

# ABSTRACT & PROGRAMME BOOK

WORLD RESEARCH AND INNOVATION CONVENTION  
ON ENGINEERING AND TECHNOLOGY 2026



**Theme:**

Digital Transformation in  
Engineering and Technology:  
Shaping the Future of  
Sustainable Innovation



**Venue:**

Bayview Hotel Langkawi



**Date:**

18-19 May 2026

# PROGRAMME BOOK & ABSTRACT



## WORLD RESEARCH AND INNOVATION CONVENTION ON ENGINEERING AND TECHNOLOGY WRICET 2026

18 – 19 MAY 2026  
LANGKAWI, KEDAH, MALAYSIA

***“Digital Transformation in Engineering and Technology:  
Shaping the Future of Sustainable Innovation”***

### ***Organised by***

Malaysian Society for Engineering & Technology  
Federation of Engineering Institutions of Islamic Countries – KLRO

Organiser



Supporter



# OPENING MESSAGE

## WRICET2026 WELCOMING ADDRESS

Assalamualaikum wr. wb.

In the name of Allah, the Most Gracious and Most Merciful.

On behalf of the organising committee, it is my great pleasure to welcome all distinguished researchers, academicians, industry experts, innovators, and students to the World Research and Innovation Convention on Engineering and Technology 2026 (WRICET2026), held on 18 – 19 May 2026 at the beautiful Bayview Resort Hotel, Langkawi, Kedah, Malaysia.



WRICET2026 is proudly organised by the Malaysian Society for Engineering and Technology (MySET) in collaboration with the Federation of Engineering Institutions of Islamic Countries, Kuala Lumpur Regional Office (FEIIC-KLRO). This convention serves as a global platform for knowledge exchange, interdisciplinary collaboration, and impactful discussions that shape the future of engineering and technology.

This year's theme, "**Digital Transformation on Engineering and Technology: Shaping the Future of Sustainable Innovation**", reflects the urgent need for the engineering and technology community to embrace digitalisation not merely as a trend but as a responsibility. Across industries and societies, technologies such as Artificial Intelligence (AI), Big Data, the Internet of Things (IoT), automation, and advanced analytics are transforming the way we design, operate, communicate, and solve complex global challenges.

However, the true value of digital transformation lies not only in technological advancement but in how these innovations are harnessed to improve sustainability, resilience, safety, and quality of life for humanity. As engineers, researchers, and technology leaders, we must ensure that digital progress remains ethical, inclusive, environmentally conscious, and beneficial to future generations.

WRICET2026 brings together experts from diverse disciplines to share groundbreaking research, exchange ideas, and foster meaningful collaborations that will contribute towards a smarter and more sustainable world. I strongly believe that the discussions and networks established throughout this convention will inspire new partnerships, innovative solutions, and transformative research with lasting global impact.

I would like to extend my sincere appreciation to all keynote speakers, presenters, reviewers, collaborators, committee members, and participants for your valuable contributions and unwavering support in making WRICET2026 a success.

May this convention provide not only academic enrichment and professional growth, but also meaningful connections and memorable experiences here in Langkawi.

Thank you, and I wish everyone a productive and inspiring conference.

**Assoc. Prof. Ts. Dr. Tinia Idaty Mohd Ghazi**  
**Conference Director**  
**World Research and Innovation Convention on Engineering and Technology 2026**



# OPENING MESSAGE

## OFFICIATING ADDRESS FROM PRESIDENT MALAYSIAN SOCIETY FOR ENGINEERING & TECHNOLOGY



Bismillah-al-Rahman-al-Rahim

Assalamualaikum and welcome to all WRICET2026 distinguished guests, speakers and participants.

It is with great honour and sincere pleasure that I welcome all distinguished guests, keynote speakers, researchers, academicians, industry professionals, students, and participants to the World Research and Innovation Convention on Engineering and Technology 2026 (WRICET2026), held from 18–19 May 2026 at the beautiful island of Langkawi, Kedah, Malaysia.

WRICET2026 is proudly organised by the Malaysian Society for Engineering and Technology (MySET) in collaboration with the Federation of Engineering Institutions of Islamic Countries, Kuala Lumpur Regional Office (FEIIC-KLRO), with the support of strategic partners, institutions, and professional bodies committed to advancing engineering excellence and technological innovation.

This year's convention is convened under the theme, “**Digital Transformation in Engineering and Technology: Shaping the Future of Sustainable Innovation**” — a theme that reflects one of the most critical global agendas of our time. In an era driven by rapid digitalisation, the engineering and technology sectors are undergoing profound transformation through Artificial Intelligence (AI), Big Data Analytics, the Internet of Things (IoT), automation, smart manufacturing, cybersecurity systems, and advanced digital infrastructure. These technologies are increasingly becoming essential in addressing pressing global concerns involving sustainability, energy transition, climate resilience, industrial efficiency, safety, resource optimisation, and societal well-being.

However, while technological advancement presents enormous opportunities, it also introduces significant challenges. Issues such as environmental degradation, cyber threats, ethical concerns in artificial intelligence, technological dependency, skills gaps, infrastructure vulnerabilities, and the widening divide between technological capabilities and societal readiness demand immediate and collective attention. As engineers, scientists, and innovators, we must ensure that digital transformation is guided not solely by technological capability but also by responsibility, ethics, inclusivity, sustainability, and humanity.

It is hoped that WRICET2026 will not only be an academic gathering but a catalyst that drives impactful research collaborations, strengthens industry-academic partnerships, advances sustainable engineering solutions, and fosters innovative ecosystems to meet national and global development goals. The exchange of expertise can create a smarter infrastructure, safer operations, greener technologies, resilient communities, and future-ready engineering education.

Moving forward, strong interdisciplinary collaboration and commitment from all stakeholders are essential. We must equip engineers and technologists with technical competence, adaptability, vision, social awareness, and a deep focus on sustainability. Innovation must be applied to benefit society and the environment for generations. Through shared knowledge, research excellence, and cooperation, we can turn challenges into opportunities for sustainable progress.



# OPENING MESSAGE

I am deeply encouraged by the remarkable participation from universities, research institutions, government agencies, industries, and professional organisations from across Malaysia and beyond. Your presence reflects our shared commitment towards shaping a smarter, safer, and more sustainable future through engineering and technology.

On behalf of MySET, I would like to extend my heartfelt appreciation to the organising committee, reviewers, collaborators, presenters, and participants for your invaluable dedication and support in making WRICET2026 a success.

May this convention inspire meaningful discussions, innovative breakthroughs, lasting partnerships, and transformative solutions that will continue to create positive impact well beyond this event.

With ***Bismillahirrahmanirrahim***, it is with great pleasure and honour that I hereby officiate the World Research and Innovation Convention on Engineering and Technology 2026 (WRICET2026).

**Ir. Megat Johari Megat Mohd Noor**  
**President**  
**Malaysian Society for Engineering and Technology**



## SPEAKERS

## KEYNOTE SPEAKERS



**Prof. Ir. Dr. Abd. Rahim Abu Talib**  
Deputy Vice Chancellor Academic and International,  
Universiti Putra Malaysia

Professor Abd Rahim Abu Talib is a distinguished scholar and leader in Aerospace Engineering, widely recognized for his contributions to research, education, and industry. He earned his PhD in Engineering Science from the University of Oxford (2003), and a B.Eng (Hons) in Aeronautical Engineering from the University of Salford (1998).

Currently serving as the Deputy Vice Chancellor (Academic and International) at Universiti Putra Malaysia (UPM), Professor Abd Rahim previously held several key positions, including Director of Quality Assurance, Head of Department of Aerospace Engineering, and Deputy Dean at the Faculty of Engineering. He also served as Deputy Chair of the Council of Quality Assurance for Public Universities (MPQ-UA).

With extensive industrial experience, he was seconded to the Aerospace Malaysia Innovation Centre (AMIC), MiGHT Meteor Advanced Manufacturing (MMAM), and the Malaysian Industry-Government Group for High Technology (MIGHT).

Professor Abd Rahim is President of the Southeast Asia Network on Aerospace Engineering (SANAE), Deputy President and Fellow of MySET, and a Top Research Scientist Malaysia from the Academy Science Malaysia, 2024. A registered Professional Engineer and ASEAN Chartered Professional Engineer, he has authored over 130 journal papers and, in 2025, is listed among the world's top 2% scientists by Elsevier and Stanford University.



**Dr. Harizal Hamid**  
Chief Executive Officer,  
Selangor Technical Skills Development Centre (STDC)

Dr. Harizal B. Hamid is a highly accomplished technologist, academic leader, and TVET advocate, currently serving as the Chief Executive Officer of the Selangor Technical Skills Development Centre (STDC). With over two decades of experience spanning academia, industry, and executive leadership, Dr. Harizal plays a pivotal role in shaping Malaysia's technical and vocational education and training (TVET) landscape. As CEO of STDC, he spearheads strategic partnerships with global technology leaders including Siemens, Festo, Dassault Systèmes, Apple, and BMW, driving the development of industry-centric certification programmes under the STDC-X initiative.

Dr. Harizal is a certified industrial trainer in Industry 4.0, industrial automation, PLC systems, and EV technology. His leadership extends to national and international collaborations, including benchmarking visits to UC Berkeley, NASA, Tsinghua University, strategic engagements with China General Nuclear (CGN), and the development of AI and green technology frameworks for the State of Selangor.

A frequent keynote speaker and conference chairman, Dr. Harizal is deeply committed to bridging the gap between emerging technologies and workforce readiness, fostering sustainable innovation, and positioning Selangor as a regional hub for technical excellence.



**Prof. Ir. Dr. Mohd Zainal Abidin Ab. Kadir**  
Dean, Faculty of Engineering  
Universiti Putra Malaysia

Prof. Zainal received his PhD in High Voltage Engineering from the University of Manchester, UK. Currently, he is the Dean and a Professor at the Faculty of Engineering, Universiti Putra Malaysia. He is a Fellow of the Academy of Sciences Malaysia (FASc) and a Fellow of the IET (FIET). Since 2015, Prof. Zainal has been an IEEE Power and Energy Society (PES) Distinguished Lecturer and was recognised as the Top Research Scientist Malaysia (TRSM) in 2014. To date, he has authored and co-authored over 450 journal and conference papers. He has supervised 40 PhD and 45 MSc students. His research interests include high voltage engineering, lightning protection, electromagnetic compatibility, renewable energy, and the grid of the future.



## SPEAKERS

## INVITED SPEAKERS



**Prof. Ir. Dr. Mohd Khairol Anuar Mohd Ariffin**  
**Professor**  
**Universiti Putra Malaysia**

Mohd Khairol Anuar bin Mohd Ariffin (MKA Ariffin) is a Professional Engineer (PEng) registered with the Board of Engineers Malaysia (BEM). He obtained his Ph.D. from the University of Sheffield, United Kingdom, and has over 16 years of experience in teaching, research, and consultancy, with research interests in Manufacturing Engineering, Optimization Techniques, and Additive Manufacturing. From 2012 to 2015, he served as the Coordinator of the AUN/SEED-Net program, contributing to regional academic and research collaboration in engineering. He later served as the Head of the Department of Mechanical and Manufacturing Engineering at the Faculty of Engineering, Universiti Putra Malaysia (UPM), and subsequently as the Dean of the Faculty of Engineering, UPM. He also previously served as the Honorary Secretary of the American Society of Mechanical Engineers (ASME), Malaysian Branch, and is currently a Panel Evaluator for the Engineering Accreditation Council (EAC) Malaysia and the Engineering Technology Accreditation Council (ETAC). At present, he is the Coordinator of the Master's Programme in Manufacturing Engineering and the Head of the Advanced Manufacturing Research Centre (AMREC), as well as the President of the ModTech Society Malaysia Branch. He has published more than 200 international journal papers and two internationally published books, and has received numerous awards at both national and international levels, including the TRSM 2024 award.



**Assoc. Prof. Dr. Norkhairunnisa Mazlan**  
**Lecturer**  
**Universiti Putra Malaysia**

Dr. Norkhairunnisa Mazlan is an Associate Professor at the Department of Aerospace Engineering, Universiti Putra Malaysia, where she specializes in advanced materials with a particular emphasis on nanotechnology applications in composites. Her research focuses on the development and characterization of nanocomposites, including innovative materials reinforced with carbon based nanofillers, aiming to enhance mechanical performance, thermal stability, and multifunctionality for applications in aerospace and agriculture. In addition to her work on nanocomposites, Dr. Norkhairunnisa is committed to advancing sustainable materials research. She explores environmentally-friendly options such as geopolymer and bio-based composites, ensuring that material innovations align with ecological and lifecycle principles. Beyond her research, Dr. Norkhairunnisa plays a vital role as the coordinator of the Master in Innovation and Engineering Design (MIED) program, where she is actively involved in postgraduate curriculum development and fostering industry collaborations. Her professional affiliations include memberships in organizations such as MyGeopolymer, IMM, MNA, and MySET. She has also taken on leadership roles as a chair and committee member for various conferences and served as a judge in international invention competitions.



**Assoc. Prof. Dr. Tinia Idaty Mohd Ghazi**  
**Lecturer**  
**Universiti Putra Malaysia**

Dr. Tinia Idaty Mohd. Ghazi is an Associate Professor in the Department of Chemical and Environmental Engineering, Faculty of Engineering, Universiti Putra Malaysia (UPM). She earned her PhD in Chemical Engineering from the University of Cambridge, United Kingdom, in 2005. Dr. Tinia's research focuses on renewable energy, wastewater treatment, photochemical technology, and process safety and loss prevention. She collaborates with international institutions, public authorities, and government sectors on knowledge transfer and community projects. Her research has been published in leading journals and is widely cited. Dr. Tinia regularly reviews manuscripts for national and international journals and evaluates research and grant applications. She is also dedicated to student soft skills development and community engagement. Since 2008, she has been an active member of the Malaysian Society for Engineering and Technology (MySET), became a fellow (FMSET), and has served as Secretary General since 2015. Dr. Tinia is a Professional Technologist and a graduate member of the Malaysian Board of Technologists (MBOT). She has organised and chaired international conferences and conventions.



## SPEAKERS

## INVITED SPEAKERS



**Assoc. Prof. Ir. Dr. Ahmad Shukri Muhammad Noor**  
Lecturer  
Universiti Putra Malaysia

Ahmad Shukri Bin Muhammad Noor (Senior Member, IEEE) received the B.Eng. degree in electrical and electronics engineering from Niigata University, Niigata, Japan, in 2002, and the M.S. degree in communication and network engineering from Universiti Putra Malaysia, Selangor, Malaysia, in 2006, and the Ph.D. degree in Nanovision engineering from Shizuoka University, Shizuoka, Japan, in 2009.

He is currently an Associate Professor with Universiti Putra Malaysia, Selangor, Malaysia. In 2021, he became a Professional Engineer under the Board of Engineers Malaysia, and published more than 95 journals mainly in Photonics. His current research interests include optical microscopy, spectroscopy, and smart sensors with optics Ahmad Shukri Muhammad Noor is a Senior Member of the IEEE Photonics Society and Optica (previously OSA) and member of MySET.



**Assoc. Prof. Ts. Dr. Harlisyah Hj. Harun**  
Associate Professor of Satellite Communications (Avionics)  
Universiti Kuala Lumpur Malaysian Institute of Aviation Technology

Assoc. Prof. Ts. Dr. Harlisyah Harun is an Associate Professor in satellite communication and avionics systems, with over two decades of experience across teaching, research, and academic leadership. She leads the Satellite Communication and Avionics System Integration (SCASI) Laboratory at Universiti Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT), designated as a national TVET Collaboration Hub for satellite technology.

Her work focuses on the design and optimisation of reliable satellite communication systems, including CubeSat telemetry architectures, coding strategies and environment-aware communication frameworks. She adopts a structured and systems-oriented approach, translating theory into practical solutions that support both research advancement and industry relevance.

Dr. Harlisyah has led and contributed to funded research initiatives, resulting in scholarly publications, patents, postgraduate completions, and laboratory capability development. She is actively engaged with professional bodies, including the Board of Engineers Malaysia (BEM), Malaysia Board of Technologists (MBOT), and Malaysian Society for Engineering and Technology (MySET).

Her professional strength lies in aligning technical depth with disciplined execution, contributing to sustained capability building in satellite and aerospace communication systems.



**Ts. Ridzuan Md Sham**  
Lecturer  
Universiti Kuala Lumpur - Malaysia France Institute

Ts. Ridzuan bin Md Sham has gained 13 years working experience in industries in the various departments of Industrial Engineering, Production Engineering and Quality Assurance. Then he switched his career in Education where currently he is teaching at Universiti Kuala Lumpur for 24 years. Registered as Professional Technologist and previously he was member of Examination and Qualification (E&Q) Committee of MBOT and BEM. He is currently an Ordinary Council Member of MySET (2021-2024) and presently member of Working Group Policy of BEM. Apart from that, he is active accreditation panel for MQA, ETAC and TTAC.



# SPEAKERS

## INVITED SPEAKERS



**Dr. Nusayba Megat Johari**  
**Research Officer**  
**Malaysian Institute of Road Safety Research**

Nusayba is a road safety researcher and practitioner at the Malaysian Institute of Road Safety Research (MIROS), currently serving as the programme manager for the International Road Assessment Programme (iRAP) in Malaysia. Her work focuses on advancing evidence-based approaches to infrastructure safety and translating technical findings into practical, policy-relevant interventions.

She has extensive experience in road safety assessment, particularly in applying iRAP methodologies, including star rating, risk mapping, and the development of Safety Investment Plans. Her research interests include school zone safety, work zone risk management, speed-related safety challenges, and the effectiveness of traffic control devices such as Variable Message Signs (VMS).

Nusayba is actively involved in national and international collaborations, supporting capacity building, stakeholder engagement, and the integration of global best practices into the Malaysian road safety landscape. She has contributed to training programmes, policy discussions, and technical workshops aimed at strengthening road safety management systems.

She is passionate about promoting the Safe System approach, advocating for safer road environments that prioritise human life through the integration of infrastructure, behaviour, enforcement, and policy.



**Ir. Ts. Sharifah Allyana Syed Mohamed Rahim**  
**Research Officer**  
**Malaysian Institute of Road Safety Research**

Sharifah Allyana is currently leading the Visibility & Conspicuity Cluster and senior researcher with the Malaysian Institute of Road Safety Research (MIROS). She was the acting director of Road Engineering & Environment Research Center between 2013 – 2015. She graduated with a Bachelor of Engineering in Civil Engineering from Universiti Putra Malaysia (UPM) in 2004 and Master of Highway and Transportation Engineering in 2013 from the same university. She is a Professional Engineer under the Board of Engineer Malaysia (BEM) and a Professional Technologist under the Malaysia Board of Technologists (MBOT).

Allyana has extensive background in national and international road safety. She has been the National Data Coordinator for the WHO Global Road Safety Status Report since the establishment of MIROS in 2007 and since then she has actively engaged and even led numerous national workshops on development and calibration of the Malaysian Road Safety Plan including the latest edition of Malaysia Road Safety Plan 2022 - 2030. Her research background is diverse as she is a classically trained civil engineer with wide-ranging interests including but not limited to anything related with road safety data, motorcyclists and pedestrian safety and even post-crash injury.mic research with industrial implementation through scalable and practical engineering solutions



## SPEAKERS

## INVITED SPEAKERS



**Dr. Mohamad Faiz Mukhtar Gunam Resul**  
Lecturer  
Universiti Putra Malaysia

Dr. Mohamad Faiz Mukhtar is a senior lecturer within the Department of Chemical and Environmental Engineering at Faculty of Engineering, Universiti Putra Malaysia. He obtained his bachelor's degree in Chemical Engineering from Universiti Putra Malaysia in 2007. He went on to pursue a Master of Science (MSc) in Chemical Engineering at Universiti Putra Malaysia in 2012, specializing in the production of biodiesel and biolubricants derived from vegetable oil. He subsequently embarked on a Doctor of Philosophy (PhD) program in Chemical Engineering at Newcastle University, United Kingdom, culminating in 2020. During his Doctoral studies, he focused on process intensification and process development, focusing on sustainable polymers. His current research interests encompass various areas, including process intensification, bio-based polymers, biodiesel, and biolubricants.



**Dr. Mohamad Rezi Abdul Hamid**  
Lecturer  
Universiti Putra Malaysia

Dr. Mohamad Rezi Abdul Hamid is a Chemical Engineer and Senior Lecturer at the Department of Chemical and Environmental Engineering, Universiti Putra Malaysia (UPM), with industrial experience in refinery, process, and terminal operations within the oil and gas sector, including PETRONAS GTS and Blackhem Holdings Sdn. Bhd. His professional experience includes involvement in process optimization, asset integrity assessment, and operational reliability improvement initiatives in refinery environments.

His research focuses on separation technologies, particularly membrane systems and porous crystalline materials such as metal-organic frameworks (MOFs) and zeolitic imidazolate frameworks (ZIFs), with applications in gas separation and process intensification. He has published extensively in peer-reviewed journals, contributed to international conferences, and is a co-inventor of a US patent. He currently serves as an associate editor and editorial board member for several Scopus- and JCR-indexed journals.

Dr. Rezi's current work emphasizes the integration of data-driven methodologies and digital tools into conventional process systems, particularly in the context of dynamic risk assessment and process heater optimization. His approach focuses on leveraging real-time and historical plant data to improve operational reliability, support predictive decision-making, and enhance safety and efficiency in complex industrial environments.



**Dr. Megat Usamah Megat Johari**  
Lecturer  
Universiti Putra Malaysia

Megat Usamah Megat Johari is a senior lecturer in the Department of Civil Engineering at Universiti Putra Malaysia (UPM). He holds a PhD in Civil Engineering, specializing in transportation engineering. His research focuses on transportation safety, highway design, traffic operations, and driver behavior.

He has been involved in numerous research and consultancy projects funded by local and international agencies, including Malaysia's Public Works Department, the ASEAN New Car Assessment Program (ASEAN NCAP), the Federal Highway Administration (USA), the National Safety Council (USA), and various State Departments of Transportation in the United States.

Dr. Megat Usamah has authored and co-authored more than 30 peer-reviewed publications in reputable journals and conference proceedings. He currently serves as principal investigator for several funded projects aimed at improving the performance, safety, and sustainability of transportation systems in Malaysia.



# SPEAKERS

## INVITED SPEAKERS



**Dr. Ho Guan Yih**  
**Manager of Centre for Graduate Studies**  
**Universiti Teknologi Petronas**

Dr Ho Guan Yih is an education strategist with extensive experiences in higher education. He currently manages postgraduate programmes at Universiti Teknologi PETRONAS (UTP), Malaysia with focus on academic quality, student progression and strategic collaborations.

Prior to his current role, Dr Ho held several key managerial leadership positions, including serving as Head, Faculty of Engineering at the same university, where he made significant contributions to strategic planning, collaboration initiatives, programme enhancement, as well as staff and student development. He has also been actively involved in the university's transformational projects and has led key initiatives, including enrolling the university in the U.S. National Academy of Engineering's Grand Challenges Scholars Programme, establishing strategic collaborations with Board of Engineers Malaysia (BEM) and advancing international partnerships such as the 9-KOSEN Japan initiative, International Research Experiences for Students (IRES) projects with three U.S. institutions funded by U.S. National Science Foundation, etc.

Dr Ho currently serves as a council member of the Malaysian Society for Engineering and Technology (MySET). He is also a Chartered Quality Professional (CQP, UK), a Full Member of the Institute of Quality Malaysia and a registered Quality Management System Senior Consultant with the Malaysia Register of Certificated Auditors.



**Assoc. Prof. Dr. Siti Barirah Ahmad Anas**  
**Lecturer**  
**Universiti Putra Malaysia**

Dr. Siti Barirah Ahmad Anas is an Associate Professor and Head of the Department of Computer and Communication Systems Engineering, Faculty of Engineering, Universiti Putra Malaysia (UPM). She also serves as an Associate Researcher at the Wireless and Photonics Networks (WiPNET) Research Centre of Excellence, UPM. She holds a Ph.D. in Electronic Systems Engineering from the University of Essex, UK (2009), an M.Sc. in Communication and Network Engineering from Universiti Putra Malaysia (2003), and a B.Eng. in Computer and Electronic Systems from the University of Strathclyde, UK (1999).

A Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), Dr. Barirah has been actively involved with the society since 2002, currently serving as an executive committee member of the IEEE Photonics Society Malaysia Chapter and having served as Chair for the 2023–2024 term. She has co-authored over 100 journal and conference papers, both locally and internationally. Her research interests include optical access networks, fault monitoring in optical networks, visible light communication, free space optics, optical code division multiple access, and optical communication and networks.



# PROGRAMME

## 18 MAY 2026 – MONDAY WRICET2026 DAY – 1

VENUE / TIME	DIAMOND ROOM – BAYVIEW HOTEL LANGKAWI, KEDAH, MALAYSIA
0830 – 0900 hrs	WRICET Registration
<b>OPENING CEREMONY</b>	
Chair: Assoc. Prof. Ts. Dr. Norkhairunnisa Mazlan	
0900 – 0930 hrs	<ul style="list-style-type: none"> <li>○ Recitation of Du'a – Muhammad Syakir Abd Yamin</li> <li>○ Welcoming Remarks by Conference Director – Assoc. Prof. Ts. Dr. Tinia Idaty Mohd Ghazi</li> <li>○ Officiating Speech by President of Malaysian Society for Engineering and Technology Ir. Megat Johari Megat Mohd Noor</li> </ul>
0930 – 1000 hrs	<p><b>K – 01</b> UPM's Strategic Integration of Sustainability in Higher Education</p> <p><b>Professor Ir. Dr. Abd Rahim Abu Talib</b> <i>Deputy Vice Chancellor (Academic &amp; International)</i> <i>Universiti Putra Malaysia, Selangor, Malaysia</i></p>
1000 – 1030 hrs	<p><b>K – 02</b> Mastering the Digital Shift: TVET Leadership in Engineering for a Sustainable and Technologically Resilient Future</p> <p><b>Dr. Harizal bin Hamid</b> <i>Chief Executive Officer</i> <i>Selangor Technical Skills Development Centre, Malaysia</i></p>
1030 – 1100 hrs	<p><b>K – 03</b> From Hormuz to Malacca: Rethinking Energy Security in a VUCA World</p> <p><b>Professor Ir. Dr. Mohd Zainal Abidin Ab. Kadir</b> <i>Dean, Faculty of Engineering</i> <i>Universiti Putra Malaysia, Selangor, Malaysia</i></p>
1100 – 1120 hrs	Morning Refreshment & Networking
<b>INVITED &amp; TECHNICAL SESSION 1</b> [Chemical and Environmental Engineering and Technology, Process Safety and Loss Prevention]	
Chair: Assoc. Prof. Ir. Dr. Ahmad Shukri Muhammad Noor	
1120 – 1140 hrs	<p><b>I – 05</b> Process Heater Optimization Using a Data-Driven Dynamic Risk Analyzer</p> <p><b>Dr. Mohd Rezi Abdul Hamid</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i></p>
1140 – 1200 hrs	<p><b>I - 06</b> Interplay Between Polymer Formulation and Rotary Drum Hydrodynamics in Achieving Uniform Pelleting of Micron-Scale Seeds</p> <p><b>Dr. Mohamad Faiz Mukhtar Gunam Resul</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i></p>



# PROGRAMME

## Cont. WRICET2026 DAY-1, 18 MAY 2026

1200 – 1220 hrs	<p><b>I - 11</b> Electrical Safety and Risk Assessment of High-Voltage Battery Systems in Electric Vehicles</p> <p><b>Assoc. Prof. Ts. Dr. Tinia Idaty Mohd Ghazi</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i></p>
1220 – 1240 hrs	<p><b>I - 07</b> Digital Transformation in Engineering and Technology Higher Education in Malaysia: A Structured Review of Enablers, Barriers, Quality Assurance and Workforce Implications</p> <p><b>Dr. Ho Guan Yih</b> <i>Universiti Teknologi PETRONAS, Perak, Malaysia</i></p>
1240 – 1255 hrs	<p><b>P – 09</b> Investigating the Environmental Benefits and Challenges of 3D Printing in Reducing Material Waste and Optimizing Product Design</p> <p><b>Ts. Mohamad Farhan bin Md Aris</b> <i>Kolej Vokasional Kota Tinggi, Johor, Malaysia</i></p>
1255 – 1310 hrs	<p><b>P - 10</b> Influence of Heavy Metal Immobilization by <i>Cytobacillus Horneckiae</i> from Agriculture Wastewater</p> <p><b>Nur Azzyati Azman</b> <i>Universiti Teknologi Malaysia, Johor, Malaysia</i></p>
1310 – 1400 hrs	Lunch & Networking

### TECHNICAL SESSION 2 [Marine Engineering and Technology]

Chair: Assoc. Prof. Ts. Dr. Tinia Idaty Mohd Ghazi

1400 – 1415 hrs	<p><b>P - 24</b> A Conceptual Measurement Framework for Underwater Radiated Noise in the Malaysian Maritime Zones</p> <p><b>Cpt. Ir. Dr. Arman bin Ariffin</b> <i>Royal Malaysian Navy</i></p>
1415 – 1430 hrs	<p><b>P - 26</b> Navigating the Digital Shift: From Reactive Maintenance to Performance-Based Contracting (PBC) in Government Engineering Assets</p> <p><b>Cdr. Ir. Ts. Mohd Shaifullah bin Abdullah</b> <i>Royal Malaysian Navy</i></p>



# PROGRAMME

**Cont. WRICET2026 DAY-1, 18 MAY 2026**

<b>INVITED &amp; TECHNICAL SESSION 3</b> [Computer and Communication, Electrical and Electronic Engineering, Science and Technology]	
Chair: Prof. Ir. Dr. Mohd Khairol Anuar Mohd Ariffin	
1430 – 1450 hrs	<b>I - 08</b> Enhanced Plasmonic Biosensing of Uric Acid via Optimized Surface Plasmon Resonance Structures  <b>Assoc. Prof. Ir. Dr. Ahmad Shukri Muhammad Noor</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i>
1450 – 1510 hrs	<b>I - 10</b> Enhancing Event Detection in Raman-Amplified Links using Physics-Guided CNN and Pump-Aware Machine Learning  <b>Dr. Siti Barirah binti Ahmad Anas</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i>
1510 – 1525 hrs	<b>P - 12</b> CO <sub>2</sub> Sensing in Soil for Early Peatland Fire Risk Prediction Using an IoT-Based LoRa System  <b>Assoc. Prof. Ir. Dr. Ahmad Shukri Muhammad Noor</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i>
1525 – 1540 hrs	<b>P - 11</b> An Enhanced MiniVGGNet for Indoor Object Classification in Elderly Care Settings  <b>Asmida Ismail</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i>
1540 – 1555 hrs	<b>P - 19</b> An Entropy-Regularized Weighted Ensemble Pseudo-Labeling Framework for Semi-Supervised Hypertension Prediction  <b>Noor Khafifah Khalid</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i>
1555 – 1610 hrs	<b>P - 22</b> Predictive Bearing Fault Detection in Induction Motors Using Multi-Sensor Signal Analysis and Intelligent Learning Models  <b>Affandy Othman</b> <i>Universiti Kuala Lumpur Malaysian France Institute</i>



# PROGRAMME

**Cont. WRICET2026 DAY-1, 18 MAY 2026**

<b>INVITED &amp; TECHNICAL SESSION 4 [ONLINE]</b> [Civil Engineering]	
Chair: Dr. Megat Usamah Megat Johari	
1610 – 1630 hrs	<p><b>I - 01</b> Examining the Relationship Between IRAP Star Ratings and Crash Outcomes for Vehicle Occupants and Motorcyclists on a Malaysian Expressway</p> <p><b>Dr. Megat Usamah Megat Johari</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i></p>
1630 – 1644 hrs	<p><b>P - 14</b> Safe, Smart, and Sustainable: Strategies to Enhance Micromobility Safety in Urban Transport</p> <p><b>Syahmi Razi bin Razali</b> <i>Universiti Kebangsaan Malaysia, Selangor, Malaysia</i></p>
1645 – 1700 hrs	<p><b>P - 15</b> Review of End-of-Life Vehicle Management in Malaysia: Challenges in Policy, Practice, and Public Acceptance</p> <p><b>Ts. Ir. Dr. Muhamad Razuhanafi bin Mat Yazid</b> <i>Universiti Kebangsaan Malaysia, Selangor, Malaysia</i></p>
1700 – 1715 hrs	<p><b>P - 31</b> Influence of Heavy Metal Immobilization and Soil Stabilisation by Sporosarcina Pasteurii</p> <p><b>Muhammad Daniel bin Hamdan</b> <i>Universiti Teknologi Malaysia, Johor, Malaysia</i></p>
<p><b>End of Session</b> <b>Certificate Presentation &amp; Afternoon Refreshment</b></p>	



# PROGRAMME

## 19 MAY 2026 – TUESDAY WRICET2026 DAY – 2

VENUE / TIME	DIAMOND ROOM – BAYVIEW HOTEL LANGKAWI, KEDAH, MALAYSIA
0830 – 0900 hrs	WRICET Registration
<b>INVITED &amp; TECHNICAL SESSION 5</b> [Civil Engineering, Building and Construction Technology]	
Chair: Assoc. Prof. Ir. Ts. Dr. Hisham Hamid	
0900 – 0920 hrs	<p><b>I - 02</b> Cultivating Road Safety Leadership in the Era of Digital Transformation: A Malaysian Professional Education Model</p> <p><b>Dr. Nusayba Megat Johari</b> <i>Malaysian Institute of Road Safety Research, Selangor, Malaysia</i></p>
0920 – 0940 hrs	<p><b>I - 13</b> Evaluating Flexible Work Arrangements as a Traffic Demand Management Strategy: Evidence from Klang Valley, Malaysia</p> <p><b>Ir. Ts. Sharifah Allyana Syed Mohamed Rahim</b> <i>Malaysian Institute of Road Safety Research, Selangor, Malaysia</i></p>
0940 – 0955 hrs	<p><b>P - 03</b> Finite Element and Experimental Investigation of the Fire and Hose Stream Performance of Sustainable Lightweight Interlocking Block Designs</p> <p><b>Zamri bin Hashim</b> <i>JKR Center of Excellence in Engineering and Technology (CREaTE), Malaysia</i></p>
0955 – 1010 hrs	<p><b>P - 05</b> 3D Printable Concrete Incorporating Clay: Anisotropy Influence on Compressive Strength Evaluation</p> <p><b>Mohd Aminul Izmeer bin Ab Ghafar</b> <i>Universiti Teknologi Malaysia, Johor, Malaysia</i></p>
1010 – 1025 hrs	<p><b>P - 06</b> Mechanical Properties of 3D-Printed Concrete Using Local Materials in Malaysia</p> <p><b>Ler Kee Hong</b> <i>Universiti Teknologi Malaysia, Johor, Malaysia</i></p>
1025 – 1040 hrs	<p><b>P - 08</b> Performance of Polyethylene Terephthalate (PET) as a Binder Modifier in Asphalt</p> <p><b>Dr. Nur Ainina Mustafa</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i></p>
1040 – 1055 hrs	<p><b>P - 28</b> Case Study of Post-Fire Damaged Structure Using Ultrasonic Pulse Velocity (UPV) and Ultrasonic Pulse Echo (UPE)</p> <p><b>Muhammad Haziq Taquiuddin Bin Rezuwan</b> <i>JKR Center of Excellence in Engineering and Technology (CREaTE), Malaysia</i></p>
1055 – 1110 hrs	Morning Refreshment & Networking



# PROGRAMME

**Cont. WRICET2026 DAY-2, 19 MAY 2026**

<b>INVITED &amp; TECHNICAL SESSION 6</b> [Mechanical and Manufacturing, Materials Science, Engineering and Technology]	
Chair: Dr. Nusayba Megat Johari	
1110 – 1130 hrs	<p><b>I - 04</b> Development of a Project Proposal Evaluation Template for Project Selection in the Malaysian Construction Industry</p> <p><b>Prof. Ir. Dr. Mohd Khairol Anuar Mohd Ariffin</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i></p>
1130 – 1150 hrs	<p><b>I - 12</b> Innovative Prototype for Automated Liquid Filling: Enhancing Productivity in SMI Sauce Manufacturing</p> <p><b>Ts. Ridzuan bin Md. Sham</b> <i>Universiti Kuala Lumpur Malaysian France Institute, Selangor, Malaysia</i></p>
1150 – 1205 hrs	<p><b>P - 02</b> A Review on Techniques to Alleviate Data Scarcity Issue Faced by Data-Driven-Based Predictive Maintenance</p> <p><b>Dr. Siow Pei Yi</b> <i>Universiti Malaya, Kuala Lumpur, Malaysia</i></p>
1205 – 1220 hrs	<p><b>P - 07</b> Automated Gas Regulator Safety System with Microcontroller and IoT Integration</p> <p><b>Dr. Jamel bin Othman</b> <i>Universiti Kuala Lumpur Malaysian France Institute, Selangor, Malaysia</i></p>
1220 – 1235 hrs	<p><b>P - 16</b> Statistical Characterization and Process Capability of Dimensional Accuracy in Heated-Chamber FDM Printing of PLA</p> <p><b>Nurul Wirdah binti Mafazi</b> <i>Universiti Teknikal Malaysia Melaka, Malaysia</i></p>
1235 – 1250 hrs	<p><b>P - 17</b> Physical Surface Coating of Recycled PET with Purified Waste Cooking Oil: A Preliminary Structural Study</p> <p><b>Dr. Rahimah binti Abdul Hamid</b> <i>Universiti Teknikal Malaysia Melaka, Malaysia</i></p>
1250 – 1305 hrs	<p><b>P - 18</b> Influence of Ball Milling Speed on the Structural and Hardness Properties of Eggshell-Derived Hydroxyapatite for Biomedical Applications</p> <p><b>Dr. Adibah Haneem binti Mohamad Dom</b> <i>Universiti Teknikal Malaysia Melaka, Malaysia</i></p>
1305 - 1400 hrs	Lunch & Networking



# PROGRAMME

## Cont. WRICET2026 DAY-2, 19 MAY 2026

<b>INVITED &amp; TECHNICAL SESSION 7</b> [Mechanical and Manufacturing, Materials Science, Engineering and Technology, Aerospace Engineering, Industrial Engineering, Oil and Gas Technology]	
Chair: Dr. Mohamad Faiz Mukhtar Gunam Resul	
1400 – 1420 hrs	<b>I - 09</b> Challenges from Innovation to Sustainability of Nanocomposites in Aerospace Applications  <b>Assoc. Prof. Dr. Norkhairunnisa Mazlan</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i>
1420 – 1435 hrs	<b>P - 20</b> Optimisation of Sawdust-Based Brick Production Using the Taguchi Experimental Design Method  <b>Tine Aprianti</b> <i>Universitas Sriwijaya, Indonesia</i>
1435 – 1450 hrs	<b>P - 21</b> A Case Study on Pressure Up-Rating and Life Extension of an In-Service Well Test Separator from 7.2 MPA (G) to 9.2 MPA(G) Using Fitness-For-Service Assessment  <b>Faiz Kasim</b> <i>Universiti Malaysia Sabah, Sabah, Malaysia</i>
1450 – 1505 hrs	<b>P - 29</b> Numerical Simulation of Tilt Gravity Die Casting Process for Automotive Front Lower Control Arm (FLCA)  <b>Ts. Dr. Mohamad Ridzuan Bin Mohamad Kamal</b> <i>Universiti Teknikal Malaysia Melaka, Malaysia</i>
<b>INVITED &amp; TECHNICAL SESSION 8 [ONLINE]</b> [Chemical, Biochemical, Environmental Engineering, Nano Technology, Mechanical and Manufacturing Engineering, Automotive Technology]	
Chair: Assoc. Prof. Ts. Dr. Harlisya Harun	
1505 – 1525 hrs	<b>I - 03</b> Environment-Aware Decision Framework for Adaptive CubeSat Ground Segment Communication Systems  <b>Assoc. Prof. Ts. Dr. Harlisya Harun</b> <i>Universiti Kuala Lumpur, Malaysian Institute of Aviation Technology, Malaysia</i>
1525 – 1540 hrs	<b>P - 01</b> Simultaneous Recovery of Liquid Crystal and Indium from LCD Panel Wastes using Subcritical Water  <b>Nuraina Nabila binti Ahmad Ruzi</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i>
1540 – 1555 hrs	<b>P - 13</b> Toward Decision-Grade Water Quality Monitoring with Unmanned Surface Vehicles: A Review of Task-Driven Architectures and Data Trustworthiness  <b>Zheng Jiuzhou</b> <i>Universiti Malaysia Sabah, Sabah, Malaysia</i>



# PROGRAMME

## Cont. WRICET2026 DAY-2, 19 MAY 2026

1555 – 1610 hrs	<b>P - 23</b> Synthesis and Structural Study of Metal – Oxides Derived from Alpha-Amino Nitrile Complexes by Thermal Decomposition Method  <b>Asst. Prof. Atheel Hassan Alwash</b> <i>Al Nahrain University, Baghdad, Iraq</i>
1610 – 1625 hrs	<b>P - 25</b> Impact of Welding Variables on Mild Steel in Gas Metal Arc Welding (GMAW)  <b>Maniyarasi Munusamy</b> <i>Politeknik Banting Selangor, Malaysia</i>
1625 – 1640 hrs	<b>P - 27</b> Design and Development of a Rotational Jig for Enhanced Radiographic Inspection of Aero Engine Compressor Blades  <b>Dr. Tamil Moli A/P Loganathan</b> <i>Politeknik Banting Selangor, Malaysia</i>
1640 – 1655 hrs	<b>P - 30</b> The Effect of Fuel Blend Ratio to the Performance of Palm Oil-Based Biodiesel on an HCCI Engine  <b>Hasyuzariza Muhamad Tobib</b> <i>Universiti Putra Malaysia, Selangor, Malaysia</i>
1655 – 1700 hrs	<b>CLOSING</b>

End of Session  
Certificate Presentation & Afternoon Refreshment



# ABSTRACT

## ABSTRACT OF INVITED PAPERS

### Invited 01

#### EXAMINING THE RELATIONSHIP BETWEEN IRAP STAR RATINGS AND CRASH OUTCOMES FOR VEHICLE OCCUPANTS AND MOTORCYCLISTS ON A MALAYSIAN EXPRESSWAY

Megat-Usamah Megat-Johari<sup>a</sup>, Nusayba Megat-Johari<sup>b</sup>, Nichal Gupta<sup>c</sup>, Alvin Poi Wai Hoong<sup>b</sup>

<sup>a</sup>Department of Civil Engineering, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

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iRAP is widely used to prioritise road safety investments from coded roadway attributes, but its crash modification factors are internationally derived and may not fully capture local conditions. This study examines how well iRAP infrastructure-based ratings reflect crash outcomes on a high-speed expressway in Malaysia. The iRAP star ratings for vehicle occupants and motorcyclists were combined with 2022-2023 crash data from the E1 Expressway, classified by severity and normalised by segment length and analysis period. For vehicle occupants, total crash rates generally decreased from 1-star to 3-star segments, but 4-star segments showed higher crash rates than 3-star segments, indicating unmodeled crash-, exposure-, or environment- related factors influence the relationship. For motorcyclists, motorcycle-involved crash rates tended to increase across the limited range of motorcyclist star ratings (1-3 stars), with similarly non-monotonic trends by severity. These mixed results, together with concentration of motorcycle crashes on 1-star segments and the absence of segregated motorcycle facilities, suggest that current motorcycle star rating may not adequately capture motorcycle risk on Malaysian expressway. The findings generally support the validity of iRAP star ratings for vehicle occupants. However, locally calibrated crash modification factors should be incorporated into the star rating evaluation to better reflect local context, particularly with regard to motorcycle risk.

### Invited 02

#### CULTIVATING ROAD SAFETY LEADERSHIP IN THE ERA OF DIGITAL TRANSFORMATION: A MALAYSIAN PROFESSIONAL EDUCATION MODEL

<sup>1</sup>Nusayba Megat-Johari, <sup>2</sup>Megat-Usamah Megat-Johari, <sup>1</sup>Sharifah Allyana Syed Mohamed Rahim, <sup>1</sup>Ho Jen Sim

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Road safety challenges are fundamentally systemic, requiring leaders who can navigate complexity across multiple agencies and disciplines. This paper examines a three-day Road Safety Leadership Fellowship Programme designed to cultivate leadership capabilities among Malaysian road safety practitioners through transformative professional education. Seventeen mid-career professionals from diverse agencies participated in an intensive programme integrating the Safe System Approach (SSA) with experiential learning methodologies. Pre- and post-programme surveys assessed changes in SSA familiarity, principle understanding, and leadership confidence. Results demonstrated substantial improvements across all measured dimensions, with participants reporting enhanced ability to explain SSA concepts, advocate for interventions, collaborate with stakeholders, and identify system failures. The findings suggest that structured professional education emphasizing systems thinking, multidisciplinary collaboration, and practical application can meaningfully strengthen leadership capacity in road safety contexts. This Malaysian experience offers valuable insights for road safety capacity development in similar settings where leadership capability remains underdeveloped despite technical expertise.



# ABSTRACT

## Invited 03

### ENVIRONMENT-AWARE DECISION FRAMEWORK FOR ADAPTIVE CUBESAT GROUND SEGMENT COMMUNICATION SYSTEMS

Harlisya Harun

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University Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT)  
harlisya@unikl.edu.my

CubeSat communication systems operating in Low Earth Orbit (LEO) are exposed to dynamic atmospheric conditions that may affect communication reliability and link performance. Existing adaptive communication approaches mainly rely on internally estimated channel conditions with limited integration of environmental information into operational decision-making. This paper proposes an environment-aware decision framework for adaptive CubeSat ground segment communication systems. The framework integrates environmental data representation, communication link modelling and adaptive decision logic. Representative environmental indicators based on Global Navigation Satellite System (GNSS)-based precipitable water vapour (PWV) and geostationary (GEO) satellite cloud-related parameters are incorporated into an environmental severity model and mapped into effective signal-to-noise ratio (SNR) degradation. A preliminary simulation-based workflow is presented to evaluate the relationship between environmental severity, effective SNR variation, bit error rate (BER) performance and adaptive operational response. The proposed framework provides a baseline for future integration of validated environmental datasets into adaptive CubeSat ground segment communication systems.

## Invited 04

### DEVELOPMENT OF A PROJECT PROPOSAL EVALUATION TEMPLATE FOR PROJECT SELECTION IN THE MALAYSIAN CONSTRUCTION INDUSTRY

Abdirahman Abukar Farah<sup>1,a</sup>, M.K.A Ariffin<sup>2,b</sup>, Nawal Aswan Abdul Jalil<sup>3,c</sup>

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This study addresses the lack of structured and evidence-based project proposal evaluation practices among small and medium-sized construction firms in Malaysia. Project selection decisions are often dominated by financial considerations and managerial judgement, with limited use of formal multi-criteria decision-making (MCDM) methods. To address this gap, the study develops a Project Proposal Evaluation Template integrating the Analytic Hierarchy Process (AHP), Simple Additive Weighting (SAW), and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). A quantitative survey was conducted among construction professionals in Selangor, Malaysia, yielding 72 valid responses. AHP was used to determine criteria weights, while SAW and TOPSIS were applied to rank project alternatives. The results indicate that life-cycle cost (35%), profitability (21%), and cash-flow adequacy (14%) are the most influential evaluation criteria. Both ranking methods produced identical results with a Spearman correlation coefficient of  $\rho = 1.00$ , confirming the robustness of the proposed framework. This study presents a spreadsheet-based decision-support tool for SME construction project selection.



# ABSTRACT

## Invited 05

### PROCESS HEATER OPTIMIZATION USING A DATA-DRIVEN DYNAMIC RISK ANALYZER

Mohamad Rezi Abdul Hamid

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Process heaters are widely used in chemical and petrochemical industries to supply thermal energy required for process operations. Maintaining stable combustion and high thermal efficiency is essential for safe operation, fuel economy, and emission control. Conventional analytical techniques such as Fault Tree Analysis (FTA) are commonly applied in process safety to understand how combinations of events may lead to undesirable outcomes. However, these analyses are typically static in nature and do not utilize the large volume of operational data continuously collected in modern plants through Distributed Control Systems (DCS). This work presents a data-driven dynamic risk assessment approach for monitoring process heater operating conditions associated with reduced combustion and thermal efficiency. Relevant process variables such as fuel flow, combustion air flow, draft pressure, and stack temperature are identified from the process instrumentation diagram (P&ID) to represent process pathways and operating conditions that may contribute to inefficient heater performance. Simulated operational datasets representing 180 minutes of operation with one-minute sampling intervals are used as input to a Python-based analytical framework. The program evaluates the activation status of nodes within a causal logic structure derived from FTA principles and dynamically determines whether specific operating conditions associated with reduced combustion efficiency become active. Based on these evaluations, a Dynamic Risk Index (DRI) is calculated over time to classify the heater operating condition into normal, warning, or critical states. Time-based and event-based probabilities are also estimated to illustrate how operational risk evolves under changing process conditions. The proposed approach demonstrates how data-driven diagnostics and dynamic risk monitoring can complement traditional process safety analysis while also providing insights for process heater performance optimization.

## Invited 06

### INTERPLAY BETWEEN POLYMER FORMULATION AND ROTARY DRUM HYDRODYNAMICS IN ACHIEVING UNIFORM PELLETTING OF MICRON-SCALE SEEDS

Mohamad Faiz Mukhtar Bin Gunam Resul, Zahin Ayuni Zainal Abidin

Department of Chemical and Environmental Engineering, Faculty of Engineering, Universiti Putra  
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The pelleting of micron-scale seeds presents a significant engineering challenge due to their poor flowability, high surface area-to-volume ratio, and susceptibility to mechanical damage. This study investigates the coupled effects of polymer formulation and rotary drum hydrodynamics on the coating performance of Begonia seeds, serving as a representative model for ultra-fine particulate systems. A biodegradable polymer matrix comprising methylcellulose (4–6% w/v), polyvinyl alcohol (0.5–1% w/v), and glycerol (1–2% v/v) was developed to achieve a balance between film-forming capability, mechanical integrity, and water responsiveness. The coating process was conducted using a laboratory-scale rotary drum system, where key operational parameters—particularly rotational speed—were systematically varied to evaluate their influence on coating uniformity, adhesion, and structural stability. Results demonstrate that coating performance is governed by a critical interplay between formulation rheology and particle–particle dynamics within the drum. At sub-optimal rotational speeds, insufficient inter-particle collisions resulted in non-uniform coating distribution, while excessive speeds induced mechanical attrition, leading to coating



# ABSTRACT

fragmentation and reduced weight gain. An optimal rotational regime was identified, where enhanced particle circulation and controlled shear forces promoted uniform layer formation, achieving up to 24% weight increase with improved coating retention. The findings highlight the importance of integrating material design with process hydrodynamics to achieve consistent pelleting outcomes. This work provides a scalable and environmentally sustainable framework for coating micron-scale particulates, with broader implications for applications in agriculture, pharmaceuticals, and particulate process engineering.

## Invited 07

### **DIGITAL TRANSFORMATION IN ENGINEERING AND TECHNOLOGY HIGHER EDUCATION IN MALAYSIA: A STRUCTURED REVIEW OF ENABLERS, BARRIERS, QUALITY ASSURANCE AND WORKFORCE IMPLICATIONS**

Ho Guan Yih<sup>1</sup>, Zahiraniza Mustafa<sup>2</sup>

<sup>1</sup>Centre for Graduate Studies, Universiti Teknologi PETRONAS (UTP)

<sup>2</sup>Integrated Engineering Department, Universiti Teknologi PETRONAS (UTP)  
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Digital transformation as conceptualised in engineering and technology higher education has been reorganised as a restructuring of institutions, including learning, assessment, governance, data practices and industry engagement and not the application of educational technologies. This transformation is now being seen more as a system-level redesign and the integration of strategy, processes, people, technology and data and not as individual digital efforts. Guided by Malaysian quality assurance (QA) and accreditation frameworks standards, this paper systematically reviews evidence published between 2024 and 2026. The review positions quality assurance (QA) as a digital control plane that governs and enables institutional transformation. The review examines key domains include e-learning, virtual laboratories, micro-credentials, enterprise architecture and generative AI in relation to academic integrity. The findings identify critical enablers such as leadership alignment, interoperable systems, faculty capacity and stackable micro-credentials, while barriers include infrastructural inequities, fragmented information systems and limited governance frameworks for generative AI. Conversely, key barriers include infrastructural inequities, fragmented information systems that undermine QA auditability and the absence of integrated institutional governance frameworks for generative AI. These changes are demonstrated to have direct impact on such important educational outcomes, which ultimately affect workforce preparedness to Industry 4.0. Based on these findings, the paper proposes a conceptual framework that positions QA evidence as a digital control plane, supported by strategies such as interoperability-driven system design, work-based learning-informed faculty development, secure and authentic assessment models and stackable credential architectures linking degree programmes, work-based learning and micro-credentials. Limitations in publicly accessible system-level data highlight important directions for future research.

## Invited 08

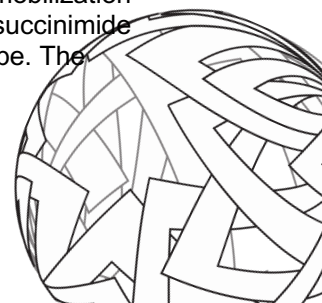
### **ENHANCED PLASMONIC BIOSENSING OF URIC ACID VIA OPTIMIZED SURFACE PLASMON RESONANCE STRUCTURES**

Ahmad Shukri bin Muhammad Noor<sup>1</sup> and Olabisi Abdullahi Onifade<sup>2</sup>

<sup>1</sup>Wireless and Photonics Network (WiPNET) Research Center of Excellence,  
Faculty of Engineering, Universiti Putra Malaysia

<sup>2</sup>Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia  
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This work introduces a biofunctionalized sensor predicated on surface plasmon resonance to quantify uric acid within physiologically relevant concentration ranges. The sensor employs the covalent immobilization of uricase enzyme using 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide (EDC) and N-Hydroxysuccinimide (NHS) crosslinking agents, ensuring the durable adherence of the enzyme onto the sensor probe. The



# ABSTRACT

uricase enzyme significantly enhances plasmonic sensors for uric acid detection, showcasing a seamless integration of optical principles and biological recognition elements. These sensors hold promise as vital tools in clinical and point-of-care settings, offering transformative potential in biosensing technologies and the potential to revolutionize healthcare outcomes in biomedicine.

## Invited 09

### CHALLENGES FROM INNOVATION TO SUSTAINABILITY OF NANOCOMPOSITES IN AEROSPACE APPLICATIONS

Norkhairunnisa Mazlan

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The advancement of nanocomposite materials has significantly transformed the aerospace industry, offering enhanced mechanical strength, reduced weight, and multifunctional capabilities. Materials reinforced with graphene, carbon nanotubes, and hybrid nanoparticles are increasingly being explored to improve structural performance, thermal stability, and sensing functionalities in both aircraft and space systems. Despite these advantages, the broader implications of nanocomposite adoption across their entire lifecycle remain insufficiently addressed. The role of nanocomposites in aerospace from a lifecycle and sustainability perspective, highlighting critical challenges related to manufacturability, recyclability, environmental impact, and material safety. The increasing complexity of nanostructured systems presents difficulties in end-of-life management, while existing regulatory and certification frameworks are not yet fully equipped to accommodate these emerging materials. Thus, there is a need for a holistic framework that supports the long-term viability and environmental sustainability of nanocomposite applications in aerospace engineering.

## Invited 10

### ENHANCING EVENT DETECTION IN RAMAN-AMPLIFIED LINKS USING PHYSICS-GUIDED CNN AND PUMP-AWARE MACHINE LEARNING

Ahmed Hassan Hussein<sup>1</sup>, Siti Barirah Ahmad Anas<sup>1</sup>, Syamsuri Yaakob<sup>1</sup>, Muhammad Hafiz Abu Bakar<sup>1</sup>,  
Kharina Khairi<sup>2</sup> and Yun Li Go<sup>3</sup>

<sup>1</sup>Wireless and Photonics Networks Research Centre of Excellence (WiPNET), Department of Computer and Communication Systems Engineering, Faculty of Engineering, Universiti Putra Malaysia

<sup>2</sup>Optical and Wireless at Network Architecture and Technical Planning (NATP), Telekom Malaysia Berhad

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As optical communication networks expand to support high-speed global connectivity, the resilience of the underlying fiber infrastructure has become critical for sustainable digital development. This paper proposes a physics-guided machine learning framework to mitigate Stimulated Raman Scattering (SRS) induced distortions in active Optical Time-Domain Reflectometer (OTDR) monitoring. SRS in Raman-amplified links causes trace distortion and false events, which severely degrade diagnostic accuracy and often lead to unnecessary, resource-intensive maintenance interventions. To address this, we developed a physics-guided convolutional neural network (CNN) that separates pump-dependent Raman distortion from the intrinsic fiber baseline, facilitating more precise fault localization. A pump-aware event detection algorithm was subsequently applied to the corrected traces, yielding a significant improvement in the macro F1-score from 0.887 to 0.955 on experimental datasets and from 0.941 to 0.996 on simulated data. By enabling highly accurate, real-time diagnostics in Raman-amplified links, this framework minimizes service downtime and prevents premature replacement of optical components. This, in turn, strengthens the robustness of national fiber infrastructures and contributes to long-term operational sustainability by optimizing resource



# ABSTRACT

utilization in line with Sustainable Development Goal (SDG) 9: Industry, Innovation, and Infrastructure. Our approach outperforms conventional threshold-based OTDR event detection, offering a scalable, software-defined diagnostic tool essential for maintaining resilient and sustainable smart cities and communities.

## Invited 11

### **ELECTRICAL SAFETY AND RISK ASSESSMENT OF HIGH-VOLTAGE BATTERY SYSTEMS IN ELECTRIC VEHICLES**

Moganeshwaran Ganesan and \*Tinia Idaty Mohd. Ghazi  
Safety Engineering and Reliability Group (SafER), Department of Chemical and Environmental Engineering, Faculty of Engineering, Universiti Putra Malaysia  
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Electric vehicles (EVs) are reshaping transportation due to their environmental advantages and technological advancements. The expanding EV population introduces new risks related to high-voltage networks, battery packs, charging equipment, and human error. This study evaluates the electrical risks of EVs within the Klang Valley transport network. A hybrid risk evaluation was employed, combining Z-numbered Failure Mode and Effects Analysis (Z-FMEA), Bayesian network modelling, and a hazard matrix due to the lack of EV failure data in Malaysia and uncertainty in expert assessments. The evaluation utilised both qualitative and semi-quantitative approaches. Electrical hazards were identified qualitatively. Key electrical concerns, such as battery overheating, insulation failure, charger malfunctions, and grounding failures, were examined through user surveys, site inspections, and expert interviews. In semi-quantitative analysis, Z-number theory was employed in conjunction with the FMEA to resolve uncertainty issues in severity, occurrence, and detection ratings, by referring to the expert opinions and their confidence levels. Next, Bayesian network modelling was applied to examine the probabilistic relationships between hazard variables and investigate which factors have the most significant impact on the occurrence of electrical incidents. Consequently, interactions of severity and probability were sorted out, utilising a hazard matrix to highlight the electrical hazards that posed the highest risk levels.

## Invited 12

### **INNOVATIVE PROTOTYPE FOR AUTOMATED LIQUID FILLING: ENHANCING PRODUCTIVITY IN SMI SAUCE MANUFACTURING**

Ridzuan Bin Md Sham<sup>1,a</sup>, Azman Haikal Bin Adira<sup>2,b</sup>  
<sup>1</sup>IA Section, Universiti Kuala Lumpur  
<sup>2</sup>BET Mechatronics, IA Section, Universiti Kuala Lumpur  
<sup>a</sup> ridzuan@unikl.edu.my

The manual operation of filling chilli sauce into the bottles in this small industry affects efficiency and productivity. To address this issue and make the production process more efficient, the industry requires the implementation of automated machinery. Automated machines can revolutionise the chilli sauce production process by eliminating the dependency on human labour. These machines can be programmed to fill bottles with chilli sauce, capping them, and labelling them. This automation would significantly increase productivity, streamline operations, and reduce the dependency on human labour. By adopting automated systems, Penang's chilli sauce production industry can keep pace with more prominent sectors in terms of modernisation. Introducing machinery would improve overall efficiency, reduce production costs, minimise errors, and increase output. These benefits would contribute to the industry's growth and competitiveness in the market. Moreover, implementing automation in SMIs could help alleviate the human labour crisis in Malaysia. By reducing the dependency on human labour, more job opportunities can be created for unemployed citizens. The workforce could be redirected to other areas of production that require human skills and supervision, fostering a more balanced and sustainable labour market. In summary, the labour



# ABSTRACT

crisis in Malaysia, particularly in SMIs, necessitates the adoption of automated machinery in industries such as chilli sauce production. By modernising the bottling process, these industries can improve efficiency, increase productivity, and contribute to the growth of the local economy while creating new job opportunities for citizens.

## Invited 13

### **EVALUATING FLEXIBLE WORK ARRANGEMENTS AS A TRAFFIC DEMAND MANAGEMENT STRATEGY: EVIDENCE FROM KLANG VALLEY, MALAYSIA**

Sharifah Allyana Syed Mohamed Rahim, Nur Mustakiza Zakaria, Nusayba Megat Johari, Norfaizah Mohamad Khaidir, Nora Sheda Mohd Zulkiffli, Nazatul Amira Abu Safian, Ahmad Azad Ab. Rashid, Muhammad Marizwan Abdul Manan

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Urban mobility in the Klang Valley faces mounting pressure from peak-hour congestion that undermines economic productivity, public health, and road safety. This paper evaluates whether Flexible Working Hours (FWH) and Work From Home (WFH) arrangements can serve as viable traffic demand management tools in the Malaysian context. Drawing on toll-plaza traffic data, stakeholder interviews, policy review, and organisational case studies across four Malaysian entities, this study finds that staggered work schedules under FWH redistribute morning peak flows, while WFH adoption measurably suppresses commuter volumes—with nearly two-thirds of respondents endorsing mandatory remote work days. The analysis is contextualised against Malaysia's Employment Act provisions (Sections 60P–60Q) and the April 2026 federal civil servant WFH directive. The paper argues that standalone flexible work policies yield limited impact unless coupled with multimodal transport planning and broader eligibility criteria.



**ABSTRACT****ABSTRACT OF TECHNICAL PAPERS****P – 01****SIMULTANEOUS RECOVERY OF LIQUID CRYSTAL AND INDIUM FROM LCD PANEL WASTES USING SUBCRITICAL WATER**Nuraina Ruzi<sup>1</sup>, Shamsul Izhar<sup>1\*</sup>, Hiroyuki Yoshida<sup>1</sup>, Eiichiro Nishio<sup>2</sup>, Yatsuhiko Utsumi<sup>2</sup>, Nobuaki Kakimori<sup>2</sup><sup>1</sup>Department of Chemical and Environmental Engineering, Faculty of Engineering, Universiti Putra Malaysia, UPM Serdang 43400 Selangor, Malaysia<sup>2</sup>Affiliation and address Environment Research and Development Center, Environmental Protection Group, Sharp Corp., 1 Takumi-Cho, Sakai-ku, Osaka 590-8522, Japan.  
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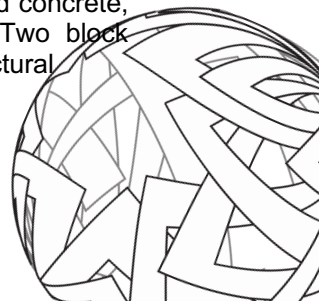
In this study, subcritical water (sub-CW) was utilized to recover valuable materials from waste liquid crystal display (LCD) panels simultaneously. Sub-CW treatment was able to remove 20% of the liquid crystal (LC), and it can be extracted at high temperature. However, LC and indium were 100% recovered when sub-CW was enhanced with NaOH and treated at 160°C and 250°C, respectively. Indium was readily recovered on the filter because it was exfoliated from the LCD glass and in the liquid phase simultaneously. Thus, the sub-CW method is more practical than other chemically induced procedures, such as acid dissolution and chlorination, because it does not require any chemical pre-treatment.

**P – 02****A REVIEW ON TECHNIQUES TO ALLEVIATE DATA SCARCITY ISSUE FACED BY DATA-DRIVEN- BASED PREDICTIVE MAINTENANCE**Pei Yi Siow<sup>1\*</sup>, Zhi Chao Ong<sup>1</sup>, Shin Yee Khoo<sup>1</sup>, Gordan Meisam<sup>2</sup>, Meor Faisal Zulkifli<sup>1</sup>,<sup>1</sup>Department of Mechanical Engineering, Faculty of Engineering, Universiti Malaya<sup>2</sup>School of Civil Engineering, University College Dublin, Belfield, Dublin D04 V1W8, Dublin, Ireland  
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Data-driven models have been researched extensively in various fields including predictive maintenance due to their predictive capabilities. One of the main factors that affects the prediction accuracy of a model is the adequacy of the training dataset. In the field of predictive maintenance, faults or structural damages are rare. It is impractical to collect real faults or damage data to train a data-driven model, which leads to data scarcity issues that reduce its prediction accuracy and reliability. This paper reviews recent techniques in alleviating data scarcity, mainly physics-informed machine learning, data augmentation, and transfer learning methods. The review shall provide an informative update, insights and potential future directions for researchers and engineers on data-driven-based predictive maintenance methods.

**P – 03****FINITE ELEMENT AND EXPERIMENTAL INVESTIGATION OF THE FIRE AND HOSE STREAM PERFORMANCE OF SUSTAINABLE LIGHTWEIGHT INTERLOCKING BLOCK DESIGNS**Zamri Hashim<sup>1</sup>, Norhaida Mohamed<sup>1</sup> and Nor Azian Aziz<sup>1</sup><sup>1</sup>JKR Centre of Excellence for Engineering and Technology (CREaTE)  
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This study evaluates the optimal design of lightweight interlocking blocks incorporating foamed concrete, recycled concrete aggregate, and rice husk ash for fire-resistant masonry applications. Two block geometries were analysed using finite element analysis (FEA) to assess their thermal and structural



# ABSTRACT

responses under fire exposure and subsequent water pressure. The numerically optimal design was then validated experimentally through full-scale fire resistance and hose stream tests on a 3 m × 3 m wall panel. Both designs exhibited comparable thermal behaviour. However, Design 1 showed greater resistance to mechanical pushing forces despite higher localised temperatures. Experimental results confirmed that Design 1 achieved a fire resistance rating of 120 minutes, maintaining integrity and insulation without collapse or flaming. The panel also withstood hose stream impact without cracking or water penetration. These findings demonstrate that Design 1 provides superior combined thermal and mechanical performance, confirming its suitability for sustainable, fire-resistant, lightweight masonry systems.

**P – 05**

## **3D PRINTABLE CONCRETE INCORPORATING CLAY: ANISOTROPY INFLUENCE ON COMPRESSIVE STRENGTH EVALUATION**

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3D printable soil-based concrete is quite challenging due to high water absorption affecting the printability during extrusion process. This research attempts to systemically develop 3DPC incorporating clay as 5 %, 10 %, 15% and 20 % replacement of natural aggregate, and evaluate their anisotropy compressive strength. The properties of printed layer with/without clay were then comparatively studied. It was demonstrated that the introduction of clay as fine aggregate has significantly improved the fresh and hardened properties of printed concrete. The outcome revealed that with 15% of natural aggregate replacement by clay (C15) showed enhancement anisotropy compressive strength of 31.9 MPa in longitudinal direction (Y-Dir) which 36.3 % higher than longitudinal direction control specimen (C0). C15 also resulted highest printing height with increase of 10 % as compared with mixed material without clay (C0). In summary, the study provides a feasible solution for the 3DPC incorporating clay with lower demand for natural aggregate.

**P – 06**

## **MECHANICAL PROPERTIES OF 3D-PRINTED CONCRETE USING LOCAL MATERIALS IN MALAYSIA**

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Chan Li-Jing<sup>1</sup>, Mohd Aminul Izmeer Ab Ghafar<sup>1</sup>, Tan Kar-Hui<sup>1</sup>, Wei XiangQian<sup>1</sup>

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Three-dimensional concrete printing is an advanced technology that extrudes fresh concrete layer-by-layer to construct structures without the need for formwork. However, this technology remains relatively new and has not yet been widely adopted in Malaysia. In this study, printable concrete mixes were developed using locally available materials to produce 3D-printed specimens. Compressive and flexural strength tests were conducted on concrete specimens with varying water-to-binder ratio, sand-to-binder ratio, and silica fume contents. The results indicate that the water-to-binder ratio has a significant influence on strength, whereas the sand-to-binder ratio and silica fume content exhibit comparatively minor effects. In addition, the 3D-printed specimens demonstrate anisotropic behaviour, with performance varying across different directions. However, no consistent directional trend was observed among the various mix designs.



# ABSTRACT

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## **AUTOMATED GAS REGULATOR SAFETY SYSTEM WITH MICROCONTROLLER AND IoT INTEGRATION**

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Gas leakage is a major safety hazard in residential and industrial environments, often leading to fire, explosions, and health-related risks. Conventional LPG regulators rely on manual inspection and mechanical shut-off mechanisms, which are insufficient for early detection and immediate response, especially when users are absent. This paper presents the design and development of an Automated Gas Regulator Safety System integrated with microcontroller-based control and Internet of Things (IoT) capabilities, thus to enhance the household safety by detecting and mitigating gas leaks effectively. The system employs an MQ-6 gas sensor for leak detection, an ESP32 microcontroller for data processing and wireless communication, and a stepper motor mechanism to automatically disconnect the gas regulator when hazardous levels are detected. A cloud-based IoT dashboard enables real-time monitoring, alerts, and remote supervision. Experimental results demonstrate that the system is capable of detecting gas leaks accurately, responding within a short time, and reliably performing automatic shut-off actions. The proposed solution enhances household safety by minimizing human intervention and providing a cost-effective, scalable, and user-friendly safety system.

P – 08

## **PERFORMANCE OF POLYETHYLENE TEREPHTHALATE (PET) AS A BINDER MODIFIER IN ASPHALT**

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The non-biodegradable nature of plastic waste combined with its recycling difficulties creates serious environmental problems as plastic waste continues to increase. In tropical regions, asphalt pavements experience high service temperatures which result in decreased binder stiffness and increased risk of rutting and permanent deformation. This research evaluates the feasibility of using waste polyethylene terephthalate (PET), obtained from discarded plastic bottles, as a modifier for asphalt binder. PET was integrated into a standard 60/70 penetration grade binder through a high-shear mixing process which operated at controlled conditions for 2-10% weight incorporation of PET. The modified binders underwent testing through penetration, softening point, rotational viscosity, elastic recovery, and Dynamic Shear Rheometer (DSR) methods which followed ASTM and Superpave specifications. The use of PET for binder modification resulted in increased binder stiffness and bettered rheological performance at high temperatures. The rutting parameter ( $|G^*|/\sin\delta$ ) showed improvement with PET addition, reaching its best results at approximately 6% PET. The use of excessive PET content leads to diminished workability and only provides minor performance benefits. The research results established that tropical pavement applications need approximately 4-6% PET as their optimal dosage range because this amount enhances pavement performance and helps reduce plastic waste.



# ABSTRACT

P – 09

## INVESTIGATING THE ENVIRONMENTAL BENEFITS AND CHALLENGES OF 3D PRINTING IN REDUCING MATERIAL WASTE AND OPTIMIZING PRODUCT DESIGN

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Additive Manufacturing (AM), is frequently championed as a cornerstone of green manufacturing due to its ability to minimize raw material waste by up to 90% and reduce logistical carbon footprints by 30% to 70%; however, its practical integration remains constrained by a "sustainability paradox" where operational efficiency often conflicts with ecological integrity. This study investigates the intersection of technical performance, user awareness, and environmental sustainability within the manufacturing sector of Johor Bahru, Malaysia, utilizing a quantitative research design with a purposive sample of 50 technical experts across strategic industrial zones including Pasir Gudang, Tebrau, and Senai. Data were collected via a structured, expert-validated questionnaire and analyzed using descriptive and inferential statistics to identify correlations between technical parameters and ecological impacts. The results identify a significant reduction in lead time (88%) as the primary driver for AM adoption, yet reveal a critical "risk literacy gap" as only 44% of respondents were aware of Volatile Organic Compound (VOC) emissions and 36% recognized the hazards of sub-micron Ultrafine Particles (UFPs). Engineering analysis further establishes bed adhesion as the dominant cause of print failure (88%), while 84% of respondents cite the inferior mechanical performance and high cost of biopolymers as a primary barrier to sustainability. Correlation analysis confirms that operational speed necessitates high energy intensity (76%) to maintain thermal stability, thereby negating original material-saving objectives, with a grand mean of 70.5% for technical constraints underscoring a high consensus on systemic bottlenecks. The study concludes that the transition toward sustainable AM in Johor Bahru is currently hindered by technical limitations and the absence of closed-loop recycling infrastructure (68%), necessitating the institutionalization of circular economy principles through stringent Standard Operating Procedures (SOPs), energy audits, and emission management protocols to synchronize industrial productivity with environmental stewardship.

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## INFLUENCE OF HEAVY METAL IMMOBILIZATION BY CYTOBACILLUS HORNECKIAE FROM AGRICULTURE WASTEWATER

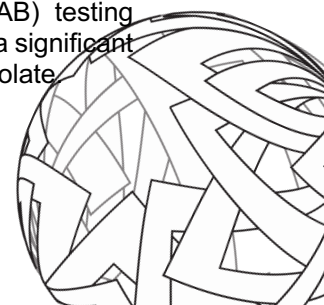
Nur Azzyati Azman<sup>1</sup>, Hazlami Fikri Basri<sup>2</sup>, Nurhazlin Azman<sup>2</sup>

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This study investigates the efficacy of Microbial Induced Calcite Precipitation (MICP) as a sustainable biotechnological solution for the immobilization of heavy metals in contaminated environments. While conventional remediation methods often face economic and environmental constraints, bioremediation through ureolysis offers a cost-effective and resilient alternative. The primary objective of this research was to isolate and characterize a native ureolytic bacterial strain, identified as *Cytobacillus horneckiae*, from agricultural wastewater and evaluate its performance in sequestering a mixture of lead (Pb<sup>2+</sup>) and cadmium (Cd<sup>2+</sup>). The isolation process utilized enrichment and subculturing techniques, confirmed by the detection of ammonia and high culture turbidity. Qualitative assessments via Urea Agar Base (UAB) testing demonstrated rapid urease production, while optical density (OD<sub>600</sub>) measurements indicated a significant increase in bacterial biomass, rising from 0.814 in the raw wastewater to 0.987 for the single isolate.



# ABSTRACT

Optimization experiments identified that the strain is alkaliphilic, achieving peak biomineralization at a pH of 9, a urea concentration of 0.75 M, and a temperature of 35°C. The biomineralization tests revealed that *C. horneckiae* facilitates rapid mineral induction, producing significant CaCO<sub>3</sub> precipitation within 30 minutes. Analysis of heavy metal removal efficiency showed that the strain possesses high tolerance to toxic environments, maintaining effective mineralization even at concentrations of 800 mg/L Pb<sup>2+</sup> and 800 mg/L Cd<sup>2+</sup>. The highest immobilization performance was recorded in a mixture of 50 mg/L Cd<sup>2+</sup> and 800 mg/L Pb<sup>2+</sup>, achieving a maximum removal efficiency of 89.06%. These results highlight the potential of agricultural waste-derived *C. horneckiae* as a robust microbial agent for the sustainable remediation of heavy metal-laden effluents, contributing to environmental protection and the circular economy.

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## AN ENHANCED MiniVGGNet FOR INDOOR OBJECT CLASSIFICATION IN ELDERLY CARE SETTINGS

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The increasing elderly population has intensified the demand for intelligent vision-based monitoring systems capable of accurately recognising objects in indoor care environments. Traditional feature-based methods such as Scale-Invariant Feature Transform (SIFT) and Histogram of Oriented Gradients (HOG) are limited by manual feature extraction and reduced robustness under real-world conditions. Convolutional Neural Networks (CNNs), particularly lightweight architectures such as MiniVGGNet, offer improved performance but remain constrained by limited depth and feature extraction capability. This study proposes an Enhanced MiniVGGNet architecture with an additional convolutional block, strengthened regularisation through increased dropout, and consistent batch normalisation across layers to improve classification performance and robustness. The models were trained using Stochastic Gradient Descent with a momentum value of 0.9 for 100 epochs and evaluated on the MYNursingHome dataset. Experimental results demonstrate that the Enhanced MiniVGGNet improves classification accuracy from 92% to 93% on the MYNursingHome dataset with corresponding improvements in macro and weighted F1-scores. The enhanced model also exhibits more stable validation loss and improved convergence behaviour. These findings indicate that modest architectural refinements can significantly enhance classification robustness while maintaining computational efficiency, making the Enhanced MiniVGGNet suitable for deployment in elderly care monitoring systems.

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## CO<sub>2</sub> SENSING IN SOIL FOR EARLY PEATLAND FIRE RISK PREDICTION USING AN IoT-BASED LoRa SYSTEM

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Peatland fires are difficult to detect due to their subsurface smouldering behavior and prolonged burning duration. Existing fire monitoring systems mainly rely on surface environmental parameters or satellite-based hotspot detection, which are often reactive. This study proposes an Internet of Things (IoT)-based soil CO<sub>2</sub> sensing system for early peatland fire risk prediction. A non-dispersive infrared (NDIR) CO<sub>2</sub> sensor, integrated with soil temperature and moisture sensors, is interfaced with an ESP32 microcontroller



# ABSTRACT

and LoRa communication module for real-time monitoring. The system transmits data to a cloud platform for trend analysis and rule-based fire risk classification. Experimental validation in controlled peat soil conditions shows that sustained elevation of soil CO<sub>2</sub> concentration, coupled with low moisture and increased temperature, can indicate early subsurface oxidation processes associated with increased fire susceptibility. The proposed system demonstrates the feasibility of using soil CO<sub>2</sub> as an early chemical indicator for proactive peatland fire prevention.

**P – 13**

## **TOWARD DECISION-GRADE WATER QUALITY MONITORING WITH UNMANNED SURFACE VEHICLES: A REVIEW OF TASK-DRIVEN ARCHITECTURES AND DATA TRUSTWORTHINESS**

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This review synthesizes unmanned surface vehicles (USVs) for engineering deployment in water quality monitoring. Using bibliometric evidence and comparative assessment of representative systems, USV-based water quality monitoring tasks are grouped into four categories: routine cruise monitoring, efficient coverage sampling, abnormal event-driven monitoring, and multi-source collaborative monitoring. Engineering constraints are structured into 10 categories across environmental, resource, and data dimensions, which are then mapped to 5 core indicators for engineering acceptance and evaluation. A four-layer architecture (carrier layer, navigation control layer, sensor sampling layer, and data layer) is abstracted, highlighting the task closed loop and data closed loop. The review further synthesizes error mechanisms (drift, biofouling, anomalies, missing data) and their mitigation pathways, including self-maintenance and online quality control, and evidence indicates that data trustworthiness is the key bottleneck for scaling USVs from prototypes to routine monitoring. The proposed framework provides actionable guidance for system selection, deployment assessment, and long-term operation.

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## **SAFE, SMART, AND SUSTAINABLE: STRATEGIES TO ENHANCE MICROMOBILITY SAFETY IN URBAN TRANSPORT**

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The micromobility, including e-scooter and bicycles gaining popularity in urban transportation but faces significant safety challenges. This narrative review for identifying relevant strategies to bridge these gaps on how integrated strategies in infrastructure design, regulatory frameworks, and user education to assess their applicability and potential adaptation for improving safety outcomes in urban transport context. The initial step in developing safety enhancement strategies was to review existing literature and identify key relationships between micromobility infrastructure, regulatory policies, and user behavior in the context of urban transport safety. Addressing these fundamental challenges through targeted infrastructure improvement, clear legal frameworks and safety interventions such speed management and dedicated stations that is crucial for realizing micromobility's sustainable urban benefits. These strategies can be a basis for policy makers, urban planners and local authorities to develop tailored adaptation frameworks that align with the needs of micromobility users.



# ABSTRACT

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## REVIEW OF END-OF-LIFE VEHICLE MANAGEMENT IN MALAYSIA: CHALLENGES IN POLICY, PRACTICE, AND PUBLIC ACCEPTANCE

Muhd Razuhanafi Mat Yazid<sup>1\*</sup>, Nur Amirah Najihah Binti Shahminan<sup>1</sup>, Syahmi Razi Razali<sup>1</sup>, Muhazri Abd Mutalib<sup>1</sup>

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End-of-life vehicles (ELV) are vehicles that are no longer used by their owners. The vehicle will either be left on the side of the road or discarded by the owner. ELV contain dangerous and toxic substances such as transmission oil, fuel, and engine coolant. These toxic substances can endanger the environment and human health if they are processed or disposed of in an improper way. Therefore, the vehicle should be properly recycled or disposed. This is to ensure that all the toxic substances are not exposed to the earth's environment. The ELV policy is an initiative aimed at reducing environmental pollution and managing vehicles that are no longer suitable for use. The implementation of this policy is also aimed at raising public awareness of the importance of managing vehicles that are no longer suitable for use. Poor management of old vehicles and ELV are due to the failure of the government to enact legislation related to the ELV policy. Current laws are lacking the explicit legislation on the management of abandoned vehicles or vehicles that have outlived their period of effective operation. Users cannot be fully responsible for ELV recycling because all parties are responsible to work together to find a solution. This study aims to map a developing nations, such as Malaysia, journey to implement policies such as ELV Policy and identify key points for successful policy introduction and implementation. Decision makers can learn from Malaysia's journey, and strive for responsible waste management initiative and sustainable automotive industries

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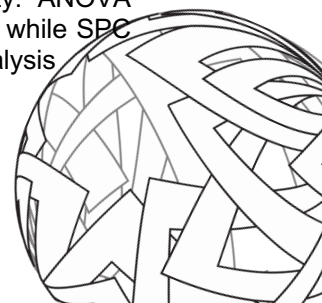
## STATISTICAL CHARACTERIZATION AND PROCESS CAPABILITY OF DIMENSIONAL ACCURACY IN HEATED-CHAMBER FDM PRINTING OF PLA

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Fused Deposition Modeling (FDM) is widely used in polymer additive manufacturing due to its simplicity and cost effectiveness; however, dimensional accuracy in desktop open-frame systems remains highly sensitive to thermal fluctuations during printing. Polylactic Acid (PLA), although generally regarded as dimensionally stable, can still exhibit variability caused by non-uniform cooling and uncontrolled ambient conditions. This study presents a statistical evaluation of the effect of heated chamber temperature on the dimensional accuracy and process capability of FDM-printed PLA components. A custom temperature-controlled heated chamber was integrated with a desktop FDM printer to regulate the printing environment. Standardized PLA specimens based on ASTM D638 Type IV geometry were fabricated under ambient conditions and three controlled chamber temperatures (40 °C, 45 °C, and 50 °C), while all other printing parameters were maintained constant. Dimensional deviations from nominal CAD values were measured and analysed using descriptive statistics, one-way analysis of variance (ANOVA), statistical process control (SPC), and process capability indices (Cp and Cpk). The results demonstrate that increasing chamber temperature significantly reduces dimensional deviation and variability. ANOVA confirmed a statistically significant influence of chamber temperature on dimensional stability, while SPC charts revealed improved process consistency under heated conditions. Process capability analysis



## ABSTRACT

showed a clear improvement in Cp and Cpk values relative to ASTM tolerance limits at elevated chamber temperatures. Overall, the findings confirm that moderate heated chamber implementation is an effective and practical approach for improving dimensional accuracy and manufacturing reliability in PLA FDM printing.

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### PHYSICAL SURFACE COATING OF RECYCLED PET WITH PURIFIED WASTE COOKING OIL: A PRELIMINARY STRUCTURAL STUDY

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This work reframes the role of recycled cooking oil (rWCO) in recycled polyethylene terephthalate (rPET) processing as a non-reactive, physical surface coating rather than a chemical modifier. Purified rWCO was prepared using a simple cornstarch-assisted clarification and applied by spray onto cleaned rPET feedstock prior to extrusion. The study focuses strictly on structural responses in terms of X-ray diffraction (XRD) and scanning electron microscopy (SEM), in order to determine whether such a low-tech, catalyst-free approach produces measurable changes in crystallinity and morphology, while explicitly excluding thermal spectroscopy (FTIR/DSC/TGA) and bulk mechanical testing at this stage. XRD patterns of oil-treated rPET retain the same peak positions as neat rPET, indicating preservation of the PET crystalline phase, while a modest reduction in crystallinity index is observed, consistent with disruption of chain packing by physically adsorbed oil molecules. SEM reveals smoother fracture surfaces and reduced microvoids consistent with extrusion lubrication and amorphous-phase wetting. The results support the hypothesis that purified rWCO acts as a temporary external plasticizer/processing aid through surface coating and limited diffusion into amorphous regions without forming covalent bonds. This preliminary structural evidence justifies future, reactive pathways (e.g., glycolysis or transesterification with catalysts) to test whether oil-derived moieties can be chemically incorporated into the PET backbone.

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### INFLUENCE OF BALL MILLING SPEED ON THE STRUCTURAL AND HARDNESS PROPERTIES OF EGGSHELL-DERIVED HYDROXYAPATITE FOR BIOMEDICAL APPLICATIONS

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Hydroxyapatite (HA) is widely used in biomedical applications due to its biocompatibility and compositional similarity to natural bone, yet conventional synthesis routes rely on high-purity reagents and energy-intensive processing. This study presents a sustainable approach for producing HA using calcium oxide derived from eggshell waste. Eggshell-based CaO was ball-milled with diammonium hydrogen phosphate at 200, 300, and 400 rpm for 4 h and subsequently heat-treated at 800 °C. Structural and mechanical characteristics were evaluated using XRD, FESEM–EDX, and micro-Vickers hardness testing. Increasing milling speed improved HA crystallinity, particle refinement, and Ca/P stoichiometry, with the Ca/P ratio approaching the ideal 1.67 at higher speeds. Hardness increased from 551.43 MPa (200 rpm) to 730.83



# ABSTRACT

MPa (400 rpm), reflecting enhanced densification and reduced porosity. Overall, the results demonstrate that optimized milling significantly improves the phase purity and mechanical performance of eggshell-derived HA, confirming biowaste-based CaO as a viable and eco-friendly precursor for biomedical-grade HA.

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## **AN ENTROPY-REGULARIZED WEIGHTED ENSEMBLE PSEUDO-LABELING FRAMEWORK FOR SEMI-SUPERVISED HYPERTENSION PREDICTION**

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Hypertension prediction is important for early cardiovascular risk management. However, current predictive models are always lack of reliability due to the limited labelled clinical data. To address this problem, we develop a new algorithm called entropy-regularized weighted ensemble pseudo-labelling (E-WEPL) to leverage unlabelled physiological data. In contrast to conventional methods, E-WEPL incorporates uncertainty quantification based on Shannon entropy and selects only high-quality pseudo-labels to reduce error during training. The proposed algorithm is evaluated using two clinical datasets related to hypertension prediction that comprises variables such as age, BMI, heart rate and body measurements. The results demonstrate that E-WEPL outperforms conventional supervised models in terms of accuracy, stability and discriminative performance. Overall, E-WEPL provides a robust approach for hypertension prediction by leveraging both labelled and unlabelled data

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## **OPTIMISATION OF SAWDUST-BASED BRICK PRODUCTION USING THE TAGUCHI EXPERIMENTAL DESIGN METHOD**

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Building materials serve as both the primary construction material and supporting attributes in construction. Bricks are among the main construction materials. The raw materials for making bricks usually consist of clay and cement. The problem at the brick manufacturing depot is that the products often crack and are less precise in size because the brick mortar is too wet. This study aims to determine the optimal combination using the Taguchi method to reduce the number of broken bricks and identify the factors affecting the quality of bricks made from sawdust. The research methods used in Taguchi's experimental design were signal-to-noise (SNR) analysis and the analysis of variance (ANOVA). Orthogonal array determination is used in the form of 2 (two) levels and 3 (three) factors. The results of the study showed that an optimal combination of experiments, as indicated by the SNR value using the larger-is-better criterion, included a clay factor of 40 kg, a sawdust factor of 7 kg, and a sun-drying duration factor of 25 days. Meanwhile, the ANOVA results indicated that the influence of clay and sawdust on compressive strength accounted for 93.16%, the effect of clay and sun-drying duration on compressive strength accounted for 86.40%, and the effect of sawdust and sun-drying duration on compressive strength accounted for 20.44%, respectively.



# ABSTRACT

P – 21

## A CASE STUDY ON PRESSURE UP-RATING AND LIFE EXTENSION OF AN IN-SERVICE WELL TEST SEPARATOR FROM 7.2 MPA (G) TO 9.2 MPA(G) USING FITNESS-FOR-SERVICE ASSESSMENT

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This study presents a structured assessment framework for pressure uprating and service life extension of ageing in-service pressure vessels using an integrated Mechanical Integrity and Fitness-for-Service (FFS) approach. Conventional validation methods, such as hydrostatic testing and design-by-rule calculations, are often impractical due to operational constraints and incomplete design data. The study focuses on the AQ1040 well test separator, which has been in operation for approximately 28 years and is proposed for pressure uprating from 7.2 MPa(g) to 9.2 MPa(g). The methodology integrates in-service inspection, material verification, non-destructive examination (NDE), code-based engineering calculations, and Finite Element Analysis (FEA). The results demonstrate that the proposed framework provides a defensible and systematic approach for evaluating pressure containment capability and remaining life without the need for hydrostatic testing. The study contributes a practical and repeatable methodology aligned with industry standards for ageing pressure vessels.

P – 22

## PREDICTIVE BEARING FAULT DETECTION IN INDUCTION MOTORS USING MULTI-SENSOR SIGNAL ANALYSIS AND INTELLIGENT LEARNING MODELS

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Early and reliable detection of bearing faults is essential for ensuring the safe and efficient operation of induction motors in industrial environments. Bearing degradation often develops progressively and, if undetected, can lead to catastrophic machine failure, unplanned downtime, and increased maintenance costs. This study presents an intelligent predictive bearing fault detection framework based on multi-sensor signal analysis and deep feature-based learning. Experiments were conducted using a Machine Fault Simulator (MFS) test rig, where four bearing conditions, identified as healthy (baseline), inner race fault, outer race fault, and combination fault were evaluated under varying rotational speeds (500, 2000, and 3000 rpm) and load conditions (minimum, medium, and maximum load). Vibration and electrical responses were simultaneously acquired using a micro-fiber composite (MFC) sensor, piezoelectric transducer, triaxial accelerometer and motor current sensor. The acquired signals were pre-processed and analysed using time and frequency domain to characterise fault-related signatures. Deep feature representations were extracted from the processed signals and used as inputs to model classifiers for fault identification, with performance benchmarked against a Bagged Tree ensemble model. The results demonstrate that the proposed intelligent framework is capable to distinguish bearing health states with high robustness across varying operating conditions. The study confirms the feasibility of predictive bearing fault detection prior to machine breakdown, offering significant benefits for industrial condition monitoring and maintenance optimisation.



# ABSTRACT

P – 23

## **SYNTHESIS AND STRUCTURAL STUDY OF METAL –OXIDES DERIVED FROM ALPHA-AMINO NITRILE COMPLEXES BY THERMAL DECOMPOSITION METHOD**

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In this work, an  $\alpha$ -aminonitrile ligand was successfully synthesized via Schiff base formation followed by a Strecker-type reaction. The chemical structure of the ligand was confirmed using FT-IR, <sup>1</sup>H NMR, and <sup>13</sup>C NMR spectroscopy. A series of transition metal complexes incorporating Fe(II), Fe(III), Cr(III), and Cu(II) ions were subsequently prepared, and their coordination behavior was investigated using IR and UV–Visible spectroscopy in addition to thermogravimetric analysis (TGA), which provided insight into their thermal stability and decomposition pathways. Thermal decomposition of the synthesized metal complexes was employed as a precursor-based strategy to obtain metal oxide nanoparticles. X-ray diffraction (XRD) analysis confirmed the formation of phase-pure  $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>,  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>, Cr<sub>2</sub>O<sub>3</sub>, and monoclinic CuO with well-defined nanocrystalline structures. The surface morphology, particle size distribution, and aggregation behavior of the obtained oxides were further examined using atomic force microscopy (AFM) and scanning electron microscopy (SEM). The thermal decomposition of  $\alpha$ -aminonitrile metal complexes is an efficient and versatile route for producing metal oxide nanoparticles with controlled crystalline phases and nanoscale features.

P – 24

## **A CONCEPTUAL MEASUREMENT FRAMEWORK FOR UNDERWATER RADIATED NOISE IN THE MALAYSIAN MARITIME ZONES**

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Underwater Radiated Noise (URN) generated by commercial shipping is increasingly acknowledged as a significant environmental issue impacting marine ecosystems. In response, the International Maritime Organisation (IMO), through its Ship Design and Construction (SDC) Subcommittee, released revised guidelines in 2023 to mitigate URN emissions. Despite these efforts, the implementation of these guidelines remains predominantly voluntary and lacks adaptation at the regional level. This study introduces a conceptual framework for measuring URN in two of the world's busiest maritime corridors: the Strait of Malacca and the South China Sea, both characterised by shallow waters, high vessel density, and complex acoustic propagation environments. The proposed methodology integrates Passive Acoustic Monitoring (PAM) and controlled pass-by measurements and adheres to international standards such as ISO 17208: Underwater Acoustics — Quantities and Procedures for Description and Measurement of Underwater Sound from Ships, and ANSI S12.64:2009, Measuring Underwater Sound from Ships. Empirical data from Malaysian coastal measurements reveal unique acoustic signatures among vessel types, with small ferries exhibiting noise levels of approximately 100 dB/1  $\mu$ Pa. Key challenges identified include signal overlap, ambient noise masking, and shallow-water propagation effects. To address these, a phased implementation approach is recommended, encompassing baseline mapping, standardisation, regulatory harmonisation, and the integration of AI-based analytics. The concept underscores the viability of establishing regional URN monitoring systems and informs future regulatory initiatives under the IMO.



# ABSTRACT

P – 25

## IMPACT OF WELDING VARIABLES ON MILD STEEL IN GAS METAL ARC WELDING (GMAW)

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Gas Metal Arc Welding (GMAW) is a widely used welding process in manufacturing industries due to its high productivity and good weld quality. However, weld quality in mild steels strongly depends on welding variables such as welding current, voltage, travel speed, shielding gas, and wire feed rate. These parameters influence heat input, weld bead geometry, microstructure, and mechanical properties. Improper control can result in defects like porosity, lack of penetration, and cracking. This paper details the influence of Gas Metal Arc Welding (GMAW) process parameters on mild steel welding and provides insights into optimizing weld quality.

P – 26

## NAVIGATING THE DIGITAL SHIFT: FROM REACTIVE MAINTENANCE TO PERFORMANCE-BASED CONTRACTING (PBC) IN GOVERNMENT ENGINEERING ASSETS.

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The management of government engineering assets is undergoing a paradigm shift from traditional, input-driven reactive maintenance to outcome-oriented frameworks. This paper explores the transition towards Performance-Based Contracting (PBC) as mandated by the Malaysian Treasury Circular PK 1.8. Historically, "as and when required" maintenance models have suffered from unpredictable costs and inconsistent asset availability. PBC addresses these challenges by tying contractor compensation to measurable Key Performance Indicators (KPIs) and System Health Indicators (SHIs). Central to this transition is digital transformation; effective PBC implementation requires a data-driven ecosystem for real-time monitoring and performance verification. Through a conceptual analysis of the Performance Management Framework (PMF), this study categorises PBC into four maturity stages; ranging from basic logistic response to full mission reliability. Applying integrating financial mechanisms such as the At-Risk-Amount (ARA), PBC incentivises contractors to adopt sustainable engineering practices and digital accountability. The findings suggest that PBC acts as a catalyst for industrial collaboration and technological growth, ensuring that national engineering assets are maintained with optimum efficiency and long-term sustainability.



# ABSTRACT

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## DESIGN AND DEVELOPMENT OF A ROTATIONAL JIG FOR ENHANCED RADIOGRAPHIC INSPECTION OF AERO ENGINE COMPRESSOR BLADES

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Digital Radiographic Testing (RT-D) is widely applied for the inspection of aero-engine components due to its ability to detect internal defects without compromising structural integrity. However, conventional RT-D inspections rely heavily on manual repositioning of components, leading to inconsistent imaging geometry, extended inspection time, and increased radiation exposure to operators. This study presents the design, development, and performance evaluation of a rotational multi-blade jig system aimed at improving inspection efficiency, repeatability, and operational safety during RT-D inspection of aero-engine compressor blades. The baseline inspection system consists of an X-ray source operating at 100 kV and 1.8 mA and a Digital Detector Array (DDA) positioned at a source-to-detector distance of 700 mm. The proposed jig accommodates up to four blades simultaneously and enables controlled multi-axis rotational positioning without manual intervention. Experimental results demonstrate that the developed jig reduces inspection time by approximately 40–60% while improving positional consistency and image repeatability. In addition, operator exposure to radiation is significantly reduced through minimized manual handling. The proposed system represents a cost-effective and practical enhancement to industrial radiographic inspection workflows and is readily adaptable to other aero-engine components.

P – 28

## CASE STUDY OF POST-FIRE DAMAGED STRUCTURE USING ULTRASONIC PULSE VELOCITY (UPV) AND ULTRASONIC PULSE ECHO (UPE)

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This case study correlate between Ultrasonic Pulse Velocity (UPV) and Ultrasonic Pulse Echo (UPE) approaches as non-destructive testing methods for evaluating concrete strength and assessing post-fire damage of ten double storey residential buildings. Indirect method pulse velocity (UPV) and direct pulse echo array (UPE) was conducted to measure concrete quality real time frequency. The paper highlights the influence of data interpretation on ultrasonic properties and correlation of UPV and UPE measurement to concrete strength according to concrete quality rating classification (BS EN 12504-4: 2021). The results reveal that the data demonstrated for UPV and UPE, compellingly categorize the post-fire condition of concrete structures into excellent (E), good (G), medium (M), Doubtful (D) and very weak (VW) to informed maintenance and rehabilitation decisions.



# ABSTRACT

P – 29

## NUMERICAL SIMULATION OF TILT GRAVITY DIE CASTING PROCESS FOR AUTOMOTIVE FRONT LOWER CONTROL ARM (FLCA)

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Numerical simulation was employed to evaluate the tilt gravity die casting process for an automotive aluminum lower control arm using Anycasting software, focusing on filling behavior, solidification characteristics, defect formation, and mold erosion. The simulation results show that controlled mold tilting enables stable and progressive filling with reduced turbulence, while solidification initiates early in the component region and proceeds directionally toward the feeding system. Although the complete casting system required a longer solidification duration, FLCA achieved full solidification within a significantly 598s. Defect analysis revealed that potential shrinkage-related defects were localized and influenced by thermal gradients and feeding conditions, demonstrating that probabilistic defect prediction is effective for identifying defect-prone regions at the design stage. Mold erosion analysis further indicated generally low erosion intensity, with localized concentrations at flow transition regions associated with higher melt velocity. Overall, the numerical results demonstrate that simulation-based analysis provides a practical and reliable approach for understanding and improving filling stability, solidification behavior, defect control, and mold durability in tilt gravity die casting of automotive aluminum components.

P – 30

## THE EFFECT OF FUEL BLEND RATIO TO THE PERFORMANCE OF PALM OIL-BASED BIODIESEL ON AN HCCI ENGINE

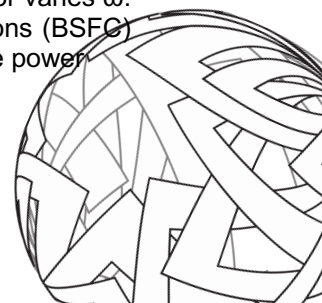
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The increasing requirements to control emission and fuel economy are become important recently. Furthermore, the hazardous components produced by internal combustion engine forces many researchers to consider with alternative fuel which is environmental friendly and renewable sources. This study intends to investigate the performance and emission level by using palm oil blends with diesel operated on HCCI-DI engine. In this study, an experiment has carried out on single cylinder diesel engine with port fuel injection (PFI) attached at the intake manifold. The HCCI-DI engine was operated at 1800 rpm with different fuel injection quantity;  $\omega = 1.1, 1.4, 1.7$  and  $\lambda = 1.8, 2.3, 2.9$ . It has found that different fuel injection with difference palm oil blends percentages is significantly affects the engine performance. Blended fuels PO5 and PO10, produce higher nitrogen oxide (NO<sub>x</sub>) and unburned hydrocarbon (UHC) emission at DI mode. At HCCI-DI mode of combustion, blended fuels PO5 and PO10 increase NO<sub>x</sub> and reduce UHC. Meanwhile carbon dioxide (CO<sub>2</sub>) and carbon monoxide (CO) slightly reduce which no significant change for varies  $\omega$ . The usage of palm oil blends on HCCI-DI engine increase the break specific fuel consumptions (BSFC) and brake mean effective pressure (BMEP) and reduce the engine performance include engine power.



# ABSTRACT

compare with conventional diesel fuel. Thus, palm oil biodiesel operated in HCCI-DI mode of combustion have an optimal PFI quantity to operate in minimal emission levels.

**P – 31**

## **INFLUENCE OF HEAVY METAL IMMOBILIZATION AND SOIL STABILISATION BY SPOROSARCINA PASTEURII**

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Heavy metal contamination in Malaysia poses significant environmental risks and degrades soil stability, yet conventional remediation remains costly and unsustainable. This study explores Microbially Induced Calcium Carbonate Precipitation (MICP) as a sustainable alternative to immobilize Lead (Pb) and Cadmium (Cd) while enhancing soil strength. Indigenous ureolytic bacteria isolated from crop residues demonstrated high urease activity, showing optimal precipitation at pH 7.2, 0.75 M urea, and 35°C. In comparison, *Sporosarcina pasteurii* performed best under alkaline conditions (pH 9). A key novelty of this research is the integration of pineapple peat, which, over a 14-day curing period, significantly increased carbonate content and reduced heavy metal mobility. Unconfined Compressive Strength (UCS) tests revealed that while heavy metals slightly inhibit penetration resistance, the MICP process effectively improves the mechanical properties of contaminated sand. These findings confirm MICP's efficacy as a low-cost, bio-based solution for soil stabilization and heavy metal immobilization.



# APPRECIATION



*Thank you for the support towards making this convention a success. It is hoped that this collaboration would be beneficial to all of us in addressing our commitment in all fields related and provide with a better networking, exchanging of ideas and experience that enhance the visibility and recognition for the organizations, around the world.*



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