrastructure for Asset Integrity and Safety	Ts. Dr. Mohd Nur Asmawisham bin Alel, Senior Lecturer and Member Geotechnical Research Group (GRG),UTM
1.15 pm - 1.30 pm	Q&A	
12:30pm – 2:00pm	Closure & Lunch	

SPEAKERS' BIODATA

Ir. Assoc. Prof. Dr. Rini Asnida binti Abdullah

Advancing Smart Tunnel Asset Management by Tunnel Lining Inspection System (TuLIS)

Synopsis:
The safety, reliability, and long-term performance of tunnels are heavily dependent on effective inspection and maintenance practices. Conventional inspection methods, while valuable, are often constrained by manual data collection, limited precision, and challenges in integrating multi-source information. In response to these limitations, the Tunnel Lining Inspection System (TuLIS) was developed as Malaysia's first digital platform dedicated to tunnel lining inspection and structural health monitoring. TuLIS integrates conventional visual inspection with advanced sensing technologies—including Close-Range Photogrammetry (CRP), Terrestrial Laser Scanning (TLS), thermography, and accelerometer-based monitoring—to deliver precise, data-driven assessments. This article presents the conceptual framework, field implementation, technological integration, and future potential of TuLIS as part of a broader movement toward smart infrastructure management. The system not only enhances inspection accuracy and efficiency but also lays the foundation for predictive maintenance and digital twin applications, positioning Malaysia as a regional leader in intelligent tunnel asset management.

Speaker's Profile:
Ir. Assoc. Prof. Dr. Rini Asnida binti Abdullah is currently the Deputy Chairman of TUSTD, IEM. She is the Project Leader of TuLIS and also Head of Geotechnical Research Group (GRG) in Faculty of Civil Engineering, Universiti Teknologi Malaysia (UTM). She obtained her Bachelor and Master Degree in Geotechnics from UTM and received her PhD in Rock Mechanics from University of Leeds, United Kingdom. Before joining UTM as academician, she has 3 years working experience with multidisciplinary consulting firm and Public Work Department.

Her research interests include rock mass classification, rock slope modelling, rock fractures and fragmentation, underground excavation and blasting. Her contribution in the rock mechanics field has been recognized twice in the Asian Rock Mechanics Symposium as one of the award recipients, from the International Society of Rock Mechanics (ISRM). She served as an editor board member of Journal of Geotechnical Engineering and Jurnal Teknologi (Special Issue).

Ir. Assoc. Prof. Ts. Dr. Muhd Norhasri Muhd Sidek

NDT Application for Tunnel Inspection and Rectification

Synopsis:

Non-Destructive Testing (NDT) has become an essential industrial tool for tunnel inspection and rectification, enabling operators to detect cracks, voids, seepage, and material degradation without disrupting operations. Techniques such as ultrasonic testing, ground-penetrating radar, infrared thermography, acoustic emission monitoring, and laser scanning provide accurate data on structural health, which guides targeted interventions like grouting, reinforcement, waterproofing, and post-repair validation. By integrating NDT into routine maintenance, industries can ensure tunnel safety, minimize downtime, reduce repair costs, and extend service life, making it a cost-effective and reliable approach to infrastructure management.

Speaker's Profile:
Ir. Assoc. Prof. Ts. Dr. Muhd Norhasri Muhd Sidek is an Associate Professor at the School of Civil Engineering, Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia. He obtained his Diploma and Bachelor of Engineering (Hons.) in Civil Engineering from UiTM, a Master of Science in Structural Engineering from Universiti Sains Malaysia (USM), and a PhD in Structural Engineering from UiTM.

Dr. Norhasri's research focuses on advanced and sustainable construction materials, particularly concrete technology. His areas of expertise include sustainable and high-performance concrete, nanomaterials in cement-based materials, ultra-high-performance concrete (UHPC), and non-destructive testing (NDT) for infrastructure assessment.
He is a registered Professional Engineer (Ir.) and Professional Technologist (Ts.) in Malaysia and actively collaborates with industry and academic partners in advancing innovative and durable infrastructure materials. Dr. Norhasri also serves as a reviewer for several international journals in the field of construction materials.

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Sr. Dr. Khairulazhar bin Zainuddin

Advanced Imaging Techniques for Tunnel Inspection

Synopsis:

Structural Health Monitoring (SHM) and the regular inspection of tunnels are fundamental to maintaining the long-term safety and stability of civil infrastructure. However, conventional visual inspection methods are often labour-intensive, time-consuming, and highly subjective. Furthermore, whilst artificial intelligence (AI) has advanced automated defect detection, existing systems predominantly rely on two-dimensional (2D) image analysis, which lacks spatial context and restricts the ability to obtain true metric measurements of defects.

To address these limitations, this presentation focuses on the synergy of advanced close-range photogrammetry and remote sensing techniques to provide a multidimensional assessment of tunnel linings. The session will first explore the integration of pretrained deep learning models with state-of-the-art Close-Range Photogrammetry (CRP). By capturing high-resolution RGB imagery to generate georeferenced 3D mesh models and orthophotos, this approach facilitates the automated extraction of cracks and enables precise dimensional analysis including crack length and width estimations within their exact spatial locations.

Moving beyond the visible spectrum, the presentation will delve into the application of Multispectral Imaging for concrete surface evaluation. By capturing near-infrared (NIR) data and applying spectral indices such as the Normalized Difference Water Index (NDWI) and Normalized Difference Vegetation Index (NDVI), inspectors can quantitatively detect early signs of structural stress, including incipient moisture accumulation and biological growth, which are often invisible to the naked eye.

Additionally, the session highlights the critical role of Infrared Thermography (IRT) in assessing subsurface conditions. By mapping thermal gradients and temperature anomalies, IRT effectively identifies hidden structural defects such as delamination, internal voids, and deeper water ingress.

Ultimately, the fusion of these three imaging modalities including high-resolution RGB photogrammetry for surface geometry, multispectral indices for material anomalies, and thermal mapping for subsurface integrity offers a highly reliable, non-intrusive, and data-driven solution for modern tunnel asset management

Speaker's Profile:

Sr Dr. Khairulazhar bin Zainuddin is currently a Senior Lecturer at Universiti Teknologi MARA (UiTM), Perlis Branch. He also serves as the Leader of the Geo3DM Special Interest Group (SIG) within the Faculty of Built Environment at UiTM Perlis Branch. He obtained his Bachelor of Science in Surveying Science & Geomatics from UiTM. Subsequently, he furthered his studies at Universiti Teknologi Malaysia (UTM), where he earned a Master's degree specialising in Industrial Surveying and a PhD in Geomatics Engineering.

Prior to embarking on his academic career, Dr. Khairulazhar gained valuable practical experience serving as an GIS Technician and research assistant. His primary research interests revolve around photogrammetry and remote sensing, with diverse applications spanning across archaeology, museum documentation, engineering, and agriculture.

Ts. Dr. Mohd Nur Asmawisham bin Alel

NIntegrated Real-Time Monitoring of Tunnel Infrastructure for Asset Integrity and Safety

Synopsis:

Tunnel infrastructure demands continuous and systematic monitoring to ensure structural safety, serviceability, and long-term asset performance. Although conventional inspection practices remain essential, they are often limited in providing timely, integrated, and data-driven information to support effective maintenance and asset management decisions. This project outlines practical experience in the implementation of the Tunnel Lining Inspection System (TuLIS) for tunnel infrastructure monitoring in Malaysia. The system incorporates integrated inspection and monitoring approaches, including visual assessment, accelerometer-based monitoring, and complementary evaluation methods, to improve the understanding of tunnel condition and structural behaviour under operational conditions. Emphasis is given to implementation experience, technical and operational challenges, key lessons learnt, and the value of real-time monitoring in supporting early anomaly detection, informed maintenance planning, and enhanced tunnel asset integrity and safety. The initiative reflects an important step towards more resilient, proactive, and technology-driven tunnel infrastructure management.

Speaker's Profile:

Ts. Dr. Mohd Nur Asmawisham bin Alel is a Senior Lecturer at the Faculty of Civil Engineering, Universiti Teknologi Malaysia (UTM), with broad experience spanning academia, research, consultancy, and industry practice. His areas of expertise include earthquake engineering, applied geophysics, structural dynamics, instrumentation, sensor-based monitoring systems, and artificial intelligence applications for civil and geotechnical infrastructure. He is actively involved in the development and application of real-time monitoring, intelligent sensing, and AI-driven solutions to support infrastructure assessment, safety, and asset management. His research interests also extend to structural health monitoring, seismic hazard evaluation, and the integration of digital and data-driven technologies for more resilient infrastructure systems.

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