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2025 mucet

MALAYSIAN TECHNICAL UNIVERSITIES CONFERENCE ON ENGINEERING AND TECHNOLOGY (MUCET 2025)

"Engineering Innovations for Resilient Society"

9 - 11 September 2025
World Trade Centre, Kuala Lumpur, MALAYSIA

2025 MUCET

"Engineering Innovations for Resilient Society"

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UNIVERSITI MALAYSIA PERLIS

Message From The Vice Chancellor

Universiti Malaysia Perlis (UniMAP)

It is with immense pride and pleasure that I extend a warm welcome to all delegates, researchers, academics, industry professionals, and esteemed guests to the Malaysian Technical Universities Conference on Engineering and Technology (MUCET 2025), held in conjunction with GTEST 2025, at the iconic World Trade Centre Kuala Lumpur.

This year's theme, "Engineering Innovations for Resilient Society," captures the urgent need for adaptable, inclusive, and forward-looking solutions to the complex challenges of our time, from climate change and energy security to digital disruption and social inequality. It aligns closely with the 13th Malaysia Plan (RMK-13), which emphasises innovation, digitalisation, and developing a highly skilled workforce to address both national and global priorities.

At Universiti Malaysia Perlis (UniMAP), we believe knowledge and innovation must serve a greater purpose in uplifting communities, protecting our environment, and strengthening the foundations of society. MUCET, as a collaboration among Malaysia's technical universities, offers a vibrant platform to exchange ideas, forge partnerships, and turn research into meaningful solutions.
This conference is about more than presenting findings, it is about shaping thought leadership, enabling transformative collaborations, and ensuring that technological advances translate into tangible benefits for the rakyat.

My sincere appreciation goes to the organising committee, reviewers, academic collaborators, and industry partners for their dedication to excellence. To all participants, I urge you to engage fully, collaborate openly, and be inspired by the perspectives shared here. Together, let us reaffirm our shared mission to engineer a future that is more resilient, inclusive, and full of promise.

Wishing you a successful and enriching MUCET 2025.

Dato' Prof. Ts. Dr. Zaliman Sauli
Vice Chancellor
Universiti Malaysia Perlis (UniMAP)

Message From The Deputy Vice Chancellor Research & Innovation

Universiti Malaysia Perlis (UniMAP)

On behalf of Universiti Malaysia Perlis (UniMAP), it is my honour and privilege to welcome you to the Malaysian Technical Universities Conference on Engineering and Technology (MUCET 2025) held in conjunction with the Global Trends in Engineering, Science and Technology Congress (GTEST 2025).

As the world becomes increasingly complex and interconnected, the role of engineers and technologists has never been more critical. The theme of MUCET 2025, “Engineering Innovations for Resilient Society”, challenges us to rethink conventional paradigms and reimagine solutions that not only address today’s problems but also anticipate the needs of tomorrow.

This conference is more than an academic congregation; it is a nexus of creativity, critical inquiry, and collective purpose. We are bringing together some of the brightest minds across disciplines and borders to deliberate on pressing issues in civil engineering, environmental sustainability, digital systems, advanced manufacturing, education, and other related fields. The diversity of tracks and topics reflects our belief that no single field holds the key to resilience; true innovation requires collaboration across sectors and domains.

I take this opportunity to congratulate the organising committee and our university partners for their unwavering dedication to curating a program that is both rigorous and relevant. The passion and professionalism of everyone involved are a testament to the academic excellence and commitment to service that define our technical universities.

To all participants, I encourage you to embrace this platform as a space for growth, be bold in your presentations, generous with your feedback, and open to new partnerships. May your contributions during this conference spark ideas that have a lasting, real-world impact.

Welcome once again to MUCET 2025. Together, let us engineer a better tomorrow.

Prof. Ir. Dr. Rizalafande Che Ismail
Deputy Vice Chancellor
Research & Innovation
Universiti Malaysia Perlis (UniMAP)

Message From The Chairman Of MUCET 2025

Universiti Malaysia Perlis (UniMAP)

It is a profound honour to welcome each and every one of you to the Malaysian Technical Universities Conference on Engineering and Technology (MUCET 2025), proudly hosted by Universiti Malaysia Perlis (UniMAP) and organised in synergy with GTEST 2025.

MUCET has always been a platform that champions research excellence, technological advancement, and the nurturing of young scholars and innovators. This year, Universiti Malaysia Perlis (UniMAP) is the proud host of this biennial event, now in its 14th edition since its inception in 2007. The congress is a collaborative effort among all Malaysian Technical Universities (MTUN): Universiti Malaysia Perlis (UniMAP), Universiti Tun Hussein Onn Malaysia (UTHM), Universiti Teknikal Malaysia Melaka (UTeM), and Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA). This year also marks the participation of Universiti Kuala Lumpur (UniKL) and Universiti Selangor (UNISEL) as co-organisers of MUCET 2025.

Throughout this two-day event, we will perceive from leading thinkers, visionary researchers, and emerging talents who are pushing boundaries in their respective fields. With 100 papers, multiple technical tracks, and distinguished speakers, MUCET 2025 promises a wealth of intellectual stimulation and networking opportunities.

As Chairperson, I am deeply grateful to the exceptional team behind this conference, the organising committee, reviewers, session chairs and technical staff whose hard work has made this gathering possible. I also extend a heartfelt thanks to our co-organisers and, most importantly, to you, the participants, who bring your knowledge, ideas, and enthusiasm to this shared platform.

I invite you to immerse yourself in the sessions, challenge assumptions, raise challenging questions, and build bridges across disciplines and institutions. Let this conference be a catalyst for action and a springboard for future collaborations.

Let us engineer not only technologies but also trust, transformation, and tenacity.

Thank you, and welcome to MUCET 2025.

Assoc. Prof. Ts. Dr. Ayu Wazira Azhari
Chairman, MUCET 2025
Universiti Malaysia Perlis (UniMAP)

About Global Trends In Engineering, Science And Technology Congress (GTEST)

The Global Trends in Engineering, Science & Technology Congress (GTEST) is a prestigious annual congress organized by Universiti Malaysia Perlis (UniMAP). Since its inception, GTEST has served as a comprehensive platform for thought leaders, researchers, academics, engineers, scientists, policymakers, and industry professionals from across the globe to converge, exchange knowledge, and explore innovations across a wide spectrum of disciplines. GTEST 2025 continues this tradition by providing an intellectually stimulating environment that fosters cross-disciplinary dialogue, technological insights, and strategic networking opportunities. The Congress brings together multiple international conferences under one umbrella—including MUCET 2025—each focusing on key domains within engineering, science, and technology.

This year, GTEST 2025 brings together 10 simultaneously held international conferences together with the Innovation Pitch and Business Matching (IPBM) programme, focusing on different issues pertaining to their respective theme:

MUCET 2025	Malaysian Technical Universities Conference on Engineering and Technology (MUCET)
ICOCET 2025 — IEEE 2ND INTERNATIONAL CONFERENCE ON COMMUNICATION ENGINEERING & EMERGING TECHNOLOGIES 2025	International Conference on Communication Engineering and Emerging Technologies (ICOCET)
AIDT	International Joint Conference on AI-Driven Digital Twin Transforming Smart Industries (AIDT)
ICoGMPaC 2025 — International Conference on Green Materials, Processing and Characterization	International Conference on Green Materials, Processing and Characterization (ICoGMPAC)
IAGRIS'25 — THE 2ND INTERNATIONAL AGRICULTURE REVOLUTION SYMPOSIUM	International Agriculture Revolution Symposium (IAGRIS)
ICOHSE 7 — 7TH INTERNATIONAL CONFERENCE ON THE ROLES OF THE HUMANITIES AND SOCIAL SCIENCES IN ENGINEERING 2024	International Conference on The Roles of The Humanities and Social Sciences in Engineering (ICOHSE)
ICoBiomasSE 2025	International Conference on Biomass Utilization and Sustainable Energy (ICoBiomasSE)
ICOBE 2025	International Conference on Biomedical Engineering (ICoBE)
ICoAEM 2025 — APPLIED & ENGINEERING MATHEMATICS	International Conference on Applied and Engineering Mathematics (ICoAEM)
CIVENTECH	International Conference on Civil Engineering & Technology (CIVENTECH)
I.P.B.M — INNOVATE. PITCH. CONNECT	Innovation Pitch and Business Matching (IPBM)

About MUCET

The Malaysian Technical Universities Conference on Engineering and Technology (MUCET) is a flagship biennial conference jointly organised by the Malaysian Technical University Network (MTUN), comprising four leading technical universities in Malaysia:

- **Universiti Malaysia Perlis (UniMAP)**
- **Universiti Tun Hussein Onn Malaysia (UTHM)**
- **Universiti Teknikal Malaysia Melaka (UTeM)**
- **Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA)**

Since its inception in 2007, MUCET has been a premier platform for knowledge exchange, cutting-edge research dissemination, and collaborative innovation in engineering and technology. Hosted in rotation by the MTUN member universities, the conference reflects the collective commitment of MTUN to advance technical education, drive industry-relevant research, and address pressing societal challenges through technological solutions.

Over the years, MUCET has grown into a dynamic platform that brings together participants from academia, industry, and government agencies. Each edition carries a distinct theme, setting the tone for critical discussions and breakthrough ideas. Past hosts have each contributed to shaping MUCET into a recognised and respected event in the engineering community.

MUCET 2025, proudly hosted by Universiti Malaysia Perlis (UniMAP), takes place on 9–10 September 2025 at the World Trade Centre, Kuala Lumpur. This year, the conference also welcomes Universiti Kuala Lumpur (UniKL) and Universiti Selangor (UNISEL) as co-organisers, further enriching its scope and participation. Held under the theme ‘Engineering Innovations for a Resilient Society’, the programme features five thematic tracks:

- **Civil & Environmental Engineering**
- **Chemical & Natural Resources Engineering**
- **Electrical & Electronic Engineering**
- **Mechanical & Manufacturing Engineering**
- **Social Science, Education & Technology Management**

MUCET 2025 is also run in conjunction with the Global Trends in Engineering, Science and Technology Congress (GTEST) 2025, expanding its reach and impact. All accepted papers, reviewed through a rigorous peer-review process, will be published in proceedings and journals indexed by Scopus/ MyCite, ensuring global visibility for contributing authors. More than just a conference, MUCET is a catalyst for building connections, inspiring innovation, and shaping the future of engineering and technology. It embodies MTUN's spirit of collaboration and its unwavering commitment to producing solutions that benefit industries, communities, and the world at large.

Organizing Committee

MUCET 2025 is made possible through the unwavering dedication and professionalism of its Organizing Committee

CHAIRMAN	
Assoc. Prof. Ts Dr. Ayu Wazira Azhari	
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Assoc. Prof. Dr. Naimah Ibrahim	
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Assoc. Prof. Ts. Dr. Mohd Aminuddin Jamlos	Ms. Janatul Naim Zulkefli

TECHNICAL REVIEWER & PUBLICATION

- Assoc. Prof. Dr. Naimah Ibrahim

TRACK 1: CIVIL & ENVIRONMENTAL

- Dr. Ilya Joohari
- Dr. Samera Samsuddin Sah
- Dr. Nor Wahidatul Azura Zainon Najib
- Assoc. Prof. Dr. Afizah Ayob

TRACK 2: CHEMICAL & NATURAL RESOURCES

- Assoc. Prof. Ts. Dr. Khairul Farihan Kasim
- Dr Lee Boon Beng
- Assoc. Prof. Dr Alina Rahayu Mohamed

TRACK 3: ELECTRICAL & ELECTRONIC

- Assoc. Prof. Dr. Ku Nurul Fazira Ku Azir
- Assoc. Prof. Dr. Aminudin Jamlos
- Assoc. Prof. Dr. Mohd Rashidi Che Beson
- Assoc. Prof. Dr. Mohd Najib Mohd Yasin
- Dr. Wan Azani Wan Mustafa
- Dr. Aimi Salihah Abdul Nasir

TRACK 4: MECHANICAL & MANUFACTURING

- Dr. Roshaliza Hamidon
- Dr. Muhammad Syahril Bahari
- Sakinah Zakaria
- Assoc. Prof. Dr. Azwan Sapit

TRACK 5: SOCIAL SCIENCE, EDUCATION & TECHNOLOGY MANAGEMENT

- Dr. Hafizah Abdul Rahim
- Assoc. Prof. Ts. Dr. Mohammad Harith Amlus
- Dr. Fatin Syazwani Safiyuddin
- Dr. Nadiah Mahmad Nasir
- Dr. Aliana Shazma Amir binti Amir

CONFERENCE SECRETARIAT

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MEDIA & COMMUNICATION	**SPONSORSHIP**
◉ Mr. Yusrizal Musanip	◉ Assoc. Prof. Dr. Mohd Najmuddion Mohd Hassan

◉ Conference Tracks/Scopes

MUCET 2025 features five thematic scopes, each designed to foster in-depth discussions, present cutting-edge research, and encourage interdisciplinary collaboration. These themes reflect the breadth of expertise across the Malaysian Technical University Network (MTUN) and align with the conference's commitment to advancing engineering and technology for societal resilience.

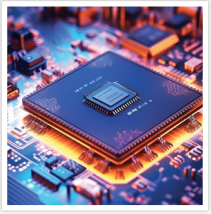
◉ Track 1: Civil & Environmental

Focusing on the design, construction, and maintenance of sustainable infrastructure, this theme addresses challenges in structural engineering, geotechnics, water resources, transportation systems, and environmental management. It highlights innovations in green building practices, climate-resilient designs, waste management, and technologies that promote environmental protection and sustainability.

Track 2: Chemical & Natural Resource

Covering the transformation of raw materials into valuable products, this theme encompasses chemical process design, bioprocess engineering, polymer technology, renewable energy, and the sustainable use of natural resources. It encourages solutions that minimize environmental impact while maximizing efficiency and economic viability and sustainability.

Track 3: Electrical & Electronic



Exploring advances in power systems, electronics, communications, control systems, and emerging fields such as the Internet of Things (IoT) and artificial intelligence, this theme emphasizes technological breakthroughs that enable smarter, safer and more connected societies.

Track 4: Mechanical & Manufacturing

Addressing innovations in design, materials, automation, robotics, and advanced manufacturing techniques, this theme focuses on improving productivity, precision, and sustainability in industrial processes. It also covers mechatronics and integration of Industry 4.0 technologies into modern manufacturing and sustainability.

Track 5: Social Science, Education & Technology Management

Recognizing the importance of human capital and organizational strategies, this theme covers education for sustainable development, technical and vocational education (TVET), management of technology, entrepreneurship, and policymaking. It bridges the gap between engineering solutions and their societal, economic, and cultural impacts

Program At A Glance

DAY 1: 9th September 2025 (Tuesday)					
08:00	Arrival of Guests and Conference Registration Malaysian Technical Universities Conference on Engineering and Technology (MUCET) 2025				
08:40	**Plenary Session 1**	**Plenary Session 2**	**Plenary Session 3**	**Plenary Session 4**	**Plenary Session 5**
	Invited Speaker: AP. Dr. Mohd Hilton Ahmad	Invited Speaker: Prof. Dr Mohd Hasbi Ab Rahim	Invited Speaker: Prof. Ts. Dr. Effendi Mohamad	Invited Speaker: Assoc. Prof. Dr. Noormaizatul Akmar Ishak	Civil & Environmental (CE)
	Civil & Environmental (CE)	Chemical & Natural Resources (CNR)	Mechanical & Manufacturing (MM)	Social Science, Education & Technology Management (SSETM)	
	KELANTAN ROOM	**SABAH ROOM**	**MELAKA ROOM**	**TERENGGANU ROOM**	**ORKID ROOM**
10:20	Morning Coffee Break				

	Plenary Session 6	Plenary Session 7	Plenary Session 8	Plenary Session 9	Plenary Session 10
10:40	Civil & Environmental (CE)	Chemical & Natural Resources (CNR)	Invited Speaker: AP Dr. Mohd Aminudin Jamlos	Social Science, Education & Technology Management (SSETM)	Civil & Environmental (CE) Mechanical & Manufacturing (MM) Social Science, Education & Technology Management (SSETM)
	Social Science, Education & Technology Management (SSETM)	Mechanical & Manufacturing (MM)	Mechanical & Manufacturing (MM)		
	KELANTAN ROOM	**SABAH ROOM**	**MELAKA ROOM**	**TERENGGANU ROOM**	**ORKID ROOM**
13:00	**Lunch Break**				

	Plenary Session 11	Plenary Session 12	Plenary Session 13	Plenary Session 14
14:10	Social Science, Education & Technology Management (SSETM)	Social Science, Education & Technology Management (SSETM)	Electric & Electronic (EE)	Social Science, Education & Technology Management (SSETM)
	KELANTAN ROOM	**SABAH ROOM**	**MELAKA ROOM**	**TERENGGANU ROOM**

DAY 1: 9th SEPTEMBER 2025

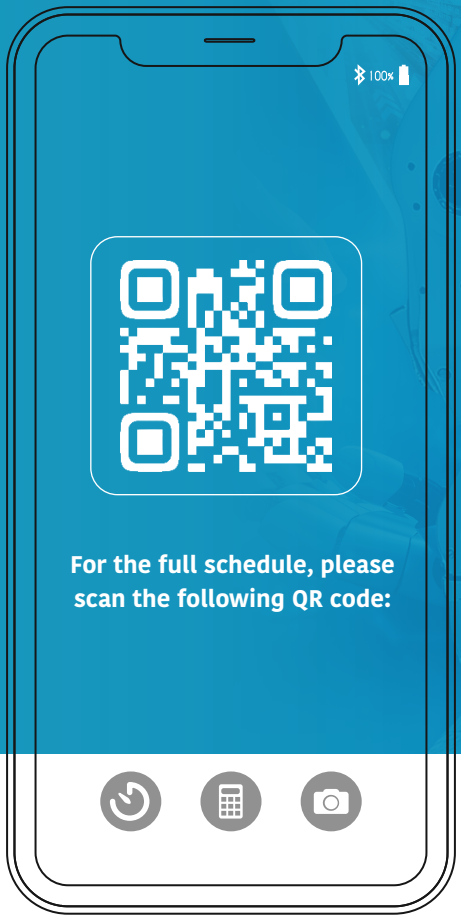
Prize Giving Ceremony Tentative
Venue: JOHOR-KEDAH ROOM

15:30	Arrival of Guests & Participants
15:45	Welcoming Speech by Prof. Ir. Dr. Rizalafande Che Ismail, the Deputy Vice Chancellor, Research & Innovation, Universiti Malaysia Perlis (UniMAP)
16:00	Presentation of Best Presenter Awards
	Presentation of Best Paper Awards
	Handover Ceremony of MUCET 2027 Hosting
	Group Photography & Refreshments
17:00	End of Ceremony

DAY 2: 10th SEPTEMBER 2025

GTEST Opening Ceremony
Venue: Dewan Tun Hussein Onn

Plenary Session Schedule



Paper Titles And Abstracts

TRACK 1 | CIVIL & ENVIRONMENTAL (CE)

ID Title & Abstract

1 Sand-Rubberchips As Retaining Earth Wall Backfill: Permeability Characteristics

Salina Sani et. al.

Backfills are used in the construction of retaining walls as they provide support and stability to retaining walls, ensuring their structural integrity and preventing soil erosion. Sand is the main material used as a backfill, though it is a limited natural resource that would inevitably run out. The present work attempted to reduce the usage of sand by admixing recycled tyre wastes as a partial replacement, primarily in the form of rubberchips. The permeability of such engineered backfill is crucial to ensure the geo-structure's drainage capacity for long-term stability. Via the constant head permeability test, the permeability characteristics of the sand – rubberchips mixes were examined at pre-determined ratios of substitution, i.e., 10 to 80% rubberchips substitution. The particle size at which 50% of the materials were finer than (D50) for the sand and rubberchips were 0.35 mm and 0.9 mm respectively, suggesting the introduction of coarse-size granules into the medium sand. Nonetheless only < 2 mm rubberchips were used to conform to the 6 cm x 6 cm direct shear test measurement. All in all, the test results revealed a constant rise in the coefficient of permeability (k) up to 80% of rubberchips substitution, with an almost double increment of k-value at 100% rubberchips replacement. It was also observed that 80% sand mixed with 20% rubberchips recorded a k-value closest to sand. While the rubber-substituted sand backfill fell under the category of 'high permeability' and 'good drainage capacity' material, verification of the strength and load-bearing characteristics are necessary for its field functionality.

13 Compressive Strength And Microstructure Of Palm Kernel Shell (PKS) And Rice Husk Ash (RHA) As Replacement Of Coarse Aggregate And Cement In Lightweight Concrete

Norpadzlihatun Manap et. al.

The increased demand for cement and aggregates in concrete construction leads to environmental concerns and increased expenses. This research utilizes inexpensive and abundant agricultural by-products, palm kernel shell (PKS) and rice husk ash (RHA), as partial substitutes for aggregates and cement in lightweight concrete to mitigate these challenges. The focus of the research is to determine and compare the compressive strengths of PKS and RHA concrete with that of standard concrete, analyze microstructural differences between PKS and RHA concrete with OPC concrete, and propose strategies to improve the compressive strength and microstructure of the PKS and RHA concrete. Various proportions of PKS (5%, 10%, 15% and 20%) and RHA (10%) were used as aggregate and cement replacement materials. Concrete cubes with dimensions of 100mm x 100mm x 100mm underwent a compressive strength test on the 7th and 28th day of curing while FE-SEM test conducted at 28th day of curing. The research methodology was a mixed method, which included a compressive strength test, FE-SEM test and questionnaires to 26 responses of G7 contractors and 27 responses of precast concrete manufacturers in Petaling Jaya. The result showed the highest compressive strength observed for PKS and RHA concrete, was achieved at the percentage of 5% PKS and RHA replacement with average strength of 15.84 MPa and 22.05 MPa on the 7th and 28th day respectively, it also met the minimum compressive strength required for M20 concrete. Meanwhile, through the FE-SEM test, it was observed that OPC concrete exhibited a denser microstructure with fewer pores than both 5% and 10% PKS and RHA concrete. The results of qualitative data highlighted the use of superplasticizers to increase workability, reducing the water-cement ratio and promoting a denser and stronger concrete mix. The study's significance is to reduce environmental impact and construction costs and address agricultural waste issues.

14 Kajian Tentang Penggunaan Semula Sisa Seramik Sebagai Bahan Gantian Agregat Halus

Norpadzlihatun Manap et. al.

Kajian ini dijalankan untuk mengkaji potensi penggunaan semula sisa seramik sebagai bahan gantian agregat halus dalam pembuatan bata simen. Masalah pengurusan sisa pembinaan yang kurang lestari mendorong kepada pencarian alternatif bahan binaan yang mesra alam. Objektif utama kajian ini adalah untuk menilai kekuatan mampatan bata simen yang dihasilkan menggunakan sisa seramik, membandingkan bata simen yang mengandungi sisa seramik dengan bata sedia ada, dan mengkaji potensi penerimaan bata simen yang mengandungi sisa seramik di pasaran industri pembinaan. Kaedah yang digunakan termasuk penyediaan sampel bata simen dengan kadar gantian sisa seramik sebanyak 0%, 20%, 40%, dan 60%. Bata simen ini diuji untuk kekuatan mampatan selepas tempoh pengawetan 7, 14, dan 28 hari. Data analisis menunjukkan bahawa bata simen dengan 20% gantian sisa seramik mencapai kekuatan mampatan tertinggi dan memenuhi piawaian minimum untuk bahan binaan. Skop kajian bagi objektif ketiga adalah melibatkan kontraktor G7 dan pengusaha kilang seramik di daerah Johor Bharu. Selain itu, kajian soal selidik terhadap kontraktor menunjukkan potensi penerimaan positif terhadap penggunaan bata ini dalam sektor pembinaan. Objektif 1 menunjukkan bahawa kandungan sisa seramik sebanyak 20% memberikan kekuatan mampatan maksimum selepas 28 hari pengawetan, membuktikan bahawa sisa seramik mampu meningkatkan ciri mekanikal bata simen, terutamanya dalam ketahanan terhadap beban mampatan. Objektif 2 pula, perbandingan antara bata simen sedia ada dan bata simen yang mengandungi sisa seramik menunjukkan bahawa bata dengan 20% sisa seramik mempunyai kekuatan mampatan yang lebih baik. Walaupun kekuatan menurun pada kandungan sisa seramik 40% dan 60%, ia masih memenuhi piawaian minimum industri. Objektif 3 mengesahkan potensi besar bata simen yang mengandungi sisa seramik dalam pasaran, berdasarkan maklum balas soal selidik yang menunjukkan penerimaan positif terhadap penggunaan sisa seramik. Penemuan ini membuktikan bahawa penggunaan sisa seramik bukan

sahaja dapat mengurangkan kesan negatif terhadap alam sekitar tetapi juga menyediakan alternatif yang mampan untuk agregat halus dalam bata simen. Kajian ini mencadangkan pengembangan lanjut terhadap sisa seramik dalam bahan binaan untuk meningkatkan kelestarian sektor pembinaan.

49 Direct Shear Test On Backfill Sample Of Sand Partially Substituted With Tyre Rubber Waste

Chee Ming Chan et. al.

Sand is a crucial raw material in civil engineering applications, especially as a backfill material for road foundation construction. Poorly constructed road foundation layer due to unsuitable materials and methods can lead to premature pavement failure including rutting, cracking, potholes and other damages. This would significantly reduce the lifespan of a road, increase maintenance costs, and more importantly, endanger the safety of road users. However, sand depletion is becoming a significant global concern, with negative implications on both the environment and economy. Therefore, it is crucial to identify suitable substitution material for sand to sustain the development projects, especially for infrastructure works like road construction. One potential substitution material is tyre rubber waste (TRW) in chips form, which is a granulated material obtained from used or end-of-life tyres. These chips are typically produced by grinding tyres into small and uniform pieces of rubber granules. In the present study, TRW in the form of chips size smaller than 2 mm were admixed with sand of similar size range to examine the substitution effect in terms of undrained shear strength. The samples simulating backfill materials were prepared in substitution ratios of 0, 25, 50, 75 and 100 %, per dry mass of the sand. Standard direct shear test (DST) was performed on the 60 mm × 60 mm sample per BS 1377:1990. It was found that 50% TRW substitution resulted in shear strength similar as that of 100% sand sample. In addition, it was observed that too much of TRW substitution, i.e. >50% led to a significant 35% decrease in shear strength, with notable similar strength range as 100TRW, but with better structurization as shown in the distinct rise in shear stress - shear strain

plot, before deflecting to a gentle, steady rise typical of a ductile or soft material. On the other hand, <50% substitution with TRW increased the shear strength by 21% compared to the sand sample, attributed to the compressible nature of rubber enabling tight interlocking among the granules, but with unknown effect on the other engineering properties, such as permeability for effective groundwater drainage. This suggests that 50% TRW substitution is the optimum percentage for the best shear strength performance. To sum up, the study has demonstrated the potential of TRW as a partial sand substitution in backfills for laying road foundation, though careful mix design trials are necessary to ensure satisfactory load-bearing performance in the long term.

57 Application Of CSP1 Method On Evaluating The Defects Of Building Fabrics At Malacca Heritage Mosques

Kamarul Aini Mohd Sari et. al.

Mosques, also known as masjid, are essential to Muslims because they have served as hubs for social and political activities as important sites for religious gatherings. One of the main concerns is the neglect that will result in destruction and how wasteful it is to see our heritage buildings disappear. This research will focus on the three oldest mosques in Melaka: Kampung Hulu Mosque, Tengkera Mosque and Kampung Kling Mosque. These mosques were chosen because they have been considered heritage mosques because they are over 100 years old. The CSP1 method and observation approach are used in the data collection process of building fabric defects found in Malacca's Heritage Mosques. Next, researchers have prepared a checklist of building fabric defects for Malacca's Heritage Mosques for further studies. As a result, 26 defects in the building fabric can be seen at the Kampung Hulu Mosque, 17 defects in the building fabric at the Tengkera Mosque and 23 defects in the building fabric at the Kampung Kling Mosque. The data was verified by expert panel consists of five people which are two conservators and three members of the Malacca Museum Corporation (PERZIM), who have more than five years of experience in heritage building management. This

research contributes to helping the PERZIM and management of heritage mosques better understand the types of defects in the building fabric and suggested repairs to preserve this heritage building.

93 Optimizing Clash Detection In Building Projects: A Building Information Modeling-Based Approach Using Revit And Navisworks

Mariah Awang et al.

Building Information Modeling (BIM) has revolutionized the construction industry by enhancing project planning, coordination, and efficiency. One of its most critical applications is clash detection, which helps identify and resolve conflicts between building systems before construction begins. This study aims to evaluate the effectiveness of BIM-based clash detection using Autodesk Revit and Navisworks in improving construction efficiency and cost savings. The research focuses on a case study of Dewan Banquet, where a clash analysis simulation was conducted to detect interferences between mechanical, electrical, plumbing (MEP), and structural elements. A total of 125 clashes were identified, which, if left unresolved, could lead to project delays and increased costs. Additionally, a questionnaire survey was conducted with construction professionals to assess the cost-saving potential of BIM-based clash detection. The results indicate that 80-100% of respondents acknowledged a reduction in project costs through BIM implementation. The findings suggest that integrating BIM for clash detection enhances project planning, reduces design conflicts, and improves overall cost efficiency. This study provides valuable insights for construction professionals, project managers, and facilities management practitioners in adopting BIM for improved project execution and risk mitigation. Future research should explore the integration of Artificial Intelligence (AI) and Machine Learning (ML) algorithms to further optimize clash detection and predictive analytics in BIM applications.

95 Conceptual Framework For Factors Affecting Construction Quality In Johor, Malaysia

Nor Abas et al.

Maintaining high construction quality is a constant challenge as quality problems affect building safety, increase maintenance costs, and reduce user satisfaction. This study investigates the factors influencing construction quality in Malaysia, with a focus on Johor, amid rapid urbanization and growing infrastructure demands. In total 33 factors were extracted and categorized from the literature and were designed in a questionnaire under 12 major groups for a survey where 125 construction professionals participated and returned their survey form. Collected data were tested by Cronbach Alpha to check the reliability before proceeding to the Relative Importance Index (RII) for determining the relative ranks of identified factors. The most significant factors are lack of expertise, followed by inconsistent design documents, insufficient cooperation between contractors, resource availability, weather conditions, and management skills. The findings offer practical recommendations for authorities and stakeholders to improve building quality. They provide an overview of high and low ranks of factors and raise awareness of quality issues that must be addressed.

108 Geotechnical Behaviour At Western Johor Peat Under Cone Penetration Test With Pore Water Pressure (CPTu)

Adnan Zainorabidin et al.

Peat is generally known as soft and problematic soil with high compressibility and low strength. To ascertain the existence and understanding of peat behaviour at the site is crucial to producing a safe and economical design. Peat sampling with minimum disturbance always becomes challenging and tends to obtain inaccurate data due to pore water pressure release. In-situ high-end measuring devices like the Cone Penetration Test with Pore Water Pressure (CPTu) have become prevalent in site investigation works due to the ability to characterize

and delineate the soil layers without taking the soil sample. The CPTu parameters of cone resistance (qc), sleeve friction (fs) and pore water pressure (u2) that were accurately and continuously generated during the test were able to establish the behaviour of soil. The purpose of this study is to identify the existence and behaviour of the peat layer dependent on the qc, fs and u2 values of Western Johor Peat. The quantitative method used starts with identifying peat properties based on a literature study, conducting in-situ CPTu and analysing data in Pontian, Parit Nipah and Sedenak, Johor sites. The findings exhibit the existence of up to 4 meters of peat layer. The behaviour of peat regarding the fluctuated values on qc and slightly low values for fs and u2 were determined. The average value of qc attained approximately ten times higher than the average value of fs and u2. In conclusion, CPTu can demonstrate the existence and behaviour of Western Johor Peat.

124 A Study On Flexural Enhancement In Beam Strengthened With CFRP Plate And Toughened Mussel Epoxy As Bonding Agent

Hilton Ahmad et. al.

Structural concrete beams of old and historic buildings are not designed to resist increasing applied loads, requires flexural beam strengthening is mandatory. In order to enhance its flexural loading resistance, Fiber Reinforced Polymer (FRP) is adopted as a strengthening material. Carbon Fiber Reinforced Polymer (CFRP) plates, which made of carbon fibers as reinforcing fibers bonded with epoxy resin, have gained popularity in structural retrofitting. However, the inherent brittleness and low shear strength of neat epoxy resin require modification with fillers such as micro-silica and zirconia. As a sustainable alternative, mussel powder which is rich in calcium carbonate ($CaCO_3$) compound acting as a rigid bio-filler, enhancing toughness, bonding strength, and impact resistance of pure epoxy resin. This study incorporates 7.5% volume fraction of mussel powder into epoxy resin, a percentage optimized reported in previous findings. The selection of 7.5% composition was justified as it demonstrated improved mechanical performance without significantly compromising the workability of the resin. The research investigates the

influence of varying CFRP plate lengths (ranging between 50 mm to 250 mm) bonded with 7.5% Toughened Mussel Epoxy (TME) by volume fraction on the flexural strength of plain concrete beams. Four-point bending tests were conducted to record failure modes, load-displacement behavior, and ultimate load capacities. Results indicate that longer CFRP plates enhance load-carrying capacity, with the 200 mm CFRP length exhibiting an optimal balance between material efficiency and structural performance, leading to a 26% increase in strength compared to unstrengthened beams. Failure modes varied with CFRP length; shorter plates primarily exhibited shear failure, while longer plates (i.e., CFRP length more than 200 mm) displayed delamination failure. The study concludes that using a 200 mm CFRP plate with TME provides a significant improvement in flexural strength, offering a cost-effective and environmentally friendly alternative to conventional strengthening techniques.

126 Optimizing 3D Printing Concrete With GGBS And Spent Catalyst: A Sustainable Approach For Cement And Sand Substitution

Noorwirdawati Ali et. al.

The study looks at optimizing the 3D printing of concrete through the addition of spent catalyst and ground granulated blast furnace slag (GGBS) as sustainable alternatives to cement and sand. The surge of environmental concerns in the construction sector makes using GGBS and spent catalysts economical in mitigating the carbon emissions in concrete production. This paper evaluates the impact on fresh properties: flowability, extrudability, and buildability of 3D printing concrete with various mix ratios of GGBS, ranging from 20% to 40% in increments of 10%, and spent catalyst from 10% to 20% in 5% increments while maintaining a constant w/c ratio of 0.5. A thorough experimental analysis was conducted to compare the modified concrete's performance to conventional mixes which included compressive strength, flexural strength, physical properties (specific gravity, and particle size distribution), and chemical properties (X-ray diffraction (XRD), and scanning electron micrograph (SEM) imaging)

of the materials. The results indicate that the incorporation of GGBS and spent catalysts not only makes the material more sustainable but also increases the printing quality, therefore, creating a practical solution in reducing the environmental impact of construction materials. This research illustrates how 3D printing can benefit from such eco-friendly methods.

138 Erosion Assessment Of Slope Failure: A Case Study Of UniMAP Pauh Campus

Nor Faizah Bawadi et. al.

Slope failures caused by erosion present significant hazards to infrastructure and safety in hilly regions. This study focuses on evaluating erosion and its impact on slope stability at UniMAP's Pauh Campus. A thorough investigation was conducted, including field surveys, soil sampling, and laboratory analyses, to characterize slope soils and assess slope stability. The primary objectives were to evaluate erosion using the ROM Scale and ROSE Index, providing a comprehensive understanding of slope dynamics to support effective management and mitigation strategies for campus safety and environmental sustainability. Key factors such as slope gradient, soil composition, vegetation coverage, drainage conditions, rainfall intensity, and land use were meticulously assessed using the ROM Scale and ROSE Index. Observations identified three locations with high potential for slope failures. Soil analysis revealed that Slopes 1 and 2 consist of well-graded sand, while Slope 3 is poorly graded. Soil erodibility was classified as very high for Slope 1 and high for Slopes 2 and 3. Over the years 2021 to 2023, the ROSE Index values were recorded as 6842.40, 5469.92, and 6475.05 tonne.m2/ha.hr, respectively, all indicating a moderate erosion risk. These findings highlight varying levels of risk, necessitating targeted recommendations for slope stabilization and soil conservation. Recommendations include establishing dense vegetation cover on Slope 1 to mitigate erosion, improving drainage systems, and implementing terraces or retaining walls to manage water flow and prevent soil displacement. Additional measures involve applying

organic matter to Slope 1, using soil conditioners on Slopes 2 and 3, regularly monitoring the slopes, and educating the campus community on erosion control practices.

181 Prediction of Uplift Pressure and Heave from Granular Pile Anchor Foundation on Expansive Soil using Regression Analysis

Alvin John Lim et. al.

Expansive soils pose significant challenges to foundation stability due to their high shrink-swell behavior, leading to excessive uplift pressure and heave in structures. Conventional foundation construction does not efficiently mitigate these effects. This study explores using granular pile anchor (GPA) foundations as a reinforcement technique to counteract uplift and improve soil stability. A small-scale model and a 3D finite element software PLAXIS of the GPA were experimented with several width and length parameters of the anchor rod to obtain and validate an optimum design. The key design parameters of the anchor dimensions of the GPA from experimental investigations were used as a dataset to develop a regression-based predictive model to estimate uplift pressure. The regression analysis reveals critical relationships between soil properties, design parameters, anchor performance, and heave mitigation, offering a reliable framework for engineers to optimize foundation designs. The proposed model demonstrates good accuracy in predicting uplift behavior, making it a valuable tool for geotechnical applications in expansive soil regions.

183 Insulation Performance Of The Coconut Husk Advancing Aerogel For Building Application

Fatin Zafirah Mansur et. al.

Insulating buildings effectively is critical for energy conservation. Traditionally, insulation materials have been composed of synthetic polymers or mineral fibers. Recent research has explored the potential of biomass materials, leveraging their inherent insulative properties. To

advance these capabilities, converting biomass into aerogel forms offers a promising approach due to their low density and thermal conductivity. This study focuses on producing coconut husk aerogel to assess its thermal insulation performance. The fabrication process involved blending sodium alginate, phytic acid, and coconut husk to create the aerogel. The influence of varying coconut husk volumes on the fabrication of coconut husk aerogel was systematically investigated, given its crucial role in gelation. The produced aerogels were comprehensively characterized using scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM-EDX), Brunauer–Emmett–Teller specific surface area analysis (BET) and Fourier-transform infrared spectroscopy (FTIR). Thermal conductivity measurements were conducted to evaluate their insulation effectiveness. Results demonstrate that the coconut husk aerogel exhibits good insulation properties, characterized by significantly low thermal conductivity.

186 Experimental Analysis Of Coconut Husk Ash As A Sustainable Binder In Compressed Brick Production

Nurliza Rahim et. al.

The increasing cost of cement and the need for effective waste management, particularly in Malaysia, have prompted the search for alternative materials in construction. This study investigates the use of coconut husk ash (CHA) as a partial replacement for cement by volume in the production of compressed bricks. The research aims to evaluate the physical and mechanical properties of CHA bricks, including density, water absorption, and compressive strength, and compare them with conventional bricks. Compressed bricks were prepared using a cement-to-sand ratio of 1:6, with CHA replacing cement at 5%, 10%, and 15% by volume. Standardized procedures and rigorous testing protocols were employed to ensure reliable data collection. The results revealed a positive correlation between the compressive strength and CHA content, with higher CHA percentages enhancing strength. The density of CHA bricks increased with greater CHA content, indicating improved compactness and structural integrity. Additionally, water absorption decreased as

the CHA percentage rose, highlighting better resistance to moisture penetration. These findings demonstrate the potential of CHA as a sustainable alternative material for low-cost housing, offering improved physical and mechanical properties compared to conventional bricks.

190 Valorisation Of Spent Coffee Ground Ash In Sustainable Brick Production

Norlia Mohamad Ibrahim et. al.

The large volume of spent coffee grounds (SCG) generated daily presents an environmental challenge if disposed of in landfill because it will decompose anaerobically, and produce the methane, that is around twenty-five times more potent than carbon dioxide in trapping heat in the atmosphere. Thus, this study explores the valorisation of SCG by converting them into ash through controlled combustion and incorporating the resulting ash as a partial replacement material in sand bricks. The ash was produced by burning dried SCG under several selected temperature which is 200°C, 300°C, 400°C, 500°C and 600°C. Five different proportions of SCG ash (2.5%, 5%, 7.5%, 10% and 15%) were added to sand bricks mixtures to investigate their effects on the physical and mechanical properties of the sand bricks. Laboratory tests, including Loss of Ignition, compressive strength, bulk density, water absorption, and thermal conductivity, were carried out to assess its performance. The experimental results exhibited a clear trend on the influence of SCG ash on the properties of the bricks. With the increase in the proportion of SCG ash in the bricks, the density and compressive strength of the bricks decreased. The control samples, which contain no SCG ash, demonstrated the best structural performance, with a compressive strength of around 7 MPa. Meanwhile, addition of the ash shows that 2.5% addition is still acceptable with the strength at 2.5MPa. The decrease in compressive strength can be attributed to the lower binding efficiency and higher porosity introduced by the ash particles, which may reduce the overall density and strength of the bricks which is proven by the increased water absorption to maximum of 19% at 15% SCG ash addition. Although the addition of biochar decreased

strength, it decreased the weight and provide good thermal insulation. The bricks became significantly lighter which may be applicable to designs that require more thermal efficiency or in non-load-bearing applications.

	TRACK 2 | CHEMICAL & NATURAL RESOURCES (CNR)
	ID Title & Abstract
50	**Kinetic Release Mechanism Of The Composite Poly(D,L-Lactide)/ Natural Clay Nanoparticles Loaded With Moringa Oleifera Leaves Extract** *Rahimah Othman et. al.*

Nanoparticulization provides distinctive advantages such as controlling the drug release rate and designing to reduce the side effect of the drug to human body. This study investigates the kinetic release and mechanism of composite poly(D,L-lactide) (PLA)/natural clay nanoparticles (NPs) loaded with Moringa Oleifera (MO) extract through in-vitro testing. To investigate the drug release profile, MO leaves need to be extracted by Soxhlet extraction and freeze-dried. The total phenolic content (TPC), total flavonoid content (TFC), 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay and 2,2'-azino-bis-[3-ethylbenzothiazoline sulphonate] (ABTS) radical cation decolorization assay for MO extract is 372.81 mg GAE/g, 90.89 mg QE/g, 91.68% and 85.1% respectively. For MO powder, the TPC, TFC, DPPH, ABTS is 373.37 mg GAE/g, 92.15 mg QE/g, 94.02%, 89.42% respectively. Freeze-dried MO powder was encapsulated in PLA/MMT to sustain its release at varying pH levels (2, 5.5, 7.4). Fixed parameters included an aqueous to organic phase ratio of 10, stirring speed of 1200 rpm, 1 wt/wt% MMT, and 5 wt/wt% MO. MO loading and encapsulation efficiencies were 12% and 16% for PLA-loaded MO NPs, and 74 % and 84 % for composite PLA/MMT-loaded MO NPs, respectively. Characterization via XRD, FTIR, and SEM revealed monodispersed spherical NPs with average sizes of 200 nm, 270 nm, and 240 nm for PLA blank NPs, PLA-loaded MO NPs, and PLA/MMT-loaded MO NPs, respectively. The release mechanism followed Fickian diffusion, and the drug release profile aligned with the Korsmeyer-Peppas model.

102 Effect Of Silica Additions On The Structure, Phase Transformation And Compressive Strength On Sintered Perlis Dolomite Mineral

Syed Nuzul Fadzli Syed Adam et. al.

Natural dolomite sedimentary rocks, which can be found in abundance in Perlis is a carbonate mineral rich with calcium and magnesium elements. These both elements were important and typically found in bioceramic materials especially for hard tissue implant material. Even though raw Perlis dolomite powder has other various elemental compositions, it lacks important component such as silica and phosphate, which commonly used as glass network former, therefore limits its potential application as bioceramic materials. This study examines the effects of different percentages of silica powder addition on sintered Perlis dolomite and the changes in its structure, phase transformation and compressive strength were analysed. Perlis dolomite with different ratios of silica (25-45 wt. %) were ball milled, compacted into pallets and sintered at 1250°C for 4 hours. The results showed at lower silica content (≤30 wt. %), MgO phase become the dominant phase. But increasing the silica content leads to the formation of akermanite, monticellite, and merwinite phase before merwinite phase disappearing at 45 wt. %. Higher silica content in dolomite enhances phase stability by increasing akermanite phase, reduces shrinkage and increases densification of the sintered samples which contributes to the improvement in compressive strength.

105 Functionalize Natural Banana Trunk Fiber With Graphene Oxide (GO) Using The Dip-Coating Method For Sustainable Biomedical Suture Application

Nadirul Hasraf Mat Nayan et al.

Developing sustainable and biocompatible sutures is crucial to overcoming the limitations of synthetic alternatives, such as non-biodegradability and adverse biological responses. This study investigates banana trunk fiber, an agricultural byproduct, as a biodegradable suture material enhanced with graphene oxide (GO) via a dip-coating technique. Extracted fibers

were alkali-treated and coated with varying GO concentrations (0.25–1.25% w/v) to improve mechanical properties, stability, and antibacterial efficacy. Characterization included swelling behavior, tensile strength, morphology, Fourier Transform Infrared Spectroscopy (FTIR), thermogravimetric analysis (TGA), and in vitro cytotoxicity evaluation using an MTT assay. Results indicated that sutures coated with 0.75% GO exhibited the highest tensile strength and structural integrity while maintaining an optimal swelling ratio. Results indicated that sutures coated with 0.75% GO exhibited the highest tensile strength of 89.3±1.2 MPa, demonstrating superior mechanical performance compared to uncoated fibers (56.7±1.1 MPa). The optimized GO coating maintained an ideal swelling ratio and enhanced thermal stability. FESEM and FTIR confirmed successful GO integration, while TGA demonstrated enhanced thermal stability, making the material suitable for biomedical applications. The MTT assay using human skin fibroblast cells showed 91.12±0.13% cell viability, confirming the biocompatibility and the potential to support wound closure. This research highlights the possibility of combining natural fibers with nanomaterials to create cost-effective, eco-friendly sutures with enhanced performance. Future studies should focus on large-scale manufacturing, in vivo biocompatibility assessments, and clinical trials to ensure successful translation into medical applications. By leveraging agricultural waste and advanced nanotechnology, this study presents a promising step toward sustainable medical innovations, addressing both environmental concerns and biomedical needs.

136 Optimizing Nanocrystalline Cellulose Extraction From Cigarette Filters Via Sulfuric Acid Hydrolysis Using Box-Behnken Design

Menaga Thmil Selvan et al.

The increase in cigarette confiscation by the Royal Malaysian Customs Department has led to insufficient storage space for cigarettes, leading to being burned, contributing to the wastage of raw materials, mainly cellulose acetate in cigarette filters. Cellulose-rich cigarette filters can yield nanocrystalline cellulose (NCC) which has good mechanical properties, biodegradability, and potential applications in advanced materials. The NCC

can be obtained by acid hydrolysis process, which commonly uses sulfuric acid. This study focuses on optimizing the extraction of NCC from seized cigarette filters sourced by Perlis Royal Malaysian Customs Department via sulfuric acid hydrolysis, utilizing a Box-Behnken experimental design to determine the ideal reaction parameters. The effects of acid concentration (31–35%), reaction temperature (45–65°C), and hydrolysis time (40–90 min) on NCC yield percentage were evaluated. The extracted NCC was characterized using Scanning Electron Microscopy (SEM), Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), and a Zetasizer to assess morphology, chemical structure, crystallinity, and particle size distribution. This study is prominent to optimize the hydrolysis parameters that maximize the NCC yield with high crystallinity and structural integrity. Findings from this study recorded the highest yield by using sulfuric acid hydrolysis can reach up to 89.95 % from the cigarette filters used. The FTIR result supported the ability of the amorphous region removal from the cigarette filter by using the sulfuric acid hydrolysis without affecting the functional groups of cellulose. The morphology of the obtained NCC exhibits a rod-like structure, confirming that its structural integrity remains unaltered. The obtained result from Zetasizer confirmed that the particle size of NCC is below 100 nm with zeta potential in range of -15 mV to -30 mV. The crystallinity of the NCC recorded up to 76 % with prominent peaks at 16.5°, 22.5°, and 34.6° at corresponding planes of (100), (200), and (004). The findings provide a sustainable approach to zero waste cigarettes' raw material into sustainable advanced material that has potential applications in biocomposites, filtration membranes, and biomedical materials.

153 Production Of Natural Food Through Treated Sewage Effluent Aquaponics System

Su Kong Ngien et al.

In Malaysia, sewage treatment plants generate millions of litres of sewage effluent that basically go to waste. Converting this waste to something beneficial will not only reduce potential pollution to the environment, but it will also bring benefits from many angles. The study in this paper

was conducted to assess the viability of switching all the normal water in an aquaponics system to treated sewage effluent and whether the food produced adhere to the heavy metal limits stated in the Malaysian Food Act 1983. The system used was a recirculating, media bed aquaponics system with catfish as the aquaculture whereas the hydroponic part consisted of eggplant and two types of chillies. At the end of the study duration, the catfishes increased to 18-fold its initial weight on average while the total chillies harvested from both types of chilli trees amounted to 94 fruits. When samples of both catfish and chillies were tested for the presence of heavy metals, none of the parameters were detected in all samples except mercury in the catfish sample, which is far below the limit imposed by Malaysian Food Act 1983. Therefore, this study showed that replacing water in aquaponic systems with treated sewage effluent is viable.

172 Optimizing Nutritional Composition And Feed Texture For Enhanced Duck Egg Production: A Comparative Analysis Of Layer Duck Feed Formulations

Mohd Najib Razali et al.

This study explores the optimization of feed formulations for layer ducks to enhance egg production and overall health. Through a comparative analysis of four different feeds, Feed A, Feed B, Feed C and Feed D—key factors such as size, texture, moisture content, and nutrient composition were evaluated to identify their effects on egg production, growth, and overall duck health. Feed D, characterized by its soft texture and balanced nutritional content, was identified as the most effective in boosting egg production, while Feed C promotes overall growth. Feed B was deemed unsuitable for egg-laying due to poor texture and consumption issues. To further understand the nutritional composition, proximate analysis, mineral analysis (ICP-OES), and FTIR spectroscopy were conducted on the feeds. These analyses revealed that optimal feed requires balanced levels of essential nutrients such as zinc, selenium, phosphorus, and calcium to promote healthy egg production and prevent deficiencies that could negatively impact both duck health and productivity. Daily egg weights

and duck body weights were tracked to monitor the relationship between feed composition and egg quality. The results highlight the importance of nutrient-dense, moisture-rich feeds with the appropriate texture to ensure sustainable, high-quality egg production. The study underscores the need for continuous monitoring and adjustment of feed formulations to maximize both productivity and duck health.

184 Evaluation Of Mixture High Density Poly-Ethylene (HDPE) Plastic, Coconut Husk, Coconut Shell And Palm Kernel Shell As Refused Derived Fuel On Heating Value

Fatin Zafirah Mansur et. al.

The inefficient combustion of biomass and plastic-derived fuels presents challenges in energy production and environmental sustainability. This study aims to evaluate and compare the Higher Heating Value (HHV) of HDPE plastic, coconut husk, coconut shell, and palm kernel shell using proximate and ultimate analysis to determine their fuel potential. Additionally, it investigates the optimal blending ratios of these materials to maximize HHV for efficient biomass energy utilization. A D-optimal design methodology is employed to statistically find the best ratio of the mixture composition, ensuring minimum experimental variance and maximum precision. The study further compares proximate and ultimate analysis methods to determine which technique provides the most accurate HHV estimation. The findings contribute to the development of sustainable waste-to-energy solutions by optimizing material selection and improving combustion efficiency while promoting cost-effective renewable energy generation.

188 Synthesis And Characterization Of Natural Colorants Nanocapsule From Clitoria Ternatea Flower

Khairul Farihan Kasim et al.

Clitoria ternatea (CT), locally known as bunga telang is used traditionally as food coloring in Malaysia. However, the color of CT is unstable and very sensitive to heat. Therefore, this study aims to investigate the microencapsulation of CT extracts using an in-situ polymerization technique utilizing six different types of polymers, including polymethyl methacrylate (PMMA), carboxymethyl cellulose (CMC), sodium alginate, gelatin, acacia gum, and chitosan. The encapsulation process was carried using an aqueous-in-oil emulsion to facilitate the formation of microcapsules. The structural, morphological, and size of microcapsules were examined using Field Emission Scanning Electron Microscopy (FESEM) and revealed that the PMMA microcapsules exhibited a size of 1.13±0.12 µm featuring smoother, less fissured surfaces and enhanced sphericity. These characteristics indicate improved stiffness and stability compared to those produced by extracts of other polymers. Thus, it is anticipated that the CT-PMMA microcapsules developed in this study show great potential as natural colorants for various industrial applications.

◉	**TRACK 3 | ELECTRICAL & ELECTRONIC (EE)**
◉	ID Title & Abstract

4 Design Of Reverse Current Protection For Solar Charge Controller

Hui Fang Liew et al.

The development of advanced solar charge controllers with reverse current protection is essential for enhancing the efficiency and durability of photovoltaic (PV) systems. This study focuses on the design and implementation of an intelligent solar charge controller that prevents energy losses and potential damage to PV panels by ensuring a unidirectional flow of electricity. One of the key features of this system

is its strong reverse current protection, which safeguards PV panels during rest periods, such as nighttime, by preventing unnecessary energy discharge. Common challenges in solar energy systems include component stress, losses due to climatic variations, and fluctuations in power output, particularly in off-grid and hybrid setups. This research proposes an improved setup by integrating a protective charge controller to enhance system longevity and reliability. Performance evaluation is conducted by analyzing power, voltage, and current accuracy using Proteus software for circuit modeling and simulation. All parameters are monitored using Arduino Uno programming to ensure high efficiency. Additionally, the system operates at 20V and 2.22A, accommodating two PV cells, each ranging between 30W and 40W at 14V. The design includes an input voltage range of 12.5V to 14V, with an expected load voltage of 5.5VDC. This research makes a significant contribution to improving solar energy systems for both urban and rural applications, supporting a more sustainable and reliable energy supply.

5 Non-Invasive Partial Discharge Detection In Power Transformers Using PZT-5H And Low-Cost Piezoelectric Sensors

Khairul Nadiah Khalid et al.

Partial Discharge (PD) is a key indicator of electrical insulation problems and can lead to the complete degradation of insulation in high-voltage equipment, such as power transformers. This study thoroughly investigates the sensitivity of PZT-5H sensors and low-cost piezoelectric sensors in detecting acoustic signals. PD emits an acoustic signal once a void emerges, whereas traditional monitoring methods often require costly corrective maintenance or power system interruptions. Therefore, developing a non- invasive monitoring system for detecting PD in power transformers is highly relevant, as it can significantly reduce maintenance costs. The proposed PZT-5H device demonstrates considerable potential for detecting PD-generated acoustic waves. However, the low-cost piezoelectric sensors showed less sensitivity in detecting acoustic signals compared to the PZT-5H device. Notably, the PZT-5H sensors are promising for recording sound waves from PD events in insulation oil, which may encourage wider

adoption of this non-invasive diagnostic method. This study underscores the effectiveness of affordable piezoelectric sensors in power transformer PD monitoring applications, affirming their feasibility for enhancing the lifespan and reliability of critical electrical infrastructure.

9 Advancing E-Waste Recycling: A Deep Learning Approach Using ResNet-Based Deconvolutional

Ahmad Husni Mohd Shapri et al.

The growing volume of electronic waste (e-waste) is a pressing environmental issue, driving the need for advanced, automated methods to accurately estimate metal content in dismantled integrated circuit (IC) packages. In this study, we present an AI-driven classification system that uses deep learning to precisely identify and categorize IC components. Our approach introduces an enhanced method based on a Deconvolutional Single Shot Detector (DSSD) combined with ResNet-50 (ResNet-DSSD), which shows substantial improvements over the standard Single Shot Detector (SSD) with VGG-16 for metal estimation tasks. To evaluate these models, we used a dataset of IC packages that included surface mount device (SMD) and through-hole (THP) components. The results of our comparative analysis clearly demonstrate that ResNet-DSSD outperforms SSD across all key performance metrics, including accuracy, precision, recall, and F1-score. For instance, ResNet-DSSD achieved a peak accuracy of 95.8% for SMD classification, surpassing SSD's 90.5%, and 97.8% for THP classification, outperforming SSD's 94.0%. The enhanced performance of ResNet-DSSD can be attributed to its deeper architecture, improved feature extraction capabilities, and deconvolutional layers, which excel at detecting small objects in complex e-waste images. These findings highlight ResNet-DSSD as a robust and reliable tool for automating metal estimation in e-waste management. By pushing the boundaries of deep learning in resource recovery, this study paves the way for more sustainable e-waste recycling practices and promotes environmentally responsible metal extraction.

10 Automated E-Waste Sorting Using Swin Transformer For Efficient Integrated Circuit Package Classification

Norazeani Abdul Rahman et al.

The rapid growth of electronic waste (e-waste) presents significant environmental and economic challenges, especially for semiconductor industries that deal with large volumes of integrated circuits (ICs) extracted from printed circuit boards (PCBs). This study investigates how artificial intelligence (AI) can revolutionize e-waste management by automating the sorting of IC packages, a critical and labor-intensive task in the industry. Current manual sorting processes are not only time-consuming and prone to errors but also increasingly inadequate as e-waste volumes continue to rise. To address this issue, we developed an AI-driven system that uses the Swin Transformer, a cutting-edge architecture, to improve the detection and classification of IC package types, such as SMD and THP, from digital images. The Swin Transformer forms the core of our system, delivering exceptional feature extraction and classification capabilities. It is further enhanced by a Feature Pyramid Network (FPN) for detecting objects at multiple scales and a DyHead module to boost accuracy, ensuring reliable identification of various IC packages. Trained on a custom IC COCO dataset and fine-tuned with Adaptive Training Sample Selection (ATSS), the system achieved a Mean Average Precision (mAP) of 68.1% and an average precision (AP) of 82.9% at an Intersection over Union (IoU) threshold of 0.50, proving its effectiveness in accurately identifying and categorizing IC packages, even in challenging conditions. By automating the sorting process, this system provides a faster, more precise, and sustainable solution for e-waste management, showcasing the potential of AI to enhance efficiency and promote environmental sustainability in the semiconductor industry.

12 Voltage Stability Enhancement In Islanded Microgrids Using Fuzzy Logic-Based Robust Droop Control

Nurul Husna Abd Wahab et al.

Voltage stability is a crucial factor in islanded microgrids, where variations in load demand and line impedance can significantly impact power quality. Conventional droop control methods often suffer from poor voltage regulation, particularly under dynamic operating conditions. This paper presents an enhanced fuzzy logic-based robust droop control strategy to improve voltage stability in islanded microgrids. The proposed approach integrates a fuzzy inference system (FIS) with a robust droop control mechanism, dynamically adjusting voltage reference values to minimize deviations. A non-ideal proportional-resonant (PR) controller is employed to regulate output voltage amplitude, ensuring improved voltage tracking and stability. The effectiveness of the proposed controller is evaluated using MATLAB/Simulink under varying load conditions (resistive and inductive) and different line impedance scenarios. The results demonstrate that the proposed controller reduces voltage amplitude deviation by 4%, maintains a stable 50 Hz output, and enhances voltage regulation compared to conventional robust droop control. Additionally, the proposed approach exhibits faster voltage stabilization and improved resilience against impedance mismatches, making it well-suited for microgrid applications, particularly in systems integrating renewable energy sources. These findings contribute to the advancement of resilient power system engineering, ensuring stable and reliable voltage control in standalone microgrids.

30 Gain Enhancement Of Metamaterial Inspired-DGS Based UWB Antenna For Wireless Communication

Mohamad Harris Misran et al.

This paper presents the design of a square patch antenna integrated with a metamaterial-inspired structure and a defected ground structure (DGS) on the same plane. The existing DGS-based UWB antenna suffered from

low gain, which restricted its operational range and overall performance. By implementing a metamaterial structure into the UWB antenna with DGS on the same plane, the antenna's gain is significantly enhanced by 5.90%. Metamaterial structures function as reflectors, effectively boosting the antenna's gain. The proposed antenna operates within a frequency range of 2.85 GHz to 12 GHz, achieving a peak gain of 7.17 dB. The miniaturized antenna is fabricated on an FR4 substrate, with more than 50% thickness reduction, dimensions of 48 mm × 38 mm × 1.6 mm. This antenna's enhanced performance and compact size make it suitable for applications such as tracking and radar systems, as well as wireless communication systems that demand large bandwidths, providing potential benefits to both the communications and defense industries by enabling more efficient and high-performance systems.

33 FitQuest: An Interactive Fitness Role Playing Game Application

Ku Nurul Fazira Ku Azir et al.

Obesity is considered as a complex and chronic condition that is set to continue as people live longer and have unhealthy lifestyles. Nevertheless, this overweight problem can be avoided and prevented by adopting approaches such as fitness applications that can help promote regular physical activity. Fitness applications that incorporate physical activity often struggle in maintaining long-term user engagement due to limited interactivity. The study presented in this paper initiated an attempt to develop the FitQuest which is an Android-based role-playing game application that integrated both gamification and fitness tracking to support a healthier lifestyle for individuals. In the study, the Unity 3D software was utilized to design and develop the characters, maps, and user interface elements of the FitQuest application. The FitQuest application used gyroscope and accelerometer sensors in the Android smartphone to track user movements as well as collect real-time performance data that included the high score and the burned calories. The one-way analysis of variance (ANOVA) test was employed to assess whether the differences between the users were statistically significant. Findings of the study reveal that the male groups burned more calories and achieved higher

scores as compared to the female groups. In addition, the younger users also demonstrated that they were more engaged than the older age groups. Furthermore, the effectiveness of the FitQuest application developed in this study was evaluated based on the perception of the users gathered through surveys. Findings from the surveys indicated that most of the users were satisfied with the FitQuest application in terms of its game design, functionality, and user experience. It is also recommended that future work should focus on not only improving the FitQuest's graphical user interface but also integrating a real-time database as well.

34 Enhancing Personalization In Movie Recommendation Using Android Application: A Machine Learning Approach

Ku Nurul Fazira Ku Azir et al.

With the rapid and tremendous growth of digital contents, personalized movie recommendations have become essential for enhancing the experience as well as interaction of users. However, conventional movie recommendation systems appear to face challenges such as low scalability, cold start issues, and limited dataset attributes that hinder their effectiveness. This paper reports a study that attempted to improve movie recommendations by using an Android application that adopted a machine learning algorithm. The Android application developed in this study employed the hybrid-based filtering algorithm that consisted of the following two algorithms: (1) a collaborative filtering algorithm with singular value decomposition (SVD); and (2) a content-based algorithm with cosine similarity. The MovieLens dataset was utilized for training and evaluation of the algorithm. The development of the Android application involved the Android Studio, the Flask-REST API for backend integration as well as the Firebase database for real-time database management. The experimental results of the study showed that the hybrid-based filtering algorithm was able to achieve recall@5 of 69.83%, recall@10 of 79.00%, mean absolute error (MAE) of 2.77, and root mean squared error (RMSE) of 2.96. The effectiveness of the Android application was also assessed by using the feedback collected from the users through surveys. Results

of the surveys showed that most of the users were satisfied with the Android application developed in the study, particularly in terms of its design (71.43%), functionality (100.00%), and usability (85.71%). The study further suggested that future research should specifically emphasize on enhancing the backend integration and graphical user interface for the purpose of broader adoption.

62 Review on Applications, Strenghts and Limitations of Numerically Propagation Prediction Methods

Badrul Hisham Ahmad et al.

This paper reviews several numerical propagation prediction methods including, integral equation methods, parabolic equation methods and ray tracing method, highlighting their applications, strengths, and limitations. Numerical methods rely on iterative approximations to solve differential equations, with each technique offering unique advantages based on accuracy, computational efficiency, and adaptability to complex environments. Integral equation techniques model problems as integral equations derived from Maxwell's equations, providing high accuracy but requiring significant computational resources. Parabolic equation methods solve a simplified version of the wave equation, efficiently handling long-range wave propagation using techniques such as the split-step Ray tracing methods use geometrical optics to trace paths of propagating rays, predict propagation paths with high accuracy, particularly in urban environments, though they remain computationally intensive. Hybrid models integrating multiple approaches and machine learning techniques are being explored to improve efficiency and accuracy. The continued development of these methods plays a critical role in advancing wireless communication, ensuring reliable wave propagation modelling across diverse scenarios.

71 Study of Dielectric Properties of Cooper Calcium Titanate/ Expoxy Resin Based Composites for Microwave Application

Noor Zirwatul Ahlam Naharuddin et al.

This study investigates the dielectric properties of copper calcium titanate (CCTO)/epoxy resin composites for microwave applications, focusing on their potential use as antenna substrates. The research aims to fabricate substrates with varying thicknesses, designs, and weight masses of CCTO, followed by characterization and analysis of their dielectric properties. The fabrication process utilizes epoxy resin as the matrix, with systematic variations in size, dimension, and weight mass to assess their influence on performance. The dielectric constant (ɛr) of the fabricated substrates is measured and analyzed to determine its dependence on CCTO concentration. Findings reveal a clear increasing trend in dielectric constant values with higher CCTO content. At 5 GHz, the dielectric constant ranges from 4.1 to 5.5, demonstrating the material's suitability for microwave applications. These results provide valuable insights for optimizing CCTO/epoxy composites in high-performance dielectric applications.

75 Managing User Frustration: Applying a Simple Heuristic towards Mobile App Localization Convergence

Muhammad Faheem Mohd Ezani et al.

Localization accuracy in mobile applications is critical for navigation and location-based services. However, users often experience frustration when localization convergence— the time taken for a device to refine its position— does not meet their expectations. This study investigates the relationship between user expectations and actual localization convergence and proposes a heuristic to mitigate frustration. We develop a mobile application that allows users to initiate localization at a fixed position while logging convergence time. The first phase of the study examines discrepancies between expected and actual convergence times. In the second phase, a simple heuristic is introduced to guide

users' expectations regarding localization accuracy. Two user groups participate: one using the baseline application and another with the heuristic-enhanced version. A comparative analysis evaluates whether the heuristic improves user experience and reduces frustration. Findings from this study contribute to mobile localization research by providing insights into expectation management and practical strategies for improving user trust in positioning systems.

100 A Multi-Featured Entropy-Based DDoS Detection And Mitigation Method In Software Defined Networking (SDN) Environment

Mohd Rashidi Che Beson et al.

Software Defined Networking (SDN) presents a new method of network administration and management that could improve security and streamline operations. By decoupling the control interface from the data forwarding interface, the SDN provides more flexibility and scalability for the network operators or administrators to configure and manage the network easily in everchanging network environment. However, it has certain drawbacks like any new technology which could affect its usability and availability. Distributed Denial of Service (DDoS) attacks are the common attacks which can bring out severe consequences for both, control and data forwarding interface in SDN. Although they cannot be completely avoided, but their impact can be reduced. In that case, entropy can play an important role. In the context of computer networking and SDN entropy is the measure of unpredictability and randomness in the network traffic pattern. It is utilized in networking and SDN to examine traffic patterns and identify anomalies of the network from typical behavior. In this paper, we propose an entropy-based approach or detecting and mitigating DDoS attack in SDN environment. The proposed approach monitors and calculates the entropy of multiple network traffic features such as source IP and MAC address, packet sizes, protocol types and time interval among data packets coming from a particular source IP at a specific time window (60 sec or 120 sec) for more accurate detection and mitigation of DDoS attack in SDN environment. Furthermore, the proposed method can prevent IP spoofing and protocol-based DDoS attack more effectively.

107 Network Reconfiguration Strategies for Power Distribution System Under Energy Regulator Reliability Constraints

Mohd Ikhwan Mohammad Ridzuan et al.

This study proposes an enhanced methodology for evaluating medium voltage (MV) distribution networks by integrating Segregation Reliability-Based Monte Carlo Simulation (SRB-MCS) with Fault Rates Alpha Tolerance (FRAT). The analysis focuses on urban, suburban, and rural MV networks, segregating fault rates and repair times to reflect geographical and infrastructural differences. By incorporating FRAT, the approach allows for tolerance in fault rate estimations, improving the accuracy of reliability assessments. The results demonstrate that this combined method provides more precise reliability metrics, aligning with real-world utility benchmarks and regulatory requirements. Urban areas exhibit better reliability performance than rural areas due to advanced network automation and proximity to maintenance centres. This research presents a practical framework for enhancing MV network reliability assessment and planning by accounting for variability in fault rates and network conditions.

127 Performance Analysis On Axial Flux Permanent Magnet Machines Design During Open-Circuit Operation

Tow Leong Tiang et al.

This paper investigates the design and analysis of an axial flux permanent magnet (AFPM) machine featuring a single stator double rotor (SSDR) configuration. The study aims to achieve efficient electromagnetic performance while reducing numerical errors associated with complex geometries. Initially, the refined triangular mesh analysis established a solid foundation for precise numerical evaluation and effective solutions. Additionally, the evaluation of the central air-gap flux distribution demonstrated strong flux linkage while also identifying opportunities for further refinement. The analysis of induced phase voltage waveforms under no-load conditions revealed balanced sinusoidal profiles, with

appropriate phase shifting among the phases, thereby indicating consistent three-phase excitation. Simultaneously, the flux linkage analysis showcased symmetric winding, which contributed to smooth torque production. Furthermore, the no-load flux mapping illustrated efficient magnetic flux channeling that prevented localized saturation. The visualization of the magnetic vector field confirmed electromagnetic coupling across both air-gaps. The interrelated findings substantiate the robustness and promising performance of the proposed machine design while advancing research in electric machine development.

129 Comparative Analysis Of Hybrid Standalone Photovoltaic System Configurations For Off-Grid Applications

Tunku Muhammad Nizar Tunku Mansur et al.

The rising demand for sustainable and reliable energy solutions in off-grid regions has driven hybrid standalone photovoltaic systems (SAPV) with battery storage to the forefront of renewable energy technologies. The system's ability to supply electricity to regions lacking conventional energy facilities has rendered it particularly valuable in rural and remote areas. This study aims to provide a comparative analysis of the hybrid SAPV configurations for off-grid applications. The research evaluated four hybrid SAPV configurations for off-grid applications with the objective of fulfilling an estimated daily demand of 6.2 kWh at Pulau Kapas, Terengganu. The configurations assessed included SAPV, SAPV with generators, SAPV with wind turbines, and SAPV with both wind turbines and generators. The methodology comprised the collection of meteorological data, estimation of residential demand profiles in rural areas, sizing of the photovoltaic array and battery storage, and simulation of all four configurations utilising HOMER Pro focussing on technical, economic, and environmental criteria. The findings indicate considerable discrepancies in system performance and costs. The SAPV combined with a wind turbine incurred the largest initial expenditure, but the system with generators proved to be the most cost-effective. The systems utilising generators demonstrated 100% reliability, with no unmet load or capacity shortfall. Conversely, the solar-only system exhibited

the most challenges, failing to meet 2.79% of total demand, particularly during intervals of low sunlight. In terms of environmental impact, the SAPV and SAPV with wind turbines configurations demonstrated 100% renewable fraction, maximizing environmental benefits. However, these systems faced challenges with reliability and higher costs. On the other hand, the SAPV with wind turbine and generator offered a balanced solution, with a 60.5% renewable fraction while maintaining reliable power supply. As a conclusion, this study highlights the trade-offs between environmental sustainability, system reliability, and cost-effectiveness in the off-grid power solutions. While purely renewable systems offer excellent environmental benefits, they face challenges in reliability and higher costs. Conversely, systems with generators provide superior reliability and lower costs but at the expense of reduced renewable fraction.

135 Enhancing Home Security Through Surveillance Camera System

Tg Isman Afiq Tg H Ismail Shabarudin Shah et al.

This paper proposes a microcontroller-based surveillance system for enhanced home security. Utilizing ESP32 microcontrollers, the ESP32-Cam captures facial images for advanced recognition software running onboard. This enables identification of authorized individuals and triggers a solenoid lock for automatic door unlocking. Additionally, a PIR sensor detects movement, prompting real-time video capture by the ESP32-Cam. Blynk software integrates seamlessly, transmitting the captured video feed to a mobile Blynk application for remote home monitoring. Users can further leverage Blynk to control the lock system and activate the buzzer as an alarm system, all from their mobile devices. This project aligns with the growing trend of integrating advanced surveillance and identification technologies for enhanced security. The proposed technology for the surveillance camera system offers a comprehensive and convenient home solution for improved protection against potential threats.

149 Characterization Of Polyvinylidene Fluoride-Based Piezoelectric Device Under Dynamic Loading For Output Performance Analysis

Ahmad Syahiman Mohd Shah et al.

Piezoelectric energy is the conversion of mechanical stress into electrical energy using materials that exhibit the piezoelectric effect. The primary objective of this study is to investigate the performance of generated voltage in thin-film piezoelectric devices under dynamic forces. A PVDF-BaTiO3 -based piezoelectric device is fabricated using the casting method. Two samples with top electrode sizes of 13 mm × 10 mm (Sample 1) and 17 mm × 13 mm (Sample 2) were evaluated for their piezoelectric characteristics. Results indicate that the larger electrode size (Sample 2) exhibits a higher capacitance of 33.3755 pF, leading to a higher voltage constant (g_{33}) of 21.8149μ Vm/N. In contrast, the smaller electrode size (Sample 1) demonstrates a lower capacitance of 32.2115 pF but a higher dielectric constant of 6.4366 and a higher piezoelectric coefficient (d_{33}) of 8.5266×10^{-11} m/V, that influences its electricity generation performance. The piezoelectric performance of the samples is tested under dynamic force using a force gauge meter with two structural configurations: a single-stacked structure and a fixed-end configuration. It was observed that the generated output voltage is non-linear with applied dynamic force.

167 Artificial Intelligence Techniques For Renewable Energy Predictive Power Generation In Extreme Weather Environments: An Overview

Muhamad Zahim Sujod et al.

This paper explores the role of Artificial Intelligence (AI) in optimizing and enhancing the predictability of renewable energy (RE) power generation, particularly in extreme weather conditions. Adverse weather events such as cloudy skies, hurricanes, floods, heat waves, and severe storms pose significant challenges to power generation, grid stability, and the overall

reliability of RE systems. AI techniques, including Machine Learning (ML), Deep Learning (DL), Supervised Learning (SL), Reinforcement Learning (RL), Support Vector Regression (SVR), and metaheuristic optimization algorithms, play a crucial role in addressing these challenges. By leveraging historical weather and system data, AI-driven predictive models improve power output forecasting, real-time optimization, and energy management. This paper provides an overview of state-of-the-art AI methodologies for RE predictive power generation in extreme weather environments and discusses their potential to enhance efficiency, resilience, and grid integration.

168 Real-Time People Detection For Automatic Fan Control Of Eco Breeze DC Fan

Zainah Md Zain et al.

This project addresses the widespread use of manually controlled ceiling fans in Malaysia, which often leads to energy wastage and safety concerns. To overcome these issues, we propose an automatic ceiling fan speed regulator that integrates a USB web camera and a DHT11 temperature sensor. The system utilizes a pre-trained image processing model to detect and count individuals entering and exiting a room via the USB web camera. Based on this occupancy count and the temperature readings, the fan is automatically activated or deactivated. The system incorporates ESP32 and Raspberry Pi 4 B+ microcontrollers, which communicate via the MQTT protocol to enhance functionality. Testing on an Eco Breeze DC ceiling fan demonstrated an impressive 98% accuracy in people detection, highlighting the potential for efficient and automated ceiling fan control in residential and commercial spaces.

177 EEG-Based Emergency Calling System For Neurological Disorder Patient

Norizam Sulaiman et al.

Neurological disorders are diseases of the central and peripheral nervous systems, which include the brain, spinal cord, and nerves. Patients with this kind of disease might face difficulty in communicating with others, movement, sensation, hearing, thinking, and emotion. Insufficient monitoring of the health status of neurological disorders patients can delay emergency responses, putting their lives in danger. Thus, the main objective of the study is to construct an assistive emergency calling system that is capable of analyzing the brain's signals or brainwaves of neurological disorders and determining their health status. The are two methods that are applied in the study. Method 1 has involved the analysis of the brain signals from the available public datasets that are related to Neurological disorders. Method 2 has involved experimental works where several brain stimulation exercise such as color blind exercise, hand gesture exercise and blindfolded exercise to mimic the Neurological disorder where the measurement is done using Electroencephalogram (EEG) device and electrodes. The MATLAB Graphical User Interface (GUI) algorithm is constructed to display the EEG data analysis and health status of the Neurological disorder patients. Here, the data analysis process includes the design of a suitable filter to split EEG signals into their frequency bands, such as Theta band (4-8 Hz), Alpha band (8-13 Hz) and Beta band (13-30 Hz), to remove any unwanted noises, and to convert the EEG signals into frequency-based signal such such as Power Spectral Density (PSD) and Fast Fourier Transform (FFT). Mean, standard deviation, and variance of the analysis of the PSD and FFT are calculated and then feed to k-NN classifier to determine the classification accuracy. The classification process involves testing and training ratios of 50:50, 70:30, and 80:20 respectively. The classification accuracy is achieved at 87.3 % using Mean PSD of blind folded activity where the classification ratio is at 80:20. Meanwhile, the emergency calling system is created using Arduino micro-controller and GSM module where the communication protocol between MATLAB GUI and GSM module is configured to establish

the communication with local community doctors or caretaker based on the triggered status of the neurological disorder patient in the MATLAB GUI. The calling system will be triggered when the alert health indicator in the MATLAB GUI turns red. On the other hand, and it will be in standby mode when the normal health indicator in the MATLAB GUI turns green.

	TRACK 4 | MECHANICAL & MANUFACTURING (MM)
	ID Title & Abstract
20	**Analysis Study Of Multi G-Codes: Effects On Surface Roughness And Tool Wear In Mild Steel Turning** *Mohd Amri Sulaiman et al.*

Cutting parameters are significant role in achieving good machining quality and operational efficiency. Besides, the selection of G-codes in CNC machining is an important factor influencing surface roughness and tool lifetime. The G96 (spindle speed increase with material diameter change) and G97 (constant spindle speed) commands significantly affect the output of turning processes. Even though in CNC machining, achieving an optimal condition between surface quality and tool wear remains challenging especially in selection G-codes command. This study focused on the effects of these G-codes on surface roughness and tool wear during turning of S20C mild steel. Examined the effects of G96 and G97 on the surface machined, analyze the progression of tool wear, and compare surface roughness (Ra) and tool wear (VB) on multiple cutting speeds for both types G-codes are main objectives. Surface roughness was measured with a Mitutoyo Surftest SJ-301, while tool wear was evaluated using a Mitutoyo toolmaker's microscope. The results showed that G96 produced better surface roughness compare to G97. On the other hand, G97 demonstrated better in life time of the cutting tool rather than G96. These findings showed that for prioritizing surface quality, G96 is recommended, meanwhile G97 is preferable for cutting tool life.

43 Design And Fabricate Rollover Warning Device With Internet Of Things Monitoring System For Commercial Vehicle

Mohamad Hafiz Harun et al.

Nowadays, there are always been heard commercial vehicle involved in accident especially related to rollover. It is a higher rate of fatal and death compared to other types of crashes which rollover events resulting impact on drivers, passengers and other road users. Several factor that contributes to the rollover events, leading to the fatal physical injuries and death such as human error and road conditions. Therefore, this study focused to develop a rollover warning device (RWD) purposely for commercial vehicles with high center of gravity. This developed system eventually gathers all the information related to the vehicle movement and evaluates its current load capacity to stay stable using the rollover index algorithm. All the vehicle information and rollover index were simulated in MATLAB/Simulink and determined to analyze the steering maneuvers with different velocities. Modified Odenthal rollover index algorithm has been utilized and integrated with TruckSim driving simulator and MATLAB/Simulink software. For experimental procedure, the step steering maneuver at different velocities and loads are applied using the Hardware-in-the-loop (HIL) simulation approach. From the result, it shows that the modified Odenthal rollover index algorithm produces a 12.3% of improvement in Time-To-Warn (TTW) for the driver to be aware of the current situation. By that reason, it will allow Time-To-Respond (TTR) for the driver to efficiently initiate the corrective action. To improve the warning system, communication and data monitoring, the rollover warning device (RWD) also equipped with IoT support system which will inform and notify the desired party whenever rollover events might to occur. This IoT support system will be very useful to allow the transportation company to observe and monitor the truck driver driving behavior for the safety purpose.

44 Optimization Of Machining Parameters For Enhanced Surface Quality And Tool Wear Reduction In Hfrp Trimming For Aerospace Applications

Syahrul Azwan Sundi@ Suandi et al.

This article presents a study on the optimization of cutting parameters to improve surface quality and reduce tool wear during the trimming process of Hybrid Fibre Reinforced Plastics (HFRP) used in aerospace applications. This study uses the Taguchi L9 Orthogonal Array approach to analyze the effects of spindle speed and feed per tooth on surface roughness (Ra), cutting temperature, and tool wear. The experiments were conducted using a Roland MDX540 CNC Router machine, and surface quality and tool wear data were obtained through an optical microscope and a thermal camera. The results of the study showed that the combination of spindle speed of 10024 RPM and feed per tooth of 0.05 mm provided the best surface quality with low Ra values, controlled temperature, and minimal tool wear. ANOVA analysis confirmed that spindle speed was the most significant parameter affecting the machining results. This study provides important guidance to improve the effectiveness of the HFRP trimming process, reduce operating costs, and produce high-quality components. The results of this study are expected to contribute to the optimization of composite material machining in the aerospace industry and open up space for further research in the field of heterogeneous material machining.

55 The Effect Of Dual Active-Regenerative Suspension System On The Ride Dynamics And Energy Recovery Of An All-Terrain Vehicle

Mohd Azman Abdullah et al.

The growing need for high-performing and energy-efficient off-road vehicles has focused research on sophisticated suspension systems that improve ride comfort and enable energy harvesting. This research analyzes the impacts of a Dual Active-Regenerative Suspension System (DARSS)

on ride dynamics and energy recuperation of an All-Terrain Vehicle (ATV). The difference between passive suspension systems and regenerative suspension systems is that passive suspension systems suppress vibration energy by dissipating it as heat while regenerative suspension systems suppress it by transforming part of the energy into electric power of use. Through the inclusion of an active control mechanism, additional allowance for enhanced stability and comfort of riding is provided as terrain changes by changing the damping forces responsively. In order to evaluate the effectiveness of the DARSS system, a multi-body dynamic model of an all-terrain vehicle (ATV) was created in MATLAB/ Simulink environment, consisting of nonlinear suspension kinematics, tire model, and road surface contours. The gravel, sand, and rocky trails served as some of the off-road simulation scenarios for benchmarking purposes. The analysis was carried out for three different configurations of suspension components: passive suspension, regenerative suspension, and dual active-regenerative suspension. The findings illustrate that DARSS offers significant advantages in ride comfort and handling stability energy recovery efficiency compared to traditional methods. The new system improved vertical acceleration by 35%, leading to improved ride quality compared to a standard passive suspension system. Moreover, the efficiency in energy harvesting using the regenerative damper was determined to range from 18% to 25%, depending on the speed and roughness of the terrain. The active control system reduced peak dynamic tire loads by 20%, which in turn improved traction and off-road capabilities, thus dynamically changing damping forces. In addition, the crude power captured from the terrain was enough to run the vehicle's low-power electronics like lighting and sensors, demonstrating self-powered capability for vehicle operation.

58 Towards Smart Manufacturing: A Sensor-Driven Analysis Of SMED Efficiency And Setup Time Reduction

Effendi Mohamad et al.

The integration of Single-Minute Exchange of Die (SMED) in manufacturing aims to reduce setup times and enhance production efficiency. This study evaluates SMED performance using an IoT-enabled system that mimics real-time production conditions through sensor-based data collection. The analysis is conducted across 60 app runs, capturing key variables, including Total Setup Time Before (TST-Before), Total Setup Time After (TST-After), Time Reduction, and the SMED Value. Three statistical analyses were performed: descriptive analysis, paired t-test with p-value, and correlation analysis to determine the feasibility and effectiveness of SMED implementation. The descriptive analysis reveals the distribution and central tendencies of each variable, highlighting the extent of setup time reductions achieved. A paired t-test was conducted to assess whether the reductions in setup times were statistically significant, with a p-value indicating the reliability of the observed improvements. Lastly, correlation analysis examines the interrelationships among the SMED variables, identifying which factors most strongly influence the SMED value. Results indicate a significant reduction in setup times, reinforcing the effectiveness of SMED in minimizing production downtime. The paired t-test confirms that the reduction in setup times is statistically significant ($p < 0.05$), validating the feasibility of the proposed approach. Furthermore, correlation analysis demonstrates a strong relationship between time reduction and SMED value, suggesting that setup time improvements directly enhance SMED performance. The findings highlight the potential of IoT-driven SMED optimization, offering a real-time decision support system for improving manufacturing efficiency. Future research could integrate machine learning models for predictive SMED adjustments, further enhancing adaptive production strategies.

89 The Influence Of Surface Wettability And Hydration On Skin-Product Interactions: A Contact Mechanics Perspective

Siti Hartini Hamdan et al.

This study investigate the tribological properties of artificial skin treated with anthocyanin-based skincare products by looking at the influence of surface wettability and hydration. The research also highlight the on hydration levels and surface energy analysis by monitoring the contact angle and surface free energy (SFE) under hydrated and dry condition. A goniometer is used for contact angle measurements, a Modular Compact Rheometer (MCR 302) for rheological analysis, and Field Emission Scanning Electron Microscopy (FE-SEM) for surface roughness evaluation. Results demonstrate that increased hydration enhances surface wettability, reducing the contact angle and improving the adhesion of anthocyanin-based serums. This is proven where it is demonstrated that increased hydration enhances surface wettability, reducing the contact angle by up to 12.65% for raw anthocyanin and 7.85% for standard liquid anthocyanin, while serum application further improves wettability by 2.23-2.71%. Furthermore, the study unveils that surface roughness and mechanical properties serve the function of controlling friction and this exerts ideas for the design of the skincare products for the best proper touch performance and efficacies. Hence, surface roughness decreases by 15.02% under hydrated conditions, contributing to smoother interactions. These results provide a more exploratory approach to the tribological properties of skin-product interactions, imparting useful, real-life consequences for developing the next generation of sophisticated skincare products that strike a perfect balance between friction, moisture, and user comfort.

109 Alternative Options Of 3d Bone Tissue Engineering Scaffolds To Reduce Carbon Footprint: AHP-Based Analysis

Salwa Mahmood et al.

The increasing demand for tissue engineering scaffolds in regenerative medicine has raised concerns about their environmental impact, particularly their carbon footprint across the product life cycle. Carbon footprint specifically referring to Global Warming Potential (GWP) for the whole product's life cycle. This paper applies the Analytic Hierarchy Process (AHP) to systematically evaluate and prioritize improvement alternatives for reducing its carbon footprint in the fabrication of 3D bone tissue engineering scaffolds. The assessment considers the main criteria which are raw material efficiency, energy consumption, and emission control. Primary data were collected through the survey instruments with researchers and experts. Meanwhile, secondary data were obtained from LCA databases and published literature. The results indicate that raw material efficiency (74.82%) is the most influential factor in minimizing GWP. Besides, among the alternatives, the optimized design and printing processes to minimize material waste have emerged as the most preferred alternative. It has the highest composite weight (52.50%), meaning it is the most preferred option based on the given criteria. It performs significantly better in the factor of optimization of material use (41.69%) and has strong contributions in other factors. Hence, the findings highlight the significance of data-driven decision-making in sustainable tissue engineering, it shows how AHP offers a structured framework for prioritizing environmentally friendly alternatives.

110 Evaluating The Environmental Impact: A Case Study For High Impact Polystyrene (HIPS) Using Life Cycle Assessment

Salwa Mahmood et al.

High Impact Polystyrene (HIPS) granulate is widely used in packaging, automotive, and consumer products due to its impact resistance, flexibility, and cost-effectiveness. The production and its life cycle

might pose environmental challenges, including potential high energy use and environmental emissions. This paper evaluates the potential environmental impacts of HIPS granulation through the Life Cycle Assessment (LCA) tool using LCA FE software. The system boundary selected is from cradle-to-gate, focusing on four key manufacturing stages: mixing, polymerization, devolatilization, and pelletization. Inputs such as styrene monomer, butadiene, carbon black, and bisphenol A were assessed alongside outputs like greenhouse gas emissions and energy consumption. The CML 2016 methodology was applied to evaluate critical environmental indicators such as global warming potential and acidification potential. Sensitivity analysis showed that switching to renewable energy sources, like photovoltaics and hydropower, could reduce impacts up to 96.54% for resource depletion and 97.31% for aquatic toxicity. The findings highlight the need for energy-efficient processes and sustainable raw materials, offering recommendations for improving the environmental performance of HIPS production.

137 Enhanced Condensation By Mimicking Desert Toktokkie Beetle

Mohamad Asmidzam Ahamat et al.

This paper concerns the adoption of hydrophilic and hydrophobic patterns inspired by Desert Toktokkie battle for condenser. The purpose of this bio-mimicry is to increase the rate of condensation which is applicable to many engineering devices. Several surfaces were fabricated by etching and coating using thin films. The surface free energy was determined using Neumann equation of state. For the wettability, the contact angle was used to determine the hydrophilicity and hydrophobicity of surfaces. The rate of condensation was measured using a thermoelectric heat flux meter. The surface energy for hydrophobic region is 21.78 mN/m, while the surface energy of hydrophilic region is 50.96 mN/m. The condensation heat transfer rate for the biomimic-ry surface is 31% higher than the untreated surface. By adopting a biomimic-ry surface in a condenser, the size and cost of engineering devices can be reduced.

161 Kurtosis-Based Classification For Real-Time Monitoring Of Cnc Milling Processes: A Vibration Analysis Approach

Ahmad Razlan Yusoff et al.

This paper presents a novel approach to real-time condition monitoring for CNC milling operations using vibration analysis integrated with Internet of Things (IoT) technology. Traditional maintenance approaches often lead to unexpected equipment failures, costly downtime, and product quality inconsistencies. To address these challenges, we developed a comprehensive monitoring system that analyzes vibration signals using kurtosis-based classification to simultaneously assess tool condition, surface quality, and machine health. Experiments were conducted on materials with varying hardness levels of cast iron, aluminum, and PVC under different machining parameters, with vibration data captured using strategically positioned accelerometers. The results demonstrate that material-specific kurtosis thresholds can accurately classify tool wear status with 95-98% accuracy, surface quality conditions, and machine health status. The classification framework shows clear correlations between kurtosis values, tool wear measurements, and surface roughness across all tested materials. This integrated approach enables manufacturers to detect potential failures before they occur, optimize tool usage, and maintain consistent product quality. The system's IoT integration facilitates real-time monitoring and decision-making, establishing a framework for Industry 4.0 implementation in manufacturing environments.

161 Cooling Slope-Cast LM25 Aluminium Fabrication For Additive Friction Stir Deposition: A Microstructural And Mechanical Study

Mohammad Kamil Sued et al.

Additive Friction Stir Deposition (AFSD), an innovative solid-state additive manufacturing (AM) technique, has offered a transformative solution for joining and fabricating high-performance aluminium alloys for almost

a decade, but the feasibility of using heat-treated cooling slope (CS) cast feedstock remains underexplored. This preliminary study examines whether LM25 aluminium alloy feedstock processed through T6 heat treatment after generation from the cooling slope cast can be effectively used in AFSD applications. Through microstructural and mechanical characterization, CS casting generates structures with reduced dendritic arm spacing (DAS) by 40% compared to permanent mould casting techniques yet subsequent AFSD pro-cessing reduces the grain structure to 5 to 8 µm. The optimal 3 mm/s deposition speed at a rotational speed of 800 RPM leads to maximum hardness value improvement by 29.4% up to 98 VHN without detecting any deposition-related defects in the test specimens if compared to the as-cast LM25 alloy feedstock. Experimental findings demonstrate how CS rapid solidification in combination with severe plastic deformation of AFSD creates complementary benefits for material properties enhancement. This research includes an evaluation of industrial use potential specifically related to aerospace and automotive lightweight components applications. The discussion presents major research obstacles alongside practical recommendations for future investigation of these problems. Hybrid metal processing techniques involving heat treatment of CS-cast aluminium alloys have proven their capability to supply high-performance feedstock for AFSD and by doing so they address an essential shortcoming in solid-state additive manufacturing.

163 Design Of Automatic "Tekong" Launcher System

Muhammad Adib Shaharun et al.

The Automatic “Tekong” Launcher System represents an innovation in sepak takraw equipment, combining precision engineering with advanced automation. This system transforms the traditional role of the "Tekong" by optimizing the ball-serving process to initiate a rally seamlessly. At its core, the system features a sturdy mechanical framework constructed from durable aluminum profiles, ensuring structural integrity. The launcher mechanism, crafted using CNC milling technology, highlights precision engineering for consistent and high-performance ball launches. Supporting

the mechanical components is a sophisticated power supply system, incorporating three 30A AC to DC converters that deliver stable power to the motors. The system operates with four 24V DC motors and two stepper motors, capable of reaching speeds of up to 2800 rpm, enabling precise control over ball velocity and trajectory. The ball speed exceeds 60 km/h, ensuring powerful and consistent serves. The heart of the Automatic Tekong Launcher System is a Programmable Logic Controller (PLC), which automates and coordinates motor and sensor functions for precise and reliable launches with minimal human intervention. Additionally, a joystick control feature allows for semi-automatic operation, offering enhanced user interaction and adaptability to different gameplay scenarios.Extensive testing has been conducted to assess the accuracy and consistency of the system. Results indicate that more than 95% of ball trajectories hit the intended target, demonstrating exceptional precision. The accuracy is influenced by key factors such as motor RPM and tyre pressure, where an optimal RPM setting of 2500-2800 rpm and a tyre pressure range of 7-9 psi yield the highest precision in ball launching. Deviations beyond these parameters may result in slight variations in ball direction and speed. By integrating automation, precision engineering, an advanced power supply, enhanced user control, modular design, and data-driven optimization, the Automatic Tekong Launcher System sets a new standard in sepak takraw equipment. Whether used for training or competitive play, this innovative system enhances the sport by delivering unmatched accuracy, power, and efficiency in ball launching.

170 Comparative Analysis Study Of Power And Vibration Signals For Different Tool Pin Sizes Of Friction Stir Welding

Mohammed Kamil Sued et al.

Process signals analysis provides meaningful information about weld quality, especially defects. Tool design is one of the most critical parameters for successful welding in FSW. Due to the tool's surface features, each design can influence the mechanical mixing and bonding related to the material flow quality. Hence, different weld quality is expected due to the required work to transfer the material. This is even

crucial when related to various material thicknesses, as one factor affecting weld quality due to the energy required to stir the material. Therefore, the energy requirement and its reaction can be used to quantify the weld condition. This paper uses three different pin sizes on different material thicknesses of AA6061. Spindle and traverse speed are constant at 1200 RPM and 50 mm/min, respectively. During welding, a current clamp meter and an accelerometer are used to measure the power and vibration. The signals captured were analyzed in the time domain and statistical method. Fast Fourier transform is used for signal characterization, and the statistical method is applied to conclude the characteristics. Then, the welded plates are subjected to mechanical testing to determine the weld joint strength. It is found for the time domain analysis the 2 mm pin produced the lowest peak of the main frequency amplitude which is 3.8% compared to 4 mm and 6 mm. All the welded plates have no visible defects except the presence of a flash. The 4 mm plate has the highest dispersion of vibration. The reason is believed to be because of material availability during the string. This shows some early investigation of power and vibration signals which required further studies. This study is important for practitioners to be able to predict the weld quality and presence of defects.

173 Elements Of The Human Factor For The Implementation Of The “Vision Zero” Concept In Railway Transport

Ahmad Fitri Yusop et al.

Railway transportation is a crucial component of modern logistics and mobility, offering efficient and sustainable transit solutions. However, human er-ror remains a leading cause of railway accidents, with over 80% of incidents linked to human factors such as fatigue, cognitive overload, and environmental stressors. This study investigates the impact of human reliability on railway safety, focusing on occupational risks among train drivers. The Human Error As-sessment and Reduction Technique (HEART) is applied to quantify error proba-bilities and identify key error-producing conditions (EPCs). Using mathematical modeling and data analysis, the study examines the influence of workload, expe-rience, and cognitive

factors on human reliability. Findings highlight the signifi-cance of fatigue, situational awareness, and decision-making in accident causa-tion. The study also proposes risk mitigation strategies, including structured training, improved safety culture, and optimized work schedules, aligning with the Vision Zero approach. Integrating human reliability analysis into railway safety frameworks can also enhance operational safety, reduce accidents, and support a more resilient railway system.

178 Battery Technological Trend And Advancement For Optimal Applications In Solar-Powered Aircraft (UAV)

Safyanu Bashir Danjuma et al.

This paper reviews different advancements and trends in battery technology that can adequately replace the use of fossil fuels in terms of energy density and effective utilisation of storage systems for optimal performance of solar aircraft. The prolonged use of fossil fuel as an energy source has caused climate change with its disastrous adverse effect on the earth's ecosystem. It necessitates the paradigm shift from fossil fuel to solar energy with photovoltaic technology. The main problem of photovoltaic technology is the storage capacity and energy density. Lithium-ion and polymer batteries have dramatically improved solar-powered efficiency because of their high energy density. Also, lithium-sulphur batteries have higher energy density attributed to the high altitude and long endurance of the world record of solar-powered aircraft recently. Preliminary results of lithium-air batteries have shown energy density close to fossil fuel. Technological advancement and state-of-the-art technology have given hope for the use of 100% solar energy in airborne solar-powered aircraft, both manned and unmanned. The Malaysia solar radiation model was developed to enhance the availability of solar radiation with the aid of photovoltaic information and geographical systems (PVGIS) software. Mission specifications and requirements were developed for optimal performance of solar aircraft.

187 Precision Agriculture In Pineapple Farming: Optimizing UAV Spraying Parameters For Liquid Fertilizer Efficiency

At-Tasneem Mohd Amin et al.

Agricultural drones have emerged as a promising technology to enhance precision and sustainability in farming practices. In pineapple agriculture, the precise application of liquid fertilizer is vital for boosting yield and minimizing environmental impact. This study investigates the optimization of drone operational parameters for liquid fertilizer spraying to maximise coverage while reducing waste. Field experiments were performed using a DJI AGRAS T20P drone equipped with centrifugal nozzles. Various combinations of flight at different altitudes (1.5 m, 3.0 m, 4.5 m), speeds (3 m/s, 5 m/s), and flow rates (2.5 L/min, 4.0 L/min) were tested on a 30m x 30m plot. Water-sensitive papers were used to capture droplet dispersion, which was then quantitatively analysed using ImageJ. Results indicate that the combination of the lowest altitude, lowest speed and highest flow rate produces the highest droplet density and most uniform coverage. As flight altitude and speed increased, droplet count, and coverage decreased due to greater drift and dispersal. While increasing the flow rate enhanced coverage, it also raised the total amount distributed. Under optimal conditions, the drone effectively treated one acre with only four passes using approximately 45 litres of fertiliser, representing a 96.25% reduction over the conventional method. Rotor-induced turbulence was shown to alter spray homogeneity, highlighting the importance of precision flight control. Overall, when operated under optimal conditions, agricultural drones provide a more efficient and effective alternative to traditional fertilisation methods, enhancing productivity while reducing environmental impact and manpower demands in pineapple cultivation.

189 **Influence Of Infill Pattern On Tensile Strength And Material Efficiency Of Fused Deposition Modelling (FDM)-Printed Polylactic Acid (PLA) Parts**

Khairul Salleh Basaruddin et al.

This study investigates the influence of infill patterns and densities on the tensile properties of Fused Deposition Modeling (FDM) 3D-printed Polylactic Acid (PLA) parts, aiming to optimize material efficiency while maintaining structural integrity. Eight infill patterns—Cross 3D, Subdivision Cubic, Octets, Quarter Cubic, Concentric, Grid, Gyroid, and Zigzag—were tested at 45%, 55%, and 65% infill densities, with a solid specimen (100% infill) serving as a benchmark. Tensile testing revealed that the Quarter Cubic pattern at 65% infill density closely matched the mechanical strength and stiffness of the solid specimen while significantly reducing material usage. Statistical analysis using Taguchi method and ANOVA identified infill percentage as the most influential factor ($p = 0.003$), while regression modeling ($R^2 = 91.88\%$) demonstrated robust predictive capability. This study contributes novel insights into the interplay between infill design and mechanical performance, guiding sustainable production of high-strength, lightweight PLA components for applications in aerospace, automotive, and consumer products.

TRACK 5 | SOCIAL SCIENCES, EDUCATION & TECHNOLOGY MANAGEMENT (SSETM)

ID Title & Abstract

8 **Does The Malaysian Construction Industry's Adoption Of The Building Information Modelling (BIM) Technology Proceed At A Sufficient Pace? Findings From A Survey**

Siti Birkha Mohd Ali et al.

Malaysia's construction industry has faced several issues such as project delays, budget constraints, and part defects. Thus, to effectively and efficiently manage the entire life cycle process, the construction industry

has embraced Building Information Modelling (BIM) as a solution to these problems. BIM is the process of building models with computer technology's aid. The facility's planning, designing, building, and operation are then simulated by feeding data into these models. In the construction industry, BIM offers numerous benefits, including decreased delays in time and cost, better project coordination, higher efficiency, and more control over design projects. Despite the potential advantages of BIM for this industry, only 10% of construction stakeholders are adopting and utilizing the technology. This study found several important reasons for the low adoption of BIM among construction companies in Klang Valley, Malaysia. A survey was sent to the targeted companies, with 100 respondents. The findings indicate that the project's quality and visualisation are the main factors impacting the adoption of BIM. Conversely, high costs and a lack of BIM guidelines were among the issues that prevented the respondents from using BIM in their projects. Further analysis reveals that the project's quality and visualisation have influenced time and cost impact of a project, as evidenced by the significant differences found by the Analysis of Variance (ANOVA) (p-value 0.009, 0.014) and the correlation test (p-value 0.871, 0.802). In conclusion, if the project quality and visualization are improved, time and cost will greatly be impacted.

17 Evaluating The Effectiveness Of The "Mari Belajar PAI" App: An Augmented Reality Approach For Deaf And Hard-Of-Hearing Students In Special Education

Rafizah Mohd Hanifa et al.

Inclusive education for deaf and hard-of-hearing students remains a significant challenge in Malaysia, necessitating innovative technological approaches to enhance learning experiences. This study aimed to develop and assess the "Mari Belajar PAI" app, which incorporates Augmented Reality (AR) technology to improve Islamic religious education for Year 1 students who are deaf or hard-of-hearing. The research involved special education teachers proficient in sign language, parents of affected children, and experts in AR and app development. Conducted at two schools in Johor (Kluang and Batu Pahat), the study used a mixed-methods

approach, gathering data through questionnaires. The data was analyzed using SPSS 26.0 with descriptive statistics, measuring dimensions like usefulness, ease of use, enjoyment, attitude, and intention to use. Results indicated high satisfaction across all areas, with Cronbach's alpha (α = 0.821) confirming the instrument's reliability. Participants found the app easy to navigate and enjoyable, positively influencing their attitudes and intention to continue using it. These findings suggest that "Mari Belajar PAI" effectively meets the educational needs of its target audience and demonstrates the potential of AR technology in special education. Future research should focus on the app's long-term impact on learning outcomes and its scalability across diverse educational settings, contributing to Malaysia's Education Blueprint 2013-2025 goals for inclusive education.

19 The Impact Of ESG On Customer Relationship Management In TNB Kangar

Noormaizatul Akmar Ishak et al.

This research aims to investigate the interplay between Environmental, Social, and Governance (ESG) principles and Customer Relationship Management (CRM) within Tenaga Nasional Berhad (TNB) in Kangar, Perlis. The problem statement is to identify a gap in understanding the influence of ESG factors on CRM in the energy sector. This study utilizes the Triple Bottom Line theory as the conceptual framework, focusing on one primary theory. In this study, ESG is the independent variable (IV), and CRM is the dependent variable (DV). This study adapts a quantitative approach as research method. The sampling technique employed is purposive sampling, targeting residential and commercial customers in Kangar, as well as TNB staff in the area. The findings show the statistical analyses performed, including Pearson correlation and regression analysis, using SPSS. The results indicate significant relationships between ESG dimensions and CRM practices, with no insignificant results reported. Based on the findings, they suggest strategies for enhancing sustainable customer relationships and improving overall organizational performance within TNB Kangar.

21 Navigating The Landscape Of Industry 4.0 Talent Through WBL

Saifullizam Puteh et al.

Industry 4.0 (IR4.0) has swiftly changed the worldwide labour market by merging AI, robotics, and big data. The demand for new skills and redefining conventional jobs has made Technical and Vocational Education and Training (TVET) essential for preparing students for the workforce. This study seeks to evaluate the proficiency of TVET students in essential IR4.0 talent domains by analysing the effects of Work-Based Learning (WBL) programmes. Data were gathered using a quantitative methodology through a questionnaire featuring a 5-point Likert scale, distributed to 159 final-year students involved with undergraduate WBL programmes throughout Malaysian polytechnics. The survey evaluated students' intellectual talents, proficiency in work talent, individual talent potential, and ethical professional talent, pertinent to IR4.0, based on the mean score. The findings indicated a high level of proficiency in cognitive skills, including innovative thinking (mean: 4.30), creativity (mean: 4.22), and adaptability (mean: 4.18). Furthermore, operational skills including leadership (mean: 4.12) and communication (mean: 4.10) were recognised as strengths. The study enhances understanding of skill readiness for IR4.0, emphasising areas requiring enhancement. This study introduces a competency classification model integrating intellectual, working, individual and professional competencies to bridge the gap between academic training and industry needs in IR4.0, offering a novel approach to skill readiness assessment. The findings emphasise the role of WBL in bridging skill gaps and suggest that stakeholders in education and industry can use these insights to enhance training programmes, ultimately supporting Malaysia's goal of developing a highly skilled workforce for IR4.0.

22 Keberkesanan Modul Strategi Metakognitif Dalam Pengajaran Penyelesaian Masalah Matematik

Kahirol Mohd Salleh et al.

Strategi metakognitif berkait rapat dengan kemahiran penyelesaian masalah Matematik kerana berupaya membantu pelajar merancang, memantau dan menilai proses penyelesaian masalah secara sistematik. Namun, pelajar kurang didedahkan dengan strategi metakognitif kerana pengajaran lebih menekankan hafalan berbanding pemikiran reflektif. Kurangnya bimbingan dan panduan kepada guru turut menyumbang kepada permasalahan ini. Oleh itu, Modul Strategi Metakognitif dibangunkan untuk membantu pelajar menguasai kemahiran menyelesaikan soalan penyelesaian masalah Matematik Tahun Enam. Modul Strategi Metakognitif yang dibangunkan juga diuji keberkesanannya terhadap pencapaian serta kesedaran metakognitif pelajar dalam kemahiran menyelesaikan masalah Matematik. Pembinaan reka bentuk pengajaran Modul Strategi Metakognitif berpandukan Model Reka Bentuk Pengajaran Dick dan Carey. Modul ini telah mendapatkan kesahan daripada seorang pakar dan 4 orang guru berpengalaman dalam pendidikan Matematik. Bagi memastikan modul ini mempunyai kebolehpercayaan yang tinggi, satu kajian rintis telah dijalankan melibatkan 15 orang pelajar. Kajian ini berbentuk kuantitatif (kuasi-eksperimen) yang melibatkan seramai 46 orang pelajar Tahun Enam. Pelajar dibahagikan kepada kumpulan rawatan dan kumpulan kawalan. Kajian ini melibatkan Ujian Pra dan Ujian Pasca serta Inventori Kesedaran Metakognitif (Jr. MAI) dengan dua konstruk utama iaitu pengetahuan kognisi dan regulasi kognisi. Dapatan kajian menunjukkan bahawa Modul Strategi Metakognitif mempunyai kesahan kandungan yang baik iaitu 84% dan kebolehpercayaan yang baik (nilai pekali Alpha Cronbach = 0.81). Nilai skor min keseluruhan keberkesanan Modul Strategi Metakognitif adalah sangat tinggi (min = 4.85). Dapatan daripada Ujian Ancova menunjukkan bahawa terdapat perbezaan yang signifikan antara kumpulan rawatan (min = 80.65) dan kumpulan kawalan (min = 47.65) dengan nilai $p = 0.00 < 0.05$. Dapatan Ujian T Berpasangan pula menunjukkan bahawa terdapat perbezaan yang signifikan antara pra dan pasca intervensi bagi pengetahuan kognisi (p

= 0.00 <0.05) dan regulasi kognisi (p = 0.00 <0.05) selepas menggunakan Modul Strategi Metakognitif. Implikasi kajian menunjukkan bahawa Modul Strategi Metakognitif yang dibangunkan berupaya menjadi alat intervensi yang berkesan dalam meningkatkan kemahiran penyelesaian masalah Matematik pelajar.

26 Examining The Factors That Influence An Organization's Intention To Adopt A Lean Integrated Management System In Malaysia Food Industry

Kamarudin Abu Bakar et al.

In today's era, lean management is progressively important and has shown its potential application in the food industry. Thus, a lean integrated management system (LIMS) is the essential advanced technology that is well-equipped with a management system and lean thinking's tools to improve the performance of management and technical work. Nevertheless, the problem arises in which the LIMS adoption had a high failure rate in the food industry in Malaysia due to a lack of consideration of both internal and external factors when employing lean management for improving the organizational innovation performance. This explanatory research aims to analyze the determinants involved in influencing the organization's intention to adopt LIMS in the food industry and how it subsequently impacts the organizational performance. Hence, the Technology Adoption Model (TAM) as a proposed framework and hypotheses was formulated to study the causal relationships among the independent variable as the determinants, including technical lean tools and practices factors, organizational factors, individual factors, managerial factors, and external factors; the organization's intention to adopt LIMS as the mediating variable; and the dependent variable, which is organizational innovation performance. A quantitative research method with a survey questionnaire was utilized to collect the data from a total of 550 respondents, including the organization's staff in Malaysia's food industry. Furthermore, Pearson's Correlation Coefficient and regression analysis were mainly used to analyze the quantitative data through the software IBM SPSS Statistics 25. The analytical results

showed that all the relationships between the independent variables and the mediator are significantly positive, while external factors possess the most significant positive relationship with the organization's intention to adopt LIMS, and ultimately the organization's intention to adopt LIMS has a significant positive contribution to organizational innovation performance. It concluded that the research benefits the organization in the food industry and the researcher with valuable insights for future study and decision-making in lean adoption.

37 Positioning Knowledge Claims: A Study Of Niche Establishment In PHD Introductions

Faharol Zubir et al.

This study investigates the rhetorical strategies employed in 25 Engineering PhD thesis introductions, focusing on how authors establish a niche. Drawing on an inductive-deductive Move analysis guided by the Bunton Model, five steps were examined: Indicating a gap, Indicating a problem or need, Question-raising, Continuing/Extending a tradition, and Counter-claiming. Analysis and comparison on the findings indicate emerging of new trends. For the step of Indicating a gap, authors highlight previous research inadequacies, non-existence, and scarcity of studies while suggesting solutions. For the step on Indicating a problem or need, the thesis writers emphasize problems and needs, often using transitional markers. For the step on Continuing/Extending a tradition, writers extend existing traditions through compact, contrastive, modal, and causal language. For Counter-claiming, they challenge limitations and weaknesses via contrastive, comparative, and modal forms. Indicating a problem/need and a gap proved the most frequent strategies, surpassing earlier findings, whereas, Question-raising was less common, hinting at disciplinary differences. The dynamic nature of introduction writing and the influence of disciplinary conventions on niche-establishing strategies are highlighted. This study offers doctoral writers' valuable insights for constructing persuasive, contextually appropriate thesis introductions.

38 The Influence Of Board Diversity On Directors' Networks And Corporate Risk-Taking: A Systematic Review

Roshima Said et al.

In the competitive global corporate landscape, board diversity is essential for enhancing the effectiveness of strategic decision-making in corporate risk-taking. It enables organisations to respond to corporate challenges while mitigating the risks of uncontrolled unilateral decisions. This systematic literature review aims to empirically examine the influence of board diversity on directors' networks and corporate risk-taking. The key issue highlighted is the need for an updated and structured review to deepen understanding of how board diversity affects directors' networks and corporate risk-taking. To achieve this objective, an extensive search was conducted for scholarly articles within prominent databases such as Scopus and Web of Science, focusing on studies published between 2024 and 2025. The study follows the PRISMA framework for systematic reviews, resulting in (n=21) final primary data articles for analysis. The findings are categorised into two themes: (1) directors' networks influence corporate risk-taking, and (2) board diversity influences directors' networks and corporate risk-taking. The analysis reveals that gender and ethnic diversity on corporate boards significantly moderates the relationship between directors' networks and corporate risk-taking, depending on the company's context, corporate risk-taking structure, and external pressures faced by the company. In conclusion, strategically integrating board diversity into the corporate risk-taking framework while leveraging directors' networks fosters inclusive strategic decision-making practices. This approach optimises corporate value and reduces the company's cost of capital.

39 Unpacking The Nexus Between Institutional Investors Ownership And Sustainability: A Recent Systematic Exploration

Wan Sallha Yusoff et al.

The nexus between institutional investor ownership and sustainability has emerged as a critical research area, given the increasing emphasis on corporate accountability and environmental, social, and governance (ESG) practices. Despite extensive research on the role of institutional investors in shaping sustainability outcomes, the extent and consistency are still up for debate. This study aims to systematically examine the relationship between institutional investors and corporate sustainability by conducting a systematic literature review (SLR). Using an advanced search strategy across Scopus and Web of Science databases, 25 relevant primary data sources were identified. The review employs a qualitative content analysis methodology to synthesize findings from diverse contexts, offering insights into the interplay between institutional investor ownership and sustainability practices. The flow of this study is based on PRISMA framework. The finding from the analysis was divided into three themes which are (1) Institutional Investors and ESG Preferences (2) Impact of Institutional Investors on Corporate Sustainability (3) Institutional Investors' Role in Sustainability Governance. The results reveal that institutional investors influence sustainability through various mechanisms, such as active ownership, stewardship engagement, and ESG-focused investment strategies. The efficacy of these mechanisms fluctuates based on investor classification, geographic distribution, and the regulatory environment. The findings underscore the significance of governance frameworks, investor diversity, and financial motivations in influencing corporate ESG performance. This study contributes to the ongoing discourse on institutional investors' role in sustainability by providing a structured synthesis of recent literature and identifying critical gaps for future research. Fortifying ESG disclosure frameworks and augmenting investor accountability mechanisms are crucial for aligning institutional investment strategies with sustainable development objectives.

42 A Systematic Review Of Linguistic Structures In Persuasive Digital Communication

Ina Suryani et al.

In recent years, the use of persuasive digital communication has garnered significant attention due to its critical role in shaping perceptions, influencing decisions, and guiding behaviour across various digital platforms. This systematic literature review examines the linguistic structures and rhetorical strategies employed in persuasive digital communication, with a focus on understanding their applications, audience impact, and cultural variations. The primary problem addressed is the lack of a consolidated and structured overview of how these elements are utilized and their implications in a globalized digital landscape. To achieve this, we conducted an extensive search of scholarly articles from reputable databases, including Scopus and Web of Science, focusing on studies published between 2021 and 2024. The review adhered to the PRISMA framework, analysing 28 relevant studies. The findings are categorized into three themes: (1) linguistic structures in persuasive digital communication, (2) rhetorical strategies and their ethical implications, and (3) audience perception and cross-cultural variations. The analysis reveals that linguistic structures such as syntax, semantics, and pragmatics play a pivotal role in crafting persuasive messages, while rhetorical strategies leverage emotional, ethical, and logical appeals to achieve communicative goals. Additionally, audience responses and cultural contexts significantly influence the effectiveness of these strategies, highlighting the need for localized and context-specific approaches. This review underscores the importance of ethical considerations in digital persuasion, alongside the need for further research into long-term audience reception and the sustainability of persuasive techniques. This comprehensive review offers valuable insights for communication professionals, educators, and policymakers seeking to enhance the effectiveness of digital communication strategies in a rapidly evolving digital ecosystem.

54 Transformational And Innovative Leadership In The Royal Malaysia Police (Rmp): A Path Toward Modern Policing

Amiruddin Ahamat et al.

This study aims to explore the role of innovative leadership within the Royal Malaysia Police (RMP) as a catalyst for enhancing operational efficiency, adaptability, and public trust in an increasingly complex security environment. Using a qualitative approach, the research investigates the impact of innovative leadership practices on decision-making and officer engagement within the RMP. The study employs qualitative interviews to gather comprehensive data from various levels of the police force. Key findings indicate that leaders who prioritize innovation significantly foster a culture of continuous improvement, which enables the RMP to respond proactively to evolving threats and societal expectations. The study identifies major challenges, such as resistance to change and limited resources, which underscore the need for strategic support to facilitate effective reform. Theoretically, the research contributes to the understanding of leadership dynamics in law enforcement, particularly in the context of innovation-driven practices. Practically, it offers actionable insights for policymakers and law enforcement agencies that aim to modernize their operations. By promoting an innovation-driven leadership model, the RMP can enhance internal effectiveness and external relationships, paving the way for a more agile, responsive, and community-centered police force.

69 Mapping The Tvet Education Program For Mtun Degree - A Case Study Of Tvet Matriculation Curriculum In Politechnic

Rosziati Ibrahim et al.

Technical Vocational Education and Training (TVET) has long been the main pillar in producing highly skilled human capital in technical and vocational fields in Malaysia. Along with the rapid development of technology and changes in the employment landscape, the TVET education system is now required to be more dynamic and relevant in meeting current industry

needs. In 2023, TVET matriculation curriculum has been introduced in Malaysian education to expand for meeting the TVET demands in the country. The curriculum focuses on 5 primary subjects which are Basic Information and Communication Technology (ICT), Physics, Chemistry, Mathematics and Engineering Technology. The curriculum has been designed to cater the feeder for Malaysian Technical University Network (MTUN) degree that consists of four technical universities in Malaysia. To map the TVET Education Program with MTUN degree, the questionnaires are distributed to the first batch of the students who take the program. The analysis was conducted based on 149 valid questionnaires, where the data was obtained through a rigorous selection process. The results from the analysis show that 75.2% of the students have a background in pure science during high school, indicating an interest and inclination towards technical disciplines. Meanwhile, 40.9% of students stated interest as the main factor influencing their choice. These results help the study in mapping the TVET education program for MTUN Degree.

73 Investigating Factors Influencing English Reading Comprehension Of Pakistani Undergraduates

Sarala Thulasi Palpanadan et al.

Many students who enter universities lack the ability to comprehend textbooks and other academic reading materials in English effectively. This affects their academic learning and performance at the expense of low grades. Thus, this pilot study aimed to explore the main factors that affected the students' English reading comprehension. Using the quantitative method, data was collected from 114 undergraduates from the Department of Education at a university in the northern part of Pakistan through a convenience sampling technique. Based on the review of the literature, six main factors were found to affect the reading comprehension of students in English. 23 items were generated for all the factors. Based on experts' feedback and pre-test findings, a questionnaire was refined and distributed to the respondents. Exploratory factor analysis was conducted to study the level of factors' effects on students' reading comprehension. The results showed that poor vocabulary, lack of decoding, and lack of

fluency were the top three factors affecting the respondents' reading comprehension. Hence, educators may focus on these factors during lessons for better learning outcomes.

76 Tasking Alarm Application For Enhanced Productivity

Muhammad Fazrulhelmi Ahmad et al.

Effective time management is crucial for productivity, yet traditional alarm systems often fail to sustain user engagement. The Tasking Alarm Application was developed to address this gap by integrating customizable alarms, task-based challenges, progress tracking, and a world clock to enhance wakefulness and motivation. Developed using Android Studio and the Waterfall Model, the application underwent rigorous user testing with 28 participants, employing Likert-scale surveys and expert validation to assess usability and effectiveness. Results indicate that 82.1% of users found the interface user-friendly, while 92.9% agreed that task challenges improved wakefulness. Additionally, 64.3% reported enhanced time management, and 75% expressed willingness to recommend the application. However, feedback on the world clock feature was mixed, suggesting areas for refinement. Overall, findings highlight the Tasking Alarm Application as an effective and engaging tool for improving wake-up routines and productivity. Future enhancements should focus on greater customization, AI-driven adaptability, and further user testing to optimize long-term engagement and efficacy.

83 Demystifying Contractual Issues In Building Information Modelling (BIM)-Focused Projects: A DEMATEL-BASED Model

Chia Kuang Lee et al.

Building Information Modelling (BIM)-focused projects are gaining prominence in Malaysia. Although BIM can reduce costs and mistakes, thus improving productivity in building projects, it has also given rise to a substantial number of contractual issues. Previous studies have primarily investigated the causes and effects of disputes, yet few have

explored the relationships between the contractual issues arise in BIM-focused projects. This study examines the critical contractual issues in BIM-focused projects and proposes relevant strategies for managing these contractual issues. Ten key contractual issues in BIM-focused projects were analyzed, and six strategies were proposed to manage these issues. Based on input from fourteen BIM experts, the leading types of contractual disputes in BIM-focused projects are: risk allocation (I7), standard care and professional negligence (I3), fragmented procurement processes (I9), liability (I5), and BIM compensation (I4). The most prominent strategies for managing these issues are: developing a BIM addendum (S1), maintaining a consistent standard of care throughout the contract (S4), including model copyright and data copyright provisions in the contract (S3), and improving forms, documents, and guidelines (S2). By mapping the relationships between these strategies and the contractual issues in BIM-focused projects, stakeholders will manage and minimize such disputes effectively.

97 Safety Culture Maturity Level At Malaysian Electronic Manufacturing Industry

Junaidah Zakaria et al.

Safety culture is an essential factor in safety performance. The main objective of this study is to measure the safety culture level in one electronic manufacturing plant located in Kedah, Malaysia. Quantitative and qualitative approaches were utilized to measure the climate factors, behavioral indicators, and OSH management system. 393 respondents answered the safety climate survey. Document reviews were conducted to retrieve all incident records from 2017 to 2023. Finally, a semi-structured interview was conducted among safety representatives to assess the current nature of the health and safety system practice, including cooperation, competence and training, management style, managing change, and shared values. The safety climate survey results revealed that the highest mean scores are personal appreciation (priorities and need for safety), supportive environment, and management commitment. Most of the respondents perceived that their company had a good safety

climate. Behaviour-related incidents among workers were calculated using a formula with the retrieved incident data. The results reported that the score is 5. A semi-structured interview was conducted to assess the health and safety systems, resulting in a score of 2. The safety culture maturity was decided by combining all three findings (safety climate score, behavior-related incident, and OSH system practices). Results revealed that the level was at four, which is the co-operation level, representing engagement of all staff to develop cooperation and commitment to improving safety is visible. Findings were further validated with three safety experts using interviews. All panels reviewed the conclusions of each profile and agreed with the findings that the current safety level at this company is at a cooperating culture. In conclusion, this study had successfully assessed the safety culture level in the electronic manufacturing industry.

104 The Effects Of Backpack Loads On Postural Deviation And Musculoskeletal Discomfort Among Elementary School Students

Mohd Shahril Abu Hanifah et al.

The excessive weight of school backpacks has become a growing concern due to its potential impact on posture and musculoskeletal health among primary school children. This study investigated the relationship between backpack loads, postural deviation, and musculoskeletal discomfort, while also identifying associated risk factors. A total of 127 school children, aged 7 to 12 years, participated. Their posture was assessed through photographs taken without a backpack (baseline) and while carrying backpack loads of 5% BW, 10% BW, and 15% BW. The Visual Analogue Scale (VAS) was used to evaluate musculoskeletal discomfort across twelve body regions. Data were analyzed using IBM SPSS Statistics Version 22. The findings indicated that backpack loads significantly affected postural deviation when exceeding 10% BW and 15% BW. Most children reported discomfort in the neck, shoulders, and upper and lower back. Key risk factors for postural deviation included age, backpack weight, and mode of transportation, while musculoskeletal discomfort was

associated with age, body weight, backpack weight, BMI, and mode of transportation. These results highlight the need for appropriate weight recommendations to reduce potential health risks. Further research is encouraged to explore long-term effects and effective interventions for preventing musculoskeletal issues in school children.

111 Design Of Computer Science MOOC Courses Based On Learning Experience Design Approach

Hidayah Rahmalan et al.

Courses on the MOOC platform are evaluated with the student learning experience in mind. Instructors use students' perceptions and engagement throughout the learning process in assessing the course materials as guidance. The building blocks of MOOC development are based on three crucial design components: user interaction design, information design, and user interface design. The developer can improve MOOC courses with user perception and interaction analysis information. A survey is taken at the end of the course to document students' perceptions and experiences while taking the MOOC courses. The findings demonstrate that students pay attention to various activities, providing a comprehensive picture of their learning behavior throughout the learning process. Perception and engagement are different indicators; however, both aspects are beneficial and significant to the instructors in evaluating the impact of MOOC usage on the students.

115 The Role Of Human Dignity Philosophy In Leadership: A Study On Student Representative Councils At Vocational Colleges

Hashima Hamid et al.

This study explores the role of Human Dignity Philosophy in shaping student leadership within the Student Representative Councils (SRCs) at vocational colleges in Johor Bahru. Given the distinct academic structures of these institutions, the study examines how leadership dynamics and ethical decision-making differ across these environments.

A qualitative case study design was employed, involving in-depth semi-structured interviews with SRC member. The study was framed using Human Dignity Philosophy, Ethical Leadership Theory, and Open System Theory to understand how leadership principles manifest in vocational education settings. Preliminary findings suggest that SRC members at technical-based institutions emphasize problem-solving and structured leadership, while those at business-oriented institutions focus on collaborative and negotiation-based leadership approaches. Despite these differences, the application of human dignity principles fosters inclusivity, ethical decision-making, and resilience among student leaders. This study contributes to the leadership discourse within TVET education, providing insights into how ethical leadership frameworks, particularly human dignity, shape student governance in diverse academic settings. The findings highlight the importance of adapting leadership training to vocational education structures. This research is among the first studies to analyze the intersection of human dignity, leadership, and vocational education governance in the Malaysian TVET context. The study offers policy recommendations for enhancing leadership programs within vocational institutions to cultivate future leaders with strong ethical and inclusive leadership qualities.

116 Student Competencies In Industry 4.0: A Systematic Literature Review

Ahmad Rizal Madar et al.

Industry 4.0 is predicted to significantly impact the way individuals comprehend their roles, necessitating a transition in skill sets from traditional labor to digital literacy, critical thinking, and adjusting to change. To excel in the era of Industry 4.0, individuals must possess a combination of technical expertise and interpersonal abilities that promote innovation, effective communication, and interdisciplinary collaboration. Previous assessments of graduate education and competencies in Industry 4.0 provided significant insights. Nevertheless, the significant gaps highlighted necessitate a novel perspective. In light of the identified gaps within the existing literature, the objectives of

this research are to analyze the progression of publications associated to graduate competencies in the framework of Industry 4.0. This paper employs a systematic literature review methodology, contributing to the essential skill set that graduates must acquire in the context of the Fourth Industrial Revolution. The PRISMA procedure serves to assess and integrate identified journals and industry reports. The findings of this study indicate the classification of industry 4.0 skill sets that businesses seek in professionals for the fourth industrial revolution. Consequently, additional research study from human resource viewpoints regarding 4IR competencies would be a requisite for contemporary research endeavors. Enhancing the skills pertinent to the Fourth Industrial Revolution in every graduate can cultivate universally applicable and high-quality talents that are resilient to future challenges. Malaysian graduates are required to embrace the competencies associated with Industry 4.0 in order to thrive within the machine-human workforce of the Fourth Industrial Revolution. This research will elucidate the understanding of 4IR skills among graduates, institutions, and industry stakeholders.

143 Anti-Money Laundering (AML) Detection For Reporting Institution Using Generalised Linear Model (GLM)

Noryanti Muhammad et al.

The Anti-Money Laundering (AML), Anti-Terrorism Financing and Proceeds of Unlawful Activities Act 2001 (AMLA 2001) in Malaysia lays a foundation for tackling money laundering, terrorism financing and any unlawful activities through the obligation imposed on reporting institution under AMLA. This paper aims to identify significant parameter outlined in AMLA 2001 for risk assessment by reporting institution and develop an effective Anti-Money Laundering (AML) detection model using generalised linear model (GLM) based on the identified AMLA parameters. The accuracy and efficiency of the proposed AML detection model is investigated using Akaike information criterion (AIC), Bayesian information criterion (BIC) and Area Under Curve (AUC). In this study, we primarily focused on Reporting Obligation parameters under AMLA 2001 which highlight nine

parameters. The model is expected to work as practical tool for reporting institutions, maximizing the ability to flag suspicious transactions with precision while reducing false positive results.

145 Renewable Energy Integration For Green Hydrogen Production: A Technological And Economic Review

Mohd Fairusham Ghazali et al.

Green hydrogen production from renewable energy is increasingly gaining attention in the transition to a low-carbon energy system. This article re-views the current technological and economic approaches for hydrogen pro-duction using renewable energy sources such as solar, wind, biomass, and geothermal. Compressed air (CAES), renewable energy desalination systems, and multi-source integration such as PV-wind-CSP show significant poten-tial in improving system efficiency and reducing CO_2 emissions. Studies have also shown that capacity optimization models, utilization of energy storage, and technical approaches such as proton membrane electrolysis (PEM) and alkali electrolysis can produce hydrogen stably, although initial investment costs remain a major challenge. In specific regional contexts such as NEOM in Saudi Arabia, Samandağ in Turkey, and China, the inte-gration of these systems shows promising results from both technical and economic perspectives, with hydrogen production costs dropping to around $1/kg by 2050. However, barriers such as renewable energy intermittency, the need for ultrapure water, and high infrastructure costs still require atten-tion. Therefore, a holistic approach encompassing system design, capacity optimization, and incentive policies is essential to accelerate the adoption of large-scale and sustainable green hydrogen production.

146 Resampling Strategies In K-Fold Cross-Validation: Tackling Imbalance In Classification Tasks

Nureize Arbaly et al.

Machine learning models often struggle with imbalanced datasets, resulting in biased training and poor prediction of minority classes. This is particularly problematic in critical applications like disease diagnosis and fraud detection, where accurate predictions for all groups are essential. To address this issue, this study evaluates the effectiveness of resampling techniques—specifically random oversampling, random under sampling and SMOTE—in conjunction with k-fold cross-validation. The goal is determining which combination optimizes model performance on imbalanced datasets, thereby improving prediction accuracy for all classes. The research uses publicly available datasets to evaluate several machine learning algorithms, including Random Forest, Gradient Boosting and Decision Tree. Results indicate that the Random Forest model consistently outperformed others by achieving the highest accuracy when paired with the random oversampling method. This combination not only improved the model's ability to predict minority class instances accurately but also demonstrated resilience against overfitting. The findings underscore the importance of selecting appropriate resampling techniques and models to address class imbalance effectively, providing valuable insights for future research and practical applications in fields such as healthcare and fraud detection.

150 Interactive Learning Redefined: Classpoint's Role In Boosting Engagement Among Engineering Students

Mohd Shafie Bakar et al.

This study investigates the effectiveness of integrating ClassPoint, an interactive teaching tool, to enhance student engagement among electrical and electronics engineering students. Using a framework grounded in the technology-enhanced learning (TEL) environment microsystem, the research evaluates how ClassPoint transforms traditional teaching into

dynamic, participatory learning experiences. Five educators from the Faculty of Electrical and Electronics Engineering Technology, Universiti Malaysia Pahang Al-Sultan Abdullah (FTKEE, UMPSA), implemented TEL strategies using the Book-end Division approach, which divides class sessions into structured segments of lectures, activities, and discussions. ClassPoint was incorporated to facilitate real-time interaction through quizzes, polls, and feedback, fostering an engaging and inclusive environment. Quantitative data were collected via surveys, and descriptive analysis revealed a significant increase in student engagement after TEL adoption. Students reported improved attentiveness, active participation, and stronger interactions with peers and instructors. The findings demonstrate that TEL environments, supported by tools like ClassPoint and structured approaches such as the Book-end Division, effectively transform teaching practices, enhancing inclusivity and interaction in engineering education.

175 Mental Workload Assessment In Visual-Mechanical Inspection Tasks: Insights From The Electronics Manufacturing Industry

Khairiah Mohd Mokhtar et al.

The increasing complexity of tasks in modern manufacturing environments has elevated cognitive demands on workers, particularly in operations requiring precise visual-motor coordination. This study investigates mental workload in visual-mechanical inspection (VMI) tasks within the electronics manufacturing industry by integrating subjective and objective workload assessments. Twenty trained female operators participated in a structured experimental protocol involving VMI tasks categorized into three levels of complexity: low, medium, and high. Mental workload was evaluated using the NASA Task Load Index (NASA-TLX) and physiological indicators were assessed via eye-tracking metrics, including pupil dilation, blink rate, and fixation rate. The statistical analysis revealed significant differences in mental workload scores and eye-tracking responses across task complexities. Specifically, higher task complexity was associated with increased pupil size, elevated blink rates, and reduced fixation rates, indicating heightened cognitive demand. Moreover, Spearman's

correlation analysis demonstrated a significant positive relationship between subjective workload ratings and eye-tracking metrics, particularly under high-complexity conditions. The results emphasize the importance of integrating both subjective and objective measures to achieve a comprehensive understanding of cognitive load in VMI tasks. These insights offer practical implications for managing the workforce, designing ergonomic tasks, and monitoring cognitive load in precision-focused manufacturing environments.

Presenter Guidelines

All oral presenters at MUCET 2025 are kindly advised to follow the guidelines below to ensure professional, smooth, and timely delivery of all conference sessions.

Presentation Duration

Total Time Allotted per Presenter: 20 minutes

- Presentation: 15 minutes
- Q&A Session: 5 minutes

A Timekeeper will be assigned to each session to assist in monitoring the duration of each presentation. You will be given visual cues:

- 15 minutes: 2-minute warning
- 17 minutes: End of presentation cue
- 20 minutes: Final cut-off

Please rehearse your presentation to fit the allocated time.

Presentation Format

- Files must be in Microsoft PowerPoint (.ppt/.pptx) or PDF format
- Slides should use a widescreen layout (16:9)
- All presentations must be conducted in English

Slide Submission & Setup

- Please bring your presentation on a USB flash drive and upload it at the Speaker Ready Desk at least 30 minutes before your session begins.
- Presenters are encouraged to test their slides during session breaks to avoid technical delays.
- Use of personal laptops is discouraged to ensure smooth transition between speakers.

During the Presentation

- Arrive at your session room 10 minutes early to meet the session chair and familiarize yourself with the setup.
- Clearly introduce yourself and your research title at the beginning of your presentation.
- Use a laser pointer or on-screen pointer to guide the audience through your visuals.
- Engage the audience but remain within the time allocated.

Technical Support

- Technical assistants will be available in each room to support AV needs.
- If you encounter any issues, notify the session chair or room assistant immediately.

Venue Information

- All conference sessions and activities for MUCET 2025 are held at the World Trade Centre Kuala Lumpur (WTCKL). Dewan Tun Hussein Onn (Main Hall) and all plenary session rooms, except Sabah and Terengganu Rooms are located on Level 2, which is also the Main Entrance level. The Sabah Room and Terengganu Room are located on the 3rd Floor.
- Please refer to the venue layout plan on the next page for the exact location of rooms, exhibition areas, registration counters, and dining zones.
- We encourage all participants to arrive early and familiarize themselves with the venue to ensure smooth participation in all scheduled sessions.

Rooms/Hall Level Remarks

- Dewan Tun Hussein Onn (THO) (level 2)
- Johor/Kedah (level 2)
- Kelantan (level 2)
- Melaka (level 2)
- Sabah (level 3)
- Terengganu (level 3)

Scan for 360° Tour of The Venue

General Information

- Please refer to the venue map for detailed room allocations and directions. Should you require any assistance, do not hesitate to approach our registration counter or any committee member on-site.
- We thank you for your participation and wish you a productive and memorable experience at MUCET 2025.

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