

## WES 2025 Opening Ceremony Programme

### Morning Session

Date 22 October 2025 (Wed)  
Time 9.00am - 12.30pm  
Venue Grand Ballroom (Level 3)  
Orchard Hotel Singapore

Date	Time	Programme
22 October 2025 (Wed)	8.00am	Registration
	8.45am	Guests to be seated
	9.00am	<b>Arrival of Guest-of-Honour</b> Mr Desmond Tan Senior Minister of State, Prime Minister's Office Deputy Secretary-General, National Trade Union Congress
	9.05am	<b>Welcome Address by WES 2025 Conference Chair</b> Ms Jasmine Foo
	9.10am	<b>Speech by IES President</b> , Er. Chan Ewe Jin
	9.15am	<b>Speech by Guest-of-Honour</b> , Mr Desmond Tan
	9.25am	<b>Launch of World Engineers Summit (WES) 2025</b>
	9.30am	<b>JAPAN's Smart and Sustainable City Initiatives</b> by His Excellency Hiroshi Ishikawa Ambassador Extraordinary and Plenipotentiary of Japan to Singapore
	10.00am	Morning Tea Break
	10.20am	<b>Engineering Urban Systems</b> by Mr Richard Lim Cherng Yih Deputy Chairman, Land Transport Authority Immediate Past Chairman, Energy Market Authority
	10.50am	<b>Navigating the Future: How Maritime Digital Twins Can Enable Innovation in Sustainable Port Operations</b> by Mr David Foo Deputy Chief Executive (Operations & Technology) / Chief Data Officer Maritime and Port Authority of Singapore
	11.20am	<b>Technological Solutions for a Climate-Resilient and Greener Future</b> by Prof Liu Bin Deputy President (Research and Technology) Tan Chin Tuan Centennial Professor National University of Singapore
	11.50am	<b>Panel Discussion</b> <b>Moderator:</b> Prof Lee Poh Seng Head of Department NUS Mechanical Engineering College of Design and Engineering National University of Singapore  <b>Panelists:</b> 1. His Excellency Hiroshi Ishikawa 2. Mr Richard Lim Cherng Yih 3. Mr David Foo 4. Prof Liu Bin
	12.30pm	Networking Lunch

Please note that the programme may be adjusted as necessary.

Ballroom 1 (Level 3)			
Track 1 - Technological Solutions for a Climate-Resilient and Greener Future			
Track	Timing	Author	Synopsis
1	2:00pm – 2:30pm	<b>Keynote Presentation 1:</b> <i>Navigating Climate Change for Singapore's Maritime Sector: Setting Sail for a Climate-Resilient Future</i> by Er. Tham Wah Wah Senior Director / Chief Engineer (Engineering & Project Management) Maritime and Port Authority of Singapore	Climate change is a complex global challenge that calls for concerted global action. AI stakeholders must work together to address this existential threat. As one of the world's busiest transshipment hubs ports, it is in the interest of Singapore's maritime sector to pull our weight as a responsible member of the international maritime community, and act swiftly and decisively to address the existential threat of climate change. This keynote will delve into how Maritime Singapore is navigating the challenges of climate change, through mitigation measures to decarbonise the maritime sector while adapting against the impacts of climate change.
1	2:30pm – 2:45pm	<b>Paper Presentation 1:</b> <i>Assessment of Wave Climate Variability in Singapore: Build its Role in the Design of Coastal Adaptation Measures</i> by Dr Mamta Jain and Liew Meng Jie DHI Water & Environment (S) Pte Ltd	DHI assessed wave climate variability along Singapore's coast, focusing on the south and west to support Tuas Port design. Multi-year measurements show Southwest Monsoon waves are highly variable, with heights often exceeding 1.0 m and periods of 4-6 seconds, driven by monsoonal winds. The west coast is more exposed due to long fetches from the Sumatra sector, producing extreme waves. High-resolution modelling is required to capture nearshore processes like refraction, shoaling, and wave-current interactions, while accounting for climate change impacts. Using joint probability analysis, the study defines realistic multi-hazard design conditions critical for resilient, long-lived coastal infrastructure.
1	2:45pm – 3:00pm	<b>Paper Presentation 2:</b> <i>Revising Rainfall IDF Estimates in a Changing Climate: A Regional GEV Approach for Singapore</i> by Dr Das Samiran University of Glasgow Singapore	Extreme rainfall events are intensifying with climate change, posing challenges for urban water system resilience, particularly in tropical regions like Singapore. This study assesses future changes in daily extreme rainfall using observations and climate simulations under three emission scenarios: SSP2-2.6, SSP2-4.5, and SSP5-8.5. Annual maximum daily rainfall is modelled with the Generalized Extreme Value distribution in a regional frequency framework, improving return level reliability and enabling updated, non-stationary IDF curves. Results show significant increases under high emissions, indicating current stationary-based designs may underestimate risks. Findings support revising hydrological standards to strengthen climate-resilient infrastructure in Singapore and similar tropical environments.
1	3:00pm – 3:15pm	<b>Paper Presentation 3:</b> <i>Integrating Advanced Technologies for Climate Risk Assessment of Eco-Tourism in SIDS</i> by Ismail Weiliang Haskoning	This study introduces a Climate Risk Assessment (CRA) framework for eco-tourism in Small Island Developing States (SIDS), integrating advanced tools for hazard evaluation and mitigation. Aligned with ISO 31000 and TCO, it assesses physical and transition risks under SSP2-4.5 and SSP5-8.5 scenarios. Flood risks are quantified using Haskoning's Global Flood Risk Tool, while coastal erosion is evaluated with CoastalS4. A SIDS case study highlights risks such as flooding, erosion, and reef degradation. The framework proposes technological and nature-based solutions, including flood defences, erosion control, reef resilience, and coral restoration, forming a flexible Climate Resilience Roadmap for sustainable eco-tourism.
1	3:15pm – 3:45pm	<b>Panel Discussion</b> <b>Moderator:</b> Ye Ho Chai Teck Deputy Director (Capability Building) Coastal Protection Department PUB, Singapore's National Water Agency	
1	3:45pm – 4:00pm		<b>Tea Break</b>
1	4:00pm – 4:15pm	<b>Paper Presentation 4:</b> <i>Modelling of a floating turbine to harvest tidal energy in the coastal environment</i> by Lin Xiangfeng, Dr Yuzhu Pearl Li and Na National University of Singapore	Floating tidal stream turbines offer a promising renewable energy solution. This study develops an integrated computational fluid dynamics (CFD) model to simulate a floating turbine under wave-current conditions. The model combines hydrodynamics, mooring systems, platform motion, and turbine dynamics, using waveFarm, MoorDyn, and an actuator line method for rotor representation. A new six-degree-of-freedom motion library accounts for turbine-platform interactions. Each module is validated against experimental data, showing good agreement. Two case studies reveal that wave-current loading causes platform re-positioning, periodic motions, increased mooring tension, and turbine performance fluctuations. The model provides a reliable tool for turbine design and safety assessment.
1	4:15pm – 4:30pm	<b>Paper Presentation 5:</b> <i>Sludge Treatment with Continuous Thermal Hydrolysis (CTH)-Pyrolysis for Biochar Production</i> by Dr Miao He and Dr Cai Qingping PUB, Singapore's National Water Agency	PUB is piloting a combined CTH-pyrolysis process in a 5 tpd facility to evaluate its technical and economic viability for producing biochar from dewatered anaerobic digested (AD) sludge. In the CTH process, high temperature and pressure break down the cellular structure of dewatered sludge. The subsequent filter press system can increase sludge solids content from 20% to 400%. The filter pressed sludge cake then undergoes pyrolysis at 500-600°C to produce biochar, achieving an overall 90% mass reduction. Sludge plant applications was also carried out to assess biochar's potential reuse as a fuel supplement, activated carbon for odor control, and construction material.
1	4:30pm – 4:45pm	<b>Paper Presentation 6:</b> <i>Microgrid Essentials To Incorporating Green And Future Technology To End Consumer</i> by Chua Han Koon, Teh Siaw Peng, Lim Jun Rong, and Nicholas Foo Chang Jun (Defence Science and Technology Agency (DSTA) Singapore), Ho See Fong, and Chua Pei Q (Rf M&E Consultancy Services Pte Ltd) and Chua Lin Meng (Singapore Polytechnic)	Microgrids reduce reliance on the national grid by enabling developments to be self-sufficient, climate-resilient, and powered by green technologies, integrating distributed energy resources (DER) such as renewables, generation, and energy storage systems, microgrids can meet daily needs and operate independently during emergencies. A new project integrates emergency generation, ESS, and backup power across a development, enabling load shedding without grid dependence. Careful design ensures optimal microgrid controller placement, electrical safety, and reliable operation. This paper explores green microgrid development, including design, testing, commissioning, and challenges such as managing transformer inrush currents, with operational workflows presented for load sharing in microgrid mode.
1	4:45pm – 5:00pm	<b>Paper Presentation 7:</b> <i>Biogas Upgrading Optimisation for Renewable Energy Storage and Energy Recovery Enhancement</i> by Dr Victor Sim and Ms Chan Hui Ling Conny Tech Pte Ltd	The global shift to renewable energy highlights the need for efficient storage to manage solar and wind intermittency. Hydrogen offers high gravimetric energy density (120 MJ/kg) and clean production via water electrolysis but faces low volumetric density and costly compression and transport. Converting hydrogen into synthetic methane via CO <sub>2</sub> methanation enhances volumetric energy density (35.9 MJ/m <sup>3</sup> ) and uses existing gas infrastructure. Biological in situ upgrading in anaerobic digesters, aided by a novel ceramic membrane contactor, improves H <sub>2</sub> dissolution, achieving 97-99% CH <sub>4</sub> and >100% increased production. Methanobacterium spp. dominate, enabling scalable, low-energy green biomethane production for decarbonization.

Ballroom 2 (Level 3)			
Track 2 - Urban Mobility Innovations for Sustainable Cities (Road and Traffic Innovations)			
Track	Timing	Author	Synopsis
2	2:00pm – 2:35pm	<b>Keynote Presentation 1:</b> <i>Building the Roads of Tomorrow</i> by Mr Lam Wee Sham Deputy Chief Executive (Technology) Land Transport Authority	Singapore's growing urban mobility infrastructure presents increasing complexity and resource challenges that traditional management approaches cannot sustainably address. LTA is embracing innovative technology and digital solutions to transform how we manage and maintain our transport assets, enabling more efficient operations with limited resources. This presentation explores the role of technology and innovation in creating sustainable urban mobility systems that support Singapore's smart city vision.
2	2:35pm – 2:50pm	<b>Q&amp;A</b> <b>Moderator:</b> Dr Raymond Ong Dean's Chair, Associate Professor Deputy Head (Research & Enterprise)   Group Head (Geotechnical Engineering, Transportation Engineering and Project Management) Department of Civil and Environmental Engineering National University of Singapore	
2	2:50pm – 3:10pm	<b>Paper Presentation 1:</b> <i>Transportation to Mobility - Navigating the Changes and the Challenges</i> by Dr Chin Kan Keong ST Engineering	Transportation engineering as a science, has been around for centuries, with innovations dating as far back as when Roman roads were being built. What used to be infrastructure-focused, the science of transportation has evolved over time. Today, the term mobility is used to describe the many facets of the science that keeps us moving safely and efficiently. How should engineers keep abreast of these and other changes and continue innovating?
2	3:10pm – 3:30pm	<b>Paper Presentation 2:</b> <i>Innovations in Road Works and Maintenance to Enhance Productivity and Sustainability</i> by Dr Low Boon Hwee and Dr Vincent Guwe Highway International Pte Ltd	This presentation highlights innovations in road maintenance that boost productivity and sustainability through advanced materials and digital solutions. An asphaltic thin overlay system for rigid pavements after trenching avoids full-depth reconstruction, reducing waste, noise, dust, and road closures while using high-performance asphalt for durability and resistance to damage. Sustainable materials include recycled plastic asphalt, incorporating processed local waste to improve performance and cut carbon footprint. AI-based road inspection enables timely defect detection, reducing manual inspections and optimizing maintenance. These integrated approaches advance smarter, greener, and more resilient road infrastructure, supporting productivity and environmental sustainability goals.
2	3:30pm – 4:00pm		<b>Tea Break</b>
2	4:00pm – 4:20pm	<b>Paper Presentation 3:</b> <i>Green Pavement: A Journey of Material Innovation</i> by Dr Than Than Nyunt, Anggraini Zulhati, Kapilani S and Chandrasekar Palanisamy Land Transport Authority	This presentation reviews a decade of innovation in sustainable pavement materials, tracking the journey from lab development to real-world application in Singapore's tropical climate. It evaluates recycled and eco-friendly materials such as warm mix asphalt and steel slag porous asphalt through extensive testing and field trials. Case studies benchmarked against international standards assess skid resistance, ride comfort, and durability under live traffic. Insights from implementation and maintenance show shaped current material selection and asset management practices. While eco-friendly options are now standard, challenges in climate resilience and long-term performance remain, guiding future sustainable urban pavement strategies.
2	4:20pm – 4:40pm	<b>Paper Presentation 4:</b> <i>Moving More with Less: The Surprising Efficiency of People-First Streets</i> by Prof Yap Fook Fah Nanyang Technological University	Our cities stand at a critical juncture, choked by traffic congestion that stifles economic activity and burdened by transportation systems that deepen social inequality. This presentation examines how redistributing finite urban street space from inefficient, single-occupancy vehicles to high-capacity transit, cycling, and pedestrian use can simultaneously address two critical urban challenges: traffic congestion and transport inequality. Drawing on global case studies, fundamental principles of traffic science, and emerging technologies, this talk will demonstrate that realising street space is not about restricting mobility, but about optimising it for everyone. By prioritising space efficient modes, we can move more people more reliably, create safer and more livable communities, and build a more equitable urban future where access to opportunity is not contingent on owning a car.
2	4:40pm – 5:00pm	<b>Paper Presentation 5:</b> <i>Harnessing Technologies in Path Safety Assessments</i> by Dr Koh Puay Ping, Yap Hui Jin, Yeong Whye Kwok and Chandrasekar Palanisamy Land Transport Authority	As Singapore aims to expand its cycling network from 730km (2025) to 1300km by 2030, this paper presents a technological approach to proactively enhance cycling infrastructure safety. Integrating an AI-enabled Path Safety Assessment Tool, adapted from CyclorAP, with a digital platform analysing 55 infrastructure attributes, the system overcomes limitations of sparse crash data. A dashboard and computer vision automate risk assessment across bicycle, pedestrian, and vehicle interactions, generating prioritised risk scores for targeted interventions. This scalable, data-driven approach advances proactive, evidence-based urban mobility planning, supporting safe, sustainable, and future-ready cycling networks in dense city environments.
2	5:00pm – 5:20pm	<b>Paper Presentation 6:</b> <i>The Singapore Road Safety Observatory (1960-2024)</i> by Dr Koh Puay Ping, Lok Koh Fah, Jephine Goh and Chandrasekar Palanisamy Land Transport Authority	This study examines the evolution of road safety globally and in Singapore from the 1960s to 2024, reviewing interventions and policies that reduced traffic fatalities. Key initiatives include the Point Demand System (1965), mandatory motorcycle helmet laws, strict vehicle import regulations, Silver Zones (2014), and Vision Zero principles (2019). Singapore achieved a 50% reduction in fatalities per 100,000 population despite rising vehicle numbers. The study highlights the integration of engineering, enforcement, data-driven policies, and public education, evolving from traditional measures to proactive, technology-enabled solutions. Insights guide planners and policymakers in preparing for future mobility technologies and Safe System implementation.
2	5:20pm – 5:40pm	<b>Paper Presentation 7:</b> <i>Bikeability Index for Singapore</i> by Dr Ligo Yang, Kim Yung Juan, Tan Chek Tien (Singapore Institute of Technology), and Yap Hui Jin (Land Transport Authority)	This study develops a multidimensional bikeability index for Singapore by integrating subjective user experiences with objective environmental data to support sustainable transport planning. Six key dimensions—cycling infrastructure, comfort, land use, directness, traffic environment, and security—were identified via literature review and validated with 30 local experts. A survey of 668 participants captured perceptions of environmental conditions and cycling behavior. Factor analysis, regression, and structural equation modeling constructed the index, linking the built environment to cycling activity. Future work will incorporate larger spatiotemporal datasets and machine learning to enhance predictive capabilities, guiding infrastructure investments and evidence-based urban design.
2	5:40pm – 5:55pm		<b>Panel Discussion</b>

Ballroom 3 (Level 3)			
Track 3 - Designing for Sustainability in Green Building Practices			
Track	Timing	Author	Synopsis
3	2:00pm – 2:30pm	<b>Keynote Presentation 1:</b> <i>Innovative Cooling and Dehumidification Strategies for Sustainable and Resilient Green Buildings</i> by Dr Chua Kian Jon Ernest Associate Professor National University of Singapore	This presentation presents innovative cooling and dehumidification strategies that enhance the sustainability and resilience of green buildings. It highlights the use of membrane-based dehumidification systems for energy-efficient moisture control, and heat-driven chillers that leverage low-grade thermal energy to minimise electrical demand. The integration of high-performance superabsorbent desiccants, offering superior moisture uptake and low regeneration temperatures, is also examined. Collectively, these technologies address both sensible and latent cooling loads with reduced environmental impact, supporting the design of low-carbon, climate-responsive buildings—particularly in warm and humid regions where conventional HVAC systems are energy-intensive and less efficient.
3	2:30pm – 2:50pm	<b>Paper Presentation 1:</b> <i>SafeAir: A Smart IoT Solution for Health-Centric Building Compliance and Automated Remediation</i> by Samuel Kheng Vidal Solution Pte Ltd	This paper presents SafeAir, a smart Indoor Environmental Quality (IEQ) system that ensures health-centric compliance with international building standards while enabling automated environmental remediation. SafeAir integrates real-time pollutant sensing (PM2.5, CO <sub>2</sub> , TVOCs, humidity, temperature, sound, light) with AI-driven analytics and compliance verification. Remediation mechanisms, such as Direct Control Ventilation and air filtration, activate automatically when thresholds are exceeded. A digital twin-based Command Center enables centralized monitoring, predictive maintenance, and executive insights. Field deployments in Singapore healthcare and education facilities demonstrate SafeAir's ability to detect mold, reduce airborne transmission risks, and enhance occupant comfort, health, and productivity.
3	2:50pm – 3:10pm	<b>Paper Presentation 2:</b> <i>Cooling the future: Brownfield District Cooling for Sustainable Urban Renewal</i> by Goh Lee Peng SP Group	As part of Singapore's journey towards net zero by 2050, brownfield district cooling is emerging as a powerful solution to cut carbon, enhance energy efficiency in existing developments, and build long-term resilience. This session draws on insights from the Tampines Distributed District Cooling (DDC) network – Singapore's first district cooling system in a brownfield setting. It will examine key design considerations, deployment challenges, and optimisation strategies, while highlighting outcomes such as carbon abatement and energy savings. The session will also explore the role of policy incentives, including BCA's Green Mark scheme and URA's GRA benefits, in enabling adoption, and how Singapore's brownfield DDC model can be scaled across the region.
3	3:10pm – 3:40pm	<b>Panel Discussion</b> <b>Moderator:</b> Dr Aaron Sham Senior Engineer Enforcement and Structural Inspection Department Building Resilience Group Building and Construction Authority	
3	3:40pm – 4:00pm		<b>Tea Break</b>
3	4:00pm – 4:20pm	<b>Keynote Presentation 2:</b> <i>in Geotechnical Engineering- Getting Started with Slope Applications</i> by Dr Kim Yungbin Assistant Professor University of Glasgow	To effectively leverage AI, geotechnical engineers must follow a structured workflow: define the problem, prepare reliable data, select suitable models, and interpret outputs within an engineering context. This presentation walks through applying AI to slope engineering—from estimating effective cohesion (c') to predicting factor of safety (FS) in rainfall-induced slope failures. Early object detection trials revealed spatial limitations, leading to an instance segmentation approach for pixel-wise analysis. The model achieved reliable, near real-time predictions, supporting rapid decision-making in landslide-prone regions. This work provides a practical roadmap for integrating AI into geotechnical practice through experimentation and informed model selection.
3	4:20pm – 4:40pm	<b>Keynote Presentation 3:</b> <i>Reimagining HVAC Optimization in the Age of AI</i> by Mr David Xu Director, AI HVAC Univers	This presentation showcases how Univers leverages Agentic AI to optimize Chiller Plant and AHU operations. Univers AI HVAC delivers continuous, adaptive optimization across equipment and system levels through advanced analytics, domain expertise, and autonomous agents. It addresses challenges like heterogeneous system modeling, poor data quality, and hidden performance variables. By combining deep HVAC knowledge with AI-driven insights, Univers interprets complex patterns and executes real-time optimization. The result is an Outcome Driven service that transforms traditional system management into an intelligent, data-validated, and collaborative process, improving energy efficiency, system reliability, and operational transparency.
3	4:40pm – 5:00pm	<b>Paper Presentation 3:</b> <i>Slope erosion impact assessment using fuzzy analytical hierarchical process: A case study in Singapore</i> by A/Prof Robert Tong, He Renfei, Zhou Xianglin (Nanyang Technological University) and Alex Shao (Urban Dot Solution Pte. Ltd.)	Slope erosion from extreme rainfall threatens infrastructure and public safety, making systematic assessment vital for resilient city planning. This study introduces a framework using the fuzzy analytical hierarchical process (FAHP). Impact ranges are estimated via an energy-friction model, with infrastructure classified into four categories and 11 sub-factors. Expert-derived weights from eight questionnaires address uncertainty. Applied to 104 verified slopes across Singapore, results show road impacts dominate, while park impacts are rare. The composite impact index is right-skewed, mostly 0.2-0.3. A Malcolm Road case demonstrates application. The framework delivers practical, transparent insights to guide infrastructure resilience and policy decisions.
3	5:00pm – 5:20pm	<b>Paper Presentation 4:</b> <i>Nature-based Green Buildings for a Resilient Future</i> by A/Prof Charles Lee University of Newcastle (Australia)	Nature-based approaches in green building design are gaining traction for achieving sustainability goals such as reducing CO <sub>2</sub> emissions. By integrating ecological processes—like natural ventilation, rainwater harvesting, green roofs, and biodiversity enhancement—these designs lower energy use, boost resilience, and create healthier workplaces. Examples include Singapore's Parkroyal Collection Pickering Hotel with cascading gardens and rainwater systems, Melbourne's Council House 2 with passive cooling and rooftop gardens, Milan's Bosco Verticale's vertical greenery, and China's Nanyang Green Towers' self-sustaining ecosystems. These case studies highlight the commercial, environmental, and health benefits of nature-based design, offering a roadmap toward regenerative, low-carbon, and resilient cities.
3	5:20pm – 5:50pm	<b>Panel Discussion</b> <b>Moderator:</b> Dr Aaron Sham Senior Engineer Enforcement and Structural Inspection Department Building Resilience Group Building and Construction Authority	

Lavender Room (Level 3)			
Special Session 1 - Systems Engineering in the Age of Complexity: Challenges and Solutions			
Special Session	Timing	Author	Synopsis
SS1	2:00pm – 2:20pm	<b>Keynote Presentation:</b> <i>Digital Standard with SysML and LLMs</i> by Mr Robert Ong President INCOSI (Singapore Chapter)	The integration of Artificial Intelligence (AI) into Systems Engineering (SE) has accelerated with Large Language Models (LLMs) like ChatGPT and GPT-4.2 advancements. AI for Systems Engineering (AI4SE) leverages LLMs and prompt engineering to automate tasks such as requirements generation and system architecture modeling. However, adoption faces challenges including model bias, hallucinations, and security concerns, raising questions about reliability. This presentation introduces an AI-agent-based methodology for certification planning, enhancing traceability and semantic links between certification rules, system requirements, and architecture. A reference implementation demonstrates its practical applicability in real-world certification planning scenarios.
SS1	2:20pm – 2:35pm	<b>Paper Presentation 1:</b> <i>Managing the Water Sources through Systems Thinking</i> by Bernard Koh PUB, Singapore's National Water Agency	Singapore, a small island city-state with limited natural water resources, is classified as highly water-stressed despite abundant rainfall, due to insufficient land for storage. As the national water agency, PUB manages the entire water loop through the Four National Taps: Catchment Water, Imported Water, ReWater, and Desalinated Water. Developed in phases, this system integrates engineering, technology, and innovation to ensure sustainability and resilience. However, climate change—through sea level rise and extreme weather—adds new complexities. To secure Singapore's water future, system thinking and integrated management remain crucial in addressing evolving challenges and safeguarding long-term water resilience.
SS1	2:35pm – 2:50pm	<b>Paper Presentation 2:</b> <i>Integrating Nature-positive approach into System Engineering: Resilience in complex urban and coastal environments</i> by Carlijn van der Sluis, Iair Smits, and Joost Noordermeer Witteveen+Bos South-East Asia	The nature-positive approach is emerging globally as a framework for infrastructure that works with natural systems. Witteveen+Bos applies this through its Nature+ methodology, integrating systems engineering to align ecological, social, and technical systems. The approach emphasizes early system analysis, scenario planning, and identifying leverage points where ecological restoration delivers co-benefits such as resilience, biodiversity, and socio-economic value. A key example is the Irtan Resilient Horizons project, linking small-scale restoration to community development. While challenges like silos, limited funding, and short-term planning persist, embedding Nature+ early fosters more adaptive, resilient, and collaborative urban planning across Southeast Asia.
SS1	2:50pm – 3:05pm	<b>Paper Presentation 3:</b> <i>Navigating complexity in Rapid Transit System development with Systems Engineering – Our Rail Story</i> by Dr Samuel Chan, Joyce Hong and Mok Ji Wei Land Transport Authority	Delivering sustainable urban mobility remains a major challenge for city developers. Beyond moving people, transport shapes quality of life, with rapid transit networks forming the backbone supported by over 20 integrated systems. Designing and integrating these require a robust systems engineering approach to meet current and future stakeholder needs. To enhance collaboration, generic system of systems requirements were captured using model-based systems engineering, organized from high-level operational to detailed physical allocations. Applying models early and throughout the lifecycle delivers significant benefits. This presentation highlights the advantages of this transformation, along with lessons learned and future opportunities for sustainable mobility.
SS1	3:05pm – 3:20pm	<b>Paper Presentation 4:</b> <i>Transforming Army Logistics: Leveraging ORSA for Decisive Action in Complex Environments</i> by M66 Lee Chee Kiang MINDEF / SAF	Army logistics today face increasing complexity from contested environments, limited resources, and dynamic missions. Operations Research and Systems Analysis (ORSA) provide data-driven frameworks to enhance efficiency and sustainability. By applying optimization, simulation, and decision modeling, ORSA enables informed logistics decisions, streamlining supply chains, reducing redundancy, and optimizing resource allocation—from fuel and maintenance to transport networks. Modeling tools anticipate demands, identify bottlenecks, and test resilient architectures. ORSA also drives innovation, supporting new technologies, reducing carbon footprint, and promoting long-term sustainability. As a strategic enabler, ORSA transforms data into action, ensuring responsive, cost-effective, and effective logistics across current and future operations.
SS1	3:20pm – 3:40pm		<b>Panel Discussion</b>
SS1	3:40pm – 4:00pm		<b>Tea Break</b>
SS1	4:00pm – 4:15pm		<b>Presentation of Certificates to Senior Chartered Engineers</b>
SS1	4:15pm – 4:30pm	<b>Paper Presentation 5:</b> <i>Systems Engineering in AI Systems</i> by Dr Jonathan Pan Home Team Science & Technology Agency (HTX), Singapore	This talk explores the vital role of systems engineering in the development and deployment of AI systems. With the ever-growing adoption of AI, systems engineering principles would help manage the associated risks such as emergent behaviors, bias, and unpredictable outputs. While challenges like the "black box" nature of AI models and distribution shifts pose significant hurdles, there are opportunities to establish frameworks in the use of AI in systems to ensure safety and resilience.
SS1	4:30pm – 4:45pm	<b>Paper Presentation 6:</b> <i>The Applications of SCADA and IoT from a Systems Engineering Approach</i> by Yao Shih Jih PingComm Pte Ltd	The Internet of Things (IoT) is reshaping traditional SCADA systems, especially in remote telemetry, monitoring, and control. This paper examines whether IoT will replace or augment SCADA, exploring their convergence through systems engineering lens. Key comparisons include architecture, control, lifecycle, testing, integration, and cybersecurity. IoT offers flexibility, scalability, and cloud connectivity, while SCADA provides deterministic control and high reliability. Real-world cases in utilities, facilities automation, and security illustrate independent and hybrid deployments. The study highlights how systems engineering guides design, integration, and operation, ensuring reliable, secure, and maintainable control systems while informing management decisions without compromising core operational requirements.
SS1	4:45pm – 5:00pm	<b>Paper Presentation 7:</b> <i>The Importance of System Engineering from Art of War Perspective</i> by Dr Lee Kar Heng TBSS Group	This paper attempts to explore the Sun Tzu's Art of War in terms of system engineering and operational test and evaluation. The objective is to demonstrate the importance of system engineering that is practiced in engineering applications. In this paper, system engineering will be discussed in terms of Sun Tzu's Art of War. The illustration of system engineering, a multi-discipline practices, will be discussed in terms of a radar design. Finally, this paper attempts to illustrate systems engineering which is cross-discipline between engineering, business, management, using the well-known Art of War.

World Engineers Summit (WES) 2025  
Full Day Session  
Date 23 October 2025 (Thu)  
Time 9.00am - 5.30pm  
Venue Orchard Hotel Singapore

Ballroom 1 (Level 3) Track 1 - Technological Solutions for a Climate-Resilient and Greener Future			
Track	Timing	Author	Synopsis
1	9.00am – 9.20am	<b>Keynote Presentation 2: Adapting to Climate-Ready Mindset – Building a Climate-Resilient Future</b> by Mr Robert Chan Vice President, Water, Asia AECOM	Climate change is a global challenge that demands a multifaceted approach, combining technological innovation with shifts in societal attitudes and behaviors. By bridging the gap between transformative mindset and innovative approaches, attendees will gain insights into strategies for fostering resilience, mitigating climate impacts, and creating a sustainable future. Whether through innovative approaches or behavioral evolution, this session highlights the importance of climate resilience and forward-thinking solutions in addressing the pressing challenges of climate change and will include real life case examples.
1	9.20am – 9.40am	<b>Paper Presentation 1: Resilient and sustainable outcomes through digitalisation and the ISO22372 standard</b> by Prof Liz Varga (University College London), Tang Yuchun and Goh Yang Miang (National University of Singapore)	Resilient infrastructure is vital for societal well-being and environmental sustainability, with assurance increasingly reliant on automated technologies due to the scale of urban systems. While digitalisation delivers timely service data, many smart cities overlook interdependencies between sub-systems, risking disruption and environmental harm. ISO 22372, developed since 2022 with global input and UNDRR collaboration, provides principles to guide cities, governments, and organisations toward integrated, climate-resilient solutions. Adoption supports system-wide resilience assessment, hazard exposure analysis, and proactive adaptation of essential services. Leveraging cloud computing, AI, IIoT, and SG, ISO 22372 enables forward-thinking policies for greener, more sustainable, and disruption-resilient infrastructure.
1	9.40am – 10.00am	<b>Paper Presentation 2: Approaches to Energy Efficient Design in Buildings</b> by Er. Tham Wai Wah, Cheng Sai Keong Albert Chua Wee Liang and Ng Junjie Maritime and Port Authority of Singapore	MPA's new buildings aim to set benchmark in sustainability, architecture and engineering, proving that innovation can enhance comfort while advancing technology. It's design prioritises energy modelling, occupancy patterns and site specific factors over aesthetics, using an optimisation framework to align energy use with on-site renewable capacity. Other than adopting novel passive cooling feature, for example the creating of Venturi Effect in the building massing, energy efficient features like the use of Passive Displacement Ventilation System could improve the building performance. This paper will explore the various approaches through passive and active means in achieving a truly energy efficient building design.
1	10.00am – 10.20am	<b>Paper Presentation 3: A Resilient and Interpretable Predictive Control Framework for Intelligent Building Operations: Integrating MPC, PCEI, and Agentic AI</b> by Teo Seow Hian Ngee Ann Polytechnic	This paper presents a hybrid predictive control framework combining Model Predictive Control (MPC) with Physically Consistent Ensemble Learning (PCEI) and agentic AI to enhance energy-efficient, safe, and intelligent building operations. MPC provides multivariable optimization but is limited by computational demands and model accuracy. PCEI improves predictive reliability through physics-consistent constraints across ensemble models, while agentic AI enables autonomous reasoning and dynamic adaptation. Guardrails ensure compliance and risk mitigation. Validated via simulations and at Ngee Ann Polytechnic's Integrated Facilities Management Lab, the system demonstrates superior energy efficiency, robustness, and regulation-aligned decision-making, supporting scalable, trustworthy smart building control.
1	10.20am – 10.40am	<b>Tea Break</b>	
1	10.40am – 11.00am	<b>Paper Presentation 4: Gasification of Sewage Sludge with the Aim for Reducing Waste to Landfill</b> by Dr Cai Qinging PUB, Singapore's National Water Agency	PUB manages about 300,000 tons of used water sludge annually from four water reclamation plants, incinerated at two facilities to produce 30,000 tons of ash. This ash is sent to Singapore's only offshore landfill, which mainly receives incineration ash and non-incinerable waste. With limited land, the landfill is projected to be full by 2035, while sludge production is expected to double by 2065. To address this, PUB is prioritizing innovative sludge reuse technologies. One approach under study is mono-sludge gasification, which converts sludge into slag—a material with potential applications in the construction industry—helping reduce reliance on landfill disposal.
1	11.00am – 11.20am	<b>Paper Presentation 5: Integrated Biofouling Management: Coatings, Cleaning, and Compliance Across the Vessel Lifecycle</b> by Marta Santiago Redondo (Pinturas Hempel SAU), Viktor Avlonitis, and Francisco Aprile (Hempel A/S) and Anna Pasiou (Hempel Coatings)	With maritime decarbonization and biosecurity compliance accelerating, biofouling management is now strategic. Antifouling coatings form the foundation of control systems, influencing performance for over five years. This paper reviews advances in self-polishing, foul-release, and hybrid coatings, stressing alignment with vessel profiles, service intervals, and environmental conditions. It examines in-water cleaning methods—brush, cavitation, water jetting—with or without debris capture, noting compatibility challenges that affect coating lifespan and compliance. Performance monitoring, inspection tools, and dry docking practices are also discussed. Antifouling coatings are positioned as strategic enablers of efficient, compliant, and sustainable operations, requiring integration with in-service technologies for optimal lifecycle performance.
1	11.20am – 11.40am	<b>Paper Presentation 6: Agent-Based Navigational Risk Modeling as a Tool for Climate-Resilient Maritime Traffic and Infrastructure Planning</b> by Derek Eden, Shubhneet Singh and Tom Foster DHI Water & Environment, Inc.	Climate change is increasing navigational risks for maritime traffic and infrastructure. This paper introduces SIREN, an agent-based modelling framework integrating AIS traffic data with geomorphenal forcings—winds, waves, currents, sedimentation, and visibility—to assess evolving grounding, collision, and allision risks. SIREN evaluates climate stressors like sea level rise, storms, and shifting meteocean conditions in open and constrained waters, including vessel failures and drifting. A Papua, Indonesia case study applies SIREN to a proposed LNG FSRU, analysing safety during approach, berthing, and sediment-affected channels. By identifying risk hot spots, SIREN supports climate-resilient navigation planning, reducing environmental, operational, and safety risks in sensitive marine environments.
1	12.30pm - 1.30pm	<b>Networking Lunch</b>	

Ballroom 1 (Level 3) Special Session 2 - Asset Management for Innovation and Sustainability			
Special Session	Timing	Author	Synopsis
SS2	1.30pm – 2.00pm	<b>Keynote Presentation: Asset Management for Innovation and Sustainability</b> by A/Prof Ng Bor Kiat Associate Professor Singapore Institute of Technology	In today's era of rapid technological disruption, climate change, and shifting stakeholder expectations, asset management must evolve beyond cost and uptime. This presentation introduces a framework integrating innovation and sustainability into strategy. The speaker will show how IoT, AI, and digital twins can predict outcomes, enhance efficiency, reduce environmental impact, and extend lifecycles—transforming assets into drivers of value and resilience. Participants will learn to align asset management with ESG principles, turning compliance into innovation. With examples and a roadmap, this presentation equips leaders to future-proof operations, achieve sustainability targets, and create long-term, responsible value.

Ballroom 2 (Level 3) Track 2 - Urban Mobility Innovations for Sustainable Cities (Smart and Green Railway)			
Track	Timing	Author	Synopsis
2	9.00am – 9.35am	<b>Keynote Presentation 2: Sustaining a World Class Metro Network in Singapore</b> by Mr Jeffrey Sim Vee Ming Group Chief Executive Officer SBS Transit Ltd	His presentation, Sustaining a World Class Metro Network in Singapore, reveals the fundamental principles that underpin SBS Transit Rail's ability to sustain two decades of operational excellence, in the areas of safety, reliability, customer experience, sustainability, and innovation. He will also share insights of how the team at SBS Transit continues to push boundaries and incubate innovative solutions for Urban Mobility Systems, including a glimpse into recently implemented technologies to deliver safe, reliable, and inclusive journeys for all.
2	9.35am – 9.50am	<b>Q&amp;A Moderator:</b> A/Prof Ng Bor Kiat Associate Professor Singapore Institute of Technology	
2	9.50am – 10.10am	<b>Paper Presentation 1: Bridging new frontier: Smart and Green Innovations in Singapore Rail Systems</b> by Melvyn Thong, Joyce Hong and Mok Ji Wei Land Transport Authority	Singapore's Rapid Transit System is vital to daily mobility, with smart and green technologies key to enhancing resilience, overcoming legacy constraints, and advancing sustainability. Beyond redundancies and asset upgrades, AI-driven condition monitoring enables fault prediction and faster recovery. Smart systems modernise fare collection, employ AV/VR for design, and digitalise depots for automated maintenance. In line with the SG Green Plan 2030, initiatives include energy recovery, eco-materials, recyclability, modular design, and AI-optimised operations. Success depends on close collaboration between operations and technology teams, coordinated governance, and structured rollouts—building a resilient, intelligent, and sustainable MRT system for the future.
2	10.10am – 10.30am	<b>Paper Presentation 2: Harnessing the Value of Data: Redefine Rail Asset Management for Sustainable Cities</b> by Tang Yu Feng Hitachi Rail GTS Singapore	Global cities face rising mobility demand, climate goals, and infrastructure renewal needs. Asset management must evolve into integrated ecosystems leveraging data. Hitachi Rail's HMAX platform unifies data from trains, signalling, and infrastructure, giving operators a holistic view for smarter, sustainable decisions. Results include 20% fewer delays, 15% lower maintenance costs, 30% energy savings, and 30% longer asset lifespans via AI forecasting, optimization, and proactive monitoring. With its open architecture, HMAX fosters collaboration among operators, OEMs, and asset owners. Aligned with Singapore's smart mobility vision, it enables industry partners to unify rail data and collectively achieve sustainability and reliability goals.
2	10.30am – 11.00am	<b>Tea Break</b>	
2	11.00am – 11.20am	<b>Paper Presentation 3: MaaS as a Catalyst for Sustainable Mobility: Insights from Deutsche Telekom's GoodRide Project</b> by Silas Wong Siemens Mobility Pte Ltd	This presentation will explore the multi-stakeholder dynamics, key lessons learned, and critical success factors in driving behavioral change through MaaS. By drawing parallels between Telekom's experience and South East Asia's unique mobility landscape, actionable insights to accelerate the region's transition towards an integrated and sustainable MaaS ecosystem will be provided.
2	11.20am – 11.40am	<b>Paper Presentation 4: DfAM as a Catalyst for Railway Innovation and Sustainability</b> by A/Prof Gan Hiong Yap Singapore Institute of Technology	What if the railways of tomorrow could be designed to be smarter, greener, and more resilient—right from the start? Additive Manufacturing (AM) is no longer limited to prototyping: it is transforming how we design, build, and maintain railway systems. This talk examines how Design for Additive Manufacturing (DfAM) acts as a driver for innovation and sustainability from hybrid DPB precision parts that push the boundaries of performance, to digital passports that offer complete traceability and lifecycle insights. To DfAM-enabled sensors that turn assets into intelligent systems. By reducing waste, speeding up development, and enabling bold new designs, DfAM can keep railways on course toward a smarter and more sustainable future.
2	11.40am – 12.00pm	<b>Paper Presentation 5: Urban Mobility Innovations for Sustainable Cities: A Data-Driven Approach on the Mutiara LRT Project in Penang</b> by Yeap Beow Heng (AIS-Hill Pte Ltd), Rezani Ramli (Asia Infrastructure Solutions Singapore Pte Ltd) and Poh Seng Tiok (Asia Infrsolutions Sdn Bhd)	The Mutiara LRT (MTL), Penang's first metro system, spans 24.8km with 20 stations, enhancing connectivity, reducing congestion, and supporting sustainable urban growth. AIS serves as Lead Designer for Package V7, covering an elevated station and depot facilities, coordinating multidisciplinary design under an accelerated timeline. Autodesk Construction Cloud (ACC) is the project's central data platform, while AIS integrates Bentley ProjectWise and iTwin for seamless file management. 3D/4D modeling, geospatial and train alignment simulations. These digital workflows enable informed decision-making, optimize depot design and operations, and demonstrate how integrated design and real-time collaboration can advance efficient, sustainable urban mobility infrastructure.
2	12.00pm - 12.20pm	<b>Panel Discussion</b>	
2	12.20pm - 1.30pm	<b>Networking Lunch</b>	

Ballroom 2 (Level 3) Special Session 3 - Vision Zero for a Sustainable and Safer Future			
Special Sesion	Timing	Author	Synopsis
SS3	1.30pm – 2.15pm	<b>Keynote Presentation: Vision Zero: How Infrastructure Resilience achieves Workplace Safety</b> by Prof Liz Varga Professor of Complex Systems Dept of Civil, Environmental & Geomatic Engineering University College London	In 2015, safety thinking shifted from Safety I (preventing things from going wrong) to Safety II (ensuring things go right). Vision Zero aligns with Safety II through proactive measures that prevent, absorb, and adapt to hazards. ISO 22372 on resilient infrastructure emphasises protecting people amid growing interdependencies. Principle 2, Proactively Protected, supports this by embedding higher safety requirements via risk management, planning, stress testing, and safe-to-fail design. Approaches like secured by design and digitalisation enable early warnings, risk assessments, and rapid mitigation. This holistic, collaborative approach strengthens organisational resilience, safeguards connected networks, and ensures safe, high-quality service delivery.

Ballroom 3 (Level 3) Track 4 - Future-Proofing Engineers Through Educational Technology and Skill Development			
Track	Timing	Author	Synopsis
4	9.00am – 9.30am	<b>Keynote Presentation 1: Developing Future-Proof Engineers by Fostering Solution-Mindedness with Human and Digital Skills</b> by Mr Toh Ser Khoon Senior Director, Engineering Singapore Polytechnic	SP Engineering cultivates solution-minded engineers through the CDIO (Conceive, Design, Implement, Operate) approach. In partnership with industry and community, SP engineering students solve authentic problems in workplace and community settings throughout their polytechnic education. Students integrate technical expertise with professional, communication and teamwork skills. These experiences foster creativity, empathy and adaptability, preparing future engineers to thrive in a rapidly evolving landscape and contribute meaningfully to society through innovative and sustainable solutions.
4	9.30am – 9.50am	<b>Paper Presentation 1: Evolution in Drafting for Civil Infrastructure Works - Will the Skillsets Today Still Be Relevant Tomorrow?</b> by Ridwan Ramli and Vincent Lo Land Transport Authority	Civil engineering has evolved from meticulous 2D hardcopy drafting to Digital Engineering and BIM, easing errors and editing. However, fewer engineers now enter the workforce with strong skills to produce clear, accurate technical plans, and reliance on advanced software can create a false sense of security. This paper explores ways to retain and cultivate essential drafting competencies during the transition from 2D/3D CAD to BIM. A roadmap is proposed to align expectations and training for new engineers, fostering appreciation for conveying design intent effectively and recognizing those who maintain strong foundational drafting skills in the digital era.
4	9.50am – 10.10am	<b>Paper Presentation 2: Authentic Learning and Skill Development in Carbon Management Education</b> by Dr Yang Yi National University of Singapore	Engineering education is vital in equipping future professionals to tackle climate change and sustainable urbanisation. This paper introduces <i>Carbon Management in the Built Environment</i> , a new course at the National University of Singapore that blends theory with practice through authentic learning and industry-informed content. Students engage in simulations, debates, and case-based learning, culminating in an authentic project as Sustainability Managers enhancing NUS's carbon strategies. Feedback-driven assessment fosters continuous improvement, with notable learning gains and career impact—students secured sustainability internships in consulting and public agencies. The course demonstrates a scalable model for future-proofing engineers in a rapidly decarbonising world.
4	10.10am – 10.30am	<b>Paper Presentation 3: Future-Proofing Engineers through AI-Human Collaboration in Biomedical Engineering Education</b> by Leo Chen Huei, Luqman Naqib Mohd Azhar, Leo Hwa Liang and Rai Bina National University of Singapore	The rapid rise of generative AI compels engineering educators to prepare students for AI-integrated workplaces. While AI is reshaping engineering, current biomedical engineering assignments often overlook critical, responsible use. To address this, two modules—BN1111 (medical device report) and BN4701 (storytelling for serious games)—were redesigned to treat AI as a collaborator rather than a shortcut. Students used AI to generate content but had to verify accuracy, refine outputs, and integrate evidence and stakeholder input. Outcomes included critical evaluation of device specifications and empathetic, culturally sensitive narratives. Findings showed most students used instruction-based prompting, highlighting emerging AI-human collaboration skills.
4	10.30am – 11.00am	<b>Tea Break</b>	
4	11.00am – 11.20am	<b>Paper Presentation 4: Contextualised Learning via Enquiring, Answering, and Reflecting (CLEAR) – Lessons Learnt From a Five-Year Journey Across Subjects and Institutes of Higher Learning</b> by A/Prof Tay En Rong, Stephen National University of Singapore	Student-Generated Questions (SGQs) support comprehension by requiring content understanding before question formulation, aligning with constructivist and inquiry-based learning frameworks. Engaging higher levels of Bloom's taxonomy, SGQs enhance learning but are often limited to multiple-choice questions. To extend impact, we developed CLEAR—Contextualised Learning via Enquiring, Answering, and Reflecting—which emphasises open-ended, industry-based questions for authentic learning and assessment. Implementations across courses and institutions show CLEAR enhances exam performance, engagement, and educator motivation. Evidence includes assessment scores, feedback, and student artefacts. Case studies in andragogy and interdisciplinary teaching highlight CLEAR's role in future-proofing engineers through technology-enhanced, skill-focused education.
4	11.20am – 11.40am	<b>Paper Presentation 5: Equipping Engineers with key skills for Technology Entrepreneurs</b> by Andy Wee IES-INCA	In today's fast-paced technological landscape, engineers need more than technical expertise—they require technology entrepreneurship skills to transform ideas into marketable products and services. Technopreneurial engineers drive innovation, create economic growth, and gain competitive advantage. Key skills include design thinking for user-centered solutions, business acumen to navigate markets, networking with stakeholders and investors, and adaptability to iterate ideas under uncertainty. By combining technical knowledge with entrepreneurial spirit, engineers can develop novel solutions, lead in competitive environments, and contribute to job creation. Cultivating these skills enables engineers to unlock their full potential and thrive in a technology-driven world.
4	11.40am – 12.00pm	<b>Paper Presentation 6: Energy Literacy and the Six Pillars of Deep Decarbonisation</b> by Dr Goh Tian and Prof Ang Beng Wah National University of Singapore	Education on climate change is closely tied to energy literacy, yet this link is often overlooked in sustainability education. Since energy use accounts for about 75% of global GHG emissions, addressing energy production and consumption is essential for climate solutions. However, energy literacy often remains peripheral due to sustainability's multidisciplinary scope. Engineering disciplines are well placed to highlight this relationship, as many mitigation strategies involve technological systems. We propose the Six Pillars of Deep Decarbonisation framework, which helps students systematically analyse energy-related climate solutions, from efficiency to policy and technology, through case studies, scenario analysis, and sustainability applications.
4	12.00pm - 12.20pm	<b>Paper Presentation 7: Scaffolding Project-Based Learning in Embedded Systems through Simulation and Templates</b> by Dr Rajesh Chandrasekhara Panicker National University of Singapore	Project-based learning equips future engineers with both foundational knowledge and higher-order thinking skills by engaging students across Bloom's taxonomy. In computer architecture and embedded systems, hardware testing often poses barriers; simulation environments address this by enabling iterative design, debugging, and refinement with immediate feedback. Code templates offer scaffolding that diminishes as students gain independence, preparing them for complex designs. Our approach has improved project success, achievement, and learning outcomes, enabling implementations like processors and neural accelerators. Building on this, we now extend the pedagogy with large language models to accelerate testbench design and foster rapid prototyping skills.
4	12.20pm - 1.30pm	<b>Networking Lunch</b>	

Ballroom 3 (Level 3) Track 4 - Future-Proofing Engineers Through Educational Technology and Skill Development			
Track	Timing	Author	Synopsis
4	1.30pm – 2.00pm	<b>Keynote Presentation 2: Future Proof by Design: Balancing Breadth, Depth, and Industry Relevance in Engineering Education</b> by Prof Pang Sze Dai Dean's Chair, Associate Professor Deputy Head (UG and Student Life, BTEch) Department of Civil and Environmental Engineering	This keynote explores how to future-proof engineers by balancing broad-based foundations with disciplinary depth at the undergraduate level. It introduces a competency framework emphasizing AI/data fluency, sustainability literacy, digitalization, automation readiness, and professional skills. Engineering accreditation can drive innovation by aligning outcomes, assessments, and experiential learning with industry needs. The talk highlights NUS College of Design and Engineering's reforms—integrating AI+X, sustainability, and digitalization into flexible, interdisciplinary pathways. It also stresses continuous industry collaboration through advisory panels, capstones, and internships to validate skills, refresh curricula, and ensure graduates remain resilient, adaptable, and ready to create real-world impact.

SS2	2.00pm – 2.20pm	<b>Paper Presentation 1:</b> <b>Engineering a Sustainable Future: Harnessing Predictive Asset Intelligence to drive Resilience and Innovation in Asia Pacific</b> by Mr Domenic Fonte (AssetFuture) and Mr Chee Kit Ho (Cushman & Wakefield)	As Asia Pacific faces increasing climate risks, aging infrastructure, and rising ESG expectations, engineering must evolve beyond traditional roles. This session explores how predictive asset intelligence is transforming asset management—enabling smarter, data-driven decisions that reduce lifecycle costs, carbon emissions, and operational risk. By integrating platforms like AssetFuture with systems thinking, engineering leadership, and global frameworks such as ISO 55001 and the UN SDGs, organizations can shift from reactive maintenance to proactive, sustainable stewardship. Featuring a real-world case study, this presentation reveals how smart asset strategies future-proof infrastructure and position engineers as strategic enablers of resilient, intelligent systems.
SS2	2.20pm – 2.40pm	<b>Paper Presentation 2:</b> <b>Assets to Impact: The Strategic Role of Engineers in ESG and Asset Management</b> by Mr Chee Kit Ho Cushman & Wakefield	This presentation examines how asset management can strategically support sustainability and ESG goals, emphasizing the role of engineers in aligning technical systems with global standards such as ISO 55001 and the UN Sustainable Development Goals (SDGs). It presents structured frameworks and maturity models to guide the integration of lifecycle thinking, circular economy principles, and social impact considerations into asset strategies. The paper highlights the evolution from compliance-based to regenerative asset management, supported by predictive technologies and performance indicators. Ultimately, it advocates for a systems-based approach where engineers lead in transforming assets into catalysts for sustainable, resilient, and socially aligned outcomes.
SS2	2.40pm – 3.10pm	<b>Panel Discussion</b>	
SS2	3.10pm – 3.30pm	<b>Tea Break</b>	
SS2	3.30pm – 3.50pm	<b>Paper Presentation 3:</b> <b>AI-Assisted Periodic Structural Inspection for Buildings</b> by Dr Marcus Chen (Vebits AI), and Koh Hui Yi, and Er. Tang Pei Luen (JTC Corporation)	Periodic Structural Inspections (PSI) in Singapore face challenges from a shortage of qualified civil/structural PEs and labour-intensive processes. This paper introduces an AI-assisted system to digitalise and streamline PSI, improving accuracy and efficiency. Using a mobile app and optional 360° camera, high-resolution images are analysed in real time to detect defects with over 90% accuracy. Defects are automatically tagged to digital floor plans, enabling instant report generation and eliminating manual referencing. Field trials showed a 75% reduction in inspection time, allowing same-day reports. By minimising human error, the system boosts safety, prevents structural failures, and delivers significant productivity gains.
SS2	3.50pm – 4.10pm	<b>Paper Presentation 4:</b> <b>Asset Management for Innovation and Sustainability through Green CBTC Project</b> by Leow Wee Lee (SMRT Trains Ltd) and Carrie Zhang (Hitachi Rail GTS Singapore)	The Green CBTC Next Gen Project, led by SMRT with Hitachi Rail, advances urban transit decarbonisation through data-driven, systems-level innovation. Combining advanced Communications-Based Train Control with real-time analytics, it enables precise movement control, energy-efficient driving, and seamless trainborne-wayside coordination. Optimised operations—smoother acceleration, extended coasting, reduced braking—deliver measurable traction energy savings. Piloted on Singapore's North-South and East-West Lines, Green CBTC demonstrates how digital signalling upgrades can enhance efficiency while cutting emissions. Aligning with national and global net-zero goals, it offers a replicable model for low-emission transit. Embedding sustainability in signalling, it sets a benchmark for modern, resilient, eco-conscious rail networks.
SS2	4.10pm – 4.30pm	<b>Paper Presentation 5:</b> <b>A New Generation of Asset Management Standards</b> by Er. Seow Kang Seng IES Asset Management Technical Committee	The ISO 55000 family of Asset Management standards, first published in 2014, defines good practices and requirements for Asset Management Systems. On 3 July 2024, ISO launched updated editions of ISO 55000 and ISO 55001, along with new guidance. Most were adopted as Singapore Standards by Enterprise Singapore in July 2025. This new generation of standards strengthens alignment with organisational objectives and addresses today's growing asset management complexity. This presentation will highlight key enhancements and guidance supporting a shift from reactive to proactive, data-driven asset management to deliver sustainable value integrating financial, environmental, and social considerations.
SS2	4.30pm – 4.50pm	<b>Paper Presentation 6:</b> <b>Reliability-Centred-Maintenance for Cost-Effective Rail Asset Management</b> by Pang Yeow Wei (SBS Transit Rail) and Loo Jang Wei (JW Consultancy)	Effective asset management is vital for sustaining reliable rail systems, where performance, safety, and public confidence depend on critical infrastructure availability. Reliability-Centred Maintenance (RCM) provides a proven framework to optimize asset management by identifying key functions, analyzing potential failures, and aligning maintenance with operational risks. This presentation will share how SBS Transit applies RCM in its rail systems and collaborates with JW Consultancy to train engineers. It will also highlight the training pedagogy and showcase maintenance reviews conducted by SBS Transit using the RCM methodology.
SS2	4.50pm – 5.20pm	<b>Panel Discussion</b>	

SS3	2.15pm – 3.00pm	<b>Paper Presentation 1:</b> <b>Vision Zero and Design for Safety: The Role of Engineers in Achieving Safer Outcomes</b> by Mr Chan Yew Kwong Workplace Safety & Health Council	Vision Zero (VZ), launched in Sweden in 1997, seeks to eliminate fatalities and serious injuries through a safe system approach, placing responsibility on designers rather than users. In Singapore, the Workplace Safety and Health (Design for Safety) Regulations, introduced in 2015, require designers to address risks early in construction projects. Design for Safety (DFS) aims to "design out" hazards, improving safety across all industries. Engineers, with their technical expertise, can embed WSH considerations into designs, enhancing safety, health, and quality of life. This presentation explores how adopting DFS principles and a VZ mindset can achieve safer outcomes and advance VZ goals.
SS3	3.00pm – 3.30pm	<b>Tea Break</b>	
SS3	3.30pm – 4.00pm	<b>Paper Presentation 2:</b> <b>From Hazard to Zero Harm: Vision Zero in the Process Industry</b> by Er. Lucas Ng Jurong Island Vision Zero Cluster	The process industry faces high risks from complex systems, hazardous materials, and potential catastrophic incidents. Vision Zero, first implemented in Sweden in 1997 for road safety and expanded to workplace safety by ISA in 2017, aims to eliminate all fatalities and serious injuries. Singapore adopted Vision Zero in 2015, with the Jurong Island Vision Zero Cluster launched in 2018 to unite industry stakeholders. This presentation examines hazards, lessons from major incidents, and strategies for operationalising Vision Zero—leadership, worker engagement, hazard elimination, safe design, and digital tools. It advocates a proactive safety culture where no level of workplace harm is acceptable.
SS3	4.00pm – 4.30pm	<b>Paper Presentation 3:</b> <b>Safety in Equipment Design</b> by Ms Clare Chay Ministry of Manpower	Through the use of accident case studies, the presentation will illustrate how incorporating safety into an equipment's design is more effective in managing risks to users, as compared to the addition of risks controls as an afterthought.
SS3	4.30pm – 5.00pm	<b>Paper Presentation 4:</b> <b>Battery Storage Systems - How could we make it safer?</b> by Mr Felipe Ong BS&B Safety Systems	Battery Energy Storage Systems (BESS) support renewable integration and grid stability, but safety gaps have led to severe deflagration incidents. Notable cases include the 2019 Arizona explosion injuring firefighters, the 2020 Liverpool blast scattering debris 70 ft, and the 2021 China incident killing two firefighters. Common causes include thermal runaway, inadequate gas detection, poor ventilation, and ineffective fire suppression, compounded by inconsistent standards and limited regulation. This abstract highlights critical BESS safety deficiencies and calls for comprehensive risk assessments, improved monitoring, explosion protection, and harmonised safety regulations to prevent future incidents and ensure safe, reliable operation of energy storage systems.
SS3	5.00pm – 5.30pm	<b>Paper Presentation 5:</b> <b>Perception AI for Human-Robot Collaboration in the Building and Construction Sector</b> by Mr William Lee Stealth AI Startup	The building and construction sector, long reliant on manual labour, is poised for transformation through Perception AI—combining visual sensing, spatial understanding, and context-aware cognition in collaborative robots (cobots). Unlike factory robots, construction cobots must navigate unstructured, unpredictable sites with humans, variable materials, and environmental noise. Perception AI enables real-time 3D mapping, object recognition, gesture interpretation, and semantic scene analysis for safe, adaptive teamwork. Applications include autonomous inspection, visual-based material handling, and learning by demonstration. Using Singapore as a model, this framework outlines a roadmap toward Industry 5.0, enhancing safety, precision, and human-centric autonomy in construction through scalable, AI-enabled robotics.
SS3	5.30pm – 6.00pm	<b>Panel Discussion</b> <b>Moderator:</b> Ms Jaime Lim Director, Major Hazards Department Director, OSH Specialist Department Occupational Safety and Health Division Ministry of Manpower	

4	2.00pm – 2.20pm	<b>Paper Presentation 8:</b> <b>GuIDES (Guided Inquiry and Dialogue Education System): Leveraging Large Language Models to Advance Critical Thinking and Skill Development in Engineering Students</b> by Shi Anqi, Wang Hanmo, Luo Jihao, Christian Pecaut, Low Kaizen, A/Prof Tay En Rong, Stephen, and Dr Alexander Lin	Preparing future engineers requires blending disciplinary knowledge with critical thinking, adaptability, and responsible use of emerging technologies. This study introduces the Guided Inquiry and Dialogue Education System (GuIDES), a Large Language Model (LLM)-enabled platform integrated into PE2203: Quality and Productivity Management at NUS. Unlike conventional web research or ad hoc ChatGPT use, GuIDES scaffolds three tasks: prompt design, LLM-facilitated analysis, and verification with feedback and reflection. Comparative analysis shows GuIDES raised presentation scores by 22.6% and quiz performance by 20.2%, while enhancing engagement, integration, and reflection. GuIDES demonstrates how structured AI integration can future-proof engineering education.
4	2.20pm – 2.40pm	<b>Paper Presentation 9:</b> <b>Equipping students with sustainability mindset and competencies</b> by Dr Cindy Lee National University of Singapore	Chemical engineers are vital in building a sustainable world through science, systems thinking and digital tools. To prepare students for this role, our department has embedded sustainability throughout the curriculum, including two new courses: <i>Circular Economy in the Chemical Industry</i> and <i>Green Chemical Process and Technology</i> . These cover LCA, RCN, IS, green chemistry and PI, equipping students with practical industry skills. Using problem-based learning, group projects, active learning, case studies and industry engagement, the courses foster problem-solving, collaboration and motivation while bridging theory with real-world applications for both undergraduate and postgraduate students.
4	2.40pm – 3.00pm	<b>Paper Presentation 10:</b> <b>Training the Future using Open Protocol BMS to Elevate Facilities Management in Educational Institutions</b> by Teo Seow Hian, Xie Yushan and Pang Ka Rong Ngee Ann Polytechnic	Tertiary campuses in Singapore rely on decades-old proprietary Building Management Systems (BMS), limiting interoperability and modern functionality. This paper explores a gradual migration to Open-Protocol BMS (OPB), enabling cost savings, adaptability, and integration with AI analytics, predictive maintenance, and IoT. Paired with Digital Twin technology and advanced data analytics, OPB can modernize educational facilities, supporting national sustainability goals like the Singapore Green Plan and creating living laboratories for future built environment professionals. The research is informed by three sequential surveys, prototyping at Ngee Ann Polytechnic, and stakeholder engagement with JTC Corporation, demonstrating the feasibility and benefits of this transition.
4	3.00pm – 3.30pm	<b>Tea Break</b>	
4	3.30pm – 3.50pm	<b>Paper Presentation 11:</b> <b>Triangulated Learning Framework to Enhance Conceptual Understanding and Competency Development in Mechanics</b> by Dr Christian Della (University of Glasgow Singapore), and Zhang Linyun, Vincent Chan, Jake Low, and Muhammad Nuur Hakim Bin Roslan (Singapore Institute of Technology)	This paper presents a Triangulated Learning Framework to enhance conceptual understanding and core competencies in undergraduate Engineering Mechanics and Mechanics of Solids. Integrating analytical modelling, real experimentation, and virtual simulation, the framework unifies three complementary learning modalities. Students solve problems using first principles, verify results with finite element analysis, and validate outcomes through hands-on testing. Simulation tools further explore system behavior. Aligned learning activities, including problem-solving labs, simulations, and project-based learning, foster technical proficiency, critical thinking, and self-directed learning. This scalable, competency-focused approach promotes verification and validation, metacognitive reflection, deeper engagement, and prepares students for real-world engineering practice.
4	3.50pm – 4.10pm	<b>Paper Presentation 12:</b> <b>Teaching Soft Robotics at Large-Scale Class with Blended Learning</b> by Dr Zhang Hongying National University of Singapore	In engineering education - particularly soft robotics - it is vital to balance rigorous theory with practical skills that foster innovation. Managing classes of over 150 students poses challenges in delivering equitable hands-on experiences, so I adopt a blended learning approach to create an inclusive, interactive environment. One topic focuses on origami-inspired soft robots. Students first learn through tutorials and videos, then apply digital tools such as SolidWorks, Grasshopper, and MATLAB for modeling and simulations. In-person sessions emphasize theory, discussion, and problem-solving. This integration of digital resources with face-to-face learning empowers students to take ownership while ensuring continuous support.
4	4.10pm – 4.30pm	<b>Paper Presentation 13:</b> <b>Capstone Learning in Action: Ten Years of the Systems Design Project at ISEM</b> by Dr Vincent Kuo National University of Singapore	The Systems Design Project (SDP) course (IE3100R) at the National University of Singapore has been the flagship capstone for industrial and systems engineering undergraduates for over a decade. Reviewing more than 200 projects (2014–2025), this study examines evolving themes, industry collaborations, and technologies. Projects span healthcare, logistics, finance, manufacturing, and sustainability, with topics such as supply chain optimization and carbon reduction. Methods progressed from optimization to machine learning and digital twins, using MATLAB, Python, R, and specialized platforms. Findings show strong alignment with accreditation outcomes and highlight SDP as a replicable model linking academia, industry, and applied innovation.
4	4.30pm – 4.50pm	<b>Paper Presentation 14:</b> <b>System Engineering for all Engineering Courses</b> by Dr Lee Kar Heng TBSS Group	University engineering courses include specialized modules from various domains such as business, law, management and humanities. Engineers must not only master technical depth but also develop the right attitude, as they are involved across the system lifecycle - from mission planning and acquisition to operation and retirement. Effective solutions must deliver suitability and effectiveness in real-world environments, a key challenge in mission-critical applications. This paper highlights the need to introduce systems engineering early in engineering education, discusses course objectives, contents and case studies, and examines the benefits and challenges of implementing such a module during foundation years.
4	4.50pm – 5.20pm	<b>Panel Discussion</b>	

## World Engineers Summit (WES) 2025

### Technical Site Visits

<b>Technical Tour 1: Punggol Digital District</b> <b>A Smart District for a Smart Future</b>		
<b>Date</b>	24 October 2025 (Fri)	
<b>Time</b>	9.30am to 11.30am	
<b>Address</b>	88 Punggol Way, Singapore 829913	
<b>Description of Guided Tour</b>	<p>Guided Tour of Punggol Digital District</p> <p>Punggol Digital District, master planned and developed by JTC, is a 50-hectare business park where innovation, education, and community converge. The district serves as a hub for emerging technologies, including cybersecurity, artificial intelligence, robotics, and fintech companies.</p> <p>Designed to integrate with Singapore Institute of Technology (SIT)'s campus, the district creates opportunities for partnership between industry and academia. This collaborative ecosystem enables businesses to ideate, test, and develop new solutions and products.</p> <p>Learn about Punggol Digital District (link: <a href="https://www.jtc.gov.sg/punggoldigitaldistrict/about">https://www.jtc.gov.sg/punggoldigitaldistrict/about</a>)</p>	
<b>Pick-up and Drop-off Location</b>	Orchard Hotel Singapore <i>To meet and depart at 8.45am</i>	
<b>Registration Fee</b>	S\$45 (subject to 9% GST)	
<b>Target Audience</b>	Engineers, Professional and Public	
<b>Itinerary</b>	<b>Time</b>	<b>Programme</b>
	9.30am	Delegation to gather at Meeting Point (In front of Bread Talk) <i>Address: 88 Punggol Way, Singapore 829913</i>
	9.30am to 10.30am	<b>Topics:</b> Punggol Digital District – The vision of the future  <b>Presenter:</b> Er. Gina Foo Director, New Estates Division 2
	10.45am	Q&A Session
	11.15am	End of Tour

<b>Technical Tour 2: SingSpring Desalination Plant (SSDP)</b> <b>Introduction of SingSpring Desalination Plant background, processes, operation &amp; maintenance</b>		
<b>Date</b>	24 October 2025 (Fri)	
<b>Time</b>	2.00pm to 4.00pm	
<b>Address</b>	90 Tuas South Ave 1, Singapore 637493	
<b>Description of Guided Tour</b>	<p>Owned by Keppel Infrastructure Trust, SingSpring Desalination Plant is Singapore's first large-scale seawater desalination plant, which commenced commercial operations in December 2005. SingSpring Desalination Plant is capable of supplying up to 136,380 m3 of desalinated potable water per day, which represents approximately 7% of Singapore's water needs.</p> <p>SingSpring Desalination Plant utilises cost and energy-efficient reverse osmosis technology. At the time of its completion, it was the largest membrane-based seawater desalination plant in the world with one of the largest reverse osmosis trains.</p> <p>The SingSpring Plant contributes to one of the "Four National Taps" in PUB's strategy to meet Singapore's water needs. The "Four National Taps" are local catchment water, imported water from Johor, NEWater and desalinated water. The SingSpring Plant continues to be an important facility for PUB to ensure sufficient water resources for Singapore, especially during periods of low rainfall.</p>	
<b>Pick-up and Drop-off Location</b>	Orchard Hotel Singapore <i>To meet and depart at 1.00pm</i>	
<b>Registration Fee</b>	S\$45 (subject to 9% GST)	
<b>Target Audience</b>	Engineers, Professional and Public	
<b>Itinerary</b>	<b>Time</b>	<b>Programme</b>
	2.00pm to 2.10pm	Delegation to gather at Meeting Point (Guardhouse) & Security Clearance <i>Address: 90 Tuas South Ave 1, Singapore 637493</i>
	2.10pm to 3.20pm	<b>Topics:</b> 1. Intake area + DAFF 2. Filtered Water pumping station / Cartridge filters area 3. RO Building 4. Post treatment & PW pumping station 5. Admin building (Control Room & Roof top)  <b>Presenter:</b> Tan Yu Ming Head, Water Plants of Sustainability Solutions Department, Keppel Infrastructure Division
	3.20pm	End of Tour