

HI-LIGHT

“Individual commitment to a collective endeavor is the catalyst for the success of teams and organizations”
– Dean foreword



Dari Meja Pengarang

Assalamualaikum WBT dan Salam Sejahtera,



Alhamdulillah, dengan izin-Nya, Majalah Hi-Light FTKE edisi ke-4 berjaya diterbitkan hasil daripada usaha gigih setiap ahli jawatankuasa serta para penyumbang artikel bagi tahun 2024. Walaupun dengan kehadiran ahli jawatankuasa baharu, kesinambungan penerbitan majalah ini tetap terjaga tanpa sebarang kekecualan.

Setinggi-tinggi penghargaan dan jutaan terima kasih diucapkan kepada semua pihak yang telah bersama-sama menjayakan penerbitan ini, meskipun dalam kesibukan tugas seharian. Pastinya, setiap helaian yang diterbitkan akan menjadi rakaman kenangan berharga pada masa hadapan—menjadi refleksi terhadap usaha dan dedikasi kita dalam memperkaya fakulti dengan perkongsian ilmu serta pengalaman berharga. Semoga penerbitan Majalah Hi-Light terus berkembang dan berdaya maju untuk edisi-edisi yang akan datang.

Saya, bagi pihak Sidang Redaksi Majalah Hi-Light FTKE edisi ke-4 tahun 2025, dengan penuh rendah hati memohon ampun dan maaf sekiranya terdapat sebarang kekurangan dalam kandungan majalah ini. Kami komited untuk terus menambah baik agar penerbitan ini menjadi lebih berkualiti dan berkesan di masa hadapan.

Salam Hi-Light,
Ir. Dr. Zamani Md Sani

ISI KANDUNGAN

SEKSYEN STAF

- Program Komuniti@Unimadani: Projek Akuaponik Pintar Bertenaga Solar @ Krubong 1
- UTeM Mengukuhkan Matlamat Pembangunan Mampan (SDG) Melalui Kerjasama Dengan Pusat Konservasi Gajah Kebangsaan, Kuala Gandah 2
- Siri Jelajah Promosi "Selangkah Ke UTeM" Oleh Staf FTKE 4
- FTKE Capai 98% Kadar Kebolehpasaran Graduan 2023 5
- Program Libat Urus Alumni Dalam Pentadbiran Fakulti Teknologi Dan Kejuruteraan Elektrik (FTKE) 6
- 2024 Short Course On Statistical Analysis For Engineering Data Using Minitab With Hands On 7
- Bengkel Pelan Strategik "International Journal Of Electrical Engineering & Applied Sciences" (IJEEAS) 8
- Research Seminar 2024: A Showcase Of FTKE Postgraduate Excellence 10
- FTKE Perkukuh Matlamat Pembangunan Mampan (SDG) Di Taman Laut Melaka 12
- Delivering AI Lectures With Visiting Prof-Ing. Hanno Homman For BELC 4873: Artificial Intelligence Course 14
- FTKE Mantapkan Penguasaan Bahasa Inggeris Buat Sekolah Kurang Murid 15

SEKSYEN TUAH

- Aktiviti Kelab HERO Sepanjang 2024 16
- Pertandingan Universiti Robot Competition - Kingdom Of Champions (U-ROCK 2024) 18
- Aktiviti Persatuan Pelajar Teknologi Dan Kejuruteraan Elektrik (E-Tesa) 2023/2024 20
- Program Pemantapan Matapelajaran Fizik 2024 Siri I, II Dan III 22
- Program Pemantapan STEM Dan Bahasa Inggeris Kepada Murid-Murid Orang Asli Dan Pendidikan Khas Di Sekolah Kebangsaan Chabau 23
- Program 3r-Reflect, Reboot & Revive FTKE 2024 24
- Program Pelajar FTKE Bersama MBOT, BEM Dan Talentcorp Malaysia: Tips Dan Pendedahan Ke Alam Pekerjaan 25
- Bengkel Dan Pertandingan Robotik (Dron) Bersama Komuniti Melaka 2024 27
- Program Kuiz Celik Maths FTKE 2024 28
- Pacuan Matlamat Pembangunan Mampan (SDG) Melalui Penganjuran Program UTeM Winter School 2024 Anjuran FTKE 29
- Seminar "Ethics At Workplace": Persiapan Pelajar Untuk Latihan Industri Dan Dunia Pekerjaan 30

SEKSYEN PENYELIDIKAN DAN INOVASI

- Innovation Competition Exhibition 2024 (ICE 2024) 31
- Inovasi Kompos Hijau Buat Generasi Baru 32
- 2024 E-AMCM Research Group & Petronas Collaboration 33
- E-AMCM As The Invited Speakers For Transformer Oil Analysis & Dissolved Gas Analysis Interpretation Seminar @ Yogyakarta Indonesia 34

SEKSYEN KARYA KREATIF

- T³: Time Travel TV Story 35
- Siri Explorasi Bukan Konvensional - Mahu Melihat Sistem Pandangan Anda Sendiri? 39

SISIPAN:

- Hasil Penyelidikan Pelajar FTKE

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PROGRAM KOMUNITI @ UNIMADANI: PROJEK AKUAPONIK PINTAR BERTENAGA SOLAR @ KRUBONG

**100%
SEGAR!**

Penulis: Mohd Rusdy bin Yaacob

Kampung Tanah Merah, Krubong Melaka, 25 Disember 2024- Majlis penyerahan set akuaponik pintar bertenaga solar telah diadakan kepada penduduk kampung Tanah Merah, Krubong sempena program Pendayaan Komuniti Universiti Awam (Komuniti@UniMADANI) di bawah tajaan Kementerian Kewangan Malaysia (MOF) yang diketuai oleh Dr. Mohd Rusdy Yaacob (FTKE). Ahli projek lain dari FTKE yang terlibat adalah Ir. Ts. Dr. Anuar Bin Mohamed Kassim, En. Mohd Wahyudi Bin Md Hussain dan En. Mohd Arif Bin Mohd Nor



Sebanyak 8 unit set akuaponik telah ditempatkan di 8 buah rumah penduduk kampung yang terpilih. rumah terpilih. Setiap set akuaponik ini dilengkapi dengan 2 tangki bagi penternakan 300 ekor ikan tilapia dan 40 buah pasu bagi tanaman sayur-sayuran seperti pak choy, kangkung dan juga bayam.

Projek komuniti ini mampu meningkatkan ilmu dan menjana pendapatan penduduk kampung melalui pembangunan kapasiti yang dilatih secara teknikal oleh para penyelidik UTeM dan juga kelestarian alam sekitar dengan teknologi solar. Kerjasama antara universiti dan komuniti ini dapat memperkukuhkan lagi hubungan sosial dan membina jaringan yang lebih kuat antara UTeM dan masyarakat setempat.



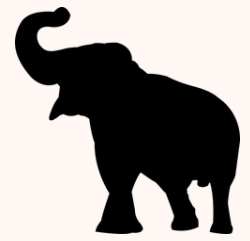
Majlis ini dimulakan dengan ucapan pembukaan oleh Prof. Ir. Ts. Dr. Ghazali Omar (TNCPI UTeM), diikuti dengan ucapan perasmian oleh En. Mohd Khawari Fazmi Zulkifli, Setiausaha Jeperun Paya Rumput yang mewakili ADUN Paya Rumput. Program ini turut dihadiri oleh Prof. Ts. Dr. Effendi Mohamad (Pengarah RICE) dan Prof. Madya Dr. Hidayat Zainuddin (Dekan FTKE)

Projek akuaponik ini adalah sistem pertanian yang menggabungkan akuakultur (ternakan ikan) dan hidroponik (penanaman sayur tanpa tanah) dalam satu sistem tertutup yang dijana sepenuhnya oleh sistem solar, dan dilengkapi dengan sistem pemantauan menggunakan IoT.





Inisiatif CSR: Pusat Konservasi Gajah Kebangsaan, Kuala Gandah



*Penulis : Mohd Rusdy bin Yaacob
Nurilyana binti Anwar Apandi*

Pada 26 dan 27 Ogos yang lalu, Pusat Pengurusan Kolaborasi RICE – UTeM, Universiti Teknikal Malaysia Melaka (UTeM) telah menganjurkan program khidmat masyarakat (CSR) di Pusat Konservasi Gajah Kebangsaan (NECC), Kuala Gandah. Program ini juga adalah anjuran bersama Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE), dengan kerjasama Kementerian Sumber Asli dan Kelestarian Alam (NRES), Jabatan Perlindungan Hidupan Liar & Taman Negara (PERHILITAN) serta Petronas Lubricant International Sdn Bhd (PLISB), bersempena sambutan Hari Gajah Sedunia 2024.

Dr. Mohd Rusdy Bin Yaacob, yang merupakan Pengarah Program ini menyatakan tujuan utama program yang berbentuk quintuple helix ini adalah untuk menyokong aspirasi negara dalam melestarikan alam sekitar dengan memelihara biodiversiti secara mampan melalui pemuliharaan habitat dan hidupan liar. Pelajar Kursus Sarjana Muda Pengurusan Teknologi, Na Qiad Xuan, yang merupakan salah seorang peserta program berkata, selain program pembersihan kawasan gajah, peserta juga turut berkesempatan melawat Muzium zoologi di Institut Biodiversiti serta mendengar taklimat dari Jabatan PERHILITAN yang disampaikan oleh Penolong Pegawai Hidupan Liar iaitu Pn. Siti Salwani binti Ismail yang telah banyak berkongsi kepentingan pemuliharaan hidupan liar bagi seluruh semenanjung Malaysia.

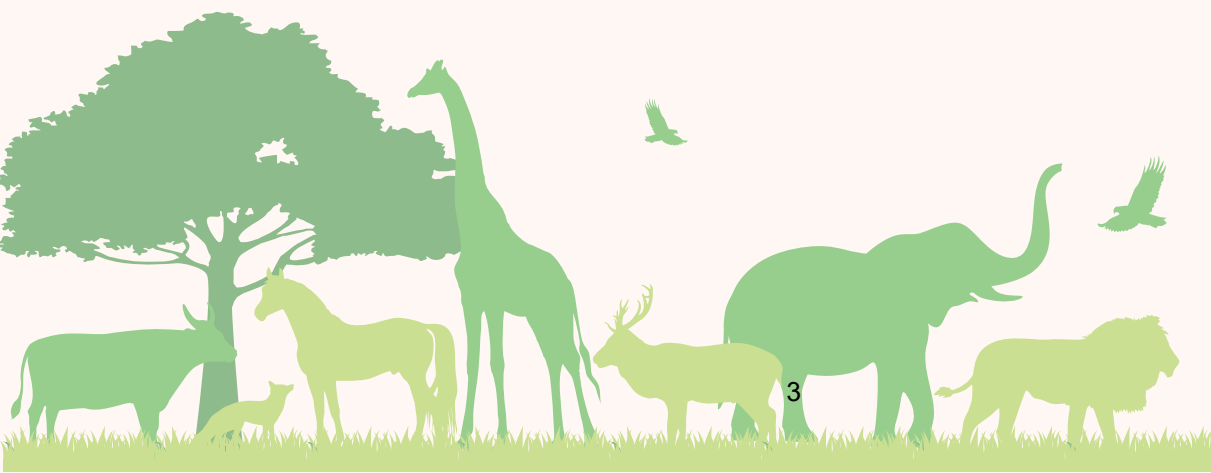
Wakil Kementerian Sumber Asli dan Kelestarian Alam (NRES), Encik Mohd Rashid bin Sarmin yang hadir sama ke program ini turut menzahirkan rasa bangga dan menyambut baik inisiatif yang telah diambil oleh UTeM terhadap pemuliharaan alam sekitar dan biodiversiti, terutama bagi pemuliharaan habitat dan hidupan liar. Program ini secara tidak langsung turut menjadi sebahagian misi penting kepada biodiversiti negara sekaligus mempromosikan usaha pemuliharaan gajah, disamping meningkatkan kesedaran di kalangan peserta mengenai kepentingan pemuliharaan biodiversiti dan perlindungan habitat gajah. Turut menyertai program khidmat masyarakat ini adalah delegasi dari Petronas Lubricant International Sdn Bhd (PLI) yang diketuai oleh En Zuraidi bin Khairuddin, yang turut menekankan kerjasama positif melibatkan pihak industri dan UTeM dalam usaha pemuliharaan untuk mencapai komitmen berterusan terhadap kelestarian alam sekitar. Pengalaman wakil PLI di dalam usaha membersihkan kawasan pusat konservasi gajah ini adalah sangat bermakna dan bermanfaat untuk diteruskan lagi pemuliharaan habitat dan hidupan liar. Terdahulu, PLI yang merupakan peneraju cabang pembuatan dan pemasaran pelincir global PETRONAS telah menjalankan kolaborasi penyelidikan pintar bersama ahli penyelidik di UTeM semenjak tahun 2022.



Di samping itu, sesi pemindahan ilmu dan kepakaran berkaitan pendawaian elektrik juga turut diadakan oleh staf akademik UTeM kepada kakitangan NECC yang terpilih. Kawasan pemerhatian gajah di NECC pernah berdepan dengan masalah kemungkinan gajah terkena renjatan pagar elektrik akibat banjir besar. Justeru itu, sesi demostrasi dan perkongsian ilmu ini adalah bertujuan untuk membantu dalam membaik pulih pendawaian elektrik tersebut. En. Mohd Ainsha bin Ahmad yang merupakan Penolong Pegawai Hidupan Liar di NECC berharap agar khidmat nasihat pihak UTeM dalam hal berkaitan pemantauan pendawaian elektrik di NECC akan dapat diteruskan, sekaligus menunjukkan inisiatif dan komitmen berterusan.



Program KSTP dan khidmat Masyarakat di Pusat Konservasi Gajah di NECC ini secara tak langsung telah menjayakan pemuliharaan spesis terancam serta pemuliharaan biodiversiti secara mampan, selari dengan fokus SDG4 Quality Education, SDG15 Life on Land dan SDG 17 Partnerships for the Goals melalui penglibatan komuniti termasuk para pelajar, staf akademik serta agensi kerajaan dan swasta.





Penulis: Mohd Rusdy Bin Yaacob

SIRI JELAJAH PROMOSI “SELANGKAH KE UTEM OLEH STAF FTKE”



Dalam merencanakan lagi aktiviti promosi bagi program-program akademik yang ditawarkan di Fakulti, JK Promosi FTKE telah menganjurkan satu siri jelajah promosi “Selangkah ke UTeM”. Sebagai langkah penjimatan, program ini dijalankan serentak dengan lawatan beberapa staf penyelia latihan industri (LI) Fakulti ke beberapa buah lokasi di seluruh negara, seperti berikut

Siri	Lokasi	Tarikh	Penceramah
Siri I	Politeknik Ibrahim Sultan	20 Ogos 2024	Ts. Dr. Nur Ilyana Binti Anwar Apandi
Siri II	Politeknik Sultan Azlan Shah	28 Ogos 2024	Dr. Ainain Nur Binti Hanafi
Siri III	Kolej Matrikulasi Kejuruteraan Pahang	3 September 2024	Ir. Dr. Fairul Azhar Bin Abdul Shukor
Siri IV	Politeknik Kota Bharu	4 September 2024	Dr. Mohd Rusdy Bin Yaacob
Siri V	Politeknik Port Dickson	9 September 2024	Profesor Madya Ir. Dr. Md Hairul Nizam Bin Talib
Siri VI	Politeknik Ungku Omar	10 September 2024	Dr. Aziah Binti Khamis

Selain daripada siri jelajah promosi di atas, JK Promosi FTKE turut menghantar wakil pempamer ke Karnival Pendidikan & Kerjaya di Kolej Matrikulasi Selangor, Kolej Matrikulasi Kedah, Kolej Matrikulasi Perlis, Kolej Matrikulasi Pulau Pinang, Kolej Matrikulasi Johor, Kolej Matrikulasi Kejuruteraan Johor, Kolej Matrikulasi Pahang, Kolej Matrikulasi Kejuruteraan Pahang dan Kolej Matrikulasi Negeri Sembilan. JK Promosi FTKE turut menyertai program Jom Masuk U Zon Tengah I, Jom Masuk U Zon Tengah II dan Jom Masuk U Zon Sabah II.

Selain itu, pihak Fakulti turut menerima lawatan oleh pelajar dari SMK Dato' Undang Syed Al-Jufri, SMKT Kluang, MRSM Tun Ghaffar Baba, MRSM Alor Gajah, SMK Lubok China dan Kolej Vokasional Port Dickson





FTKE CAPAI 98% KADAR KEBOLEHPASARAN GRADUAN 2023

Penulis : Arfah Binti Ahmad

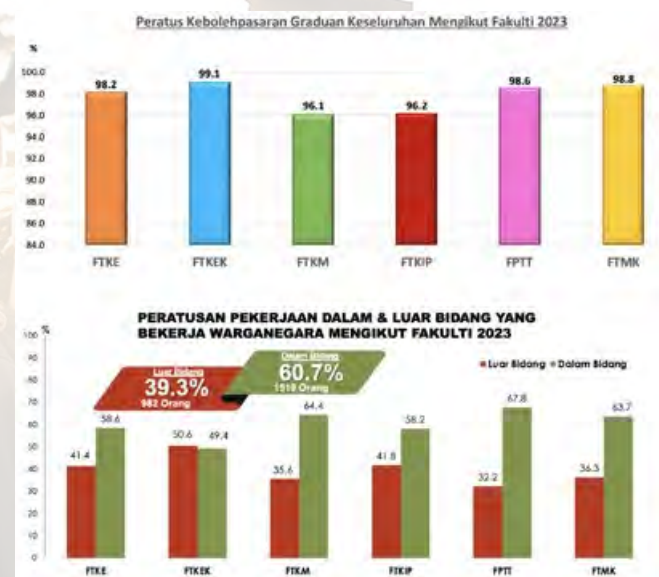


Universiti merupakan sebuah institusi pengajian tinggi yang berperanan penting dalam menghasilkan sumber modal insan dalam memenuhi keperluan aktiviti ekonomi yang berasaskan ilmu pengetahuan. Dalam hal ini, kemasukan pelajar (enrolmen) dan penghasilan tenaga kerja (graduan) adalah rujukan bagi memahami proses pembangunan modal insan yang dihasilkan oleh sesebuah institusi pendidikan tinggi. Kebolehpasaran graduan bermaksud keupayaan graduan yang dihasilkan oleh sesebuah universiti untuk dipasarkan dalam industri iaitu graduan yang memiliki kecekapan untuk memperoleh pekerjaan dan mengekalkan pekerjaan yang bersesuaian. Berdasarkan Pelan Strategik Kebolehpasaran Graduan 2021 - 2025, kadar kebolehpasaran graduan berupaya memberikan petunjuk tentang keupayaan ekosistem pengajian tinggi negara untuk menghasilkan graduan yang berkualiti serta memenuhi permintaan tenaga kerja daripada industri. Semakin tinggi kadar kebolehpasaran graduan, semakin tinggi kualiti graduan yang dihasilkan oleh sesebuah institusi dalam memenuhi permintaan semasa industri.



Bagi tujuan ini, Kementerian Pengajian Tinggi Malaysia (KPT), telah mewujudkan Sistem Kajian Pengesanan Graduan (SKPG) yang berfungsi sebagai instrumen untuk mengukur kebolehpasaran graduan di seluruh institusi pengajian tinggi di Malaysia. Selain itu, SKPG juga bertujuan untuk memahami isu-isu berkaitan pekerjaan yang di hadapi oleh graduan, mendapatkan maklum balas dari graduan berkaitan aspek penting institusi pengajian, dan membantu kerajaan dalam membuat keputusan serta menggubal polisi berkaitan pekerjaan graduan berasaskan fakta yang jelas. Justeru itu, para graduan yang telah menamatkan pengajian diwajibkan untuk menjawab SKPG ini yang di jalankan secara dalam talian.

Analisis kebolehpasaran graduan UTeM yang bergraduat pada tahun 2023 menunjukkan UTeM mencapai kadar kebolehpasaran 97.7%. Kadar kebolehpasaran graduan UTeM pada tahun 2023 meningkat sebanyak 1.3% berbanding tahun sebelumnya. FTKE mencatatkan peratusan kebolehpasaran 98.2% untuk graduan 2023. Peratusan kebolehpasaran graduan mengikut fakulti menunjukkan FTKEK mencapai peratusan paling tinggi iaitu 99.1%, diikuti oleh FTMK (98.8%), FPTT (98.6%) dan FTKE (98.2%). Daripada keseluruhan 514 orang graduan FTKE yang bergraduat pada 2023, seramai 389 graduan bekerja, 90 orang sedang melanjutkan pengajian, 19 orang meningkatkan kemahiran, dan hanya 9 orang yang masih belum bekerja. Daripada 98.2% ini, sebanyak 58.6% graduan FTKE bekerja dalam bidang berkaitan antaranya sebagai jurutera, juruteknik dan menceburi bidang berkaitan kejuruteraan elektrik dan teknologi. Majlis Apresiasi Kebolehpasaran Graduan UTeM telah diadakan pada 30 Oktober 2024 bertempat di Hatten Hotel, Melaka bagi meraikan seluruh ahli jawatankuasa yang telah bertungkus - lumus menghubungi graduan 2023 bagi kelancaran SKPG. Buat julung kalinya, UTeM mencapai kadar responden 100% bagi SKPG 2023. Diharapkan agar peratusan kebolehpasaran graduan FTKE khususnya dan UTeM umumnya terus meningkat dari semasa ke semasa.



PROGRAM LIBAT URUS ALUMNI DALAM PENTADBIRAN FAKULTI TEKNOLOGI DAN KEJURUTERAAN ELEKTRIK

Penulis : Arfah Binti Ahmad

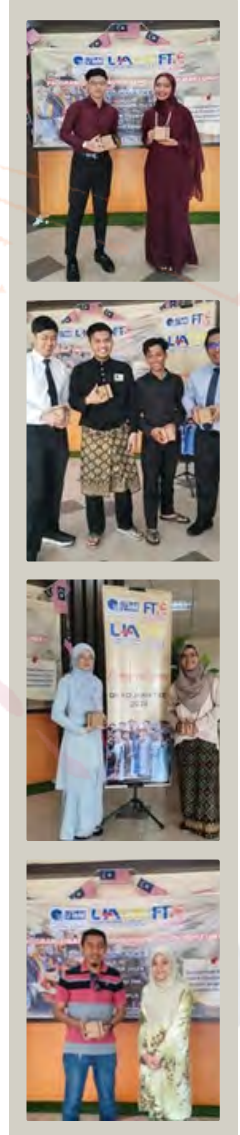


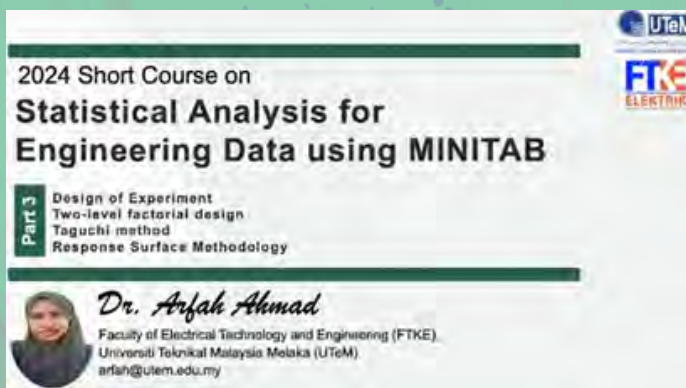
Bersempena dengan Konvokesyen UTeM yang ke-20, satu program libat urus alumni dalam pentadbiran Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE) telah di adakan pada 11 November 2024. Program ini dijalankan di perkarangan lobi FTKE, kampus induk bermula jam 8:30 pagi sehingga jam 5:00 petang. Program ini telah dihadiri oleh graduan pra-siswazah dan pasca-siswazah FTKE. Objektif utama program ini diadakan adalah untuk menjalin kerjasama dan hubungan yang berterusan antara alumni dan pihak pengurusan FTKE.

Buat julung kalinya, Jawatankuasa Alumni dan Kerjaya FTKE dengan kerjasama Pusat Alumni, Kerjaya dan Keboleh Pasaran Graduan UTeM (U-ACE) telah menganjurkan program libat urus alumni dan pentadbiran di FTKE bagi meraikan bakal graduan pra-siswazah dan pasca-siswazah FTKE yang bergraduasi pada majlis konvokesyen UTeM yang ke-20. Antara aktiviti yang dijalankan pada program ini adalah sesi ramah mesra graduan bersama pentadbiran FTKE, pengumpulan data alumni, sesi bergambar dan penyampaian cenderahati. Kesemua graduan yang hadir pada program ini mendapat cenderahati khusus dari FTKE sebagai tanda kenangan dan terima kasih.

Alumni bukan sahaja berperanan sebagai duta institusi, malah mereka turut menjadi penghubung antara dunia akademik dan industri. Melalui kepakaran dan pengalaman kerja yang dimiliki, alumni dapat membuka peluang kerjasama penyelidikan, penganjuran latihan industri serta perkongsian pengalaman kerjaya bersama pelajar sedia ada. Inisiatif ini bukan sahaja memperkasa pembangunan bakat baharu, malah turut meningkatkan daya saing universiti dalam melahirkan graduan yang berkemahiran tinggi dan memenuhi kehendak pasaran kerja.

Program ini juga bertujuan untuk pengumpulan data dan penyimpanan maklumat bakal alumni FTKE. Maklumat alumni FTKE penting bagi pengemaskinian data dalam membantu meningkatkan kadar kebolehpasaran (GE) graduan tahun 2024. Selain itu, maklumat alumni ini juga diperlukan bagi membolehkan alumni dihubungi untuk jalinan kerjasama, keperluan akreditasi dan bagi persediaan kaji selidik yang melibatkan alumni. Secara khususnya, program ini berjaya mendapat sambutan yang menggalakkan daripada graduan FTKE apabila seramai 130 orang graduan menghadiri program ini. Pihak Jawatankuasa Alumni dan Kerjaya FTKE serta U-ACE mengucapkan jutaan terima kasih kepada semua alumni dan pihak pentadbiran fakulti yang membantu menjayakan program ini.





Statistical analysis plays a pivotal role in engineering disciplines, as it enables professionals to make data-driven decisions, optimize processes, and improve product quality. By applying techniques such as hypothesis testing and ANOVA, engineers can determine the significance of observed variations in data, identify root causes of process inefficiencies, and predict future performance trends. The use of software like MINITAB streamlines these tasks by offering intuitive data visualization and step-by-step guidance for advanced procedures. This practical approach empowers both students and industry practitioners to confidently handle complex datasets, enhance their problem-solving skills, and ultimately drive innovation within their respective fields.

On June 29th, ERADA Solutions Sdn. Bhd., in collaboration with Centre for Robotics and Industrial Automation (CERIA) and the Faculty of Electrical Technology and Engineering (FTKE) organized a short course entitled 'Statistical Analysis for Engineering Data using MINITAB (with hands-on)'. The short course was open to the public with a fee of RM 210 for non-students and RM180 for students. The short course was conducted by FTKE lecturer, Dr. Arfah binti Ahmad who has background in statistics and data analysis. The trainer has extensive knowledge of statistical analysis procedures and has been involved in a variety of research projects, including the social science studies.

2024 SHORT COURSE ON STATISTICAL ANALYSIS FOR ENGINEERING DATA USING MINITAB WITH HANDS ON

Author : Arfah Binti Ahmad



During the training, participants had the opportunity to install the trial version of MINITAB software and perform the analyses using the exercises and examples provided. There were three main components of the statistical analysis procedure covered in the training; graphical analysis and descriptive statistics, hypothesis testing and Analysis of Variance (ANOVA), and the Design of Experiment (DOE). For each part of the analysis, samples of real engineering data were provided and the participants were shown a step-by-step analysis using the MINITAB software.

The short course on Statistical Analysis for Engineering Data using MINITAB is one of the initiatives taken by the FTKE and CERIA to promote knowledge sharing and generate income for the faculty and the university. The training was held, annually since 2021 and was conducted online via Microsoft Teams application. A total of 26 participants joined the short course this year, marking the highest number of participants to date. All participants came from various backgrounds, with the majority being postgraduate students from Malaysian universities. Previously, on October 27th 2021, the short course had 19 participants. In 2022, 25 participants joined the training, 14 of whom are postgraduate students and industry workers from Malaysia and Brunei. In 2023, 18 participants took part in the short course. Taken into account the encouraging responses from the participants, it is planned to hold this short course yearly as part of the knowledge transfer activities by the CERIA research group.





BENGKEL PELAN STRATEGIK

"International Journal of Electrical Engineering & Applied Sciences" (IJEAS)

PENULIS: JURIFA BINTI MAT LAZI

Pada 18 hingga 20 September 2024, Bengkel Pelan Strategik "International Journal of Electrical Engineering & Applied Sciences" (IJEAS) telah diadakan bertempat di Hotel Royal Chulan Damansara, Kuala Lumpur. Bengkel ini bertujuan merangka pelan strategik dan hala tuju IJEAS bagi tempoh 2024-2027 dengan pendekatan yang lebih dinamik dan berdaya saing. Selain itu, bengkel ini juga bertindak sebagai platform untuk menyelaraskan semula aktiviti penerbitan IJEAS, termasuk perbincangan mengenai peningkatan jumlah terbitan serta strategi berkesan bagi memenuhi keperluan pengindeksan Scopus dan Web of Science (WoS) pada masa hadapan.

Penerbitan jurnal berindeks merupakan salah satu indikator utama kecemerlangan penyelidikan dan akademik sesebuah universiti. Tanpa pengiktirafan ini, kualiti se suatu artikel akan diragui. "International Journal of Electrical Engineering and Applied Sciences" (IJEAS: ISSN: 2600-7495) ditubuhkan pada tahun 2008 di bawah pengurusan Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE), Universiti Teknikal Malaysia Melaka (UTeM). Jurnal ini menyediakan platform terbaik bagi para akademik dan penyelidik untuk berkongsi ilmu serta membincangkan inovasi terkini dalam bidang kejuruteraan dan teknologi.

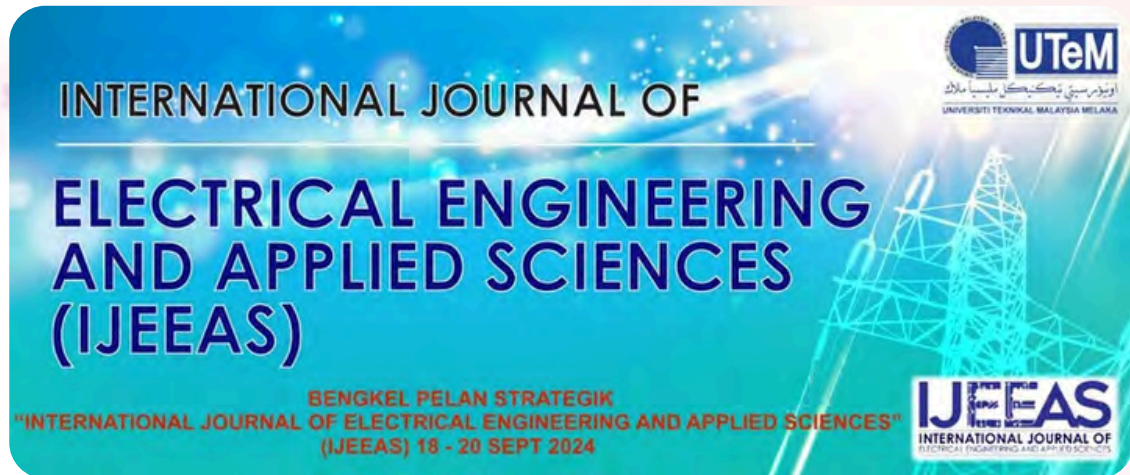
Sejajar dengan objektif yang digariskan dalam bengkel ini, IJEAS merangka strategi mampan bagi memperoleh pengindeksan dalam Scopus dan WoS menjelang tahun 2026. Inisiatif ini selaras dengan keperluan penerbitan berimpak tinggi yang menjadi teras utama dalam dunia akademik masa kini.

Seramai 10 orang ahli terlibat dalam bengkel ini, masing-masing memainkan peranan penting dalam memastikan hala tuju IJEAS berada pada landasan yang betul. Dengan komitmen yang tinggi, mereka telah menyumbang kepada perancangan strategik dan penyelarasan aktiviti penerbitan jurnal.

Setakat tahun 2024, IJEAS telah menerbitkan tujuh volume dan diindeks dalam beberapa pangkalan data seperti Google Scholar, Copernicus, MyJurnal, DOAJ, dan MyCite. Bagi meningkatkan keterlihatan dan impak akademik UTeM, usaha ke arah pengindeksan dalam Scopus dan Web of Science (WoS) menjadi keutamaan. Oleh itu, satu bengkel pemantapan pelan strategik serta penambahbaikan laman sesawang jurnal telah dirancang bagi memastikan IJEAS memenuhi kriteria ketat yang ditetapkan oleh kedua-dua pengindeks utama ini.



Diharapkan semua ahli akademik FTKE secara khususnya, serta warga akademik UTeM secara umumnya, dapat memberikan sokongan penuh dalam usaha memperkukuh kedudukan IJEEAS di peringkat antarabangsa. Dengan kerjasama dan dedikasi yang berterusan, IJEEAS berpotensi menjadi jurnal akademik bertaraf dunia yang diiktiraf dalam pangkalan data berprestij seperti Scopus dan WoS.



Senarai editor bagi IJEEAS adalah terdiri dari ahli-ahli akademik yang berkaliber dari dalam dan luar negara adalah seperti di bawah:

- 1) Prof John Fletcher (UNSW, Australia)
- 2) Prof Dr Tamer Khatib (ANU, Palestin)
- 3) Chong Shin Horng (ARTC, A*STAR, Singapura)
- 4) Associate Professor Yam Siwakoti (UTS, Australia)
- 5) Amran Mad Razi (UPM, Malaysia)
- 6) Ahmad Asrul bin Ibrahim (UKM, Malaysia)
- 7) Hana Abdull Halim (UNIMAP, Malaysia)
- 8) Herdawatie Abdul Kadir (UTHM, Malaysia)
- 9) Zainah Md Zain (UMPSA, Malaysia)
- 10) Mohd Kamalrulzaman bin Md Akhir (UTHM, Malaysia)



RESEARCH SEMINAR 2024: A SHOWCASE OF FTKE POSTGRADUATE EXCELLENCE

Penulis: Nur Ilyana Anwar Apandi
JK Pengajian Siswazah FTKE 2024

The FTKE Research Seminar 2024, an event for postgraduate research students, was held on 4th September 2024, organized by the FTKE Postgraduate Committee. The seminar provided a platform for students and supervisors to assess and refine their research projects, fulfill accreditation requirements and foster a supportive research environment. It aimed to enhance research quality and direction by allowing students to present their work.



The seminar also facilitated systematic monitoring of progress, ensuring timely project completion. The seminar fostered academic rigor and accountability, allowing students to showcase their findings, receive feedback, and identify improvement areas. The seminar not only highlighted the academic rigor and creativity of our students but also fostered a collaborative environment where ideas could be exchanged freely. Faculty members and fellow students provided valuable feedback, contributing to the refinement and advancement of the presented research. The seminar comprised a concurrent series of engaging presentations, each followed by in-depth analytical discussions.

The list of winners for the Best Presenters Awards is as follows:

1. NORHAFIZA BINTI MOHAMAD
2. NUR ASYIQIN BINTI MOHD ISA
3. NOR AISHAH BINTI MD ZUKI
4. SHAARMILA A/P KANDAYA
5. MELVIN GAN YEOU WEI
6. NUR AMIRAH BINTI OTHMAN
7. NURFAEZAH BINTI ABDULLAH
8. SUZIEE BINTI SUKARTI
9. NORNAZURAH BINTI NAZIR ALI
10. TUAN NURSABRINA BINTI TUAN ROHISHAM



This year, the committee received an impressive array of extended abstracts, showcasing the diverse and innovative research being conducted within the five key research groups.

The table listing the extended abstract submissions from our talented presenters is shown:

Scope	Student Name	Programme	Title of Extended Abstract	Keywords
ELECTRIC VEHICLE, POWER ELECTRONIC, MACHINES AND DRIVES (EL-PRODRIVES)	MOHD ZULFI BIN AB RAHMAN -	Doctor of Philosophy (PhD)	Evaluation of Permanent Magnet Synchronous Motor with Soft Magnetic Composite Core for Electric Vehicle Application	PMSM losses; Core
	NOR AISHAH BINTI MD ZUKI -	Master of Philosophy (MPhil)	Numerical Analysis Various Rotor Types of BLDC Motor for Residential Elevator Application	BLDC motor; Residential Elevator; FEM
	NORRIMAH BINTI ABULLAH -	Doctor of Philosophy (PhD)	THE EFFECTS OF VARIATION IN POLE PITCH RATIO ON THE THD AND THRUST RIPPLE OF THE SRELSM	SRELSM; THD; Thrust ripple
	NUR ASHWIN BINTI MOHD NASIR -	Doctor of Philosophy (PhD)	Operational Parameters of the Segmented Switched Reluctance Linear Synchronous Motor	Asymmetric bridge converter; Domestic lift; Segmented SRELSM
	NUR ASYIQIN BINTI MOHD ISA -	Master of Philosophy (MPhil)	Broadband Radiation Field of Isolated Breakdown Pulse Train and Preceding Negative Ground Flash Under the Influence of Monsoon Seasons	Isolated Breakdown pulse train; Negative CG flash; hybrid negative CG flash
	NURFAEZAH BINTI ABULLAH -	Doctor of Philosophy (PhD)	Assessment of Electromagnetic and Vibration Characteristic of Segmented Stator of High Speed IPM	Vibration; Characteristic; Segmented stator
	ZURAIDI BIN MD TAHIR -	Doctor of Philosophy (PhD)	A NEW MULTI-CARRIER SWITCHING MODULATION STRATEGY FOR HIGH-BANDWIDTH POTENTIAL BALANCING CONTROL OF MULTILEVEL INVERTERS	MULTILEVEL INVERTERS
	MD SHOWKOT HOSSAIN -	Master of Science in Electrical Engineering (MScEE)	Performance Analysis of a Three-Phase TCHB Multilevel Inverter and Control of PMSM Using NLC Technique	Multilevel inverter; Torqueless Clamped H-bridge; Nearest Level Control Technique
	MUHAMMAD HAZIQ BIN MO JAMAL -	Master of Science in Electrical Engineering (MScEE)	Model Predictive Control (MPC) for Enhanced AC Motor Drive Dynamic Response	MPC; Motor Drive; Cost Function
	MUHAMMAD AMIRUL HASRAF BIN ABULLAH -	Master of Science in Electrical Engineering (MScEE)	INVESTIGATION OF TREEDING AND TRACKING ON THE SURFACE OF CERAMIC INSULATOR UNDER CLEAN AND DIRTY GROUNDING CONDITION	INVESTIGATION OF TREEDING AND TRACKING ON THE SURFACE OF CERAMIC INSULATOR UNDER CLEAN AND DIRTY GROUNDING CONDITION
ELECTRICAL ASSET CONDITION MONITORING (E-AMCM)	NUR FARHANA BINTI MOHD AZLAN -	Master of Science in Electrical Engineering (MScEE)	Effect of Corrosion Factors and Metal Passivator on Sulphur Corrosion of Transformer Insulating Oil	Factorial Design; Mineral Insulating Oil; Surface resistivity
	RAJA SAHARUDDIN BIN RAJA DAUD -	Master of Science in Electrical Engineering (MScEE)	Condition Assessment of Medium Voltage Gas Insulated Ring Main Unit Using Health Index Based on Malaysia Utility Practices	Health Index; Condition Assessment; Gas Insulated Ring Main Unit
	ATIFA FADHA BINTI MUNAUWER -	Doctor of Philosophy (PhD)	Scrutinize and Stratified on the Features of Positive Cloud-to-Ground Flashes in Tropics	Positive Lightning; Cloud-to-ground flash; Monsoon
ENERGY AND SMART GRID TECHNOLOGY (ESGT)	NGATONO -	Master of Philosophy (PhD)	Permanent Magnet Generator for Hydro Power: A Systematic Review	Permanent Magnet Generator; Hydro Power; Systematic Literature Review
	NOR AFIZA BINTI MOHD NOOR -	Doctor of Philosophy (PhD)	Evaluating the relationship between energy demand and multiple economic variables in Malaysia using regression analysis	Economic variables; energy demand; regression
	NORHAFIZA BINTI MOHAMAD -	Doctor of Philosophy (PhD)	Evaluation of The Correlation of effective variables with Energy Consumption	Zero-emission; energy consumption; occupancy
	NORNAZURAH BINTI NAZIR ALI -	Doctor of Philosophy (PhD)	The Impact of Processing Parameters and Filler Concentration on Silicone Rubber Insulating Material: Percentage of Weight Loss	Silicone Rubber; insulator; curing time
	NUR AMIRAH BINTI OTHMAN -	Doctor of Philosophy (PhD)	Total Acid Number as an indicator in evaluating Aged Mineral Oil Synthetic Ester Reprofiled Oil	Power transformer; retrofitting; total acid number
REHABILITATION ENGINEERING AND ASSISTIVE TECHNOLOGY (REAT)	REZA ISTONI -	Doctor of Philosophy (PhD)	Comparative Analysis of Statistical Distribution Models for Energy Optimization in Wind Turbine Systems Using	Wind Speed Distributions; Wind Energy Assessment; Statistical Modeling
	SUZIEE BINTI SUKARTI -	Doctor of Philosophy (PhD)	Optimizing M&V with Deep Learning: A Study on Feature Selection	Deep Learning; Measurement & Verification (M&V); Energy Efficiency
	ZAMRI BIN ZAKARIA -	Doctor of Philosophy (PhD)	RISK EVALUATION AND FRAMEWORK IN MALAYSIAN ENERGY PERFORMANCE CONTRACTING (EPC) PROJECTS	Energy performance contracting; risk in EPC projects; framework in EPC project
	AMY CHIN SWIN YEE -	Master of Science in Electrical Engineering (MScEE)	Impact of PV Penetration on Grid Transition in Sarawak's Remote Villages	grid transition; rural electrification; off-grid solar systems
	FADUNA BINTI MOHNI -	Master of Science in Electrical Engineering (MScEE)	Evaluating Efficacy Performance of Lamp Technologies for Enhanced Street Lighting Applications	efficacy; uniformity; LED
ROBOTICS AND INDUSTRIAL AUTOMATION (RIA)	LEE WEI WEN -	Master of Science in Electrical Engineering (MScEE)	Optimizing Economic and Emission Dispatch through Hybrid Optimization Algorithms	Optimization; Economic Load Dispatch; Artificial Bee Colony
	SHAARMILA A/P KANDAYA -	Doctor of Philosophy (PhD)	Classification of Brain Stroke based on Susceptibility-Weighted Imaging (SWI) using Machine Learning	Magnetic Resonance Imaging (MRI); time-consuming and Susceptibility Weighted Imaging (SWI)
	IZZATUL HUSNA BINTI AZMAN -	Master of Science in Electrical Engineering (MScEE)	Stroke Diagnosis System Using Machine Learning Technique Based on Magnetic Resonance Imaging Images	Stroke; Computer-Aided Diagnosis; Diffusion-Weighted Imaging
	MARLINA BINTI IAHAVA -	Master of Science in Electrical Engineering (MScEE)	Sensory optical side-coupling on Different scattering areas with ZnO Nanorods-coated glass substrate	Zinc Oxide; Side coupling; optical sensor
	KALAIYARASAN A/L GANASEGARAN -	Master of Science in Mechanical Engineering (MScME)	Design and Kinematic Analysis of a Wearable Hand Exoskeleton for Rehabilitation	Hand exoskeleton; Robot-assisted rehabilitation; Forward kinematics; Singularity analysis; Anthropometric measurements
REHABILITATION ENGINEERING AND ASSISTIVE TECHNOLOGY (REAT)	TUAN NURSABRINA BINTI TUAN ROHISHAM -	Master of Science in Mechanical Engineering (MScME)	Investigation of Multimodal Sensor Fusion for Enhanced Continuous Hand Movement Prediction in Exoskeletons	Electromyogram (EMG); Multimodal Sensor Fusion; Ensemble Learning
	FAUZAL NAIM BIN ZOHEDI -	Doctor of Philosophy (PhD)	Gradient Descent Algorithm Single Input Fuzzy Logic (GDA-SIFLC) controller testing analysis for depth control of Remotely Operated Vehicle (ROV)	Remotely Operated Vehicle (ROV); Single Input Fuzzy Logic (SIFLC); Gradient Descent Algorithm (GDA); Depth Control
	MELVIN GAN YEDU WEI -	Doctor of Philosophy (PhD)	Stereo matching algorithm using census transform and edge preserving filters	Census transform; Minimum spanning tree; Bilateral filter
	IVOR SYAZA FARHANA BINTI MOHAMAD MURAD -	Doctor of Philosophy (PhD)	Formulation of Lyapunov-Based Rotor Angle Regulator for A Synchronous Generator Through Nonlinear Swing Equation	Swing equation; rotor angle stability; synchronous generator
	RADEN AGUSTINUS SUWODIO -	Doctor of Philosophy (PhD)	A Fuzzy Logic Controller of Hydrogen-Hydrogen-Oxygen (HHO) Generator to Improve Vehicle Engine Performance	Engine performance; Fuzzy logic; HHO

FTKE extend our heartfelt congratulations to all the presenters for their hard work and dedication. Their contributions are a testament to the high standards of scholarship and innovation that our faculty upholds and look forward to seeing the continued progress and impact of their research in the years to come.





FTKE PERKUKUH MATLAMAT PEMBANGUNAN MAMPAN (SDG)

di Taman Laut Melaka

Penulis: Mohd Rusdy Bin Yaacob,
Atikah Binti Razi-Urusetia UWINS 2024



Program pembersihan pantai yang melibatkan sekumpulan peserta dari program mobiliti UTeM Winter School 2024 (UWINS 2024) serta pelajar dan staf Universiti Teknikal Malaysia Melaka (UTeM) telah berjaya dijalankan di Pulau Dodol, Pulau Undan dan Pulau Nangka pada 27 Februari 2024. Program ini dianjurkan oleh Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE), UTeM dan Pusat Pengurusan Kolaborasi RICE – UTeM, dengan kerjasama PUSPANITA cawangan Kementerian Sumber Asli dan Kelestarian Alam (NRES), Pejabat Perikanan Negeri Melaka dan Ingenious City Engineering Solutions Sdn Bhd.

Menurut Pengarah Program UWINS 2024, Dr. Mohd Rusdy Bin Yaacob, pemilihan Taman Laut Melaka sebagai lokasi program ini bertujuan untuk mempromosikan destinasi pelancongan baharu negeri Melaka kepada mahasiswa antarabangsa yang menyertai UWINS 2024. Seorang peserta dari Universiti Teknologi Brunei, Nour'El Syifa binti Mohammad Safri, menyatakan bahawa program ini bukan sekadar aktiviti kebersihan pantai, tetapi satu usaha kolektif yang mencerminkan komitmen berterusan terhadap kelestarian alam sekitar.

Timbalan Pengarah Pejabat Perikanan Negeri Melaka, Nawar Abd. Karim menegaskan bahawa sejak ketiga-tiga pulau tersebut diwartakan sebagai Taman Laut Negara pada Mei 2023, jumlah pengunjung yang direkodkan telah mencecah 2,000 orang. Beliau menyambut baik penglibatan pelajar dan agensi kerajaan dalam program ini sebagai langkah proaktif dalam menangani pencemaran serta memastikan ekosistem laut terus terpelihara.

Ketua delegasi dari Kementerian Sumber Asli dan Kelestarian Alam (NRES), Dr. Mohd Redzuan bin Ramli, turut menyatakan kebanggaannya terhadap inisiatif yang dilaksanakan. Beliau menekankan bahawa penglibatan peserta UWINS 2024 secara aktif dalam program ini bertepatan dengan salah satu misi utama NRES, iaitu pelaksanaan tindakan mitigasi dan adaptasi ke arah pembangunan daya tahan iklim.

Program ini turut dihadiri oleh delegasi dari PUSPANITA cawangan NRES, Pejabat Perikanan Negeri Melaka, dan Ingenious City Engineering Solutions Sdn. Bhd. Selain aktiviti pembersihan pantai, satu demonstrasi inovasi teknologi turut diadakan oleh penyelidik UTeM, memperkenalkan 'Smart Aqua Unmanned Surveillance Robot' kepada para peserta. Demonstrasi ini dikendalikan oleh Ir. Dr. Anuar bin Mohamed Kassim, pensyarah kanan UTeM yang juga merupakan penaung kepada IngeniousCity Engineering Solutions Sdn. Bhd., sebuah syarikat spin-off di bawah UTeM. Inisiatif ini bertujuan untuk memperkukuh pemindahan ilmu dari akademik ke industri melalui pertukaran pengetahuan dan pengalaman.

Dekan FTKE UTeM, Prof. Madya Dr. Hidayat bin Zainuddin, menegaskan bahawa penyertaan staf dan pelajar UTeM bersama peserta UWINS 2024 dalam program ini sejajar dengan Matlamat Pembangunan Mampan (SDG). Khususnya, aktiviti ini menyokong SDG 13 (Climate Action), SDG 14 (Life Below Water), dan SDG 17 (Partnerships for the Goals) melalui penglibatan peserta antarabangsa serta agensi kerajaan dan swasta. Program pembersihan pantai ini bukan sahaja memberi impak positif dalam usaha menangani perubahan iklim global, malah memastikan kesejahteraan kawasan perairan Taman Laut Melaka terus terjaga untuk generasi akan datang.



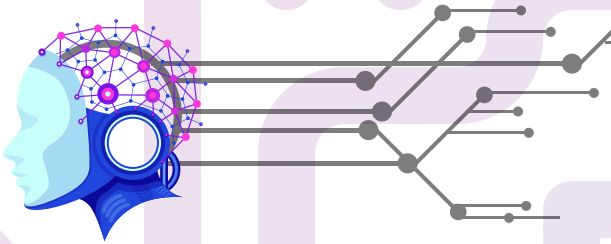


Delivering AI lectures with visiting Prof-Ing. Hanno Homman for BELC 4873: Artificial Intelligence Course



Written by : Dr. Tarmizi Bin Ahmad Izzuddin

On the 6th and 7th of November 2024, the faculty's 4th-year mechatronic students enrolled in BELC 4873: Artificial Intelligence were fortunate to participate in a lecture delivered by Prof-Ing. Hanno Homman from Hannover University, Germany. Professor Hanno, one of the visiting professors to FTKE, had previously requested to deliver a lecture on a specific topic of the course. Among the topics, he chose to present "Introduction to AI with Neural Networks," which is part of the BELC 4873 syllabus.



Prof. Hanno's extensive background in both academia and industry was crucial in delivering this lecture, as it allowed him to provide a well-rounded and practical perspective on the application of artificial intelligence. Before joining Hannover University, he had worked at major German companies, specifically Bosch GmbH and Philips GmbH. His work focuses on the application of computer vision and artificial intelligence in healthcare imaging and robotics.

During the two-day lectures, participating students received comprehensive instruction on the topics as well as practical hands-on sessions using Python. The hands-on sessions provided a new perspective on the topic as Prof. Hanno demonstrated the application of neural networks to machine vision applications. For example, in one of the hands-on sessions, students were required to perform a simple image segmentation task (segmenting an object in an image from its background) based on the theory of the perceptron (a single artificial neuron model). Although the topic is covered in the current course, such applications offered a new view on the theory of artificial neural networks, allowing students to better appreciate and understand the theory while providing a solid foundation for more advanced AI topics such as deep learning.

In summary, the two-day lecture with Prof. Hanno was a wonderful experience for both the students and me personally. A huge thanks to FTKE's higher management team for organizing this event. Such academic collaboration with foreign universities is crucial for broadening our perspectives and ensuring the courses offered by the faculty remain relevant. In the future, it is hoped that such exercises can be further expanded to other courses offered by the faculty.





FTKE MEMPERKASAKAN PENGUASAAN BAHASA INGGERIS BAGI KATEGORI SEKOLAH KURANG MURID (SKM) MELALUI PROGRAM PEMANTAPAN 'HELLO TALK!'

Penulis: Mohd Rusdy Bin Yaacob (Urusetia UWINS 2024)



Program Pemantapan Bahasa Inggeris 'Hello Talk!' bagi pelajar Sekolah Kebangsaan Tanjong Tohor, Muar telah berjaya dijalankan pada 26 Februari 2024 yang lalu. Program ini dianjurkan oleh Fakulti Teknologi dan Kejuruteraan Elektrik, UTeM dan Pusat Pengurusan Kolaborasi RICE – UTeM dengan kerjasama Pusat Pengajian Bahasa UTeM dan Pejabat Pendidikan Daerah Muar. Program ini menggabungkan 22 mahasiswa tempatan dan antarabangsa sebagai fasilitator, bersama 33 orang peserta di kalangan murid-murid Sekolah Kebangsaan Tanjong Tohor, yang dikategorikan sebagai Sekolah Kurang Murid (SKM). Meskipun dianjurkan semasa musim cuti penggal persekolahan yang lalu, penyertaan yang diterima di kalangan murid-murid adalah begitu menggalakkan. Mahasiswa yang terlibat adalah dari Institut Teknologi Sepuluh Nopember (ITS), Indonesia dan Universiti Teknologi Brunei (UTB), Brunei yang sedang mengikuti program mobilti tanpa kredit - UTeM Winter School (UWINS) 2024.

Program 'Hello Talk!' ini merupakan sebuah Program Perkongsian dan Pemindahan Ilmu (KSTP) yang bertujuan untuk memindahkan ilmu dan kepakaran dalam teknik komunikasi dan pertuturan dalam Bahasa Inggeris kepada murid-murid SK Tanjong Tohor. Selain daripada itu, program ini juga berjaya mewujudkan satu suasana yang positif dan kondusif dalam memotivasikan murid-murid untuk berkomunikasi dengan lebih yakin dalam Bahasa Inggeris.



Pengarah Program UWINS 2024, Dr. Mohd Rusdy bin Yaacob menekankan bahawa penglibatan mahasiswa antarabangsa dalam program ini adalah sejajar dengan matlamat dalam memperkukuhkan Matlamat Pembangunan Mampan (SDG), khususnya pada SDG 4 dan SDG 17 iaitu Pendidikan Berkualiti dan Kerjasama Demi Matlamat. Penglibatan pensyarah - pensyarah dari Pusat Pembelajaran Bahasa, UTeM iaitu Profesor Madya Dr. Muliati binti Sedek dan Puan Teh Zanariah binti Mohd Raus turut memainkan peranan penting agar penyampaian modul seperti 'Words Formation Games', 'Train the Brain' dan 'Pronounce It Perfectly' adalah bersesuaian dengan tahap intelektual murid-murid sekolah rendah.

Guru Penolong Kanan Hal Ehwal Murid, Puan Wahidah Binti Abd.Wahab berkata, pihak sekolah sangat berbesar hati dengan penglibatan para peserta UWINS 2024 dalam mengadakan program perkongsian ilmu dan khidmat masyarakat kepada murid-muridnya. Bagi sekolah yang dikategorikan sebagai Sekolah Kurang Murid (SKM), peluang murid-muridnya untuk berinteraksi dengan mahasiswa dari luar negara dilihat dapat meningkatkan lagi tahap keyakinan mereka untuk berkomunikasi dalam Bahasa Inggeris pada masa hadapan. Menurut salah seorang peserta UWINS 2024, Sandrina Bintang Natalia dari Institut Teknologi Sepuluh Nopember, beliau tidak menyangka sambutan yang sangat menggalakkan dan terharu dengan keterujaan dan semangat yang ditunjukkan oleh para peserta yang hadir untuk mengikuti program 'Hello Talk!' ini. Program ini dianggap sebagai usaha yang penting dalam mempertingkatkan lagi pemantapan Bahasa Inggeris di kalangan murid-murid di sini sambil memberi ruang interaksi antara mahasiswa luar negara dengan murid-murid dalam suasana yang santai dan menyeronokkan.

Penulis: Ts Aminurrashid Bin Noordin
(Penasihat Kelab HERO)

Sepanjang tahun 2024, Kelab HERO telah menganjurkan dan menyertai pelbagai aktiviti dan program yang memupuk kemahiran teknikal serta semangat kesukarelawan di kalangan ahli. Pada 19 Mei 2024, Kelab HERO menganjurkan **Training of Trainers (TOT) Drone** di Lobi FTKE, Kampus Induk. Program ini memberi pendedahan kepada peserta mengenai pemasangan dan pengendalian dron jenis DIY dan DJI Tello secara manual serta automatik menggunakan aplikasi Tello EDU.



Seterusnya, pada 21 Mei 2024, pasukan HERO telah menyertai **Robomaster 2024 di UKM, Bangi**. Tiga cabaran telah dihadapi oleh pasukan UTeM HERO, antaranya cabaran “Capture The Flag” di mana UTeM HERO berjaya menjuarai pertandingan tersebut. Namun, dalam cabaran “Urban Chase,” terdapat isu komunikasi yang menyebabkan pasukan HERO gagal untuk mendapatkan sebarang tempat. Pada cabaran terakhir ‘Blind Maze’ pasukan UTeM HERO juga gagal mendapat markah yang baik. Keputusan akhir pasukan UTeM HERO hanya mendapat tempat 8 terbaik dari 12 pasukan yang bertanding.



Pada 25 Mei 2024, Kelab HERO menganjurkan program **TOT Line Following Robot** telah diadakan di Perpustakaan Laman Hikmah. Program ini memberi peluang kepada peserta untuk mempelajari pemasangan, pengkodan, dan pengujian robot mengikuti garisan, sekaligus meningkatkan kemahiran teknikal mereka.



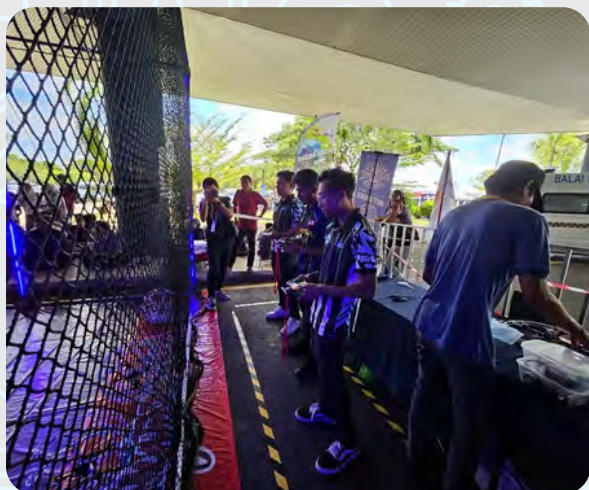
Selain itu, pada Hari TVET FKKEK yang berlangsung pada 29 Mei 2024 dan **Infineon Day** pada 8 Jun 2024, Kelab HERO memainkan peranan penting dalam mengendalikan aktiviti pemasangan DIY dron dan pengendalian dron DJI Tello. Aktiviti ini menarik perhatian pengunjung dan juga anak-anak kakitangan Infineon yang ingin mempelajari teknologi dron dan robotik.



Pada 13 Oktober 2024, Kelab HERO menyertai program **Hari Bersama Penduduk Taman Angkasa Nuri** sebagai sukarelawan. Dalam program ini, ahli kelab memberikan pendedahan kepada penduduk mengenai dron dan 'line following robot' mengikuti garisan. Kanak-kanak yang hadir berpeluang mengendalikan dron menggunakan aplikasi Tello dengan bimbingan fasilitator.



Kelab HERO juga menyertai **Kejohanan Dron Soccer Piala Hang Tuah 2024** yang berlangsung dari 31 Oktober hingga 3 November 2024 di Lapangan Terbang Antarabangsa Melaka (LTAM). Pasukan "Aero UTeM" menunjukkan prestasi cemerlang dan berjaya meraih tempat ke-4 daripada 14 pasukan yang bertanding. Kejohanan ini memperlihatkan kemahiran teknikal dan strategi pasukan HERO dalam sukan 'drone soccer'.



PERTANDINGAN UNIVERSITI ROBOT COMPETITION – KINGDOM OF CHAMPIONS (U-ROCK 2024)

Penulis: Profesor Madya Dr. Ahmad Anas
Bin Yusof (Ketua Pasukan U-Rock)

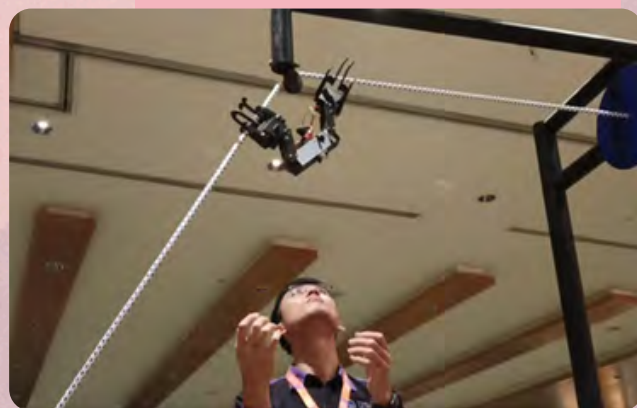


University Robot Competition merupakan pertandingan bertaraf antarabangsa yang dianjurkan oleh Universiti Malaysia Perlis (Unimap). Pertandingan ini terbuka kepada pelajar universiti tempatan dan antarabangsa, memberi peluang untuk membangunkan kemahiran kejuruteraan robotik dalam bidang seperti operasi dron penghantaran makanan, robot berkaki untuk perlumbaan 100 meter, dan robot memanjat tali untuk misi dart ke target. Sejak 2019, Fakulti Teknologi Kejuruteraan Elektrik (FTKE) telah menyertai pertandingan ini untuk meningkatkan kreativiti, inovasi, dan jaringan profesional pelajar serta staf.

Pada kejohanan U-ROCK 2023, pasukan Fakulti Teknologi Kejuruteraan Elektrik (FTKE) dari Universiti Teknikal Malaysia Melaka (UTeM) telah mencipta sejarah dengan meraih tempat pertama dalam kategori pertandingan Rope Climbing Robot. Kejayaan ini melayakkan pasukan FTKE membawa pulang hadiah wang tunai berjumlah RM 2,000. Pencapaian ini bukan sahaja membuktikan keupayaan dan kebolehan pelajar FTKE dalam bidang pembangunan dan penyelidikan teknologi robotik, malah turut mengangkat nama UTeM sebagai institusi yang komited dalam menghasilkan inovasi berteknologi tinggi.

Momentum kecemerlangan ini diteruskan dalam kejohanan 'U-ROCK 2024' yang diadakan sempena Putrajaya Festival of Ideas 2024 di peringkat kebangsaan. Untuk edisi kali ini, FTKE menghantar tiga pasukan yang terdiri daripada 18 orang pelajar dari program BELM, BELG dan BELR. Pasukan ini turut diiringi oleh empat orang staf akademik sebagai penasihat teknikal, iaitu:

- Prof. Madya Dr. Ahmad Anas bin Yusof – Ketua Pasukan
- Dr. Mohd Saifuzam bin Jamri – Penasihat Teknikal bagi kategori Drone Delivery Challenge
- Dr. Mohd Khairi bin Mohamed Nor – Penasihat Teknikal bagi kategori Legged Robot Challenge
- Ts. Aminurrashid bin Noordin – Penasihat Teknikal bagi kategori Rope Climbing Robot Challenge





Hasil usaha gigih dan semangat juang yang tinggi, pasukan FTKE berjaya mencatatkan pencapaian berikut dalam U-ROCK 2024:

(Pertandingan)

- Tempat Pertama: Rope Climbing Robot Challenge (RM 2,000)
- Tempat Ketiga: Drone Delivery Challenge (RM 1,000)
- Tempat Kelima: Legged Robot Challenge

(Penyampaian dan Pameran)

- Tempat Kedua: Legged Robot Challenge (RM 200)
- Tempat Ketiga : Rope Climbing Robot Challenge (RM 150)

Pencapaian cemerlang ini sekali lagi mengharumkan nama UTeM di persada kebangsaan dan memberikan pengiktirafan terhadap keupayaan teknikal serta inovasi yang dibawa oleh pelajar dan staf FTKE. Lebih penting lagi, ia mencerminkan komitmen UTeM dalam melahirkan graduan yang berdaya saing dan menyumbang kepada pembangunan teknologi masa depan. Kejayaan ini turut memberi inspirasi kepada generasi pelajar yang akan datang untuk terus meneroka potensi mereka dalam bidang robotik dan teknologi kejuruteraan.



AKTIVITI PERSATUAN PELAJAR TEKNOLOGI DAN KEJURUTERAAN ELEKTRIK (e-TESA) 2023/2024

Electrical Technology and Engineering Student Association (e-TESA) adalah persatuan pelajar di bawah Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE), Universiti Teknikal Malaysia Melaka (UTeM). E-TESA memainkan peranan penting dalam pembangunan komuniti melalui pelbagai aktiviti inovatif dan berimpak. Kelab ini menekankan pembangunan holistik pelajar dan masyarakat dengan menganjurkan program yang merangkumi pendidikan, seni, sukan dan teknologi.

Aktiviti yang telah dijalankan sepanjang tahun 2024 e-TESA

- **Bengkel dan Program Latihan**

Salah satu program yang menonjol ialah Bengkel Adobe, yang membekalkan peserta dengan kemahiran reka bentuk grafik yang penting.

- **Acara Sukan:**

Acara seperti 'Fun Run' dan pertandingan 'athletic' memupuk gaya hidup sihat di kalangan warga universiti.

- **Festival:**

Acara ini menjadi platform untuk mengetengahkan bakat kreatif dan inovasi, serta mengeratkan perpaduan dalam komuniti.



Program-program ini bukan sahaja menyeronokkan, malah bersifat pendidikan yang membantu meningkatkan kemahiran insaniah dan teknikal para peserta. Melalui bengkel dan aktiviti yang pelbagai, e-TESA berjaya menarik pelajar dari pelbagai latar belakang untuk terlibat dalam pembelajaran dan pengalaman baru, selaras dengan usaha memperkasakan pendidikan STEM dan kemahiran teknologi.

Dengan semangat inovasi dan kerjasama, e-TESA terus menerajui usaha memperkasakan komuniti UTeM dengan merapatkan jurang antara teknologi dan kemanusiaan demi masa depan yang lebih baik.

Inisiatif e-TESA menyokong beberapa Matlamat Pembangunan Mampan:

- **SDG 3 (Kesihatan dan Kesejahteraan):** Acara sukan dan Fun Run memupuk gaya hidup sihat.
- **SDG 4 (Pendidikan Berkualiti):** Bengkel seperti Bengkel Adobe menyediakan peluang pembelajaran berterusan.
- **SDG 11 (Bandar dan Komuniti Mampan):** Aktiviti komuniti menggalakkan keharmonian dan penyertaan aktif dalam kalangan warga UTeM.





PROGRAM PEMANTAPAN MATAPELAJARAN FIZIK 2024 SIRI I, II DAN III

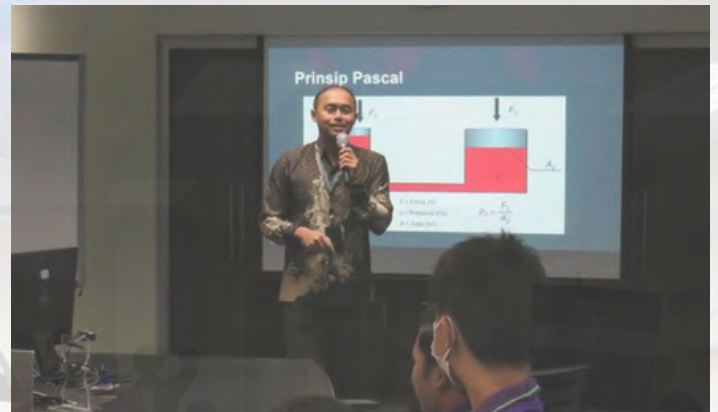
PENULIS: MOHD RUSDY BIN YAACOB

Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE) telah berjaya menganjurkan Program Pemantapan Mata Pelajaran Fizik sebanyak tiga siri sepanjang tahun 2024 iaitu pada 18 Januari 2024, 17 Mei 2024 dan 21 November 2024. Program berasaskan STEM ini merupakan program SULAM secara khidmat langsung, yang diterapkan dalam matapelajaran BMCG 2372 Mekanik Bendalir (Sem 1 2023/2024), BMKU 3643 Sistem Hidraulik & Pneumatik (Sem 2 2023/2024) dan DELC 2123 Pengautomatan (Sem 1 2024/2025).

Pelajar-pelajar FTKE yang terlibat telah diberi tugas yang melibatkan pengaplikasian prinsip asas Fizik seperti Hukum Paskal dan Hukum Gerakan Linear bagi tujuan pemindahan ilmu kepada murid-murid sekolah yang mengambil matapelajaran Fizik SPM. Para pelajar telah diperuntukkan selama 16 hingga 20 jam dalam waktu kuliah / makmal bagi menyiapkan tugas yang turut menyumbang kepada peratusan markah akhir bagi mata pelajaran yang diambil.



Berdasarkan maklum balas yang diambil di kalangan murid-murid serta guru pengiring yang hadir, kesemuanya telah memberikan maklum balas yang positif dari segi keberkesanan program seumpama ini yang memberi peluang kepada murid-murid untuk melihat aplikasi sebenar bagi teori yang telah dipelajari di dalam kelas, selari dengan SDG4.



Antara sekolah yang terlibat adalah SMK Dato' Dol Said, SMK Krubong, SMK Air Molek dan SMS Muzaffar Syah. Selain melihat sesi demonstrasi oleh para pelajar FTKE di makmal-makmal, murid-murid sekolah turut diberikan ceramah berkaitan prinsip tekanan dan hidraulik, diikuti taklimat promosi program-program yang ditawarkan di FTKE oleh Dr. Mohd Rusdy Bin Yaacob.



Mahasiswa Antarabangsa Perkasa STEM dan Bahasa Inggeris di SK Chabau

Penulis: Mohd Rusdy bin Yaacob



Program pemantapan STEM dan Bahasa Inggeris 'Mathy Talk!' bagi pelajar Sekolah Kebangsaan Chabau, Muar telah berjaya dijalankan pada 28 Ogos 2024. Program ini merupakan anjuran bersama Fakulti Teknologi dan Kejuruteraan Elektrik, UTeM dan Pusat Pengurusan Kolaborasi RICE – UTeM dengan kerjasama Pusat Pengajian Bahasa, UTeM, Pejabat Pendidikan Daerah Jasin dan Macrotech Solution (M) Sdn. Bhd.

Program ini telah dirasmikan oleh YB Datuk Khaidhirah Abu Zahar, ADUN Rim, Jasin. Program ini menggabungkan 19 mahasiswa tempatan dan antarabangsa sebagai fasilitator, bersama 32 orang peserta di kalangan murid-murid Sekolah Kebangsaan Chabau, termasuk di kalangan anak-anak orang asli dan murid-murid pendidikan khas. Mahasiswa yang terlibat sebagai fasilitator adalah dari Fatoni University, Thailand dan Institut Teknologi Sumatera, Indonesia serta mahasiswa dari UTeM sendiri. Antara modul-modul yang digunakan adalah *My Garden*, *Let's Go To The Market* dan *Let's Go Hunt*, yang telah berjaya menarik minat murid-murid untuk turut serta dalam setiap permainan / aktiviti yang dijalankan.

Program ini juga berjaya mewujudkan satu suasana yang positif dan kondusif dalam memotivasikan murid-murid untuk berkomunikasi dengan lebih yakin dalam Bahasa Inggeris. Program ini juga telah berjaya membuka peluang interaksi antara pelajar luar negara yang mengikuti program mobiliti tanpa kredit di UTeM dengan murid-murid Sekolah Kebangsaan Chabau dalam mewujudkan satu suasana yang santai dan kondusif bagi murid-murid untuk mempelajari bidang berkaitan STEM serta berkomunikasi dengan lebih yakin dalam Bahasa Inggeris. Program ini adalah sejajar dengan matlamat dalam memperkukuhkan Matlamat Pembangunan Mampan (SDG), khususnya pada SDG 4 dan SDG 17 iaitu Pendidikan Berkualiti dan Kerjasama Demi Matlamat.





PROGRAM 3R

Reflect, Reboot & Revive

**PENULIS: Puan Mashitah Binti Che Razali
Dr Nur Azura Noor Azhuan**

Jawatankuasa Kecemerlangan Akademik Pelajar telah menganjurkan program 3R-REFLECT, REBOOT & REVIVE FTKE 2024. Program ini telah dijalankan pada 24 Oktober 2024 yang lalu bertempat di TAMPIN WATER PARK HUTAN LIPUR GUNUNG TAMPIN. Seramai 30 orang peserta disasarkan dan 29 orang pelajar telah berjaya menyertai program ini. Peserta yang dipilih diberi keutamaan kepada pelajar yang berstatus kedudukan bersyarat (KS). Program ini diadakan di Tampin Waterpark bagi menarik minat pelajar berkenaan untuk mengikuti program yang telah dirancang.

Tujuan utama program ini adalah untuk meningkatkan semangat, berkongsi permasalahan dan langkah-langkah yang boleh di ambil oleh pelajar dalam pembelajaran untuk meningkatkan purata nilai gred (PNG) mereka pada semester hadapan. Dr. Sazuan Nazrah binti Mohd Azam, seorang pensyarah kanan dari FTKE, tampil sebagai penceramah undangan dalam sesi perkongsian ilmu yang penuh inspirasi. Dengan pengalaman luas dalam kaedah seperti “reality check,” “the root cause rundown,” “fix it mode,” dan “mirror moment,” beliau berjaya memikat perhatian para pelajar sepanjang sesi berlangsung. Lebih menarik, sesi tersebut diakhiri dengan peluang unik bagi pelajar untuk muhasabah dan merenung pencapaian diri serta menetapkan azam baharu demi melonjakkan prestasi akademik.



Langkah ini bukan sahaja dapat memupuk semangat baharu, malah dapat memberi mereka ruang untuk mencipta strategi kejayaan yang lebih berfokus dan berkesan. Di akhir sesi, para pelajar diberi peluang membuat refleksi diri dan mencipta azam baru untuk meningkatkan prestasi pelajaran masing-masing. Terima kasih kepada para pelajar yang menunjukkan semangat yang tinggi sepanjang program ini berlangsung. Semoga terus maju mencipta kejayaan dan menjadi kebanggaan seluruh warga FTKE.





PROGRAM PELAJAR FTKE BERSAMA MBOT, BEM DAN TALENTCORP MALAYSIA: TIPS DAN PENDEDAHAN KE ALAM PEKERJAAN

Penulis: Dr. Nurul Ashikin binti Mohd Rais

Jawatankuasa Kebolehpasaran Pelajar (GE) di bawah FTKE telah berjaya mengadakan Program Pelajar Tahun Akhir FTKE bersama MBOT dan BEM pada 5 dan 7 Jun 2024 yang bertempat di Bilik Seminar Kampus Teknologi, FTKE. Manakala Program Bersama TalentCorp Malaysia telah diadakan pada 20 November 2024. Kedua-dua program ini melibatkan pelajar tahun akhir FTKE yang akan menjalani Latihan Industri. Tujuan kedua-dua program ini adalah untuk memberi pendedahan kepada pelajar-pelajar mengenai keperluan di alam pekerjaan serta panduan dalam proses pencarian tempat untuk menjalani Latihan Industri.

Ts. Shazwan bin Ahmad, merupakan penceramah dari MBOT manakala, Ir. Hamzah bin Hashim mewakili BEM sebagai penceramah yang dijemput untuk berkongsi pengalaman serta pendedahan kepada pelajar-pelajar tahun akhir mengenai MBOT dan BEM sebelum mereka memasuki alam pekerjaan. Pendedahan ini penting bagi pelajar untuk merencana langkah-langkah yang perlu diambil untuk menjadi seorang Teknologis Profesional (Ts.) dan Jurutera Profesional (Ir.).



Ts. Shazwan bin Ahmad, merupakan penceramah dari MBOT manakala, Ir. Hamzah bin Hashim mewakili BEM sebagai penceramah yang dijemput untuk berkongsi pengalaman serta pendedahan kepada pelajar-pelajar tahun akhir mengenai MBOT dan BEM sebelum mereka memasuki alam pekerjaan. Pendedahan ini penting bagi pelajar untuk merencana langkah-langkah yang perlu diambil untuk menjadi seorang Teknologis Profesional (Ts.) dan Jurutera Profesional (Ir.). Manakala bagi Program Bersama TalentCorp Malaysia, Puan Rahmah binti Mohamed Razali telah dijemput untuk memberikan tips dan panduan dalam penyediaan resume yang 'comprehensive' kepada pelajar-pelajar tahun akhir ini. Dalam program ini, para pelajar dibimbing untuk merangka resume melalui portal talent.mynext.my dan platform LinkedIn. Diharap dengan pendedahan secara 'hands-on' ini dapat memberi manfaat dan peluang yang lebih cerah kepada pelajar-pelajar ini untuk mendapat tempat Latihan Industri kelak.





BENGKEL DAN PERTANDINGAN ROBOTIK (DRON) BERSAMA KOMUNITI MELAKA 2024

Penulis : Ts Aminurrashid Bin Noordin



Dron dan teknologi robotik semakin menjadi pemacu dalam pelbagai industri , termasuk pertanian, pemantauan alam sekitar dan logistik. Kemampuan dron untuk mengumpul data masa nyata serta menjalankan tugas-tugas khusus seperti pengawasan dan pemetaan telah mengubah cara organisasi beroperasi. Apabila komuniti didedahkan kepada teknologi ini pada peringkat awal, mereka bukan sahaja dapat memahami potensi inovasi yang tersedia, malah bersedia untuk menghadapi keperluan pekerjaan baharu dalam era Revolusi Perindustrian 4.0. Pendedahan sebegini juga mendorong lebih ramai pelajar menceburi bidang Sains, Teknologi, Kejuruteraan , dan Matematik (STEM), yang seterusnya menyumbang kepada kemajuan sosioekonomi negara.



Menyedari akan keperluan ini, Kelab HERO, eTESA, dan RG Drone [DAI-TECH], CeRIA telah memainkan peranan penting dalam menjayakan Bengkel dan Pertandingan Robotik (Dron) anjuran Jabatan Kemajuan Masyarakat Negeri Melaka pada 13 Julai 2024. Program ini bertujuan untuk memperkasa komuniti sekitar Kampung Padang Kemunting, Masjid Tanah, Melaka dengan memberikan pendedahan asas terhadap teknologi dron dan robotik.

Sepanjang program ini, komuniti diberi peluang untuk mempelajari cara memasang dan menerbangkan dron secara manual. Selain itu, peserta turut menyertai pertandingan dron yang dianjurkan secara berkumpulan. Aktiviti ini bukan sahaja menyeronokkan, malah meningkatkan pemahaman peserta mengenai teknologi robotik dan dron yang kini semakin berkembang.

RG DRONE [DAI-TECH] dan CeRIA bertindak sebagai penganjur utama dengan kerjasama HERO dan eTESA, menyediakan fasilitator dan peralatan dron bagi memastikan kelancaran bengkel dan pertandingan. Program ini telah berjaya menarik minat pelajar sekolah rendah dan menengah untuk mengenali teknologi ini, sejajar dengan matlamat memperkasakan pendidikan STEM di peringkat komuniti.

Program ini juga memberi impak besar kepada pembangunan mampan (SDG), terutamanya SDG 4 (Kualiti Pendidikan). Dengan mendedahkan komuniti kepada teknologi dan inovasi, ia membantu dalam merapatkan jurang digital dan memperkasa komuniti setempat untuk terlibat dalam bidang teknologi masa hadapan.

Bengkel ini merupakan salah satu inisiatif yang menyokong Landasan 2 (Keseimbangan pendidikan antara teknologi dan kemanusiaan) dan Landasan 11 (Memberdayakan komuniti melalui pemindahan ilmu). Maklum balas daripada peserta menunjukkan penerimaan positif terhadap program ini, dengan ramai yang menyatakan minat untuk menyertai aktiviti serupa pada masa akan datang.



Program Kuiz

CELIK MATHS FTKE 2024

PENULIS: DR NUR AZURA NOOR AZHUAN

CELIK MATHS FTKE 2024		
CONGRATULATIONS to the winners of Quiz Series		
1 st Ong Jun Zhi (D012210125) RM50	1 st Lim Shi Feng (D012210134) RM50	1 st Low Wei Hong (B012120011) RM50
2 nd Yap Wei Hao (B012120016) RM30	2 nd Ong Hang Hui (D012310074) RM30	2 nd Muhammad Azmi bin Khairuzzaman (B02110385) RM30
3 rd Josevein Hutagalung (B112320091) RM20	3 rd Nur Syifa Damia Yusri (B082210339) RM20	3 rd Tharshini A/P C Selvagumar (B012110067) RM20
Organized by MTC Committee, FTKE		

Siri pertama menyaksikan penyertaan seramai 57 pelajar, diikuti dengan peningkatan kepada 74 peserta dalam Siri 2. Siri 3 mencatat jumlah penyertaan tertinggi dengan 106 peserta. Program ini bertujuan untuk memupuk minat serta semangat kecemerlangan dalam bidang matematik dalam kalangan pelajar. Melalui pertandingan ini, pelajar berpeluang mengasah kemahiran matematik mereka berdasarkan asas yang telah dipelajari, selain membina keyakinan diri dalam menyelesaikan masalah matematik.

Dalam Siri 1, pemenang tempat pertama dirangkul oleh Ong Jun Zhi dari DEL, diikuti dengan Yap Wei Hao di tempat kedua dan Josevein Hutagalung di tempat ketiga. Siri 2 menyaksikan Lim Shi Feng muncul sebagai juara, sementara Ong Hang Hui dan Nur Syifa Damia Yusri masing-masing meraih tempat kedua dan ketiga. Siri 3 pula berakhir dengan kemenangan Low Wei Hong di tempat pertama, diikuti oleh Muhammad Azmi bin Khairuzzaman dan Tharshini A/P C Selvagumar di tempat kedua dan ketiga.

Selain menggalakkan persaingan sihat, program ini turut membantu pelajar meningkatkan minat mereka terhadap matematik. Penyampaian hadiah bagi Siri 1 telah disempurnakan oleh Ir. Dr. Fairul Azhar Bin Abdul Shukor, Timbalan Dekan (Akademik) FTKE. Sementara itu, bagi Siri 2 dan 3, hadiah disampaikan oleh Profesor Madya Dr. Hidayat Bin Zainuddin, Dekan FTKE. Penganjuran Kuiz Celik Maths FTKE 2024 ini membuktikan komitmen MTC dalam menyokong perkembangan akademik pelajar serta memperkukuh budaya kecemerlangan dalam bidang matematik di FTKE.

Jawatankuasa Mathematic Tutorial Centre (MTC) telah menganjurkan program 'Kuiz Celik Maths FTKE 2024', yang berlangsung dalam tiga siri pada 25 Jun (Siri 1), 28 Ogos (Siri 2), dan 6 November (Siri 3). Program ini mendapat sambutan menggalakkan daripada pelajar diploma dan prasiswazah FTKE, dengan jumlah penyertaan yang meningkat dalam setiap siri.





PACUAN MATLAMAT PEMBANGUNAN MAMPAN (SDG) MELALUI PENGANJURAN PROGRAM UTEM WINTER SCHOOL 2024 ANJURAN FTKE

PENULIS: MOHD RUSDY BIN YAACOB

UTeM Winter School (UWINS) 2024 yang melabuhkan tirainya Februari lalu telah meninggalkan impak positif ke arah agenda Matlamat Pembangunan Mampaan (SDG). Program Mobiliti Tanpa Kredit yang buat julung kalinya dianjurkan oleh Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE), Universiti Teknikal Malaysia Melaka (UTeM) ini telah berlangsung selama 2 minggu dan disertai oleh 16 orang mahasiswa dari Brunei dan Indonesia, serta 8 orang mahasiswa UTeM sendiri. Dekan FTKE, Profesor Madya Dr. Hidayat Bin Zainuddin berkata, penganjuran UWINS 2024 ini adalah selari dengan SDG17: Partnerships for the Goals, dengan penyertaan peserta dari luar negara. Bagi sekolah yang dikategorikan sebagai Sekolah Kurang Murid (SKM), peluang murid-murid untuk berinteraksi dengan mahasiswa dari luar negara dilihat dapat meningkatkan lagi tahap keyakinan mereka untuk berkomunikasi dalam Bahasa Inggeris pada masa hadapan.



Akhir sekali, UWINS 2024 turut memberi tumpuan kepada isu pemanasan global dan kelestarian alam sekitar melalui penganjuran Program CSR Beach Clean Up di sekitar kawasan Taman Laut Melaka yang meliputi Pulau Dodol, Pulau Undan dan Pulau Nangka, dengan kerjasama Kementerian Sumber Asli dan Kelestarian Alam (NRES) dan Pejabat Perikanan Negeri Melaka. Penglibatan para pelajar dan agensi kerajaan dalam membersihkan pantai merupakan satu langkah positif untuk menangani isu pencemaran dan menjaga kelestarian ekosistem laut di kawasan tersebut, bertepatan dengan SDG14: Life Below Water serta SDG13: Climate Change



Selain dari menawarkan peluang pertukaran budaya di kalangan peserta, tarikan utama UWINS 2024 adalah penganjuran Kursus Pensijilan Profesional – Asas Teknologi Hidraulik yang diiktiraf oleh Bosch Rexroth Academy. Pengarah UWINS 2024, merangkap pelatih bertauliah di bawah UTeM-Bosch Rexroth Licensed Training Center, Dr. Mohd Rusdy Yaacob berkata, sijil profesional yang diberikan bakal menjadi nilai tambah kepada setiap peserta dalam meningkatkan tahap kompetensi dan kemahiran berpanduan TVET pada masa hadapan. Ini adalah selari dengan SDG4: Quality Education. Selain itu, SDG4 turut dipacu melalui penganjuran Program Pemantapan Bahasa Inggeris, Hello Talk! kepada murid-murid Sekolah Kebangsaan Tanjong Tohor.

UWINS 2024 turut membawa semua peserta ke D'Impian Agro Farm, Muar bagi menjalani lawatan sambil belajar yang berkonsepkan Agro-Pelancongan. Salah seorang peserta UWINS, Dayang Nurfarahin Dena Binti Abdul Hakim berkata, lawatan seumpama ini dapat meningkatkan kesedaran peserta tentang krisis keterjaminan makanan dunia yang semakin kritikal. Justeru, lawatan ini dilihat sebagai langkah awal dalam memacu SDG2: Zero Hunger di kalangan para peserta yang kesemuanya adalah di kalangan generasi muda.





SEMINAR "ETHICS AT WORKPLACE": PERSIAPAN PELAJAR UNTUK LATIHAN INDUSTRI DAN DUNIA PEKERJAAN SEBENAR



Penulis: Ir. Dr. Intan Azmira Binti Wan Abdul Razak



Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE) telah menganjurkan seminar bertajuk "Ethics at Workplace" secara atas talian menggunakan platform Microsoft Teams pada 7 September 2024 (Sabtu). Seminar ini adalah anjuran Jawatankuasa Latihan Industri (JKLI) Program Kejuruteraan Dan Diploma Kejuruteraan yang mensasarkan pelajar tahun tiga program Ijazah Sarjana Muda Kejuruteraan Elektrik (BELG), Ijazah Sarjana Muda Kejuruteraan Mekatronik (BELM), dan pelajar tahun dua program Diploma Kejuruteraan Elektrik (DEL).

Program ini bertujuan memberikan pendedahan dan persediaan kepada pelajar berkaitan kod etika dan tatacara bekerja yang perlu diamalkan semasa menjalani Latihan Industri, seterusnya menjadi bekalan berharga untuk mereka dalam menghadapi cabaran dunia pekerjaan yang sebenar. Program ini diketuai oleh Pengarah Program, Ir. Dr. Intan Azmira Binti Wan Abdul Razak, yang juga merupakan Ketua JKLI Program Kejuruteraan Dan Diploma Kejuruteraan FTKE. Selain itu, urusetia yang terlibat terdiri daripada:

1. Dr. Nor Hidayah Binti Rahim
2. Dr. Kyairul Azmi Bin Baharin
3. Ir. Mohd Khairi Bin Mohd Zambri
4. Mohd Bazli Bin Bahar
5. En. Fawwaz Amir Bin Kamarudin
6. En. Abd Rahim Bin Baba

Penceramah jemputan bagi seminar ini ialah Encik Ghafar bin Jenal, seorang Facilities Manager di Medivest Sdn. Bhd. Beliau merupakan Alumni Kolej Universiti Teknikal Kebangsaan Malaysia (KUTKM), lulusan Diploma Kejuruteraan Elektrik/Elektronik pada tahun 2005, serta Alumni Universiti Teknikal Malaysia Melaka (UTeM), lulusan Ijazah Sarjana Muda Kejuruteraan Elektrik/Elektronik pada tahun 2009.

Seminar ini dilaksanakan untuk mencapai beberapa objektif utama:

1. Pendedahan kepada Kod Etika Kerja: Memberikan pemahaman kepada pelajar tentang etika dan tatacara yang perlu dipatuhi semasa Latihan Industri.
2. Penekanan Nilai Profesionalisme: Menggalakkan pelajar agar bekerja dengan penuh dedikasi, jujur, dan amanah dalam melaksanakan tugas.
3. Meningkatkan Kemahiran Komunikasi: Melatih pelajar berkomunikasi dan berinteraksi secara berkesan dalam suasana profesional.
4. Menimba Pengalaman untuk Masa Depan: Memberikan panduan kepada pelajar dalam memilih pekerjaan yang sesuai selepas tamat pengajian.

Seminar ini telah memberikan impak positif kepada para pelajar FTKE. Selain mendapat pendedahan tentang amalan etika di tempat kerja, pelajar juga dapat memahami kepentingan dedikasi, integriti, dan kemahiran komunikasi untuk menjadi pekerja yang kompeten. Anjuran program seperti ini membuktikan komitmen FTKE dalam melahirkan graduan yang bukan sahaja cemerlang dalam akademik, tetapi juga bersedia menghadapi dunia pekerjaan yang sebenar dengan nilai-nilai profesionalisme yang tinggi. Semoga seminar ini menjadi pemangkin kejayaan kepada para pelajar dalam Latihan Industri dan kerjaya mereka kelak!



INNOVATION COMPETITION EXHIBITION 2024 (ICE 2024)

Penulis: Syahar Azalia Binti Ab Shukor

Jabatan Pengajian Diploma Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE), Universiti Teknikal Malaysia Melaka (UTeM) telah menganjurkan Pertandingan Innovative Competition Exhibition 2024 (ICE 2024) kali-4 untuk pelajar Tahun Satu Program Diploma Kejuruteraan Elektrik (DEL) bagi semester 1-2023/2024 yang telah mendaftar subjek Kemahiran Asas Elektrik (DELP 1111). Pertandingan ini telah dikelolakan oleh tenaga pengajar yang mengajar subjek tersebut yang mana mereka terdiri daripada Dr. Ahmad Aizan bin Zulkefle, Ir. Mohd Khairi bin Mohd Zambri, Dr. Hazriq Izuan bin Jaafar, Dr. Aimie Nazmin bin Azmi, Mohd Fairus bin Abdollah, Norhazilina binti Bahari, Dr. Nur Zawani binti Saharuddin, Dr. Aine Izzati binti Tarmizi, Dr. Nor Hidayah binti Rahim, Puan Mashitah binti Che Razali, Puan Atikah binti Razi dan Puan Syahar Azalia binti Ab Shukor selaku pengarah bagi program tersebut. Pertandingan ini telah diadakan secara bersemuka bertempat di Makmal Elektrik dan Elektronik 1 dan 2, FTKE pada 17 Januari 2024.



Ketua Jabatan Pengajian Diploma, Dr. Junainah binti Sardi merupakan penasihat kepada program ini dan beliau banyak membantu dan memberi idea serta tunjuk ajar kepada kesemua tenaga pengajar yang telah menjayakan pertandingan ini. Juga tidak lupa kepada Dekan Fakulti Teknologi dan Kejuruteraan Elektrik (FTKE), Profesor Madya Dr. Hidayat bin Zainuddin yang merupakan penaung program ICE 2024. Jutaan terima kasih diucapkan kepada semua Ahli Jawatankuasa ICE 2024 yang telah bertungkus lumus berusaha agar program ini berjalan dengan lancar.

Pertandingan ini merupakan salah satu instrumen penilaian yang digunakan dalam mengetengahkan dan mencungkil kreativiti dan inovasi pelajar. Semasa proses penilaian, kemahiran insaniah pelajar, keberhasilan projek dan impak kepada industri dan masyarakat telah dinilai. Panel penilai dari kalangan Panel Penasihat Industri(IAP) FTKE telah dijemput bagi menilai pertandingan ICE 2024, yang terdiri daripada En. Ghafar bin Jenal, En. Mohd Zulkarnain bin Rasimon, dan Ts. Dr. Muhammad Ikhwan bin Zamhuri. Beberapa panel dalaman FKE juga dijemput menjadi juri dan sejumlah 10 orang juri telah dilantik sempena Pertandingan ICE 2024.

Tujuan utama perlaksanaan pertandingan ICE 2024 adalah bertujuan untuk memenuhi instrumen penilaian yang sejajar dengan piawaian akreditasi dari Engineering Technology Accreditation Council (ETAC) iaitu penglibatan panel industri dalam aktiviti pembelajaran dan pengajaran, selain daripada pengukuhan elemen amalan terhadap kursus Asas Kemahiran Elektrik (DELP1111). Selain daripada mendapatkan proses penilaian yang lebih telus, lantikan panel dari kalangan IAP FTKE adalah bertujuan bagi mendapatkan lebih banyak maklumat dan cadangan di atas keberhasilan projek pelajar. Setiap kumpulan terdiri daripada 3 orang pelajar dan para pemenang diberikan ganjaran hadiah dalam bentuk wang tunai serta sijil penyertaan. Hadiah tempat pertama adalah berupa wang tunai RM 150, kedua RM90, ketiga RM60, dan 21 tempat saguhati berjumlah RM30. Semua pelajar yang terlibat diberikan sijil penyertaan untuk meningkatkan kompetensi pelajar. Jabatan Pengajian Diploma berharap pertandingan ini akan menjadi acara tahunan untuk pelajar jurusan diploma yang mengambil subjek DELP 1111 ini.



INOVASI KOMPOS HIJAU BUAT GENERASI BAHARU

Penulis: Syahar Azalia Binti Ab Shukor

Inovasi kompos hijau merupakan salah satu pendekatan lestari yang relevan dalam bidang pendidikan TVET (Technical and Vocational Education and Training). Ia bertujuan untuk memperkenalkan teknologi hijau dalam pengurusan sisa organik dan penghasilan baja kompos berkualiti tinggi. Inovasi kompos hijau dapat diterapkan dalam sistem TVET untuk melatih generasi baru yang berkemahiran tinggi dalam teknologi hijau, keusahawanan dan pemeliharaan alam sekitar. Kejayaan projek ini bergantung kepada integrasi teknologi moden, kolaborasi dengan industri dan modul pendidikan praktikal yang komprehensif.

Kerosotan kualiti tanah akibat penggunaan baja kimia secara berlebihan serta peningkatan jumlah sisa organik yang tidak diuruskan dengan baik menimbulkan cabaran besar dalam sektor pertanian dan pengurusan sisa. Dalam konteks ini, inovasi kompos hijau muncul sebagai penyelesaian yang mampan, dengan memberikan tumpuan kepada penggunaan sisa organik sebagai sumber untuk menghasilkan baja berkualiti. Dalam pendidikan TVET, pendekatan ini bukan sahaja menggalakkan pemeliharaan alam sekitar tetapi juga melatih pelajar dengan kemahiran teknikal yang relevan. Ia juga boleh melatih pelajar untuk memanfaatkan sisa organik daripada rumah, kantin, dan industri sebagai sumber utama untuk menghasilkan kompos. Ini mengurangkan ketergantungan kepada tapak pelupusan sampah

Pelajar TVET boleh dididik untuk melihat kompos hijau sebagai peluang perniagaan. Mereka boleh menghasilkan dan memasarkan baja organik di bawah jenama tempatan, sekali gus menyumbang kepada ekonomi hijau. Selain itu, kompos hijau merujuk kepada baja organik yang dihasilkan melalui penguraian bahan organik seperti sisa makanan, daun kering, dan sisa pertanian. Proses ini memanfaatkan mikroorganisma semula jadi untuk mengubah sisa organik menjadi baja yang kaya dengan nutrien. Proses kompos hijau juga dapat mengurangkan pelepasan gas rumah kaca yang biasanya dihasilkan oleh sisa organik di tapak pelupusan. Ini menjadikan pelajar TVET agen perubahan dalam usaha melindungi ekosistem global.

Cabaran utama inovasi kompos hijau ini ialah kurangnya kesedaran tentang manfaat kompos hijau kepada masyarakat dan juga negara. Dari situ kita dapat lihat bahawa melalui kempen pendidikan dan aktiviti komuniti ia dapat membuka peluang dan ruang kepada lebih ramai lagi mencuba sekaligus dapat mendorong masyarakat untuk lebih cakna dan ada keinginan untuk melakukannya demi kesejahteraan dan memelihara alam sekitar

Inovasi kompos hijau adalah langkah penting dalam memastikan kelestarian pendidikan TVET. Dengan integrasi teknologi moden, latihan praktikal, dan kolaborasi industri, pelajar dapat dilatih menjadi tenaga kerja yang kompeten dan sedar akan tanggungjawab terhadap alam sekitar. Pendekatan ini bukan sahaja meningkatkan kebolehpasaran pelajar tetapi juga menyumbang kepada pembangunan mampan secara global.





RESEARCH COLLABORATION e-AMCM & PETRONAS

Author: Ir. Dr. Imran Sutan
Chairul

2024 e-AMCM RESEARCH GROUP & PETRONAS
COLLABORATION TO GAIN TECHNICAL KNOWLEDGE ON
TRANSFORMER FLUIDS

Electrical Asset Condition Monitoring (e-AMCM) Research Group is grateful for collaborating with Group Technical Solutions (GTS) of Petroliaam Nasional Berhad (PETRONAS). The engagement started under the Collaboration with Higher Education Strategic Initiatives (CHES) programme, to steer discourse on advancing talent, technical and technology developments for sustainable energy innovations. Our first meeting was held at the Faculty of Electrical Technology and Engineering (FTKE), UTeM while the second meeting was held at Petronas, KLCC, where collaboration terms were discussed and finalized. The collaborations were first realized when three of the e-AMCM Research Group members (Ir. Dr. Norazhar Abu Bakar, Ir. Ts. Dr. Mohd Shahril Ahmad Khair, and Ir. Dr. Imran Sutan Chairul) travel to Petronas Chemical Olefin Glycol Derivative (PCOGD), located at Kerteh, Terengganu. At PCOGD, awareness and knowledge regarding ester-based transformer oil were presented to PCOGD technical team members. The collaboration was continued when e-AMCM Research Group delivered an online webinar entitled “K-Class Transformer Fluid Reduces Fire Risk & Insurance Costs – How?” to PETRONAS engineers.



“Ester oils for transformers were developed as an alternative to mineral to mineral oils, driven by the need for biodegradable and fire-resistant insulating liquid. Using ester-based transformer oil reduces environmental impact in case of leaks or spills due to its biodegradable and non-toxic characteristics. Moreover, Ester oils have a higher flash point and fire point than mineral oils, making them safer for use in areas with fire hazards. Additionally, ester oils can absorb more moisture without compromising their insulating properties, which helps in maintaining the transformer’s solid insulation. However, ester oils typically come at higher cost compared to mineral oils. Additionally, their higher viscosity may necessitate design modifications in transformer to ensure effective cooling.”

Our collaborations were resume when Ir. Chan Chee Ying of GTS, PETRONAS, invited by FTKE for delivering talk to 4th year students (BELG), under the Engineering Seminar subject. Her talk is entitled “Soft Touch. Tough Act - Navigating the Oil & Gas Industry as an Electrical Engineer”.

For records, there are 8 members of the e-AMCM Research Group: Ir. Dr. Norazhar Abu Bakar, Syahrani Johal, Ir. Ts. Muhamad Falihan Bahari, Dr. Norhidayah Rahim, and Mrs. Arfah Syahida Mohd Nor. Ir. Ts. Dr. Mohd Shahril Ahmad Khair, Ir. Dr. Sharin Ab Ghani, Ir. Dr. Imran Sutan Chairul, Ir. Muhammad



E-AMCM INVITED AS HONOURABLE SPEAKERS FOR TRANSFORMATOR OIL ANALYSIS & DISSOLVED GAS ANALYSIS INTERPRETATION SEMINAR IN YOGYAKARTA, INDONESIA

Writer : Ir. Ts. Dr. Mohd Shahril Ahmad Khair



"If you want to go fast, you need to go alone. But if you want to go far, you need to go with your team", said Ir. Dr. Norazhar Abu Bakar. With just over a year after its establishment, Electrical Asset & Condition Monitoring (e-AMCM) Research Group has been proven to be one of the most successful and relevant research group after spreading its wings to the neighboring country, Indonesia.

Condition monitoring for power transformers, such as oil analysis and dissolved gas analysis (DGA), is crucial for ensuring reliable electricity distribution. By regularly assessing the health of transformer components, engineers can detect potential failures, extend equipment lifespan, and reduce downtime. These proactive measures are especially vital in regions where the demand for electricity is rapidly growing. Through collaborative seminars and research activities, groups like e-AMCM help utilities adopt best practices, ultimately contributing to safer and more efficient energy infrastructures on both local and international scales.

In November 2024, e-AMCM gained the trust of PT Transformator Services Indonesia (TSI) – a company that provides services, maintenance, diagnostics, analysis, and consultation associated with power transformers to utilities in Indonesia such as Perusahaan Listrik Negara (PLN). Four members of the executive committee (Ir. Dr. Norazhar Abu Bakar, Ir. Ts. Dr. Mohd Shahril Ahmad Khair, Ir. Dr. Imran Sutan Chairul, and Ir. Dr. Sharin Ab Ghani) were invited as honorable speakers for the Transformer Oil Analysis & Dissolved Gas Analysis Interpretation Seminar held at THE ALANA Hotel & Conference Center Malioboro, Yogyakarta.



A diverse group of industry experts from all over Indonesia participated in this two-day training. Each speaker was given two hours of slot to share their expertise with the experts. Interestingly, a 3-hour slot was allocated at the end of the training, specifically dedicated for the question - and - answer session between experts and the speakers. e-AMCM would like to express their deepest appreciation to TSI for the invitation and sponsorship.



Shahrudin Zakaria
Norazlina Abd Razak
Maslan Zainon
Shamsul Anuar Shamsudin

T³ TIME TRAVEL TV STORY



T³: Time Travel TV Story explores a new kind of time travel—delving into mind-bending possibilities raised by quantum transportation.

Far beyond the reaches of our own solar system lies the Gliese 667 Star System, a fictional star system located roughly 20 light-years away. At its heart is not a sun as we know it, but a star named Gliese, radiating light and energy that nurtures the planets constantly orbiting around it.

One of these planets is named William-Prime. William-Prime bears similarities to our Earth, with abundant water and the essential presence of oxygen for humans. It supports a diverse range of plants and animals of all kinds, providing ample resources for food. You and your family have been living on this planet for around 20 years. As the oldest child, you have reached adulthood and are now 20 years old, having grown up with your father starting the family. Then, you successfully complete your high school with very impressive grades, and your application to enroll in a university in New York, America, planet Earth has been very positively accepted.

Surprisingly, after 20 years of wandering and surrounded by family conflicts, your father now feels a strong desire to return to his hometown; Riverdale which is located on Earth within our Solar System. This is actually another reason behind your father's advice about pursuing further studies. During that time, advanced technology introduced a revolutionary transportation system known as 'JFK Quantum Universe- Intergalaxy Transportation', which facilitated quantum transportation across any place in galaxies.

In the realm of real-world of physics, a groundbreaking achievement was made in 2012 with the discovery of particle quantum teleportation. This remarkable feat involved the successful creation of particle replicas between two islands situated 143 km apart, namely La Palma and Tenerife in Spain. The process relied on entangled twin photons, which allowed for the spontaneous replication of particles without any constraints of SPACE or TIME, resulting in perfect duplicates.



This fascinating phenomenon in the field of physics holds significant potential for the future security of internet data. By utilizing the unique ability to replicate data through entangled particles, it offers a promising solution to safeguard information from interception by any third parties. This advancement opens the door for the development of the quantum internet, which is anticipated to be the groundwork of the next generation of technology.

Question arises: If individual particles can be spontaneously duplicated successfully, could the same principle be applied to larger entities, such as groups of atoms? A cluster of atoms forms a molecule, and a collection of molecules makes up a cell. Similarly, a collection of cells forms an organ. However, transporting an entire group of organs (with spiritual completeness) becomes a significantly more complex task. But, for the sake of something greater, let's assume that this technological concept, Quantum Universe-Intergalaxy Transportation, may one day be developed as a dream by many scientists.

In the continuation of the family story, your father's longing to return to his village remains strong and persistent. Now, you and your family embark on an extraordinary journey across the vast expanse of two star systems, covering a distance of 20 light years, aboard the remarkable and expensive Quantum Transportation.

After all, you and your family have arrived at JFK Quantum Universe-Intergalaxy Transportation in New York. It is envisioned to replace John F. Kennedy International Airport, one of the busiest airports in America. Next, you and your family step into a taxi and make your way directly to the most inviting residential property in New York.

"What a beautiful house!". This charming home is situated right here in Riverdale. Upon arrival, you are thrilled to finally meet your grandparents face-to-face, marking the first time since you were born. It has been over 20 years since your father migrated to William-Prime, a planet in the Gliese 667 Star System.



Shortly after completing your bachelor's degree in electronics at Stony Brook University, one of the top engineering programs in New York, you are accepted into their esteemed master's program in Electrical Engineering. During your fifth year at the university, you have the incredible opportunity to join the Astronomy Club, which organizes a series of visits to Hawaii to examine their latest cutting-edge telescope system.

At that time, the telescope system renowned for its remarkable sophistication, as it integrated data from telescopes on Earth, satellites around Earth, and nearby planets. This ingenious combination continues to enable the concept of the most powerful combined-image telescope, giving it the appearance of being the largest-sized telescope class within our solar system.

Now you arrive in Hawaii, and you are absolutely amazed by this exceedingly advanced technology, renowned for its capability to observe objects that reside in the vast depths of space, far beyond our imagination. In fact, it can even capture highly detailed images of distant planet systems, revealing their awe-inspiring beauty. You wonder what else this technology can do.

Suddenly, a brilliant thought strikes you: How wonderful it would be to be able to see your beloved hometown, the very place where you were born and raised. The cherished moments now fill your heart with a sense of longing. You deeply yearn for everything you left behind, as it has been a significant five years since you departed from your cherished home and school. With a mixture of longing and anticipation, you carefully adjust the telescope, aligning it with the Gliese 667 Star System and precisely aiming it towards a specific corner of William-Prime planet.

Now, your thoughts drift to the current condition of your beloved house, once a place of happiness and cherished memories. And what about your high school? You can't help but wonder about the situation at your school, imagining what the students there are doing now.

As you continue observing, the telescope reveals a familiar scene: your old school appears just as busy as you remember, bustling with evening sport activity. "Nothing changed", you mumble to yourself. You've now redirected your telescope to focus on your old home. It looks unchanged, as quiet as it was before.

Unexpectedly, a small truck enters the vicinity of the house through the main entrance. The sight of the truck evokes a sense of familiarity. Could it be that the buyer of your father's house also happens to own a small truck? Remarkably, it's the very same type of truck that your father once owned. "What a coincidence!" you exclaim to yourself.



Then you see, out of nowhere, a small figure emerges from the house, running straight toward the truck. The vehicle stops suddenly, just barely avoiding the boy. The driver jumps out, scanning for the boy. You keep watching the scene, and finally, the boy is seen lying beside the truck, unmoving.

You fall silent for a moment, memories rushing back from your past. A similar incident from your childhood flashes in your mind. It was the same tragic event. You remember the moment your father asked you to follow him and attempted to place you in the truck, where a small remote-controlled toy truck was already waiting. It was packaged so beautifully that you couldn't wait to open it right away.

Returning your attention to the telescope, you spotted the boy still with the driver. Suddenly, the boy steps out and climbs onto the truck. You couldn't help but flinch! A wave of excitement, like discovering a new toy, suddenly overwhelmed you. It felt like *deja vu*.

A moment later, another figure rushes out of the house toward the truck. 'My mom? No... this can't be,' you blurt out to yourself, your mind racing. The figure appears to be a woman, though it's hard to tell from this distance. She seems upset as she confronts the driver, then takes the small boy inside.



"My mom?! Really?!" You're taken aback, overwhelmed by the shock of the scene unfolding before your eyes. Speechless, you struggle to grasp how this moment feels so familiar. Is it merely an illusion? How could this be happening the same way, again?". This puzzling situation is resolved in this way to be understood; what is really going on is that you see yourself. When you used the Advanced Telescope, you were 25 years old, and you had been living in New York, on Earth, for 5 years. The separation between Earth and the William-Prime planet spans 20 light years. The light that originated from William-Prime's planet began its journey 20 years ago—when you were just 5 years old. Now you are 25. That day, your birthday became unforgettable because of the cherished present your father gave you.



Light emitted from any source acts as a record of the past, making an astronomer like a real historian observing events that happened deep into the past. The movement of photons is like how data is stored on CD-ROMs, which are arranged in a circular pattern from the center to the side. In contrast, light's recorded data travels in a straight line. If we disregard color, electromagnetic waves transmit codes through frequencies and amplitudes.

If someone observes it, thousands of codes align on a single plane to form a "pattern" on the retina, frame by frame, like the sequential data from a CD-ROM. The brain then combines distinct data from both retinas and our experiences to create a 3D representation, as vivid as possible.

So clearly, without a doubt, you're not seeing objects. That object had already moved to another planet five years ago. The object does indeed not even exist on William-Prime (you yourself are proof of that).

What you perceive as an 'object' may not exist at all. This suggests humans have never seen an object firsthand; only its pattern copied as an image onto retina really matters! The atom in the retina and the atom in the object are never directly connected; instead, we receive a copy of information from the external world. Our perception heavily depends on photon signals that help the brain create the external world we perceive every day.

Thankfully, we now know that sound does not propagate electromagnetically. Otherwise, we could have found ourselves trapped in perception, unable to check for the truth of that perception. The situation from 20 years ago, when you were a kid, could perhaps have been fully experienced with audio and visual, making it impossible to distinguish between reality and what is just a recorded view.

Thank you once again for journeying this far. Perhaps now you've experienced your own version of Time Travel TV—not through a time machine or near a black hole, but through the layers of perception. If you ask whether reality truly exists, well... isn't that the question we're all still trying to answer?

SIRI EXPLORASI BUKAN KONVENSIONAL

Penulis:

Shahrudin Zakaria, Norazlina Abd Razak, Sulaiman Sabikan



Artikel ini bertujuan memberi peluang eksplorasi kepada pembaca untuk memungkinkan mereka tiba-tiba sedar dan menghayati kewujudan sistem pandangan diri mereka sendiri (yang selama ini mungkin dianggap tidak pernah wujud) sambil memberi inspirasi kepada pembangunan sistem pandangan robot pada masa depan. Ahli sains terkenal, John Dalton telah memberikan kita inspirasi yang mendalam. Beliau, yang terkenal dengan teori atomnya, dikatakan telah mewasiatkan agar matanya dibedah-siasat selepas kematiannya. Dalton mengalami 'buta warna', di mana beliau tidak dapat membezakan sebahagian warna. Bayangkan, bagi beliau, epal hijau dan merah kelihatan serupa—suatu pengalaman visual yang amat menarik jika anda cuba mengambil alih tempatnya. Bayangkan pula, bagaimana jika epal merah sentiasa kelihatan hijau di mata anda? Dalton telah menjadikan dirinya sendiri sebagai sejarah dalam dunia sains 'vision'. Dengan iltizam Dalton itu, artikel ini teruja untuk ditulis dan berita baiknya, kita tidak perlu menunggu seperti Dalton untuk cuba menyingkap sistem pandangan sendiri. Dengan sedikit usaha dan hanya menggunakan gerakan lengan, kita boleh mula menerokainya hari ini. Bukankah itu suatu peluang yang berharga untuk dilepaskan?

Gerakkan lengan kanan anda dari keadaan tegak ke keadaan mendatar seperti Rajah 1 (seperti gaya mengalahkan lawan dalam sukan gusti-lengan). Lakukan gerakan ini dua kali; pertama pada saat pertama, dan ulangi gerakan yang sama pada saat kedua. Sambil itu, katakan pada diri anda bahawa anda sedang berusaha memahami suatu hakikat dan membantu meyakinkan diri anda bahawa anda sebenarnya hanya melakukannya sekali sahaja, bukan dua kali (mengkhayalkan gerakan kali kedua sebagai 'virtual' adalah sangat penting).



Rajah 1



Takala anda memesongkan lengan anda ke kiri, sistem pandangan anda belum lagi berfungsi.

Setelah satu saat, maka barulah anda akan mengalami 'visual' gerakan tangan tersebut (seperti latihan yang dilakukan di Rajah 1 untuk saat yang kedua dalam mengkhayalkan gerakan kedua).



Rajah 2

Pertama sekali, laraskan meter di Rajah 2 agar cahaya dari lengan anda sampai ke mata dalam masa 1 saat. Maka inilah hasil ujikajinya:

Percaya atau tidak, sebenarnya, kepantasan cahaya telah memperdayakan kita selama ini, menyebabkan kita terlepas dari menyedari kehadiran sistem pandangan diri kita itu (kerana ia dicipta dalam keadaan tersembunyi). Oleh itu, apa yang perlu kita cuba lakukan ialah mencabar secara mental akan wujudnya meter kawalan kelajuan cahaya seperti yang ditunjukkan dalam Rajah 2, di mana kelajuannya boleh dikawal. Secara teori, dalam fizik klasik, kelajuan cahaya berkait dengan sifat kemagnetan (μ) dan keelektrikan (e) medium, iaitu $V_c = 1/\sqrt{\mu e}$. Katakanlah, dengan kaedah yang menakjubkan, kedua-dua sifat fizik ini (μ dan e) dapat diubah, maka kelajuan cahaya juga boleh berubah.

Tatkala anda memesongkan lengan anda ke kiri, sistem pandangan anda belum lagi berfungsi. Setelah satu saat, maka barulah anda akan mengalami 'visual' gerakan tangan tersebut (seperti latihan yang dilakukan di Rajah 1 untuk saat yang kedua dalam mengkhayalkan gerakan kedua). Hakikatnya, menggerakkan lengan anda dan pengalaman sistem pandangan (lengan anda nampak bergerak) adalah dua perkara yang berbeza dan terpisah. Menggerakkan tangan ialah proses otak menghantar isyarat ke otot dan kesannya adalah gerakan tangan. Rasa pada sendi seperti penat dan lenguh adalah 'feedback' untuk kita agar mengalami rasa gerakan.

Secara khusus, pada saat pertama anda menggerakkan tangan, anda hanya dapat merasainya. Kejadian hakiki pertama itu sebenarnya tidak dapat diakses terus secara 'visual'; ia hanya dapat dirasai. Anda seolah-olah buta pada kejadian hakiki pertama, kerana sistem pandangan anda hanya berfungsi kemudian (delayed visual perception).

Bayangkan, jika keadaan ini berterusan, anda dijangka mengalami kekeliruan mendadak kerana sistem pandangan anda sentiasa terlambat sesaat. Namun, lama-kelamaan, otak anda dijangka akan boleh mengadaptasi mengikut keadaan baharu tersebut sesuai dengan sifat otak yang diketahui sebagai neural-plasticity. Namun selepas itu, anda mungkin akan insaf bahawa sistem pandangan mula berubah menjadi sekadar tambahan dalam kehidupan, iaitu untuk memastikan kejadian telah pun berlaku dengan betul. Bersyukurlah kepada Tuhan atas kelajuan cahaya yang pantas, yang menjadikan dua keadaan terpisah tersebut dirasakan serentak sehingga kita merasakan realiti alam bagaikan hakiki. Setelah perjalanan artikel ini tiba di penghujungnya, tanyakanlah pada diri anda: adakah dengan mengetahui dunia luar bermaksud kita benar-benar menerima maklumat itu secara langsung atau cukupkah hanya foton cahaya yang tiba kemudiannya, untuk membentuk gambaran dunia di dalam minda (visually constructed)?



**ANDA DIJANGKA MENGALAMI
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EVALUATION OF EXPERIMENTAL PERMANENT-MAGNET SYNCHRONOUS MOTOR UTILIZING NEW MAGNETIC MATERIAL FOR CORE

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Keywords: PMSM; losses; core

INTRODUCTION. The drive to make electrical motors more efficient and perform better is a key focus in modern engineering especially in the realms of green technology and electric vehicles. The Permanent-Magnet Synchronous Motor (PMSM) is particularly noteworthy, not just for its excellent efficiency and compactness, but also for its dependable performance [1]. Typically, these motors have been built with silicon steel cores, but exciting new developments in magnetic materials are set to revolutionize how these motors perform. This article takes a closer look PMSM that incorporates a cutting-edge magnetic material in its core, aiming to uncover both the obvious and subtle benefits this brings compared to traditional designs. The field of material sciences is constantly evolving, and it has recently introduced several new magnetic materials that promise to reduce energy loss in motors, increase magnetic effectiveness, and enhance durability against heat [2]. The motor in this work uses a novel magnetic material with high magnetic saturation and low magnetisation resistance, which could reduce eddy current energy losses. This new material was tested against silicon steel for torque, efficiency under varying loads, and losses. This research seeks to understand how these novel materials may change PMSM design and performance through meticulous investigation.

As the world moves towards renewable energy, motor efficiency and eco-friendliness become more important. This research will improve motor design knowledge and practice, supporting global energy efficiency efforts. This thorough dive into PMSMs' new magnetic core material could lead to motor technology advances that affect design and application across sectors. This article examines these experimental results and compares them to existing motor technology to show how this new material could improve motor performance, including its pros and cons.

FUNDAMENTALS OF IPMSM DESIGN AND PARAMETER

The basic structure of IPMSM motor is shown in Fig. 1. It consists of two main parts which are stator and rotor. The stator consists of number of coils and lamination of slots while the rotor comprises permanent magnet. The stator is stationary part where as the rotor is rotating part of the motor. The IPMSM motor is designed for 12 poles and 18 slot arranged in three phase. Figure 2 illustrates the overall characteristics of each type of magnetic material used as an IPMSM core to evaluate their performance in this experiment. The stator and rotor are made from four type of different magnetic material Hiperco 50, MuMetal, Finemet FT3M and MetGlas 2714A. Meanwhile, Neodymium Boron Iron (NdFeB42) is the material for the permanent magnet and copper is for coil. Table 1 shows the motor specification of the IPMSM motor for this research. The target torque specification for this motor is 120 Nm.

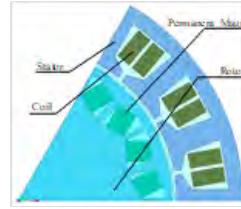


Fig. 1. Basic structure of IPMSM motor with different type of material core

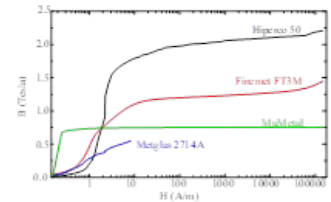


Fig. 2. B-H curve comparison for various magnetic material

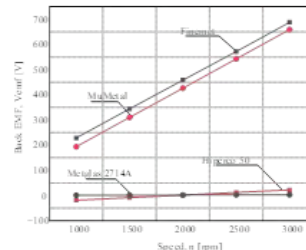


Fig. 3. Simulation result of IPMSM motor

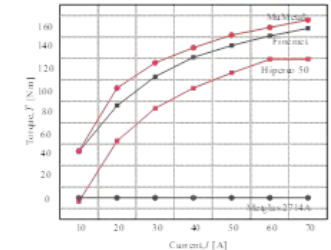


Fig. 4. Torque develop at static current

RESULT AND DISCUSSION Figure 3 and Figure 4 presents simulation results for various types of IPMSM motors using different magnetic materials for their cores. Figure 3 illustrates the back EMF produced by Finemet FT3M, MuMetal, MetGlas 2714A, and Hiperco 50. The highest back EMF, reaching 687.78 V at a speed of 3000 rpm, is generated by the Finemet FT3M core, while the lowest, 2.97 V, is produced by the MetGlas 2714A material. Figure 4 depicts the torque generated by the IPMSM motors. At an injected current of 70 A, the highest torque recorded is approximately 158.42 Nm, achieved by the Finemet FT3M core. The torque for MetGlas 2714A gradually decreases due to nearing saturation of the material's flux density.

SUMMARY This paper explores the simulation of four types of IPMSM motors using different core materials for electric vehicle applications. Based on the simulations, the embedded Finemet FT3M core, made from nanocrystalline alloys, is selected for further analysis due to its significant electromagnetic force (EMF) and torque development. This choice aims to achieve a target torque exceeding 120 Nm.

ACKNOWLEDGMENT The authors extend their gratitude to Universiti Teknikal Malaysia Melaka (UTeM) for its invaluable support and collaboration in this study.

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Numerical Analysis Various Rotor Types of BLDC Motor for Residential Elevator Application

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Keywords: BLDC Motor; Residential Elevator, FEM

INTRODUCTION. Residential elevators play a crucial role in enhancing accessibility and convenience within modern homes. The motor system employed in residential elevators significantly influences their performance, reliability, and energy efficiency. There are several types of motors that can be used as the domestic elevator such as linear motors and rotational motors. In this research, there are four rotor structure of BLDC motor been analyzed for residential elevator application. Finite Element Method (FEM) is used as a tool to solve the electromagnetic field problems for given models with appropriate materials, boundaries and source conditions applying Maxwell's equation over finite region space. As mention by [1], [2], FEM can provide magnetic analysis with high accuracy because it gives an approximation on a microscopic scale. In simulation result torque had been identified for such investigation. Based on the result, the model that produced highest torque will be choose, to fabricate as a motor for residential elevator. A small size and low cost elevator called domestic elevators are required in order to make sure it is affordable and practical to be installed at least double-storey house to promote independent living to elderly.

METHODOLOGY. The basic structure of BLDC motor consists of two main parts which are stator and rotor as shown in Figure 1. The stator consists of number of coils and lamination of slots while rotor comprises permanent magnet. The stator is stationary part where as rotor is rotating part of the motor. The BLDC motor is designed for 18 slot and 20 poles arranged in three phase. The permanent magnet is arranged back to back to each other so that the magnetization direction will be symmetrically distributed [3]. The target torque specification for this motor is 25 Nm.

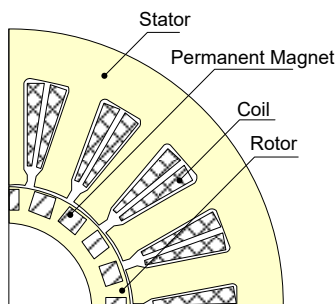


Figure 1 Basic Structure

In this research, the BLDC motor is model using Solidwork software and analyze using Finite Element Method

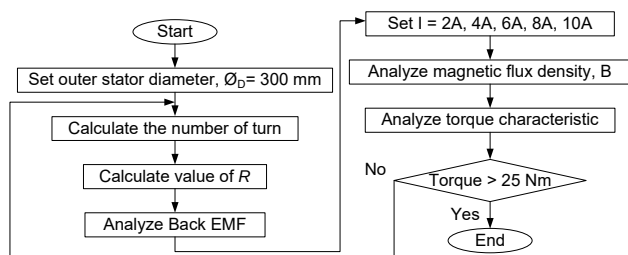


Figure 2 Overall analysis flowchart

(FEM). FEM is used because it can provide magnetic analysis with high accuracy. The FEM is used as a tool to obtain all the result. The size of copper used in this study is 1.0 mm. The coil factor for the number of turn is fixed as 60%. After the number of turns calculated, the resistance also can be calculated. Current injected to the motor varies from 2 A to 10 A. Figure 2 shows the overall analysis flowchart for BLDC motor.

RESULTS AND DISCUSSION. The torque produced by BLDC motor is shown in Figure 3. When injected current 10 A, the highest torque produced is about 28 Nm which is generated by embedded aluminium. The torque for slotted rotor is slowly drop due to flux density for the material is almost saturated.

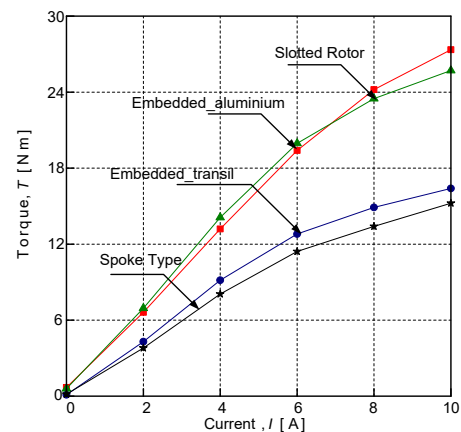


Figure 3 Torque

CONCLUSION. This paper present details simulation four types of BLDC motor with different rotor structure that will use in residential elevator application. Based on the simulation, rotor with embedded aluminium is chosen for further analysis because it is simple structure to fabricate and easy to assemble. The embedded aluminium rotor structure had achieved the target specification which is 25 Nm.

ACKNOWLEDGEMENTS. The authors would like to thank the Universiti Teknikal Malaysia Melaka (UTeM).

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THE EFFECTS OF VARIATION IN POLE PITCH RATIO ON THE THD AND THRUST RIPPLE OF THE SSRLSM

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Keywords: SRLSM; THD, Thrust ripple

INTRODUCTION. This paper explores how changes in dimensional parameters affect the static characteristics of segmented switched reluctance linear synchronous motors (SSRLSM). The study uses an equation derived from a validated analytical model to analyze the impact of varying dimensional parameters, specifically focusing on the pole pitch ratio. By examining the effects of different pole pitch ratios on the THD and thrust ripple, the paper provides insights into how these changes influence motor performance [1-3].

METHODOLOGY. The SSRLSM's analytical model was developed using the permeance analytical model (PAM) and converted into a magnetic equivalent circuit (MEC) to derive a mathematical equation for studying its static properties. This model was validated with FEM simulations and measurements. The study focused on the impact of different pole pitch ratios (1, 0.75, 0.5, and 0.25) on the THD and thrust ripple of the SSRLSM. Figure 1 illustrates the study's flow chart. The effects were analyzed using the model in Figure 2 and equation (1) for three mover positions: fully aligned, partially aligned, and fully unaligned, with the fully aligned position used as an example.

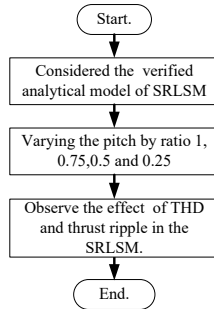


Figure 1 The flow chart of the studying the effect of the magnetic pitch ratio on the permeance of the SSRLSM.

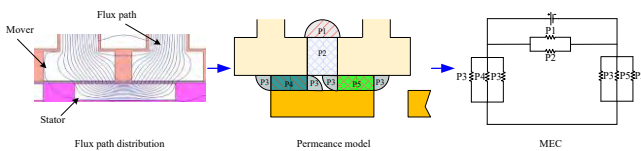


Figure 2 Developed analytical model of SSRLSM using PAM [3].

$$P_T = (P_1 + P_2) / ((P_3 + P_4 + P_5) / (P_3 + P_5 + P_6)) \quad (1)[3]$$

RESULTS AND DISCUSSION. Figure 3(a) and (b) illustrate the effects of decreasing the pole pitch ratio on the Total Harmonic Distortion (THD) and thrust ripple of the SSRLSM. As the pole pitch ratio decreases from 1 to 0.75, 0.5, and 0.25, both THD and thrust ripple increase. Figure 3(a) shows that at a pole pitch ratio of 1, the THD is 12.26%. This increases to 23.31%, 33.12%, and 29.92% for pole pitch ratios of 0.75, 0.5,

and 0.25, respectively. Figure 3(b) indicates that the thrust ripple ratio rises from 0.96 to 1.16, 1.12, and 1.1 as the pole pitch ratio decreases. At a pole pitch ratio of 0.5, both THD and thrust ripple are at their highest. Despite variations in current (2A, 1.2A, 1A, and 0.2A), these parameters are primarily affected by changes in the pole pitch ratio. This is due to the less uniform magnetic field distribution, which introduces higher harmonic content into the magnetic flux waveform, thereby increasing THD. Additionally, the decreased pole pitch ratio results in suboptimal alignment between the stator and rotor poles, causing fluctuations in thrust force and leading to increased thrust ripple.

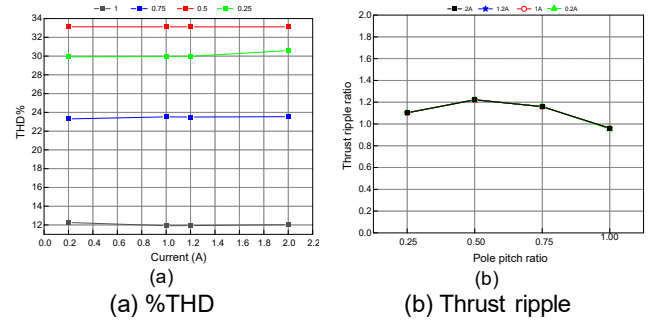


Figure 3 The effect of varying the pole pitch ratio on the THD and thrust ripple ratio of the SSRLSM.

CONCLUSION. Reducing the pole pitch ratio in SSRLSMs increases both Total Harmonic Distortion (THD) and thrust ripple. Despite current variations (2A, 1.2A, 1A, and 0.2A), the primary factor influencing these parameters is the pole pitch ratio. This is due to increased non-uniformity in magnetic flux distribution and thrust force variations. These effects, linked to the motor's dimensions and static characteristics, ultimately impact its performance and efficiency.

ACKNOWLEDGEMENTS. The authors extend their gratitude to Universiti Kuala Lumpur (UniKL), Majlis Amanah Rakyat (MARA), and Universiti Teknikal Malaysia Melaka (UTeM) for their support.

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Operational Parameters of the Segmented Switched Reluctance Linear Synchronous Motor

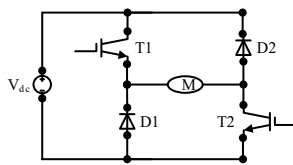
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Keywords: Asymmetric bridge converter, Domestic Lift, Segmented SRLSM

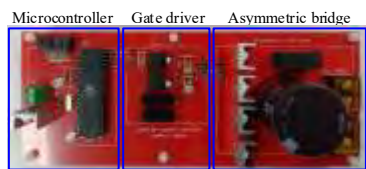
INTRODUCTION. A segmented switched reluctance linear synchronous motor (SSRLSM) has been proposed and designed in [1], [2]. This SSRLSM is designed to fulfill the design targets for a domestic lift application. In order to study the dynamic characteristics of the SSRLSM, a simple driver circuit consisting of an asymmetric bridge converter (ABC) was developed. Based on the developed circuit, the experiment was conducted to obtain the operational parameters of the SSRLSM such as voltage response and current response.

AIM OF WORK. The research was conducted to fulfill the following objectives: designing an SSRLSM for domestic lift application, developing a lab-scale prototype, conducting measurements to determine the static characteristics of the SSRLSM, and developing a driving circuit to study the dynamic characteristics of the SSRLSM.

METHODOLOGY. In this research, an ABC was designed to study the voltage and current response of the SSRLSM. The converter was designed using Proteus software and subsequently developed into a prototype for experimentation. Figure 1 illustrates the basic circuit of the single-phase ABC and the developed prototype. The developed circuit comprises an asymmetric bridge converter, gate driver, and microcontroller. For this experiment, the on-time of the switching was varied between 0.16 seconds and 0.8 seconds to determine the time constant for the current to reach its final value. Conversely, the off-time was varied from 0.16 seconds to 0.8 seconds to determine the time required for the current to fully demagnetize.



(a) ABC circuit



(b) ABC prototype

Figure 1 Asymmetric bridge converter

RESULTS AND DISCUSSION. Based on the data analysis, the current reached its steady state after 0.44 seconds. Conversely, it took 0.8 seconds for the current to fully demagnetize. Figure 4 illustrates the current profile for the SSRLSM at different voltages. The results demonstrate a direct correlation between current and voltage, with the current increasing linearly as the voltage increases.

Specifically, currents of 2.73 A, 3.94 A, and 5.23 A were recorded for voltages of 50 V, 75 V, and 100 V, respectively.

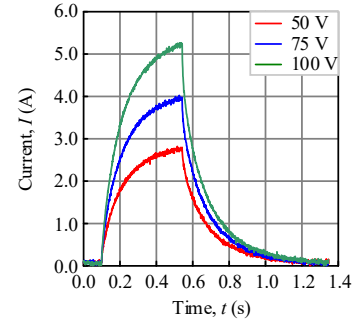


Figure 4 SSRLSM current response ($t_{on} = 0.44$ s)

CONCLUSION. An ABC was designed to investigate the appropriate voltage and current waveforms necessary to drive the SSRLSM. Analysis of the data revealed that the current takes 0.44 seconds to reach its final value and 0.8 seconds to fully demagnetize. Apart from that, it shows that, at 0.44 seconds, the current, I increase as the voltage, V increase.

ACKNOWLEDGEMENTS. The authors would like to thank Ministry of Education Malaysia, Universiti Teknikal Malaysia Melaka (UTeM) for providing the research grant FRGS/2018/FKE-CERIA/F00356.

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Broadband Radiation Field of Isolated Breakdown Pulse Train and Preceding Negative Ground Flash Under the Influence of Monsoon Seasons

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Keywords: Isolated Breakdown pulse train; Negative CG flash; hybrid negative CG flash

INTRODUCTION. Over the past century, lightning occurrences have been intensively studied as a manifestation for improving lightning and protecting systems, as this phenomenon gives threats on human life and property. However, many investigators only provide a limited number of lightning thunderstorm events, which does not represent the whole monthly and yearly trend.

The research aims to analyse the intracloud (IC) and ground (CG) lightning discharge in tropical thunderstorms using electric fast field radiation generated by lightning flash over five consecutive years, focussing on the complex and variable nature of lightning generation mechanisms, influenced by meteorological and geographical factors as previous studies [1], [2]. This comprehensive study will provide a clear understanding of the probability of producing flashes due to meteorological conditions and contribute to a better understanding of the lightning discharge.

AIM OF WORK.

- To demonstrate the existence, statistical trend, and characterisation of an IC flash, namely an isolated breakdown pulse train under the influence of the monsoon seasons.
- To present the features of IC flash, namely the IBPs preceding Narrow Bipolar Pulse (NBP), under the influence of the monsoon seasons.
- To perform a qualitative analysis on the typical negative CG flashes by characterizing its parameter during both Northeast and Southwest monsoons using fast field data.
- To characterize the hybrid negative CG flashes and evaluate the differences with the typical negative CG flash in relation with Northeast and Southwest monsoons

Table 1 Percentage of types of flashes due to monsoons.

Monsoon	Dataset	IBP train	NBP preceding IBP train	
Northeast	10,216	79	7	
First Intermonsoon		6	0	
Southwest		3	16	
Second Intermonsoon		2	0	
Monsoon	Dataset	Hybrid negative CG		
		Type 1	Type 2	Type 3
Northeast	1,467	8	8	9
Percentage		0.5 %	0.5 %	0.6 %
Southwest	696	3	4	3
Percentage		0.4 %	0.6 %	0.4 %

METHODOLOGY. The flat antenna was used to sense the vertical electric field. The physical height of the antenna is 1.5

m and the effective height is 0.27 m. The antenna is connected to the electronic buffer circuit by using a 60 cm long coaxial cable (RG58). Using the 10 m long coaxial cable (RG-58), the signal from the antenna is transmitted into 12-bit digital transient recorder (Teledyne Lecroy HDO4024) equipped with 200 MHz High-Definition Oscilloscope.

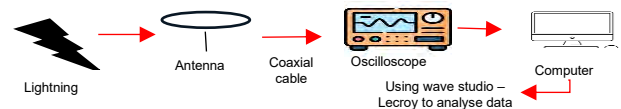


Figure 1 The schematic diagram for electric field recording and analysis.

RESULTS AND DISCUSSION. Malaysia's tropical monsoons give significant influence on the distribution of IC flash (namely IBP train and NBP preceding IBP train) and CG flash (namely typical negative CG and hybrid negative CG flash). For the IC flash, the positive initial peak was more common compared to the negative ones. These activities were frequently observed and totally absent during specific monsoon seasons.

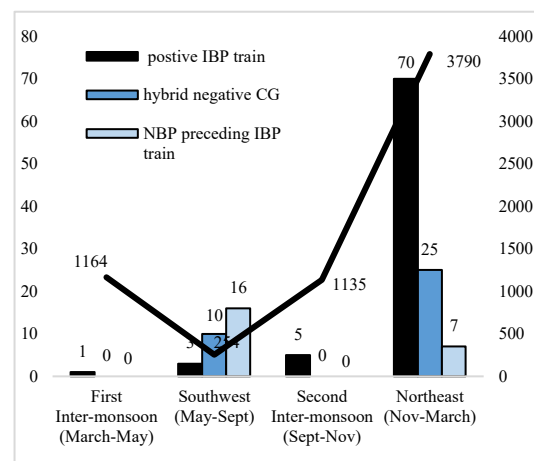


Figure 1 The variation of lightning types with monsoons

CONCLUSION. This study reveals a clearer picture of how the meteorological conditions could lead to certain types of flashes.

ACKNOWLEDGEMENTS. I would like to thank to Zamalah Scheme and Minister of Education (MOE), Malaysia.

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Assessment of Electromagnetic and Vibration Characteristics of Segmented Stator of High Speed IPM

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Keywords: Vibration, characteristics, segmented stator

INTRODUCTION. High-speed Interior Permanent Magnet motors are gaining popularity in a variety of industries, because to their high-power density, efficiency, and small size. However, the high-speed operation usually result in severe structural vibrations, which have an impact on motor performance. The vibrations come from varieties of sources, including electromagnetic forces, load torque changes, and inherent structural resonances [1], [2]]. Cogging torque and torque ripple are key of the electromagnetic sources in electric motors that contribute significantly to the vibration profiles [3],[4]. Segmented stator is one approach to overcome vibrations caused by electromagnetic sources. Thus, the aim of work is no load, dynamic load and mechanical analysis to asses the vibration characteristic by utilizing the segmented stator. Next, analyze the impact of no load and load of the amplitude and frequency of segmented stator by investigating the correlation between cogging torque, torque ripple using FFT analysis. The last one is to investigate the frequency component vibration of segmented stator configurations in order mitigating the stator structural vibrations.

METHODOLOGY. The simulation of the model is executed using ANSYS MAXWELL R1 2021 finite element method (FEM). Additionally, through the electromagnetic assesment, the electromagnetic forces that occur along the stator tooth is analyze using FFT analysis. The characteristics of vibration is defined by using modal and harmonic response integrated with the ansys workbench. Regarding to the no load study, the cogging torque, T_{cog} is calculated using Equation (1). The electric frequency of cogging torque is calculated using Equation (2).

$$T_{cog} = -\frac{1}{2} \phi_g^2 \frac{dR}{d\theta} \quad [\text{N}] \quad (1)$$

$$f_{cog} = f_e \text{ LCM}(2p, Q_s)/p \quad (2)$$

Meanwhile, the dynamic performance of segmented stator is performed by construct the ANSYS external circuit editor with load torque condition to predict the performance of segmented IPM motor. The control method is using sinusoidal control to reduce the torque ripples. The FFT analysis is done for no load and dynamic load analysis to predict the harmonic component. In mechanical assessment, the electromagnetic forces on the stator tooth tip, the tangential and radial forces is evaluating using Maxwell Stress Tensor Method to define the significant impact of the stator tooth using Equation (3)-Equation (4). The analysis is executed using modal analysis and harmonic response analysis. The harmonic respond is set for different angular velocity from 0 to 45 000 rpm with increment of 15 000 rpm. This is to identify on which frequency the segmented stator experienced a severe condition of vibration. The Equivalent Radiated Power (ERP) waveform is captured and compare with the no load and dynamic load analysis FFT result.

$$Fmst_r = \frac{1}{2\mu_0} (Br^2 - Bt^2) \quad (3)$$

$$Fmst_t = \frac{1}{\mu_0} (BrBt) \quad (4)$$

RESULTS AND DISCUSSION. Based on the Figure 2, it shows, a peak is observed at 3 000 Hz with 0.012mNm magnitude. The strong dominant frequency is indicating at 6 000 Hz with 0.00063 mNm. Meanwhile, the torque ripple components are more spread out, but less pronounced at other frequencies. While, dynamic condition with no load, the most significant peaks are occurred at 3 000 Hz, with 0.026 mNm magnitude, which can indicate as primary harmonic. It is similar when the torque ripple with load show the significant peak at same frequency.

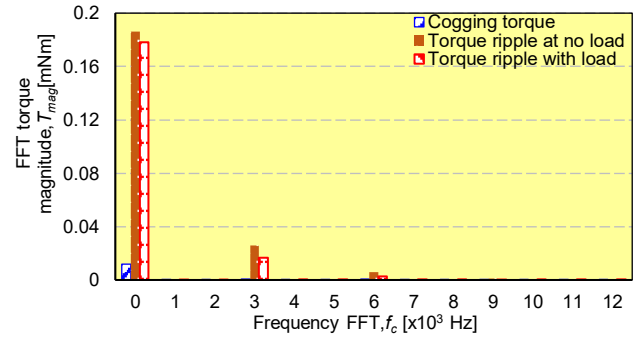


Figure 2 FFT torque magnitude

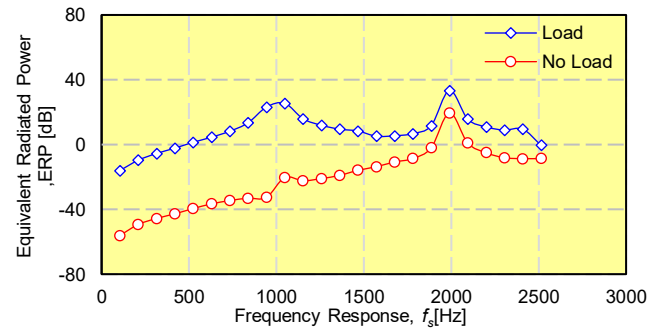


Figure 3 ERP waveform at no load and load condition

Figure 3 represents the frequency response of a system under load and no-load conditions. In frequency response analysis. The x-axis, indicate the frequencies response with the values range from 104.72 Hz to 2513.3 Hz mechanical frequency. The y-axis graph represents the gain or attenuation in dB at each corresponding frequency. The segmented stator exhibits attenuation negative dB values at lower frequencies 104.72 Hz to around 1047.2 Hz. At higher frequencies from 942.48 Hz onwards, the load condition starts showing positive gain values, indicating that the system amplifies these frequencies. At 1899.7 Hz, the load condition exhibits a very high gain 33.422 dB, indicating a potential resonance frequency where the system amplifies signals significantly under load.

CONCLUSION. Both graphs are related and complementary with the FFT analysis and the ERP waveform. It shows that the cogging torque and torque ripple magnitude is has significant component at 1899.7 Hz and the frequency response curve shows a peak (resonance) at 1899.7 Hz, then the system could potentially experience excessive vibration or noise at that frequency when under load.

ACKNOWLEDGEMENTS. The authors would like to thank Ministry of Education Malaysia, Universiti Teknikal Malaysia Melaka (UTeM).

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Multi-Carrier Switching Strategy for High-Bandwidth Potential Balancing Control of Multilevel Inverters

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Keywords: DTC, MPC, CSF

INTRODUCTION. This paper confers on investigation of a Direct Torque Control (DTC) of induction motor drive by 3 level Neutral Point Clamp (NPC) multilevel inverter. The imbalance problem may deteriorate the electric drive performance which might cause a short circuit condition [1]. Various balancing control strategies were proposed, however, most of them employed complex Space Vector Modulation (SVM) and hysteresis-based controller that generates variable switching frequencies.

The proposed method will offer a reliable balancing control strategy with a constant switching frequency, and moreover, it will provide excellent electric drive performance. This research proposed a new multi carrier switching modulation strategy that establish a high-band-width control for neutral point potential in the NPC inverter. The potential of the proposed High-bandwidth potential balancing strategy is validated through the MATLAB/SIMULINK environment and verifications of the effectiveness via experiment.

AIM OF WORK. The main purpose of the Research is:

- To study, implement and improve the performance of the DTC of induction machines using three-level NPC Multilevel Inverter.
- To propose a new multi-carrier switching modulation strategy for high-bandwidth potential balancing control and a constant switching frequency of the 3-level NPC multilevel inverter.
- To verify all improvements obtained in the proposed method via simulation and experimental results.

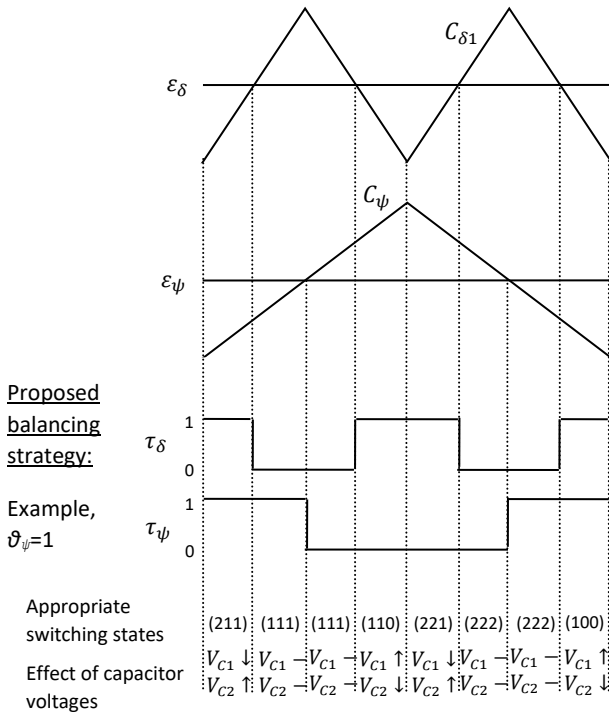


Figure 1 Proposed selection of switching state for balancing of capacitor voltages and constant switching frequency.

METHODOLOGY. Formulate a new multicarrier Switching Modulation Strategy for balancing control of multilevel Inverter and modelling and evaluating proposed strategy via MATLAB Simulink environment. Verification of the effectiveness of the proposed strategy via experiment result. The experiment consists of three main parts depicted in Figure 2 consist of DS1104 R&D Controller Board, Altera FPGA and 3-Level NPC Multilevel inverter.

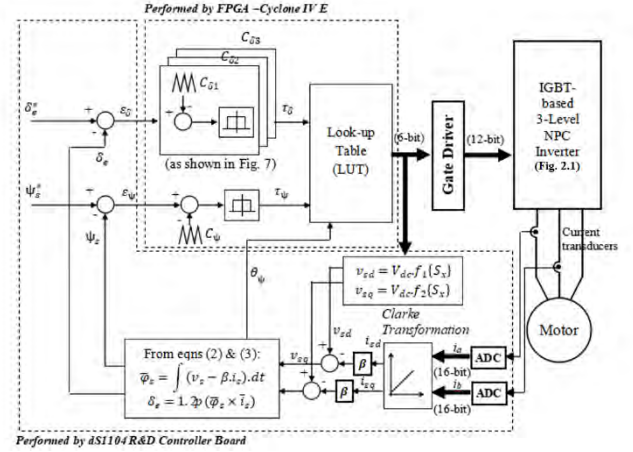


Figure 2 Proposed experiment setup

RESULTS AND DISCUSSION. From the experiment result, the proposed method shows the estimated torque can follow the reference value while voltage capacitor VC1 and VC2 still regulate at half of Vdc as show in Figure 3

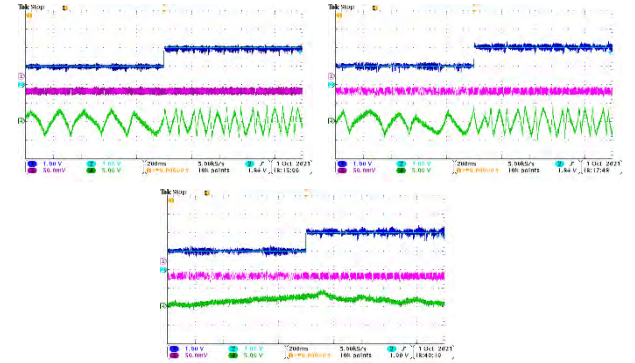


Figure 3 Experimental results of torque response, flux and voltage error Ve (a) Conventional (b) CSF (c) Proposed Multicarrier

CONCLUSION. A simple control for induction motor performed by DTC fed by multi-carrier switching modulation to overcome the imbalance capacitor voltage problem of NPC.

ACKNOWLEDGEMENTS. The authors gratefully acknowledge the financial support provided by the Ministry of Higher Education, Malaysia, (MOHE), and Universiti Teknikal Malaysia Melaka (UTeM).

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Performance Analysis of a Three-Phase TCHB Multilevel Inverter and Control of PMSM Using NLC Technique

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Keywords: Multilevel Inverter; Transistor Clamped H-bridge; Nearest Level Control Technique;

INTRODUCTION. The Transistor Clamped H-Bridge (TCHB) MLI stands out for its ability to generate numerous output levels with fewer components, making it ideal for cost-sensitive and efficient applications like electric vehicles and renewable energy systems [1]. This research addresses key challenges in MLI technology, focusing on reducing Total Harmonic Distortion (THD) and minimizing component count to enhance system reliability and lower costs. The study explores the use of the Nearest Level Control (NLC) method in a three-phase symmetrical TCHB MLI, optimizing performance by reducing THD while maintaining efficiency at low switching frequencies.

Furthermore, the study extends to the integration of the TCHB MLI with a Permanent Magnet Synchronous Motor (PMSM) drive system, utilizing Field-Oriented Control (FOC) to enhance motor performance, specifically in terms of torque and speed control. The results demonstrate that the NLC method significantly reduces THD in the TCHB MLI, and its symmetrical configuration allows for a reduction in electronic components, leading to improved reliability and cost savings. Future research should concentrate on experimentally validating the proposed system

AIM OF WORK. The key objectives of this research endeavor encompass:

- Implementation of the NLC method within three-phase symmetrical TCHB MLIs to mitigate THD.
- Evaluation of the NLC method's effectiveness from inverter output by analyzing THD.
- Design and validation of a TCHB MLI fed PMSM employing FOC for enhanced torque and speed control.

Table 1 Simulation Parameters Used for the System Design

	Parameter	Value
TCHB MLI	$V_{dc1}, V_{dc2}, V_{dc3}$	350V
	Switching frequency	4 kHz
	Reference frequency	50 Hz
	Number of poles: P	3
PMSM	Rated Speed: N_s	2300 rpm
	Stator resistance: R_s	0.0918 Ω
	d-axis and q-axis inductance: L_d, L_q	0.975 mH
	Rated torque: T	41.4 Nm
	Magnet flux linkage: ψ_f	0.1688 Wb

METHODOLOGY. The three-phase TCHB MLI topology with IGBT loss calculation have been done and the NLC technique has been elaborated for the adopted topology. Also, a simplified Matlab/Simulink based TCHB MLI fed PMSM motor drive was presented using field-oriented control technique. The 13-level TCHB inverter fed PMSM system simulation models were tested with dynamic speed and torque conditions for performance analysis of the system, also THD was analyzed to confirm the effectiveness of the proposed TCHB MLI based FOC control system in closed-loop condition. Table 1 shows the simulation parameter used in the system design. By adding three cascaded TCHB cell, the 13-level output is

formed as in equation 1.

$$v_{inv} = v_1 + v_2 + v_3 \quad (1)$$

The nearest voltage level can be obtained by:

$$v_{inv} = 0.5v_{dc} * \text{round}_{0.5} \left\{ \frac{v^*}{0.5v_{dc}} \right\} \quad (2)$$

RESULTS AND DISCUSSION. It can be seen from figure 1, that a current THD of 4.77% is achieved using NLC modulation technique for the proposed three-phase TCHB MLI, which is relatively low. It confirms the effectiveness of the NLC technique in reducing harmonic content and enhancing the performance of the TCHB MLI fed PMSM drive system.

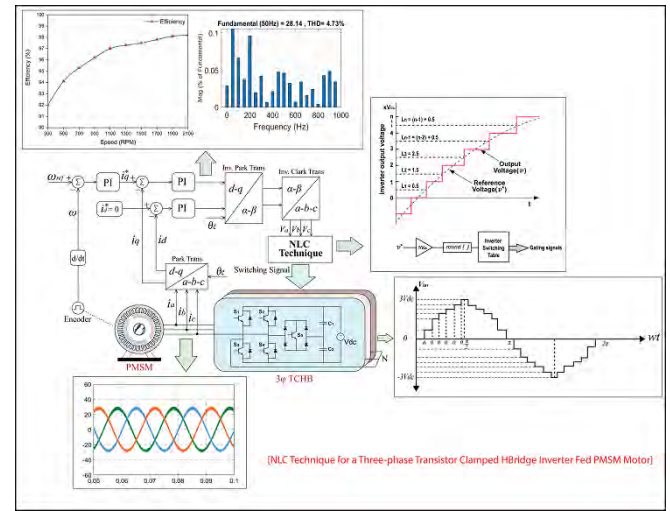


Figure 1 Illustration of three-phase TCHB MLI fed PMSM motor control using NLC technique

CONCLUSION. This research highlights the effectiveness of the NLC technique in a three-phase TCHB multilevel inverter for PMSM motor drives. The NLC method significantly reduces THD to around 4.73% and lowers switching losses, enhancing overall system efficiency and power quality. Simulation results show that the TCHB inverter with NLC handles dynamic speed and torque variations smoothly, maintaining consistent performance with minimal oscillations. The FOC ensures precise control with reduced torque ripples. Further research should be conducted on experimentally validating the system and exploring advanced control strategies.

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Model Predictive Control (MPC) for Enhanced AC Motor Drive Dynamic Response

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Keywords: MPC, Motor Drive, Cost Function.

INTRODUCTION. Induction motors (IM) have been a vital part of industrial machinery for decades, thanks to their durability, efficiency, and cost-effectiveness. However, controlling these motors, particularly when varying their speed, poses significant challenges due to their complex, nonlinear behavior and constantly changing parameters. Over time, advancements in power electronics and digital control have led to the rise of Model Predictive Control (MPC) as a leading method for optimizing motor performance. MPC, especially when applied to speed and torque control in IMs, has greatly improved the precision and efficiency of motor control systems.

This study seeks to enhance the control of 3-phase induction motors by developing a new approach called cascade MPC (CMPC), which focuses on speed and current control. The aim is to simplify the control process while maintaining or improving the motor's performance. To achieve this, we will conduct both simulations and experimental validations to ensure the CMPC performs reliably in various conditions. Additionally, a detailed comparison will be made between the CMPC and conventional MPC, assessing their performance in terms of speed, torque, and current control.

A key innovation in this research is the simplification of the MPC algorithm by excluding the speed variable (ω_m), making the control process more straightforward. This approach is expected to reduce computational complexity while still delivering precise and responsive motor control. The novelty of this research lies in its potential to offer a more efficient and practical MPC framework, which could be particularly beneficial for industrial applications that demand reliable and precise motor control.

AIM OF WORK. The main purpose of the this research is:

- Develop a Simplified Control Strategy:

Create a cascade Model Predictive Control (CMPC) method for a 3-phase induction motor drive that simplifies the existing MPC algorithms by neglecting the effect of motor speed (ω_m), reducing computational complexity while maintaining control accuracy.

- Ensure Robust Performance Across Platforms:

Validate the performance of the newly designed CMPC through both simulation and experimental setups, ensuring that the control strategy performs consistently in real-world applications.

- Enhance Control Precision and Efficiency:

Evaluate the effectiveness of the CMPC in managing speed, torque, and current, and compare it with conventional MPC methods, highlighting improvements in control precision, response time, and overall efficiency.

- Benchmark Against Established Control Techniques:

Conduct a comprehensive comparison between the proposed CMPC and traditional control methods such as Field Oriented Control (FOC) and Direct Torque Control (DTC), demonstrating the advantages and potential applications of the new approach.

METHODOLOGY. This research is aimed to design a Cascaded Model Predictive Control (CMPC) with appropriate

weighting factor tuning method in realization of experimental setup using dSPACE DS 1104 controller. The work undertaken in this project is divided into three main phases as follows:

- The first phase of the project:

focused on the literature review which includes IM model, DTC, FOC, conventional MPC, torque MPC, current MPC, current regulators, cost function design, weighting factor selection, problem identification and research gap. [RO1]

- The second phase of the project:

The second phase of the project is focusing on the proposed cascade torque and current MPC control for 3-phase induction motor drive. [RO1,RO2]

- The third phase of the project:

This phase covers the hardware circuits designed and construction. The developing parts involve in the selection of components /devices and fabricate components to produce best output performance. [RO2,RO3]

Using this 2 cost function:

$$i_{k+1} = \left(1 - \frac{R \cdot T_s}{L}\right) i_k + \frac{T_s}{L} V_k \quad (1)$$

$$i_{k+1} = \left(1 + \frac{T_s \cdot kb}{ka}\right) \cdot i_{means} + \frac{T_s}{ka} \cdot ((-j\omega_m L_m + kc) \cdot \Psi_r + L_r \cdot V_{o1})$$

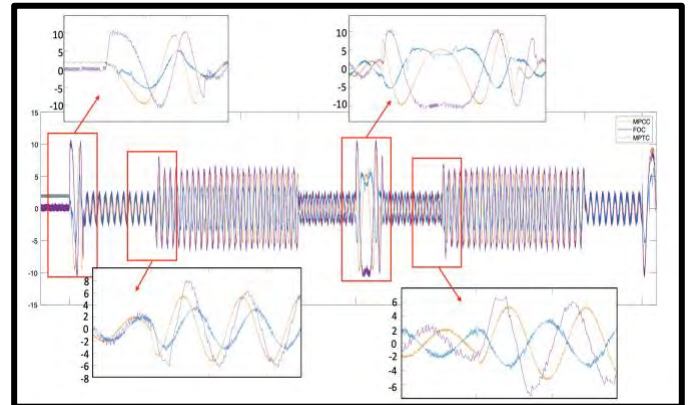


Figure 1 Result

CONCLUSION. The proposed Cascaded MPC can be applied to high performance induction motor drive to replace the common methods of the FOC and DTC by maintaining it superior performance. With the development of MPC which reduce the drive complexity by reduce the current and speed loops. It can be applied to the existing drive system to achieve a fast dynamic and steady state responses. As well as the proposed MPC can be applied to other drive application such as in electric vehicle application, traction system, General Electric appliances and high performance industrial machines.

INVESTIGATION OF TREEING AND TRACKING ON THE SURFACE OF CERAMIC INSULATOR UNDER CLEAN AND DIRTY GROUNDING CONDITION

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INTRODUCTION

The formation of contamination on the surface of insulator especially in salty environment may lead to treeing and tracking process and cause breakdown in high voltage system. Typically, the electrical breakdown may cause single line to ground fault due to formation a treeing and tracking into a ground or equipment (negative to positive or vice versa). However, the criteria of treeing and tracking propagation channels and the frequency behavior is not well understood. Therefore, the issue aforementioned above has motivated one to explore the occurrence of initial mechanism of treeing and tracking on the surface of insulator. The main aim of this research study is to investigate the electrical breakdown characteristics of treeing and tracking during the initial stage, formation of channels and the final stage that produce sparks voltage on the surface of insulators 33kV.

AIM OF WORK.

The main purpose of the Research Seminar is:

- To observe and measure the channel progress of electrical treeing and tracking on the surface of ceramic insulator using the combination of electric field and high speed photographic camera. [RO1]
- To identify the initiation progress of treeing and tracking in developing channel that can leads to puncture voltage based on cleand and dirty grounding condition [RO2]
- To characterize the initiation progress of treeing and tracking by considering submicro-structure of the waveform recorded using high speed transient recorder (LeCroy HDO4024). [RO3]

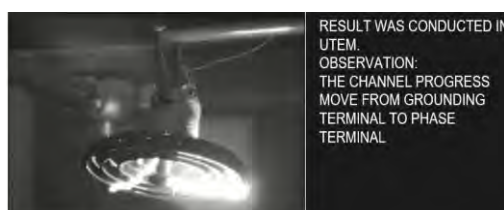
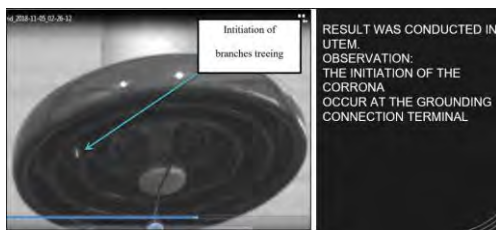
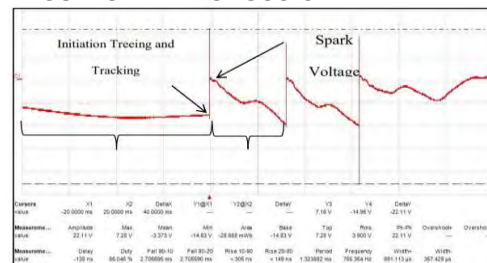


Table 2 Research Assessments vs PLO

Research Planning																
List major activities involved. Indicate duration of each activity to the related month(s)																
	2023										2024					
Project activities	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
Briefing on Research Objective																
Meeting with supervisor																
Study project background																
Search and get the information																
Update Research Progress to Supervisor																
Prepare for Research Proposal Defense																
Update Research Progress																

The rated voltage of the disc insulator use is 36kV as the nominal voltage for the type of the insulator used is 33kV. Since the rated voltage much larger than nominal voltage, the suitable rated voltage for withstand voltage in one minute is been identified and being set up in the proper withstand voltage is 36kV. Means, the ionization process could not occurred when there is no spark voltage profile presence during the testing.

RESULTS AND DISCUSSION.



Effect of Corrosion Factors and Metal Passivator on Sulphur Corrosion of Transformer Insulating Oil

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Keywords: Factorial Design; Mineral Insulating Oil, Surface resistivity

INTRODUCTION. Higher dielectric losses result from dissolved copper in the oil, although copper that deposited on paper insulation remarkably enhance the conductivity of the insulation part. However, there is a lack of thorough studies aimed at methodically examining the influential of corrosion correlated aspects on copper dissolution in insulating oils and copper deposited onto surfaces of the insulation, such as Kraft paper [1]-[3]. Moreover, the purpose of this work is to explore how factors of corrosion affect the amount of copper sulfide compound that deposits on paper insulation while it is immersed in transformer mineral oil (TMO). To investigate the impacts of four significant factors: (i) oil temperature, (ii) elemental sulphur concentration, (iii) testing period, and (iv) BTA concentration, used a two-level factorial design experiment. The findings derived from the two-level factorial design prove that the oil temperature has the greatest impact on the surface resistivity.

AIM OF WORK. The purpose of this study is to assess the efficacy of BTA (as a metal passivator) in reducing sulphur corrosion on the surface resistivity of insulating paper immersed in corrosive TMO utilizing a two-level factorial design. A two-level factorial design was used to efficiently generate a design of the investigation and assess the effects of the elements. ANOVA was used to create a response model. Following that, an equation was developed to predict the surface resistivity on the paper insulation immersed in a TMO-S8 combination, with correlations to corrosion parameters such as oil temperature, elemental sulphur concentration, testing period, and BTA concentration.

METHODOLOGY. This study used a 0.2 μm nylon membrane to filter transformer mineral oil (TMO) before bubbling it with nitrogen. The modified oil was added with elemental sulphur (S8) in particular amounts, following a test protocol that changed the oil temperature, elemental sulphur concentration, and testing period. The sulphur was properly weighed to obtain concentrations of 5 ppm, then dissolved in the oil while stirring at 119 °C and 230 rpm.

The two-level factorial design was utilized to measure the surface resistivity of all 13 samples. The ASTM D257 standard was adhered to when the measurements were taken using a portable resistivity meter (Model used: 272A, Monroe Electronics Inc.) [4]. Screening these factors was facilitated by a two-level factorial design matrix, which led to a total of 21 test trials. Following the surface resistivity experiments that were conducted in accordance with this design array, the effects of the factors were assessed using ANOVA.

RESULTS AND DISCUSSION. The table contains list of effects derived from the two-level factorial design is presented in Table 1, while the half-normal probability plot is illustrated in Figure 1. According to the examination of Figure 1, Factor A (oil temperature) deviates significantly from the straight line. For each model term, Table 3 offers information regarding the value of sum of squares (SS) and percentage of contributions. Factor A is the most significant factor, contributing 63.68% from a percentage perspective.

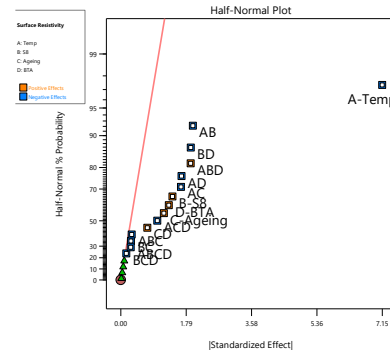


Figure 1 Half-normal probability plot

Table 1: Effect list of ANOVA

Factor Model	Standardised effects	Sum of squares (SS)	Percentage contributions (%)
A	-7.1513	204.5600	63.68
B	1.4163	8.0231	2.50
C	1.1813	5.5814	1.74
D	1.3163	6.9301	2.16

CONCLUSION. An important benefit of this design is its capacity to accurately identify important elements, therefore reducing the number of necessary test runs. The analysis demonstrates that the oil temperature has the greatest impact on surface resistivity, accounting for 63.68% of the observed variation. In addition, a regression model was obtained that effectively predicts surface resistivity using variables such as oil temperature, elemental sulphur concentration, and aging duration. This model exhibit a high coefficient of determination ($R^2 = 0.9913$) and the p-value (0.0023) highlight the model's strong capacity to explain 99.13% of the variability in surface resistivity.

ACKNOWLEDGEMENTS. The authors acknowledge the financial support provided by the Ministry of Higher Education Malaysia and Universiti Teknikal Malaysia Melaka (UTeM) under the Fundamental Research Grant Scheme (grant no.: FRGS/1/2022/TK07/UTEM/02/11).

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Condition Assessment of Medium Voltage Gas Insulated Ring Main Unit Using Health Index Based on Malaysia Utility Practices

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Keywords: Health Index, Condition Assessment, Gas Insulated Ring Main Unit

INTRODUCTION. The formulation of the Health Index (HI) to assess the state of the gas-insulated Ring Main Unit (RMU) is presented in this study. A total of 250 condition monitoring records for an 11 kV distribution RMU, with ages ranging from 1 to 27 years, from Malaysia utility operator were examined. The scoring, weighting, and ranking techniques served as the foundation for the development of the HI algorithm. Alongside the HI, the risk factor was also introduced. It is applied to enhance the RMU's final HI estimation accuracy adopted from previous study [1]. Using condition-based monitoring (CBM) data the ranking, weighting, and score for each parameter were determined. It was discovered that the HI approach could be utilized to assess the condition of RMU using the condition monitoring data. The results were then utilized to create a maintenance plan and optimize cost management. The maintenance trend moving from time-based maintenance to condition-based maintenance with non-intrusive assessment method introduced [2] to avoid high maintenance cost.

AIM OF WORK. The main purpose of the research is:

- To identify the criteria, weightage and score of Ring Main Unit (RMU) parameters based on condition monitoring population data.
- To formulate the Health Index (HI) algorithm based on condition monitoring data for Ring Main Unit (RMU) condition assessment.
- To investigate the effectiveness of Health Index (HI) in assessing condition of Ring Main Unit (RMU) using statistical technique.

METHODOLOGY. The RMU's condition is assessed using the weighting and scoring system. Each weight denotes the relative relevance of a component that goes towards the failure's underlying cause. The level of performance in respect to each defined attribute is reflected in the scoring. The outcome will be a single weighted score that will represent each component or compartment's overall performance. The methodology of HI development can be summarized in Figure 1 and final HI can be categorized as Table 1.

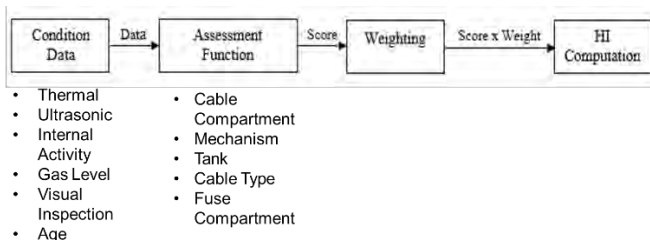


Figure 1: Principle of HI Development Process

Table 1: Range of FHI classification and suggested action.

%FHIRMU	Condition	Action	Colour
81-100	High	Extend Maintenance	Green
51-80	Medium	Normal Maintenance	Yellow

%FHIRMU	Condition	Action	Colour
0-50	Low	Immediate Repair	Red

RESULTS AND DISCUSSION. A total of 250 units RMU analyzed, and 44% are in good condition. From this finding can be suggested that 44% of RMU does not require maintenance and the maintenance schedule can be extended. Meanwhile, 50% falls in Medium HI level suggested normal maintenance cycle. The poor condition RMU is 6% and required immediate repairs or maintenance. From this analysis, an insight into maintenance planning can be established. Summary of the analysis in Figure 2.

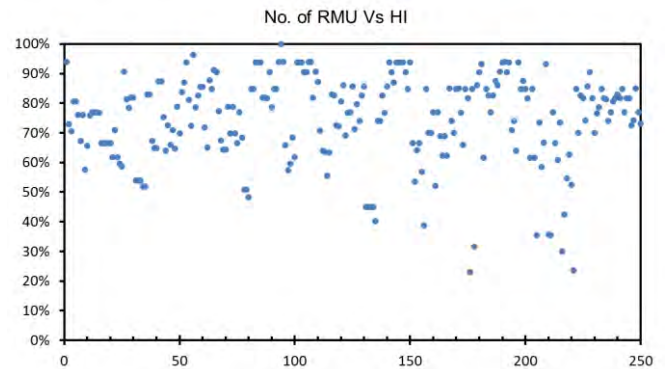


Figure 2: Total number of RMU with HI

CONCLUSION. A medium voltage Ring Main Unit health status evaluation tool has been developed. The RMU is divided into several evaluation categories, including general visual examination, fuse compartment, cable compartment, mechanism compartment, and tank compartment assessments. The risk component was integrated into the health index computation to produce the final RMU health index, which provides a holistic health index calculation. It has been established that the suggested strategy is effective based on the examination of the RMU condition. Knowing the RMU's health index allows for the implementation of efficient maintenance strategies and planning. The maintenance engineer can therefore make decisions more quickly and easily. In addition to offering an overview and insight condition of RMU in indexing form as an input for maintenance planning and repair operations while optimizing maintenance cost and resources, this HI approach provides a new condition assessment method for RMU in Malaysia Utility.

ACKNOWLEDGEMENTS. The authors wish to extend their thanks for the encouragement and financial assistance of Universiti Teknikal Malaysia Melaka (UTeM) and Ministry of Higher Education. Special thanks also to TNB Research for the technical support.

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Scrutinize and Stratified On the Features of Positive Cloud-to-Ground Flashes in Tropics

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Keywords: Positive Lightning; Cloud-to-ground flash; Monsoon

INTRODUCTION.

This research aims to study the rare occurrence of positive cloud-to-ground (+CG) lightning flashes in tropical regions, particularly in Malaysia, using five years of electric field data from 2015 to 2019. While negative CG flashes are common and well-studied, positive flashes, which account for only about 10% of all ground flashes, are less understood but significant due to their distinct formation and impact. Reports suggest that positive flashes in Malaysia might occur more frequently than the global average, motivating a detailed investigation to better understand their behavior and characteristics in this region.

AIM OF WORK. The main purpose of the research is:

- To perform quantitative analysis by presenting statistical information of overall features of ground flashes (positive and negative ground flashes) and cloud activities gathered from 4 years lightning measurement data by emphasizing positive ground flash under influence of seasonal.
- To characterize the significant parameters of positive return strokes electric field from five years recording data within 2 seconds of recording duration.
- To characterize the initiation process of preliminary breakdown and leader pulses in positive ground flash in Malacca, Malaysia
- To explore the relationship of positive ground flashes occurrence with monsoon season in Malacca, Malaysia

METHODOLOGY.

The experimental setup for this investigation measurement were adapted from [1] and was recorded at Universiti Teknikal Malaysia Melaka (UTeM), Malaysia (Latitude: 2°16'39.8586"N, Longitude: 102°16'30.72" E). Figure 1 shows the schematic diagram of electric field measurement. A parallel flat plate antenna was used to measure the fast electric field and slow electric field. The output signal was then connected to the computer and the waveforms was analyzed in detail by using Wavestudio software.

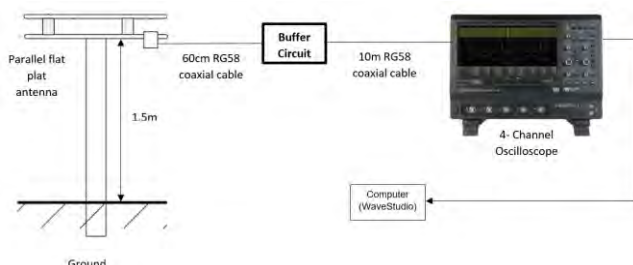


Figure 1 Schematic diagram of the electric field measurement

RESULTS AND DISCUSSION. Table 1 shows the percentage of +CG under the influence of monsoons seasons. It can be seen that the majority of the CG flash were dominated by -CG. +CG only contributed 0.9% of total CG.

Our result is consistent with [2] with a small percentage of +CG occurrence. Other researchers such as [3], however reported a larger +CG occurrence with 33.14% and 21.91% accordingly.

Table 1 Percentage of CG flashes due to monsoons

Monsoon	- CG	+CG
First Inter-monsoon (April)	17.4	0.0
Southwest (SW)	11.3	0.2
Second Inter-monsoon (October)	14.5	0.1
Northeast (NE)	55.9	0.5

Figure 2 shows the occurrence of positive CG under the influence of monsoon season in Malaysia. 61.7% of the +CG occurred during the NE monsoon. 23.3% of +CG were recorded during SW monsoon and 15% were recorded during second inter-monsoon (October). There is no +CG recorded during the first inter-monsoon (April).

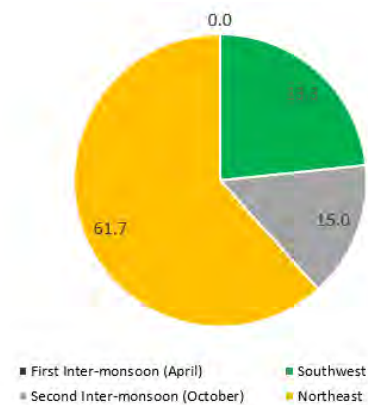


Figure 2 Percentage of +CG with monsoons

CONCLUSION. This study will present a comprehensive representation the statistical information of the whole flashes of positive cloud-to-ground flashes. This profile will also examine in term of the relationship with the climate changes such as the monsoon seasons in Malaysia.

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Permanent Magnet Generator for Hydro Power: A Systematic Review

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Keywords: Permanent Magnet Generator, Hydro Power Systematic Literature Review, Renewable Energy Technology Efficiency and Performance Optimization

INTRODUCTION. Hydropower technology continues to evolve, and one of the most promising innovations is the use of Permanent Magnet Generators (PMGs). PMGs offer several advantages over conventional generators, such as higher efficiency, lower maintenance, and the ability to operate at low speeds. Therefore, this study aims to provide a systematic review of the use of PMGs in hydropower. The Systematic Literature Review (SLR) method, following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. This study is expected to make a significant contribution to the existing literature by summarizing the latest developments in PMG technology for hydropower applications

METHODOLOGY. A systematic literature review is a protocol-driven approach that enables the identification of significant future research opportunities.

Identification. The systematic review process consists of three main phases used to select several relevant papers for this study. The first phase involves identifying keywords and searching for related terms using thesauruses, dictionaries, encyclopedias, and prior research. After gathering all relevant terms, search strings were created for the Scopus IEEE Explore and Mendeley databases. In the first phase of this systematic review process, our research successfully retrieved 617 papers from both databases.

Screening. In the initial screening phase, duplicate papers were removed, resulting in the exclusion of 5 articles..

Eligibility. For the third step, known as the eligibility phase, a total of 50 articles were prepared.. Finally, 20 articles were deemed suitable for further review (see Table 1)

Table 1. The selection criterion is searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time line	2014 – 2023	< 2014
Literature type	Journal (Article)	Conference, Book, Review
Publication Stage	Final	In Press

Data Extraction and Analysis. The primary goal of this study was to identify relevant topics and subtopics. The data collection phase was the initial step in the theme development process. Figure 1

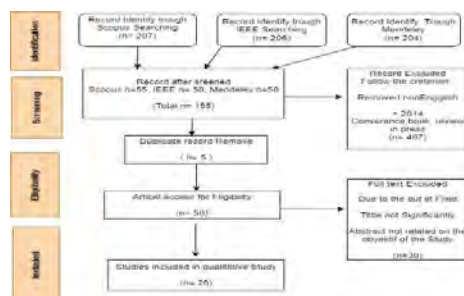


Figure 1. Flow diagram of the proposed searching study

RESULTS AND DISCUSSION. In this section, we present the results of the literature review based on the final selected references. This year distribution shows an increasing interest in research on PMGs for hydropower, especially in the last ten years.

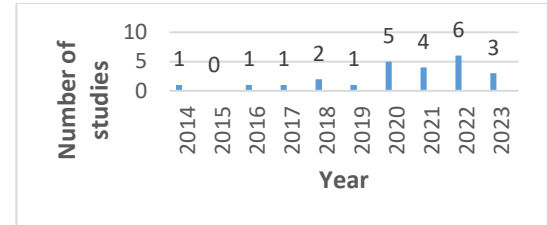


Figure 2. Year Distribution of Publications

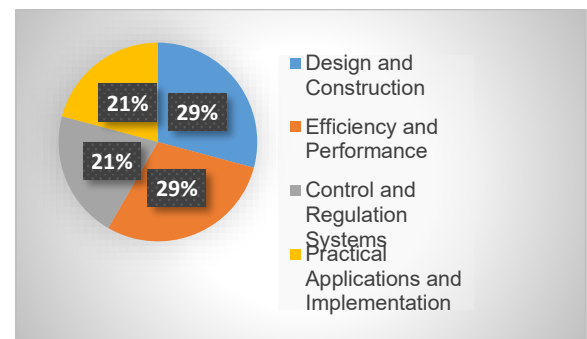


Figure 3. Type Study of article reviewed

CONCLUSION. The systematic literature review on permanent magnet generators (PMGs) for hydropower has revealed significant advancements and insights across several key areas: Design and construction, Efficiency and performance, Control systems, and practical implementation

ACKNOWLEDGEMENTS. The author would like to thank for Main and Co supervisors, my parents, my beloved wife and my beloved children as well as all parties who helped write this article.

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Research Seminar for the FTKE Postgraduate (PG) students 2024

Permanent Magnet Generator for Hydro Power: A Systematic Review

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Evaluating the relationship between energy demand and multiple economic variables in Malaysia using regression analysis

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Keywords: Economic variables; energy demand; regression

INTRODUCTION. The increasing dependence on energy today has accelerated global demand for it. However, increased consumption and demand growth have serious effects for the world's climate. The government of Malaysia has formulated long-term plans to ensure the energy sustainability is aligns with the global agenda and other developments. Among the initiatives is the introduction of the NEEAP [1], NEP [2] and NET[3]. Long-term energy demand is influenced by a variety of factors, as highlighted by multiple studies. Key determinants include socioeconomic variables [4][5], climatic conditions [6][7][8], technological advancements [4][7], GDP and population [9], macroeconomic [8] and economic complexity [10]. This study focuses on evaluating the relationship between energy demand and multiple economic variables. The historical data of Malaysia energy demand and multiple economic variables ranging from year 1980 to 2021 has been gathered via reliable resources. The data then statistically being analyzed using regression analysis. The results shows that urban population has the highest coefficient of determination (R^2) of 0.9838, followed by population (0.9785), CO₂ emissions (0.9475), manufacturing output (0.9453), life expectancy (0.9407), imports (0.9379), gross domestic product-GDP (0.9361) and exports (0.9205). The findings of this study will be utilized to choose the most accurate economic input variables in energy demand forecasting model.

AIM OF WORK. The main purpose of this study is to evaluate the strength of relationship between multiple predictors focusing on economic variables and energy demand using regression analysis. The aim of this process is to identify what are the economic variables that have a significant impact on, hence can be employed to forecast the energy demand accurately.

METHODOLOGY.

The study dataset was primarily derived from historical data. Data is collected from reliable websites. Data has been preprocessed and cleaned to remove missing values, outliers, and inconsistencies in the dataset. Linear regression and correlation are used to investigate the relationship and strength between two quantitative variables. The formula of simple linear regression is given by:

$$Y = mX + c \quad (1)$$

Where, Y: dependent variable, m: slope or regression coefficient and c: y-intercept. It represents the best-fitting straight line describing the relationship between the variables by minimizing squared differences between actual and predicted values. The coefficient of determination (R^2) shows how correlated one dependent and one independent variable are. The value should be between 0.0 and 1.0, where the closer to 0.0, the less associated the dependent value is. The closer to 1.0, the more associated the value is.

RESULTS AND DISCUSSION.

From a total of 83 datasets gathered, 32 were chosen and tested statistically using linear regression. Table 1 summarizes the findings for the top 8 variables with the highest R^2 value.

No.	Description	R^2 Value
1	Urban Population	0.9838
2	Population	0.9785
3	CO ₂ emissions	0.9475
4	Manufacturing Output	0.9453
5	Life Expectancy	0.9407
6	Imports	0.9379
7	GDP	0.9361
8	Exports	0.9205

Two issues have been identified in the dataset collection that have the potential to significantly impact energy demand. First, there is a scarceness of historical data for certain variables that may be gathered over an extended period. Second, the historical data for some of the variables obtained is incomplete, making it ineffective for analysis purposes.

CONCLUSION. Energy demand is influenced by a combination of various factors. The integration of these factors into forecasting models can enhance the accuracy and reliability of long-term energy demand predictions.

ACKNOWLEDGEMENTS. A sincere thanks to the supervisor and co-supervisor for their guidance in this research.

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Table 1: Regression analysis of data

Evaluation of The Correlation of Effective Variables With Energy Consumption

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Keywords: zero-emission; energy consumption; occupancy

INTRODUCTION. The higher educational institutes (HEI) are one of the key players in the global movement towards energy-efficient and zero-emission buildings when the buildings accounted for approximately 40% of total energy usage. HEI, as in the study by Pereira *et al.* [1] typically have a mix of building types, such as classrooms, laboratories, student's accommodations, and administrative offices, each with varying energy demands. The previous studies in [2-7], categorized the academic institution into few different spaces such as academic offices and administration. Due to the mixture of building types and different space usage and energy use in the universities, the benchmarking for universities' energy consumption is more challenging than the stand-alone commercial buildings [8] as the space usage in the university influences the energy consumption [9]. Therefore, one of the key challenges in energy efficiency in the higher education sector, is lack of correct indicators to evaluate and/or compare the various impacts, causes and consequences associated with inefficiency in energy use. To address this concern, this research aims to identify and evaluate the key variables that ensure a strong correlation ($R^2 \geq 0.75$) between these variables and energy consumption. A novel aspect of this study is its focus on occupancy profiles and behaviors, which often lead to significant discrepancies between predicted and actual energy use. To achieve this, a questionnaire was administered to occupants of higher education institutions, specifically targeting staff and students at Universiti Teknikal Malaysia Melaka (UTeM). Preliminary results indicate that Cooling Degree Days (CDD) show no significant correlation with energy consumption. In contrast, occupancy readiness demonstrates a strong correlation, with values reaching up to 0.9. These findings suggest that indicators with a high correlation to energy consumption are crucial for accurately representing energy efficiency.

AIM OF WORK. The main objectives of the research are:

- To identify variable(s) with close correlation that effectively influence the energy consumption
- To evaluate the correlation of the CDD and occupancy readiness with energy consumption using regression method

METHODOLOGY. In general, the methodology of the research can be divided as follows:

Stage 1: Develop a questionnaire on awareness and readiness towards Net Zero Energy Building (NZEB) and Net Zero Emission

Stage 2: Evaluate the correlation of the CDD and occupancy readiness towards energy consumption of UTeM using regression method. The equation of LR is given in Eq. (1)

$$Y = \beta_1 X_1 + \varepsilon \quad (1)$$

For data collection of energy consumptions and respondents, five target locations are selected; each represents one space usage as in Table 1:

Table 1: The five locations selected

Space	Location
Teaching	Fakulti Kejuruteraan Elektrik (FKE)
Accommodation	Satria

Common Space	Laman Hikmah
Sports Area	Pusat Sukan
Administration	Canselori & HEP

RESULTS AND DISCUSSION. From the pilot study, the occupancy readiness correlated from 112 respondents is tabled in Table 2. A strong correlation is exhibits for the occupancy readiness since all values of $R^2 > 0.75$.

Table 2: Correlation between occupancy readiness

Question	R^2
Lighting	
• Temporarily leaving the room	0.7739
• As a Last Person	0.7500
Electrical Appliances	0.9012
Blind Control	0.7075

Table 3 shows the summary of correlation for the five locations from January 2023 until June 2023. Due to extremely low values of R^2 , it proves CDD contributes to no correlation towards energy consumption.

Table 3: Summary of correlation for the five locations from January 2023 – June 2023

Loca- tion	R^2					
	Jan 23	Feb 23	Mar 23	Apr 23	May 23	June 23
FKE	0.015	0.015	0.039	0.002	0.027	0.010
Canselori	0.106	0.003	0.001	0.000	0.080	0.005
Satria	0.252	0.180	0.040	0.005	0.098	0.014
L.Hikmah	0.053	0.007	0.320	0.189	0.002	0.005
P.Sukan	0.027	0.024	0.186	0.006	0.114	0.058

CONCLUSION. The findings underscore the importance of identifying variables that strongly correlate with energy consumption to accurately model and predict the energy efficiency in educational institutions. The significant correlation shows between occupancy readiness and energy consumption, as opposed to the negligible relationship with Cooling Degree Days, highlights the critical role of occupant behavior in influencing energy use. These results suggest that models incorporating occupancy profiles are likely to yield more reliable predictions, thereby enhancing energy management strategies.

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Evaluation of The Correlation of Effective Variables With Energy Consumption

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The Impact of Processing Parameters and Filler Concentration on Silicone Rubber Insulating Material: Percentage of Weight Loss

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Keywords: Silicone Rubber; insulator; mixing time;

INTRODUCTION. Silicone rubber (SiR) has become an increasingly popular polymer for outdoor high-voltage (HV) insulators due to its favorable properties. However, outdoor insulators encounter various stresses, including environmental, electrical, and mechanical [1], raising concerns about its long-term durability. Prolonged exposure to electrical stress can lead to aging which may cause physical degradation and potential insulation failure. As a result, extensive research is ongoing to improve the resilience of SiR under these severe conditions.

One approach to enhance SiR's performance as an outdoor insulator is through its processing parameters. Previous studies in [2], [3] have documented the impact of mixing time on both the dielectric and mechanical properties. The importance of processing parameters becomes particularly evident when fillers are added to the polymer. Poor dispersion of fillers can lead to aggregation, which, depending on the quantity used, may increase the insulator's conductivity and result in insulation failure [4]. Therefore, enhancing the processing parameters of SiR is crucial to improve filler dispersion and, consequently, enhance the material's resilience as an outdoor high-voltage insulator.

AIM OF WORK. This study aims to analyze the impact of processing parameters, specifically mixing time, on the performance of SiR material, as measured by weight loss of samples following tracking and erosion tests. The study will also investigate the effect of varying filler concentrations on the samples performance. By observing weight loss in samples with different filler contents and mixing time, this research seeks to determine how these parameters influence SiR's performance against tracking an erosion as HV insulator under the Incline Plane Tracking (IPT) tests.

METHODOLOGY. The SiR samples were blended with varying concentrations of Alumina Trihydrate (ATH) filler, using different processing parameters. The filler concentrations selected were 10, 30, and 50 parts per hundred rubber (pphr), while the mixing times were 5 and 10 minutes, respectively. The blended samples were then cured using a hot press machine at 170°C and 50 bar for 10 minutes.

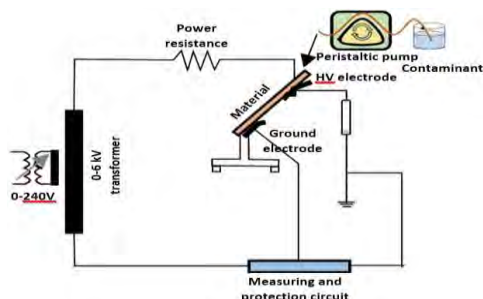


Figure 1 The IPT test set-up.

After curing, the samples were post-cured in a forced-air oven for 12 hours at 130°C. In total, 19 samples were prepared for testing. The set-up for test is shown in Figure 1. The samples were then tested for 6 hours at 3.5 kV. The weights of the samples before and after testing were recorded to determine the weight loss experienced by each sample.

RESULTS AND DISCUSSION. The percentage weight loss data for all samples was input into the Design Expert Software, where the interaction between filler concentration and mixing time was analyzed. The resulting 3D graph, illustrating the interaction between these variables and their effect on weight loss percentages, is shown in Figure 2. By focusing on the highest filler concentration of 50 pphr, it is evident that as mixing time decreases, weight loss increases. This suggests that at this concentration, a longer mixing time is necessary for proper filler dispersion, which enhances the samples' resistance to tracking and erosion.

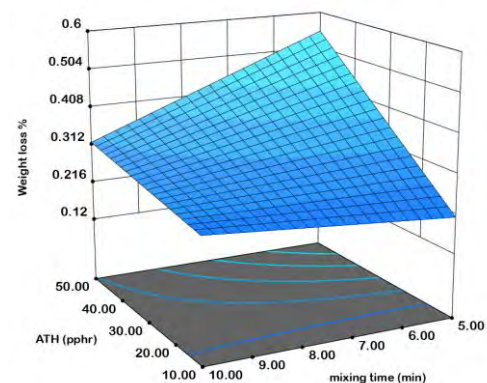


Figure 2 The percentage of weight loss of SiR sample.

CONCLUSION. It can be concluded that at higher filler concentrations, the effect of mixing time becomes more pronounced. At 50 pphr, an increase in mixing time is followed by a decrease in weight loss percentages, indicating better dispersion of the filler within the SiR matrix. This improved dispersion contributes to the lower weight loss of the samples during the tracking and erosion test.

ACKNOWLEDGEMENTS. The author wishes to extend gratitude to UTeM for the support in this research.

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Total Acid Number as an Indicator in Evaluating Aged Mineral Oil-Synthetic Ester Retrofilled Oil

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Keywords: Power transformer; retrofilling; total acid number

INTRODUCTION. A suitable insulation liquid for power transformers should possess excellent dielectric strength and heat transfer capabilities, low viscosity, resist oxidation and thermal degradation. It should also be economically efficient, readily accessible, and provide a long operational lifespan [1]. Mineral oil (MO), which satisfies these requirements, serves as the primary dielectric fluid for power transformers. Nonetheless, recent environmental policies have raised concerns regarding aspects such as biodegradability, non-toxicity, fire safety, recyclability, and disposal [2]. Mineral oil exhibits low degree of biodegradation, has low moisture tolerance, is derived from non-renewable resources, and possesses high flammability.

Recently, ester oil (EO) has been identified as an alternative insulating liquid, offering solutions to these challenges. Ester oil offers higher flash and fire points, a greater moisture saturation limit, good thermal stability, and meets environmental standards. These benefits make ester oil an attractive alternative for retrofilling existing transformers, replacing existing mineral oil [3]. In this process, it is necessary to drain the aged oil from the transformer tank and replace it with new oil. Nonetheless, a small portion of the original liquid may persist in the inaccessible areas of the transformer even after the draining process has taken place. Previous research has shown that, there is approximately 10 % of the original oil remains in the transformer tank [4]. Eventually, this residual oil will mix with the new oil, thereby impacting the dielectric properties of the fresh insulating oil.

AIM OF WORK. In view of the above perspectives, this paper aim to assess the performance of new synthetic ester (SE) oil mixed with different concentration of age mineral oil (AMO) after the retrofilling process. This area of research has not been extensively investigated, thus highlighting the importance of assessing the retrofilled oil prior to its utilization in industrial applications. In particular, this paper will concentrate on the evaluation of retrofilled oil performance using the Total Acid Number (TAN).

METHODOLOGY. The new MO and SE oil samples were initially filtered and purged with nitrogen in order to remove contaminants and excess moisture, respectively. Subsequently, the MO was thermally aged in a vacuum oven at 130 °C for 150 hours, while the SE oil was remained as a fresh and new oil. During the retrofilling process, the fresh SE oil was heated to 60 °C to reduce the viscosity of oil. The AMO and SE oils were mixed in the following ratios: 3:97 (3% AMO, 97% SE); 5:95 (5% AMO, 95% SE); 7:93 (7% AMO, 93% SE); and 9:91 (9% AMO, 91% SE). The aged mineral oil-synthetic ester retrofilled oil (AMO/SE) sample was then allowed to rest for 24 hours before testing. This process helps to disperse air bubbles and fully impregnate the insulation papers before testing.

The acid content in the AMO/SE retrofilled oil samples was assessed by measuring the TAN through coulometric titration, in accordance with ASTM D664, using the Metrohm 848 Titrino plus [5].

RESULTS AND DISCUSSION. Table 1 presents the initial value of TAN for fresh SE and AMO samples. The TAN value of the fresh SE oil was observed increased after mixed with

AMO, as shown in Figure 1. The increase is attributed to the oxidation during the thermal aging of MO, which produces degradation by-products like carboxylic acids in the AMO. These acids dissolve in the AMO, raising the acidity of the fresh SE oil at all mixing ratios. In Figure 1, it is also notable that decreasing the AMO content in fresh SE oil led to an increase in TAN values. Firstly, the significant increase in TAN value for the 3:97 AMO/SE retrofilled oil is believed due to the higher concentration of SE oil which is made from a polar functional group called the carbonyl group. This situation gives the molecule more acidic. Secondly, the greater TAN value observed in the 3:97 AMO/SE retrofilled oil, compared to the 5:95, 7:93, and 9:91 AMO/SE ratios, is linked to its greater water content. This greater water content is attributed to the hydrolysis reaction of the ester oil and the equilibrium partitioning of water between the cellulose paper and the oil, both contributing to a rise in oil acidity.

Table 1: Initial TAN value of oil samples

Sample Type	TAN value (mgKOH/g)
Fresh SE	0.017
AMO	0.035

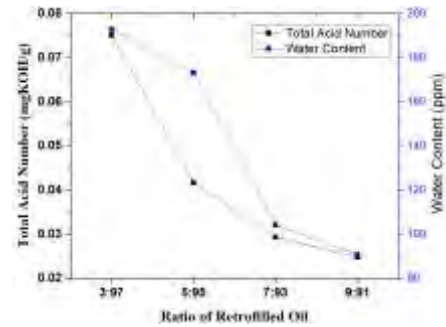


Figure 1 TAN value of AMO/SE retrofilled oil

CONCLUSION. A higher TAN value in the AMO/SE retrofilled oil with a larger concentration of fresh SE is attributed to the increased net acidity, as well as the combination effects of oxidation and hydrolysis reactions.

ACKNOWLEDGEMENTS. The authors would like to thank UTeM and the Ministry of Higher Education, Malaysia, for supporting the Fundamental Research Grant Scheme (FRGS/1/2020/FKE-CERIA/F00415).

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Comparative Analysis of Statistical Distribution Models for Energy Optimization in Wind Turbine Systems Using

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Keywords: Wind Speed Distributions, Wind Energy Assessment, Statistical Modeling

INTRODUCTION

The optimization of wind energy systems remains a critical area of research due to the growing global demand for sustainable and renewable energy sources. Recent studies underscore the significant potential of wind energy, particularly in regions like Indonesia, where wind energy potential is estimated at approximately 61 GW [1]. Despite this, the actual installed capacity remains substantially low, highlighting the challenges associated with geographic dispersion and fluctuating wind conditions, which hinder effective energy production [2].

To optimize wind energy output, a thorough understanding of wind speed characteristics and their distribution is crucial. Wind speed not only varies geographically but also temporally, influencing the energy generation potential of wind turbines. Accurate modeling of wind speed distributions, such as the Weibull and Rayleigh models, is essential for predicting energy output and optimizing turbine performance [3], [4].

This study aims to provide a comparative analysis of various wind speed distributions and their impact on energy optimization for wind turbine systems in Indonesia, focusing on data from a one-year period to develop a wind characteristic map for enhanced turbine configuration and energy productivity.

AIM OF WORK

The primary objective of this study is to determine the most suitable wind speed distribution model for optimizing energy production in wind turbine systems. The specific aims are:

1. To analyze wind speed variations over a one-year period to develop a comprehensive wind characteristic map.
2. To evaluate the effectiveness of different statistical distributions (Weibull, Rayleigh, Lognormal, Gamma, and Gumbel) in modeling wind speed data.
3. To assess the impact of these distributions on the energy output of wind turbines, particularly in fluctuating wind conditions common in Indonesia.

METHODOLOGY

Data Collection: Wind speed data were collected from multiple locations across Indonesia over a one-year period using high-resolution anemometers. This data was used to capture detailed variations in wind speed and direction [5].

1. **Data Preprocessing:** Collected data underwent preprocessing, including outlier removal and normalization, to ensure data integrity. Descriptive statistics such as mean, standard deviation, and quartiles were calculated to summarize the wind speed data [6].
2. **Distribution Fitting:** The study fitted multiple wind speed distributions—Weibull, Rayleigh, Lognormal, Gamma, and Gumbel—to the preprocessed data. Parameters for

each distribution were estimated using Maximum Likelihood Estimation (MLE), and the goodness-of-fit was evaluated using Kolmogorov-Smirnov (KS) tests, Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC) [7], [8].

3. **Comparative Analysis:** Energy outputs were simulated for different turbine configurations, adjusting blade lengths and tower heights under each wind speed distribution. Optimization techniques such as Particle Swarm Optimization (PSO) were employed to find the most efficient configurations for maximum energy production [9].
4. **Validation:** The accuracy of the wind speed models was validated using Quantile-Quantile (Q-Q) and Probability-Probability (P-P) plots, confirming the suitability of the chosen distributions for the observed wind speed data [10].

RESULTS AND DISCUSSION

The results indicated significant variability in wind speed across different regions and seasons in Indonesia. The Weibull and Rayleigh distributions provided the best fit for the wind speed data, with the Weibull model slightly outperforming according to AIC and BIC values. These findings are consistent with recent research that highlights the Weibull distribution's effectiveness in diverse climatic conditions [3], [4].

Simulations of energy output showed that optimizing turbine configurations based on Weibull distribution parameters yielded higher energy production, particularly in regions with more consistent high wind speeds. Taller turbines with longer blades were found to be more effective in these conditions, confirming the importance of site-specific turbine optimization [9].

The Rayleigh distribution also proved useful, particularly in areas with lower average wind speeds. This suggests a dual strategy for turbine deployment in Indonesia: using Weibull-based optimization in high-wind areas and Rayleigh-based models in lower-wind regions to maximize overall energy output [7].

CONCLUSION

This study underscores the importance of selecting appropriate wind speed distribution models for optimizing energy output in wind turbine systems. The findings suggest that while the Weibull distribution generally provides the best fit for Indonesian wind speed data, the Rayleigh distribution can also be effective under certain conditions. By optimizing turbine configurations to match local wind characteristics, energy productivity can be significantly enhanced, supporting the broader adoption of wind energy in Indonesia's energy mix.

Future research should consider integrating real-time data with machine learning models to refine these optimizations

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further. Additionally, exploring the integration of wind energy with other renewable sources could offer insights into developing a more resilient energy infrastructure.

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Optimizing M&V with Deep Learning: A Study on Feature Selection

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Keywords: Deep Learning; Measurement & Verification (M&V); Energy Efficiency

INTRODUCTION. Research into predicting building energy usage typically chooses features based on their availability, which can complicate data collection. Meteorological and time-related parameters are frequently used features for energy forecasting, crucial for forecasting energy usage patterns [1,2]. This study extends this approach by applying Deep Learning techniques in industrial energy Measurement and Verification (M&V), examining the impact of feature selection on model performance. The study identifies effective feature selection methods from twelve techniques, based on metrics like Training Time, RMSE, and MAE. LASSO regression, identified as the most effective, is then used as input for a classic one-layer Deep Neural Network (DNN). The findings validate that careful feature selection indeed ensures precise verification of energy savings, thereby improving M&V efficiency and supporting a shift in M&V practices to align with the evolving demands of modern industrial energy management.

AIM OF WORK. The main purpose of the research is:

- To address deficiencies in industrial building energy M&V through the use of deep learning techniques.
- To test the effectiveness of a shortened four-month dataset in providing reliable energy verification, challenging the conventional extended M&V data collection periods.

METHODOLOGY. This section details the various datasets and methodologies employed in the research. Figure 1 provides a schematic overview of the study's framework. It covers the key phases involved: gathering data, segmenting data, preprocessing, selecting features, analyzing correlations, developing models, and evaluating models:

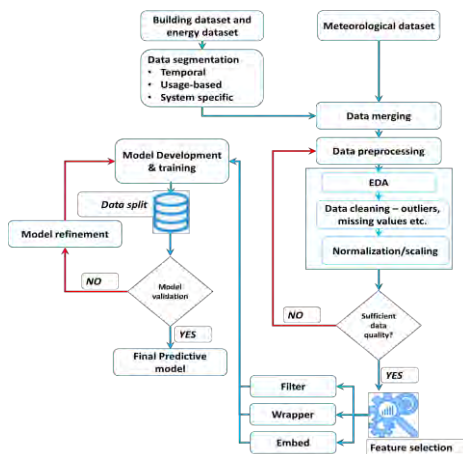


Figure 1 Overview of research structure

Performance metrics are used to evaluate the accuracy of models developed from pre-ECM data, which were tested against a dataset. Key metrics for this assessment include CVMSE, NMBE, MSE, MAE, and R-squared.

RESULTS AND DISCUSSION. This study performs a dependability assessment to study the impact of feature selection on energy consumption in M&V. Twelve feature selection methods were evaluated, with the best features

determined by 8 performance metrics from a classic DNN's single hidden layer, as illustrated in Figure 2.

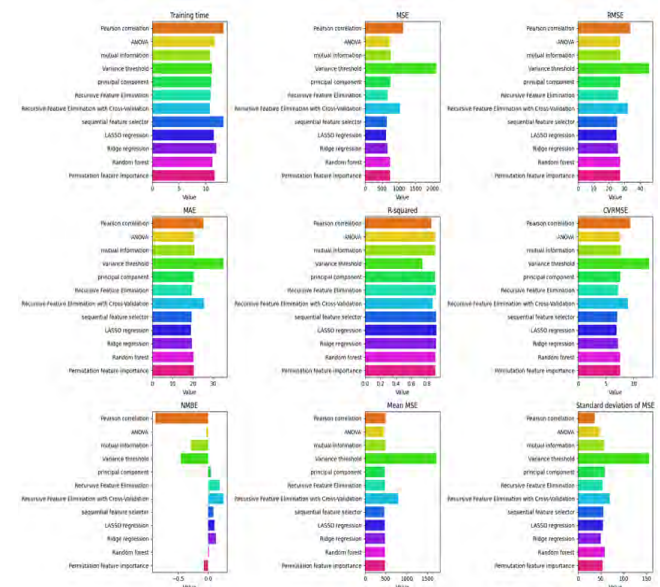


Figure 2 Evaluation of Performance Metrics for Feature Selection Methods

The bars in each subplot signify various feature selection methods, with their lengths reflecting the values of performance metrics. LASSO Regression stands out by excelling in MSE and R-squared metrics while requiring lower training times. In contrast, Variance Threshold demonstrates the highest MSE and the lowest R-squared, suggesting suboptimal performance. Both Sequential Feature Selector and Recursive Feature Elimination show a good balance among MSE, R-squared, and training time. Going forward, these leading methods will serve as inputs for a DNN. LASSO is identified as the superior method for deep learning in industrial energy Measurement and Verification (M&V), surpassing others like SFS and RFE.

CONCLUSION. This research demonstrates the effective application of deep learning techniques to industrial energy M&V, highlighting the benefits of using a shortened four-month dataset for rapid and accurate energy savings verification. LASSO regression, in particular, excelled among twelve tested feature selection methods, optimizing both MSE and R-squared metrics while reducing training time. These findings support a shift towards shorter data collection periods and enhanced feature selection, promoting more dynamic and efficient M&V practices. This study not only advances the field of energy M&V but also underscores the potential for integrating deep learning into sustainable industrial energy management.

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RISK EVALUATION AND FRAMEWORK IN MALAYSIAN ENERGY PERFORMANCE CONTRACTING (EPC) PROJECTS

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Keywords: Energy performance contracting; risk in EPC projects; framework in EPC project

INTRODUCTION. Energy Service Companies (ESCO) provide EPC, a service agreement, to Energy Users (EU) to improve Energy Efficiency (EE) [1]. EPC projects are widely acknowledged as among the most efficient global strategies for improving EE [2]. However, EPC projects are plagued by numerous uncertainties, which increase project risk [3]. The various risk factors and categories can affect the overall energy-saving performance of EPC projects and thus draw research interest [3].

AIM OF WORK. The main purpose of the Research Seminar is:

- to explore the existing project issues in identifying risk factors and categories in EPC projects
- to improve the M&V Protocol for quantifying energy savings associated with investment risks using the Monte Carlo method in EPC projects
- to develop the risk framework for effective risk mitigation strategies in EPC projects.

METHODOLOGY. The above objectives have been accomplished by using research methods for data collection, such as semi-structured interviews, case studies and focus group discussions. The data analysis method will use qualitative data analysis using content analysis, thematic analysis and ATLAS.ti software. For quantitative data analysis will use regression analysis and Monte Carlo Simulation. Findings from the literature review synthesised to formulate a conceptual framework for the risk framework in Malaysian EPC projects. Some experts and practitioners will validate the risk framework in the field of EPC in Malaysia.

RESULTS AND DISCUSSION. As a result, better techniques and viewpoints for risk identification and evaluation as well as risk framework in EPC projects, such as assessing the risks from a dynamic system perspective and improving the M&V Protocol. Table 1 shows 6 risk categories and 24 risk factors, which were obtained from 21 people who were interviewed. Figures 1a and 1b show the probability of getting Net Present Value (NPV) and Internal Rate of Return (IRR) from Monte Carlo Simulation. Figure 2 shows the risk framework that has been developed in EPC projects.

Table 1 Risk category and factor

Risk Category	Risk Factor
Behavioral and Operational	Difficult staff management and ineffective staff
	Inadequate operation & maintenance
	Lack of involvement in Energy Management Systems
	Lack of qualified professionals
M&V	Organizational and occupant behavior
	High cost of Energy and M&V Audit
	Inaccuracy M&V design
	Lack of competence in M&V and saving evaluation skills
	Poor data quality
Technological	Lack of competence in new technology
	Poor equipment performance

Contract	Unavailable technology
	Contract duration
	Contract parameters
	No participant of the building owner in contract development
Regulatory and Policy	Difficulty of procurement and finance process
	Insufficient incentive policies
	Lack of standardisation and guidelines
	Weak legislation
Financial and Investment	Financing difficulties
	Insufficient investment
	Lack of financial
	Lack of skills and expertise in financing

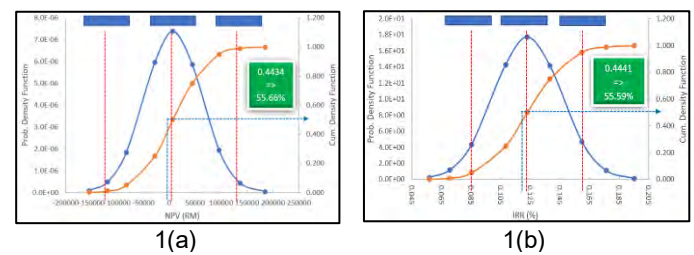


Figure 1a NPV and 1b IRR

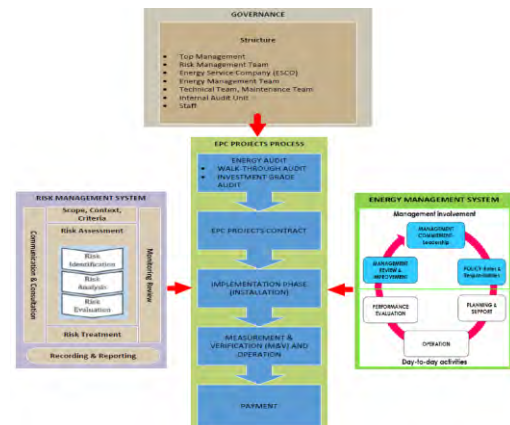


Figure 2 Risk Framework in EPC Projects

CONCLUSION. This research identified and categorized critical risk factors, improved the accuracy of energy savings quantification and investment risk assessment, leading to more reliable decision-makers and a robust risk framework developed in EPC projects.

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Impact of PV Penetration on Grid Transition in Sarawak's Remote Villages

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Keywords—grid transition, rural electrification, off-grid solar systems

INTRODUCTION

In recent years, rural electrification in Malaysia, particularly in Sarawak, has undergone significant transformation. Off-grid solar solutions have been deployed to extend electricity access to rural communities in the most remote areas [1]. While these systems have achieved notable achievements, off-grid solar systems are still considered a temporary electrification solution for providing 24-hour electricity to rural villages [2]. The local power utility prefers grid lines as the long-term solution due to the high maintenance costs associated with solar battery systems. As the grid continues to expand, it will eventually reach areas currently served by off-grid solar systems. Consequently, these off-grid solar systems could be left unconnected to the grid. However, since these off-grid solar systems are situated near the customers, there is potential to enhance network voltage profiles and reduce network losses. This paper explores the shift from off-grid solar systems to grid-connected systems, providing a comprehensive analysis of the technical impacts when integrating PV systems into two different levels of distribution networks (33kV and 11kV) in terms of voltage profiles and network losses.

AIM OF WORK

This research aims to provide a detailed analysis of voltage profiles and active power impacts on 33kV and 11kV distribution networks with and without PV.

METHODOLOGY

This paper models and simulates the integration of off-grid solar PV systems into 33kV and 11kV networks in Sarawak using DIgSILENT Powerfactory software. The study examines the integration of off-grid solar systems into 33kV and 11kV networks through two case studies.

Case I: Rural Area A, with a 33kV network, transitioned 105kWp of solar capacity from off-grid solar systems to the grid, representing low PV penetration.

Case II: Rural Area B, with a 11kV network, models the integration of 771.8 kWp of solar PV capacity, presenting high PV penetration. The study also considers upgrading this network to 33kV to handle increased PV capacity.

Actual load profiles of existing off-grid solar under energy-limited conditions are used as the base load (1.43 kWh). Future loads are represented as 3 times (4.28 kWh) and 6 times (8.55 kWh) the base load.

RESULTS AND DISCUSSION

In Case I, the voltage levels in the 33kV network remain relatively stable across the distance with the PV integration. However, in Case II, there is a noticeable increase in 11kV grid across various load scenarios. The high PV penetration causes significant voltage variations, exceeding the acceptable limits in the 11kV network. Further analysis of upgrading the 11kV network to 33kV shows that this upgrade results have addressed the issues observed in the 11kV.

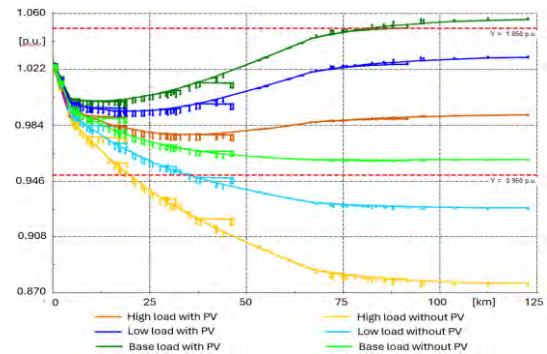


Figure 1: Rural Area B's voltage along feeder in 11kV (Case II)

Case II with high PV penetration shows substantial reduction in energy losses compared to Case I shows a greater overall reduction. Higher energy losses occur at the 11kV network. In energy losses due to its higher PV penetration compared to Case I.

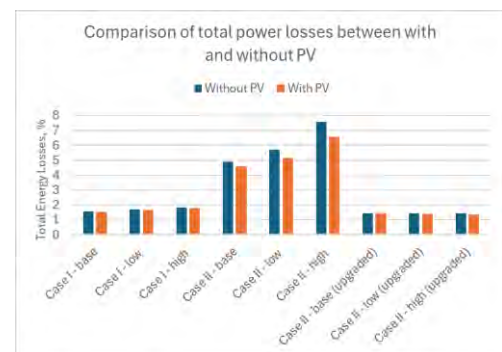


Figure 2: Total Power Losses Comparison between Case I and Case II.

CONCLUSION

PV integration can cause voltage raise, especially in 11kV networks, necessitating careful management to avoid regulatory breaches. In contrast, 33kV networks experience minimal impact from PV, even at high PV penetration levels. Additionally, integrating higher PV capacity into the grid can contribute to a greater reduction in energy loss.

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Evaluating Efficacy Performance of Lamp Technologies for Enhanced Street Lighting Applications

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Keywords: efficacy; uniformity; LED

INTRODUCTION.

The efficacy performance of lamp technologies is a critical factor in the design and implementation of efficient street lighting systems. This study focuses on evaluating the performance of Bukit Rambai street lighting installation. The ME3 (Table 1) street lighting classification for urban roads with moderate traffic is referred to as a guideline. The ME3 standard [1] define the specific requirements which is overall uniformity (μ_o), longitudinal uniformity (μ_L), and luminance (cd/m^2), making it suitable for streets that require a reliable yet cost-effective lighting solution [2]. Analyzing key parameters such as pole distance and pole height length is the objective of this project. Proper selection of parameters plays a pivotal role in ensuring energy efficiency and optimal illumination levels.

Table 1 Lighting Classes

Class	L_{av} (cd/m^2)	μ_o	μ_L
ME3	≥ 1.0	≥ 0.4	≥ 0.6

AIM OF WORK.

The main purpose of the research work is:

- To evaluate the aspect of road types and their street lighting needs.
- To verify the design complies with ME3 street lighting standard.

METHODOLOGY.

To measure the luminance-based quality criteria, a rectangular grid of the relevant area is defined. There are usually three transversal points and a minimum of ten longitudinal points per traffic lane (3X10 point)/lane), i.e. typically 60 points for two lanes as Figure 1. The distance of transversal point (d) and distance of longitudinal points (D) is estimated in Eqn.1 and Eqn. 2.

$$d = \frac{\text{road width } (W)}{3} \quad (1)$$

$$D = \frac{\text{pole distance } (S)}{10} \quad (2)$$

RESULTS AND DISCUSSION.

Figures 2 and 3 presents the simulation measurement results using the DiALux tools approach. By increasing the height and distance of poles, the overall uniformity (μ_o), longitudinal uniformity (μ_L), and luminance (cd/m^2) is also increased.

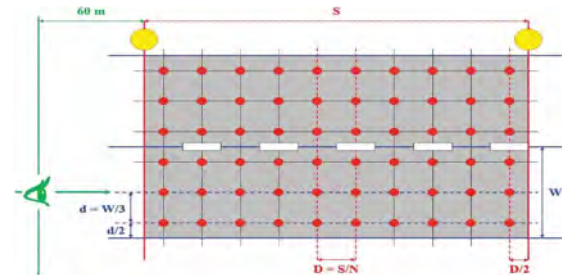


Figure 1



Figure 2

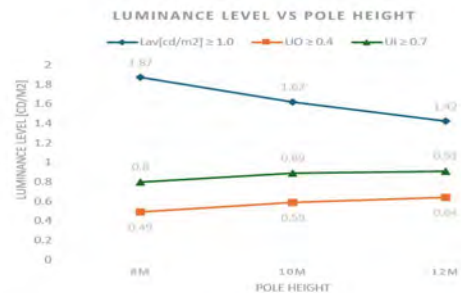


Figure 3

CONCLUSION.

In conclusion, the findings demonstrate that increasing pole height and pole-to-pole distance leads to a decrease in average luminance (L_{av}) levels. However, higher pole heights generally enhance uniformity (μ_o and μ_L) while still meeting or exceeding the specified requirements for ME3 standard.

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Optimizing Economic and Emission Dispatch through Hybrid Optimization Algorithms

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Keywords: Optimization; Economic Load Dispatch; Artificial Bee Colony

INTRODUCTION. The rising global fuel prices have significantly increased the cost of electricity generation, leading governments to implement measures that alleviate the financial burden on consumers. In Malaysia, the government has allocated RM1.935 million in electricity subsidies for consumers in Peninsular Malaysia for the January to June 2024 period [1]. This subsidy is crucial in mitigating the impact of fuel price hikes, particularly for lower-income households, ensuring that electricity remains accessible. However, the financial strain on both citizens and the government highlights the urgent need for efficient energy management strategies. This research focuses on developing and applying hybrid optimization algorithms to address the complex challenge of economic and emission dispatch. A new hybrid algorithm, termed the Bee Eel Forage Algorithm (BEFA) [2], is introduced to enhance the optimization process. By combining the strengths of the Artificial Bee Colony (ABC) and Electric Eel Foraging Optimization (EEFO) algorithms, BEFA addresses common limitations such as premature convergence and local optima. The proposed methodology optimizes the allocation of load among generating units to minimise both the overall generation cost and environmental impact.

AIM OF WORK. The main purpose of this work is to develop and evaluate a new hybrid algorithm called the Bee Eel Forage Algorithm (BEFA) to optimize the economic and emission load dispatch problem in the IEEE 26 bus system.

METHODOLOGY. The Bee Eel Forage Algorithm (BEFA) is a new optimization method that uses the employed bee phase and scout bee phase from the Artificial Bee Colony (ABC) and resting phase from the Electric Eel Foraging Optimization (EEFO) algorithms. As a swarm-based approach, BEFA employs a population of solutions to explore the solution space. Initially, initial solutions are randomly generated within the defined bound. Next, the BEFA algorithm iteratively cycles through these phases, updating solutions and tracking the best solution found so far. It terminates when a predefined maximum number of iterations is reached. Figure 1 shows the flow chart of the BEFA algorithm.

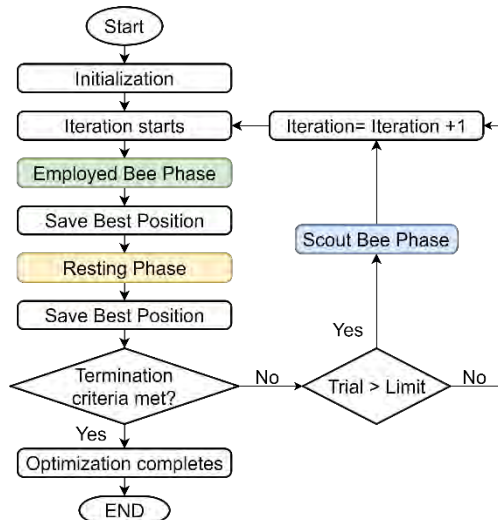


Figure 1 Flow chart of Bee Eel Forage Algorithm

This work focuses on economic and emission dispatch. To demonstrate the algorithm's effectiveness, it is applied to the IEEE 26-bus system. This system represents a power system with essential components like generators, loads, and transmission lines. The IEEE 26-bus system includes five generating units located at buses 2, 3, 4, 5, and 26. The BEFA algorithm determines the optimal power generation of these units while meeting the system's total demand of 1263 MW and adhering to system constraints. The economic dispatch function is represented by equation (1) in dollars/hour, and the emission dispatch function is represented by equation (2) in tons/hour.

$$TC(P_G) = \sum_{i=1}^{N_G} a_i P_{Gi}^2 + b_i P_{Gi} + c_i \quad (1)$$

$$EM(P_G) = \sum_{i=1}^{N_G} 10^{-2} \times (\gamma_i P_{Gi}^2 + \beta_i P_{Gi} + \alpha_i) + \varepsilon_i e^{\lambda_i P_{Gi}} \quad (2)$$

RESULTS AND DISCUSSION. The results obtained by the BEFA algorithm for economic and emission dispatch are presented in Table 1. These results are compared to those of the original ABC and EEFO algorithms. BEFA consistently achieves the lowest average minimum costs and emissions for optimal power generation across 30 independent runs. The lowest standard deviations of BEFA indicate its superior consistency compared to the other algorithms.

Table 1 Results for Economic and Emission Dispatch

Algorithm	Cost (dollars/h)			
	Mean	SD	Min (Best)	Max (Worst)
BEFA	15446.7426	0.0009	15446.7407	15446.7440
ABC	15446.7731	0.1342	15446.7405	15447.4801
EEFO	15446.7656	0.0314	15446.7405	15446.8631

Algorithm	Emission (ton/h)			
	Mean	SD	Min(Best)	Max(Worst)
BEFA	15870.4102	1.8738	15869.7846	15879.1349
ABC	15896.0948	115.3020	15869.7846	16482.1614
EEFO	15884.2172	15.3147	15870.5705	15935.7405

CONCLUSION. The study successfully demonstrates the efficacy of the Bee Eel Forage Algorithm (BEFA) in optimizing economic and emission dispatch for the IEEE 26-bus system. By hybridizing the strengths of the ABC and EEFO algorithms, BEFA effectively addresses the challenges of economic and environmental sustainability in power generation.

ACKNOWLEDGEMENTS. This research is financially funded by the Ministry of Higher Education of Malaysia under project number FRGS/1/2022/TK07/UTEM/02/63.

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Classification of Brain Stroke based on Susceptibility-Weighted Imaging (SWI) using Machine Learning

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Keywords: Magnetic Resonance Imaging (MRI), time-consuming and Susceptibility Weighted Imaging (SWI)

INTRODUCTION.

Magnetic Resonance Imaging (MRI) plays a crucial role in the diagnosis of brain disorders, with stroke being a significant category among them. Recent studies have shown that patient's life will be safe if they received treatment within six hours of a stroke. However, the conventional manual diagnosis of brain stroke by neuroradiologists is subjective and time-consuming. Hence, the previous studies have shown lack of accuracy and time. To address this issue, the research presents analysis of brain stroke based on MRI images according to pre and post stroke patient. This research mainly focuses on Susceptibility Weighted Imaging (SWI) sequences. Moreover, there are five processes in this system, those are pre-processing, segmentation, feature extraction, classification, and performance analysis. Firstly, pre-processing which includes three techniques, those are image normalization, background removal and image enhancement. Then, the suggested techniques that used in segmentation process were adaptive threshold, fuzzy c-means, and marker-controlled watershed. Based on the Jaccard Index, Dice Coefficient, FPR, and FNR, which show over- and under-segmentation errors and the execution processing time of the algorithms, the performance comparisons of the methods have been evaluated.

AIM OF WORK. The main purpose of the Research Seminar is:

- To analyse pre and post brain stroke patient according to Susceptibility Weighted Imaging (SWI) images based on clinical data.
- To segment the brain stroke based on Susceptibility Weighted Imaging (SWI) magnetic resonance imaging (MRI) images using machine learning.
- To classify the brain stroke based on Susceptibility Weighted Imaging (SWI) MRI images using machine learning techniques.
- To verify the performance of the brain stroke classification and location of lesion area on MRI images based on accuracy, sensitivity and specificity.

METHODOLOGY.

This chapter presents five process to analyze brain stroke using magnetic resonance imaging (MRI) images, those are pre-processing, segmentation, feature extraction, classification and performance analysis. The neuroradiologist labels and verifies the brain stroke class according to its category.

RESULTS AND DISCUSSION.

In the training phase, careful consideration of numerous parameters and reasoned analysis of various experimental outcomes are crucial. Sensitivity and precision serve as common metrics for assessing multiclassification model performance. Sensitivity, also known as recall or probability of detection, measures the percentage of true positives correctly identified by the model, indicating its ability to detect genuine occurrences, such as brain stroke cases in our context. In machine learning, model performance is evaluated using training and testing loss measures during their respective phases.

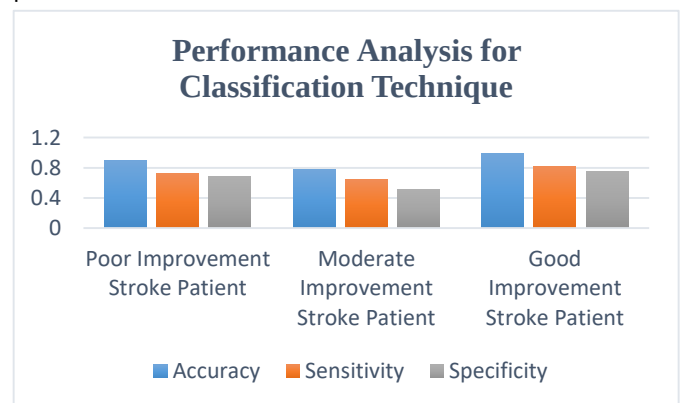


Figure 1 Caption of illustration

CONCLUSION. In conclusion, the proposed brain stroke segmentation and classification technique demonstrates promising potential for brain stroke diagnosis, offering an efficient and automated tool to assist medical professionals in timely and accurate assessments. Overall, this automated technique can be concluded as applicable for neuroradiologists to use as a competent pre-assessment, efficient clinical workflow, avoid bias, and assist in clinical decision-making, allowing for more personalized treatment plans for ischemic stroke patients. In the nutshell, the analysis of brain stroke based on brain MRI using machine learning holds immense promise for revolutionizing stroke care and improving patient outcomes. By leveraging advanced computational techniques, we can usher in a new era of precision medicine that empowers clinicians with the tools and insights needed to combat this debilitating condition effectively.

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Stroke Diagnosis System Using Machine Learning Technique Based on Magnetic Resonance Imaging Images

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Keywords: Stroke; Computer-Aided Diagnosis; Diffusion-Weighted Imaging

INTRODUCTION. Stroke is the third leading cause of death in Malaysia, with 47,928 fatalities recorded in 2019. Timely and accurate diagnosis is critical, yet only 21% of patients receive treatment within three hours of symptom onset [1]. The reliance on manual diagnosis, coupled with a shortage of specialists, leads to delays and inaccuracies in stroke detection. Existing imaging technologies also struggle to reliably detect and delineate stroke lesions [2]. This study aims to overcome these challenges by developing a Computer-Aided Diagnosis (CAD) system using Diffusion-Weighted Imaging (DWI) sequences.

AIM OF WORK. The main purposes of this research are:

- To analyze the brain Diffusion-weighted magnetic resonance imaging (DWI-MRI) images of stroke lesions to aid ischemic and hemorrhagic stroke early treatment decision making.
- To develop stroke diagnosis system to aid ischemic and hemorrhagic early stroke treatment decision making.
- To evaluate the performance of the segmentation and classification techniques in terms of accuracy, sensitivity and the specificity of the severity scoring classification for early stroke diagnosis treatment.

METHODOLOGY. The study utilized Diffusion-Weighted Imaging (DWI) sequences, with images preprocessed through enhancement and normalization techniques to improve quality. Segmentation was conducted using the Fuzzy C-Means Active Contours (FCMAC) method to delineate regions of interest. Subsequently, image classification was performed using K-Nearest Neighbors (KNN), Support Vector Machines (SVM), Convolutional Neural Networks (CNN), and Bilayered Neural Networks. The KNN classifier was integrated into a MATLAB App Designer graphical user interface (GUI) to facilitate real-time diagnostic analysis.

RESULTS AND DISCUSSION. The FCMAC method achieved a Dice coefficient of 0.654, precision of 0.849, and recall of 0.706, demonstrating effective segmentation. Among classifiers, KNN performed best with 96.1% accuracy, 98.2% precision, 77.8% recall, and an F1-score of 82.4%. The KNN integration into the GUI enhances usability, enabling seamless image processing and robust diagnostic support.

Table 1 presents the segmentation technique employed with past project [3, 4, 5]

Segmentation Method	Dice Coefficient	Precision	Recall
FCMAC – proposed study	0.654	0.849	0.706
Modified 3D UNet [3]	0.58	0.68	0.60
CNN-based decoder with residual encoder [4]	0.662	0.694	0.664
Optimization-based K means clustering [5]	0.709	0.904	0.636

Table 2 presents the classification technique employed in this study

Classification Method	Precision	Recall	F1-Score	Accuracy
Support Vector Machines (SVM)	0.922	0.657	0.635	0.922
K-Nearest Neighbor (KNN)	0.982	0.778	0.824	0.961
CNN	0.852	0.571	0.850	0.865
Bilayered NN	0.958	0.768	0.806	0.941

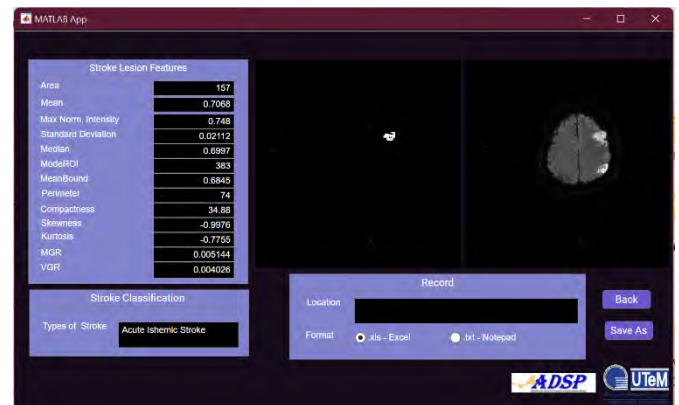


Figure 1 MATLAB App Designer GUI for real-time analysis and diagnostic support

CONCLUSION. This study introduces a precise CAD system for stroke diagnosis, improving clinical decision-making. Future work will enhance real-time algorithms, broaden validation, and integrate additional imaging modalities.

ACKNOWLEDGEMENTS. We acknowledge the support of FTKE and UTeM for their contributions to this research.

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Sensory optical side-coupling on Different scattering areas with ZnO Nanorods-coated glass substrate

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Keywords: Zinc oxide; side coupling; optical sensor

INTRODUCTION. Sensor platforms with nanomaterial have improved optical sensors [1]. The glass substrate has recently garnered significant attention from researchers due to its stability, low cost, and straightforward fabrication and manufacturing process. The intensity of light transmitted from a solitary light source positioned at one side of the glass substrate is relatively ineffective, resulting in a substantially reduced overall coupled power [1]. Accordingly, to address this issue, the technique of optical side coupling will ultimately be utilized on the surface of the glass substrates that have been coated.

Zinc oxide nanorods were deposited on the glass substrate to achieve this. The sensor is tested with various concentrations RI solutions. Most performance parameters were met by the 0.022m² sample. This novel technique greatly enhances the output coupling voltage, as demonstrated across different areas of the glass substrate. Therefore, the suggested method is crucial in expanding the potential for investigating superior, practical, and dependable optical sensing devices in various industrial applications.

ANALYTICAL THEORY. Figure 1 illustrates the suggested sensing mechanism for the various concentrations of refractive index (RI) solution. The following equation (1) contains the mathematical formula that describes the decrease in light intensity that occurs as a result of the amount of sensing mediums that is represented.

$$\alpha = \frac{-\ln\left(\frac{I}{I_0}\right)}{L} \quad (1)$$

Numerical analysis of sensing response across different refractive index (RI) levels will use the sensing performance factor (γ). Equation (2) demonstrates the sensor performance factor (γ) expression:

$$\gamma = \frac{T_{max}}{T_{min}} = e^{L(\alpha_{min} - \alpha_{max})} \quad (2)$$

METHODOLOGY. ZnO nanorods as coating material. This will develop on glass substrates using hydrothermal synthesis [2]. The synthesis involves glass substrate preparation, seeding, and growth. For ultrasonic cleaning, ordinary microscope glass substrates were placed in soapy water for 15 minutes. After discarding the soapy water, another 15 minutes of cleaning with DI water. The glass substrates were immersed in acetone [CH₃COCH₃] in a water bath for 15 minutes to eliminate organic material. Placed samples in a 90°C vacuum oven for 1 hr.

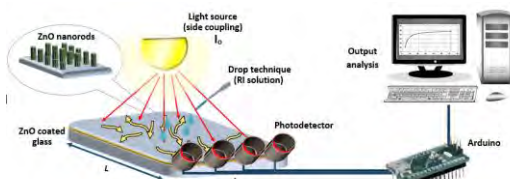


Figure 1 Sensing mechanism of experiment setup

The hydrothermal growth of ZnO nanorods has been extensively studied [2]. 0.0132g of zinc acetate [Zn(O₂CCH₃)₂·2H₂O] will be diluted in 60 ml of pure ethanol [C₂H₅OH] (HmbG Chemical, Germany) to start the seeding procedure. Stir the mixture continually at 60°C. To alkalise the solvent, 0.0003g sodium hydroxide were added. Dissolving 1.4875g of zinc nitrate hexahydrate [Zn(NO₃)₂·6H₂O] (Sigma-Aldrich) and 0.7 g of HMT [(CH₂)₆N₄] in 500 mL of DI water created a 10 mM aqueous ZnO growth solution. The seeded glass substrates are immersed in the growth fluid and heated to 90°C in an oven. The solution must be replaced every 5 hours to maintain nanorod formation for 12hr.

RESULTS AND DISCUSSION. The results in figure 2 were tested using various concentration of refractive index (RI) solutions and demonstrated a high level of linearity at 97.5% and a sensitivity of 0.0125V/%. After analyzed the experimental data, it became noticeable that the sample with an area of 0.022m² produced the most favourable results in terms of reducing backscattering while also improving the responses in general.

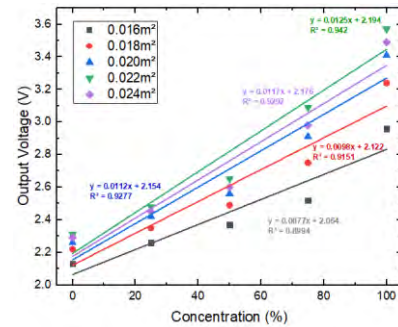


Figure 2 Trendline of every samples

CONCLUSION. Light side coupling onto ZnO-coated glass substrates for sensing was successfully demonstrated in these studies. The suggested sensor showed that the 0.022m² sample performed effectively in most areas. Thus, the recommended method is essential for studying superior, practical, and reliable optical sensing applications.

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Title: Design and Kinematic Analysis of a Wearable Hand Exoskeleton for Rehabilitation

Abstract

Hand therapy is vital for restoring motor function, yet traditional rehabilitation approaches often fall short due to their reliance on manual operations, which lack the necessary repeatability and intensity for effective therapeutic training. To address these limitations, robot-assisted rehabilitation has been explored, but designing a hand exoskeleton remains a complex challenge due to the hand's intricate structure and high degree of freedom. This study aims to develop a wearable hand exoskeleton tailored to individual anthropometric measurements using SolidWorks integrated with Simscape Multibody and MATLAB software. A forward kinematics-based mathematical model is created to accurately determine the position and orientation of the hand by using joint angles as input variables. These models are simulated to replicate four standard rehabilitation hand movements—mass flexion, extension, opposition, and cylindrical grip—to evaluate their dynamic behavior and effectiveness in a rehabilitation setting. Both models are further analyzed and compared for singularity through a series of advanced mathematical evaluations, including Jacobian determinant/near singular point analysis, rank analysis, condition number analysis, and velocity and acceleration assessments for each finger via MATLAB software. These analyses provide critical insights into the kinematic performance and limitations of the models, offering guidance for further refinement. The results demonstrate that the hand exoskeleton can deliver precise and repeatable movements, making it a viable tool for enhancing rehabilitation therapy and improving patient outcomes.

Investigation of Multimodal Sensor Fusion for Enhanced Continuous Hand Movement Prediction in Exoskeletons

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Keywords: Electromyogram (EMG); Multimodal Sensor Fusion; Ensemble Learning

INTRODUCTION. Hand exoskeletons are important assistive devices used to help the user, especially the post-stroke patient, regain their hand strength and dexterity. These devices help in rehabilitation by offering the needed control and support during hand movements which are fundamental in enabling the patients undergo different tasks that enhance their quality of life. Accurate motion prediction of hand movements is important to control the exoskeleton systems. Hand exoskeletons have been chosen as a potential solution in the case for grasping and manipulation [1], [2], [3]. However, the biomechanics of the hand and wrist movements are quite complex for developing control strategies for the decoding of motion intentions from sEMG signals [2]. This study focuses on the integration of forearm Electromyography (EMG) signals and hand grip forces to enhance motion prediction accuracy through multimodal sensor fusion, addressing the limitations of using single-modal data alone. The objectives of the research are to establish the relationship between EMG signals, hand grip forces, and wrist positions based on EMG-mechanical sensor fusion; to investigate the effectiveness of this fusion method for continuous motion prediction; and to validate the performance of multimodal sensor fusion in terms of accuracy in grasping estimation and motion prediction. The methodology includes data acquisition data from both EMG and mechanical sensors at two conditions, static and dynamic, and followed by using the machine learning techniques, specifically Artificial Neural Networks (ANN) and Support Vector Machines (SVM), with ensemble learning of majority voting. The results show that the motion prediction using the proposed EMG-mechanical sensor fusion improves significantly than the single modality. Multimodal sensor fusion provides a stable and more efficient to enhance the control of exoskeletons, thus leading to more responsive to the assistive devices.

AIM OF WORK. The objectives of this research are:

- To establish the relationship between forearm MEG signals, hand grip forces and wrist positions based on the EMG-mechanical sensor fusions.
- To study the EMG-mechanical sensor fusion method for continuous motion predictions.
- To validate the multimodal sensor fusions performance in terms of grasping estimation and motion prediction accuracies.

METHODOLOGY. This research data was collected using EMG sensors and hand dynamometer. In data acquisition, subjects went a series of hand grips and wrist positions whereby the sensors recorded EMG and force data at sampling rate of 2000 Hz. Time-domain features, RMS and MAV were used to extract the EMG signals and mechanical data. These features were then utilized in three different modalities: EMG only, mechanical force only, and both EMG and mechanical data. Then, the extracted data that were obtained from each of the modality was used to train two models, ANN and SVM. These models were integrated using majority voting so that the effectiveness of the prediction was enhanced. The models were evaluated using accuracy, precision, recall, and F1-score to compare the performance of

the sensor fusion approach in predicting continuous hand movements.

RESULTS AND DISCUSSION.

The results of this research were analyzed by comparing the predictive accuracy of different sensor modalities. Table 1 indicates that the ANN model performs better with multimodal input (EMG + Force), achieving a high prediction accuracy of (73.7789%), compared to using EMG (0.2570%) or force (26.4781%) alone. The SVM model also has an added advantage of using multimodal input with an accuracy of 31.8966%, while using force alone yields (26.7352 %) and using EMG (15.5172%). The majority voting gives an accuracy of 42.6735%, which indicates that the results obtained using both models provide a balanced performance, even as it is not able to perform better than ANN model but higher than the accuracy of the SVM model when using the combined EMG and force modalities.

Table 1 Modalities and the accuracy of ANN and SVM predictions

Algorithm	Modality	Prediction Accuracy	Prediction Accuracy with Majority Vote
Artificial Neural Network (ANN)	EMG	0.2570 %	42.6735 %
	Force	26.4781 %	
	EMG + Force	73.7789 %	
Support Vector Machine (SVM)	EMG	15.5172 %	42.6735 %
	Force	26.7352 %	
	EMG + Force	31.8966 %	

CONCLUSION. The integration of the EMG signals and mechanical force with majority voting does not significantly improve prediction accuracy compared using each of the modality. Thus, multimodal sensor fusion needs further improvement. In future work, it is planned to add sensors, such as IMUs, for more accurate hand movement predictions.

ACKNOWLEDGEMENTS. We acknowledge to the Fundamental Research Grant Scheme, Ministry of Education Malaysia, and UTeM for their sponsorship of the research.

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Gradient Descent Algorithm Single Input Fuzzy Logic (GDA-SIFLC) controller testing analysis for depth control of Remotely Operated Vehicle (ROV)

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Keywords: Remotely Operated Vehicle (ROV); Single Input Fuzzy Logic (SIFLC); Gradient Descent Algorithm (GDA); Depth Control.

INTRODUCTION. The application of underwater ROV is critical in doing underwater monitoring, surveying, and rescue [1]. Other task being done by ROV is underwater welding where maintaining depth is essential. Concurrent task handling maintaining depth and manipulating manipulator make it difficult for ROV operator [2]. Underwater environments that uncertainty also promote even more difficulties [3]. An underwater ROV that equipped with auto depth controller is needed to facilitate the job. GDA-SIFLC controller is introduce to control depth of ROV.

SYSTEM IDENTIFICATION (SI) MODELLING. SI modelling needs experimental data of input and output. The relationship between input and output is compute into transfer function. By using MATLAB toolbox, the model transfer function is generated.

EXPERIMENTAL SETUP. Arduino Mega 2560 is paired with motor driver L298N to give signal to prototype ROV. Sensor MPX4250 was used to measure depth. The step input given was 57cm while the multiple stairs input given were 57cm and 40cm.

GRADIENT DESCENT ALGORITHM SINGLE INPUT Fuzzy Logic Controller (GDA-SIFLC). SIFLC simplified the FLC from 2 input to 1 input using sign distance method (SDM). Figure 1 shows the block diagram of SIFLC.

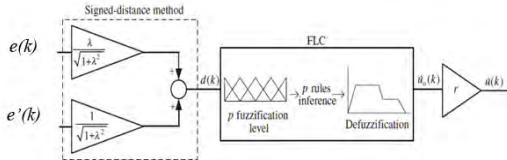


Figure 1: SIFLC block diagram.

The error and differential error of the system was combined into d using equation 1.

$$d = \left(e(k) \times \frac{\lambda}{\sqrt{1+\lambda^2}} \right) + \left(e'(k) \times \frac{\lambda}{\sqrt{1+\lambda^2}} \right) \quad (1)$$

The optimal value of λ was obtained using gradient descent algorithm (GDA) and implemented in simulation and hardware testing.

RESULT AND DISCUSSION. The ROV model with best fit 83.32% is shown in Figure 2. Overshoot at 1.26%, 1.5cm steady state error and 2.72s settling time.

Table 1: Actual and GDA-SIFLC result

	Actual	GDA-SIFLC
SSE (cm)	1.5	0
Tr(s)	0.86	0.87
Ts (s)	0.91	2.17
OS (%)	1.26	1.95

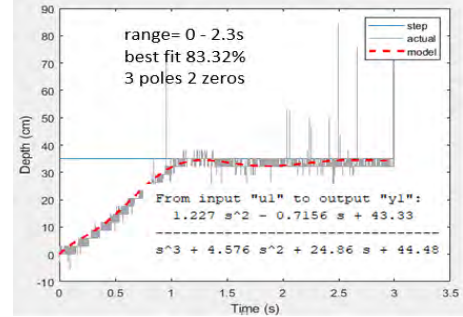


Figure 2: Generated model using SI

The GDA-SIFLC corrected the steady state error (SSE) from 1.5cm to 0. Although it has a bit higher overshoot (%OS) and time rise (Ts), it still acceptable and it cater main issue which is SSE. Hardware implementation in Figure 3 shows promising result.

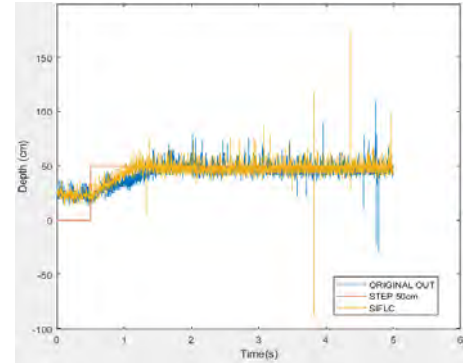


Figure 3: Experimental result

CONCLUSION. GDA-SIFLC controller had been successfully designed and cater SSE error in the ROV depth system. The simulation and real plan experiment show promising result.

ACKNOWLEDGEMENT. We wish to express our gratitude and appreciation the support granted by Universiti Teknikal Malaysia Melaka in pursuing this research specially to Underwater Technology Research Group, Faculty of Electrical Engineering, Centre of Research and Innovation Management for supporting this research.

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Stereo matching algorithm using census transform and edge preserving filters

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Keywords: Census transform; Minimum spanning tree; Bilateral filter

INTRODUCTION. This paper introduces a local based stereo matching algorithm that produces depth information or disparity maps. The taxonomy for the proposed algorithm are matching cost computation, cost aggregation, disparity optimization and disparity refinement. Relatively, the techniques are Census Transform (CT), Minimum Spanning Tree (MST), Winner Take All (WTA) and Bilateral Filter (BF). Here, the proposed algorithm only provides qualitative results; the disparity maps. In order to validate the performance of the algorithm, standard online benchmarking dataset; Middlebury Stereo, was included, resulted in quantitative results.

AIM OF WORK. The objectives of the Research Seminar are:

- To propose stereo vision algorithm that produces disparity maps.
- To utilize Census Transform at matching process.
- To utilize edge preserving filters on algorithm.
- To validate the performance of proposed algorithm through standard online benchmarking datasets.

METHODOLOGY. The experiment begins with matching cost computation. The input images; left and right image, provide by Middlebury Stereo will correspond with each other to produce initial disparity map. Here, Census Transform (CT) [1,3] is introduced and presented in equation (1),

$$CT(p, d) = \sum_{(x,y) \in w} \text{Hamming}(Cen_{ref}(p), Cen_{tar}(p - d)) \quad (1)$$

where p equals (x, y) and the coordinate of the targeted pixel, while d equals disparity value. Meanwhile, Cen_{ref} represents census bit string for references images (left image) and Cen_{tar} represents census bit string for target image (right image). Next, the algorithm proceeds with cost aggregation. Here, an edge preserving technique, Minimum Spanning Tree (MST) [2,3,4] is introduced to improve the accuracy of disparity maps. The equation is presented in (2),

$$MST = [CT_i(p, d), E_i] \quad (2)$$

where $CT_i(p, d)$ represents a set of vertices that corresponds to the data set, which obtained from previous stage; matching cost computation. In addition, E_i represents the edge that connects the vertices. Then, disparity optimization uses a local based approach. Here, Winner Take All (WTA) is applied and presented in equation (3).

$$d(p) = \arg \min_{d \in D} CA(p, d) \quad (3)$$

where $d(p)$ equals $d(x, y)$, the disparity value at the coordinate of (x, y) . Meantime, D defines the range of disparity of the image and $CA(p, d)$ represents data from previous stage; cost aggregation. Finally, disparity refinement also utilize edge preserving technique, Bilateral Filter (BF) [5]. The equation is presented in (4),

$$B(p, q) = \exp\left(-\frac{|p-q|^2}{\sigma_s^2}\right) \exp\left(-\frac{|d(p)-d(q)|^2}{\sigma_d^2}\right) \quad (4)$$

where (p, q) equals coordinates for the targeted pixels and the neighboring pixels. Then, $|p - q|$ equals spatial Euclidean

and $|d(p) - d(q)|^2$ equals Euclidean. After that, σ_s^2 equals spatial distance and σ_d^2 , equals color similarity parameters.

RESULTS AND DISCUSSION. The experiments are run through a personal computer with features of CPU i7 and 8G RAM. The proposed algorithm implemented the research using 15 samples of input images from Middlebury Stereo. These processes resulted to qualitative results, the disparity maps, presents in Figure 1. The 15 set of disparity maps (qualitative results) are then upload to the Middlebury Stereo website and quantitative results is provided and presented in Table 1. Here, *nonocc error* defines the error of invalid disparity values on the non-occluded regions and *all error* defines the error of invalid disparity values on all pixels of the disparity map image. Table 1 shows the quantitative results for the proposed algorithm where avg nonocc error is 7.83% and avg all error is 10.8%

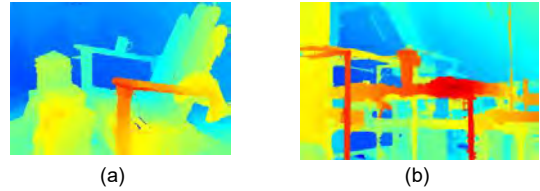


Figure 1 Disparity maps produced by the proposed stereo vision algorithm, (a) Adirondack, (b) Pipes

Table 1 Quantitative results for the proposed algorithm

avg nonocc (%)	avg all (%)
7.83	10.8

CONCLUSION. A stereo vision algorithm that produce disparity maps are produced, while utilize Census Transform and edge preserving filters. Moreover, the performance of the proposed algorithm is validated, through standard online benchmarking datasets, where the nonocc error is 7.83% and avg all error is 10.8%.

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Formulation of Lyapunov-Based Rotor Angle Regulator for A Synchronous Generator Through Nonlinear Swing Equation

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Keywords: Swing equation; rotor angle stability; synchronous generator

INTRODUCTION. The synchronous generator's rotor angle operation within the power system's generation system is impacted by disturbance occurrences. The disturbance will cause rotor angle instability and disrupt the synchronous generator's rotor oscillation, impairing the power system's efficiency [1]. This paper aims to develop a rotor angle deviation regulator (RADR) for the nonlinear swing equation of a synchronous generator using a Lyapunov approach. It is anticipated that the proposed regulator will guarantee the rotor angle's asymptotic stability and resilience to uncertainty. The regulator is developed using techniques from backstepping and Lyapunov redesign. A MATLAB/SIMULINK simulation is run in order to verify the regulator's robustness and efficacy. The simulation's outcome demonstrates that, in spite of disturbances, the regulator's asymptotic stability and robustness are guaranteed.

METHODOLOGY. The robust Lyapunov redesign approach and the backstepping control technique are used to develop the RADR algorithm for a nonlinear swing equation because the Lyapunov redesign effectively handles uncertainty. Combining these two approaches has the advantages of ensuring the robustness of the control algorithm, compensating for matched and unmatched uncertainties, and providing stable control of output tracking [2]. The state variable equation of the nonlinear swing equation is taken into consideration as in (1) and (2).

$$\dot{x}_1 = x_2 \quad (1)$$

$$\dot{x}_2 = -\frac{\pi f_0}{H} D x_2 + \xi + \Delta u + u \quad (2)$$

where H is the inertia constant, D is the damping power, u is the controller, ξ is the nonlinearity as in (3), and Δu is the input uncertainty as in (4).

$$\xi = -\frac{\pi f_0}{H} (P_{max} \sin \delta_0 \cos x_1 + P_s \sin x_1) \quad (3)$$

$$\Delta u = \frac{\pi f_0}{H} (\Delta P + P_m) - \frac{d^2 \delta_0}{dt^2} \quad (4)$$

The control law is obtained via accumulation of the nominal control law, u_{nom} and the robust control law, u_r , as written in (5)

$$u = -K_2 z - x_1 + \frac{\pi f_0}{H} D x_2 - \Delta u - K_1 x_2 - \xi \frac{z \xi}{z \xi + \tau e^{-\alpha t}}, \quad (5)$$

$\varepsilon > 0, \alpha_1 > 0$
which satisfied the robust design inequality of $\dot{V}_2(z) \leq -K_1 x_1^2 - K_2 z^2 + \tau e^{-\alpha t}$.

RESULTS AND DISCUSSION. The experiment is conducted on a single-machine infinite-bus system. The performance of RADR in rotor angle stability is demonstrated through four case studies. The first case study is analysed using the stable system (system without fault), whereas the other three case studies are based on the one used in [3], which involves three fault occurrence situations: in the middle of the transmission line (fault = 0.63 p.u.), at bus 1 with zero to ground impedance (fault = 1.8 p.u.), and at bus 1 with j0.01 p.u. to the ground (fault = 0.4 p.u.), where p.u. indicates per unit. Subsequently, the fault in cases 2, 3, and 4 was resolved by eliminating the faulty line after 2.5 and 6.5 cycles, commonly referred to as the fault clearing time (FCT). The outcome is obtained through MATLAB simulation utilising the Simulink toolbox.

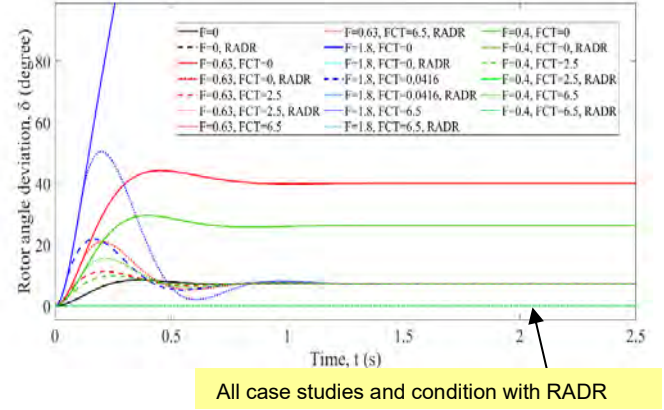


Figure 1 Rotor angle deviation for various fault conditions

Figure 1 presents the transient response performances for every case study, both with and without RADR installed in the system. The application of RADR results in minimised rotor angle deviation which is represented by a straight line across 0°. This indicates that RADR controls the rotor angle deviation to continuously approach 0°, achieving the proposed objective of asymptotic rotor angle stability.

CONCLUSION. The outcome demonstrates that, by controlling the rotor angle to consistently approach 0° regardless of the fault and fault clearing time, the proposed RADR ensures the asymptotic rotor angle stability for the nonlinear swing equation. The effectiveness of the proposed RADR algorithm under different fault conditions ensures both transient and steady state performance, which proves that the proposed RADR benefits in preserving power system stability and rotor angle stability.

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A Fuzzy Logic Controller of Hydrogen-Hydrogen-Oxygen (HHO) Generator to Improve Vehicle Engine Performance

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Keywords: Engine performance; Fuzzy logic; HHO

INTRODUCTION. Hydrogen-hydrogen-oxygen (HHO) gas supplementation to a gasoline engine is one of efforts in improving the engine performance [1]. Many researchers work based on the fixed HHO flow rate method, which typically use 0.25 - 0.50 liters per minute of HHO for each 1000 cc engine size [2]. However, the fixed HHO flow rate method does not provide an optimal engine performance because its HHO flow rate does not adapt to engine speed, load, and the commanded air-fuel ratio (AFR) issued by the engine control unit (ECU) [3], [4]. Moreover, there is no mathematical model of engine torque generation in the engine fueled by gasoline with HHO [5], so it causes improper simulation and unavailable justification for engine performance achievement. Therefore, it needs a new model as a solution, simulation, measuring the engine performance, and comparative study in engine performance due to HHO usage and without HHO.

AIM OF WORK. The main purpose of the Research is:

- To propose a mathematical model of engine torque generation in the engine fueled by gasoline with HHO gas.
- To propose the model of the adaptive and the fixed HHO flow rate controllers in improving the gasoline engine performance.
- To simulate the models using Matlab-Simulink, then to measure and compare the engine performance without HHO, and using the fixed and adaptive HHO flow rates.

METHODOLOGY. Simulation of the gasoline engine using the adaptive HHO flow rate involve the models of the 1500 cc gasoline engine coupled with HHO generator, the proportional-integral (PI) engine speed controller, and the adaptive HHO controller. The adaptive HHO controller manages the electric current of the HHO generator to produce the proper HHO flow rate for any engine operation by adapting to engine speed, load, and the commanded AFR variations. The proposed model of the adaptive HHO controller works based on a combination of fuzzy logic and polynomial function controls, which involves the engine parameters, such as mass airflow (MAF), air-fuel ratio (AFR), and the commanded AFR. As a result, the HHO flow rate adapts to engine speed, load, and the commanded AFR variations. The observed parameters include the air-to-fuel ratio (AFR), engine torque, and engine thermal efficiency. The research also simulates the gasoline engine using the fixed HHO flow rate with 0.75 liters per minute of HHO gas. Besides, the research also proposes a mathematical model of engine torque generation in the engine fueled by gasoline with HHO gas. Finally, comparative study in the gasoline engine performance improvement due to the fixed and adaptive flow rates is conducted.

RESULTS AND DISCUSSION. The adaptive HHO flow rates due to the proposed adaptive HHO controller improves the AFR error against the commanded AFR by 100% for all engine operations. On the contrary, the fixed HHO flow rate improves the AFR error by 0 % - 100 % (uneven) depending on engine speed, load, and the commanded AFR. Similarly, the adaptive HHO flow rate improves the engine torque during small, medium, and big-loaded engine operations, respectively, by 1.5 % - 4.7%, 6.8 % -26.8 %, and 21.1 % -

72.8 % depending on engine speed (2500 rpm - 4000 rpm) and the commanded AFR (12.6 - 15.4). Conversely, the fixed HHO flow rate improves the engine torque by 0% - 0.6%, 0.3% - 14.2%, and 9.3% - 50.1%, respectively. Besides, the adaptive HHO flow rate improves engine thermal efficiency during small, medium, and big-loaded engine operations, respectively, by 11.5 % - 19.8 %, 11.7 % - 19.8 %, and 11.8 % - 19.9 %, depending on engine speed and the commanded AFR. The improvement of engine thermal efficiency is lower than the fixed HHO flow rate usage. However, the improvement is relatively stable against the changes in engine speed and load. On the contrary, the fixed HHO flow rate improves engine thermal efficiency by 11.6 % - 28.9 %, 9.1 % - 20.9 %, and 7.5 % - 16.8 %.

CONCLUSION. The proposed model of the adaptive HHO controller, which works based on a combination of fuzzy logic and polynomial function controls, improves AFR and engine torque better than that provided by the fixed HHO flow rate method. On the other hand, the adaptive HHO controller improves engine thermal efficiency smaller than that provided by the fixed HHO flow rate, but the improvement is more stable against the changes of load and engine speed. For future work, the research needs to explore the electronics-embedded system design and implementation of the adaptive HHO controller by referring to the proposed model..

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