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INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
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# IIUM ENGINEERING CONGRESS 2021

## 22-23 JUNE 2021
## VIRTUAL
## KUALA LUMPUR, MALAYSIA

ICCCE 2021 | ICBioE 2021 | ICMAAE 2021 | ICEPEE 2021

Organized by:

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# MESSAGE FROM THE PRESIDENT

**YBhg. Datuk Dr. Mohd Daud Bakar**
President
International Islamic University Malaysia

*Assalamu'alaikum wrt. wbt.*

A very warm welcome to all participants of the IIUM Engineering Congress 2021.

The primary focus of the congress is to create an effective medium for institutions and industries to discuss solutions, and problem-solving techniques. which address issues that lead to innovations and create new ideas in the respective field for the betterment of all humanity through 4 conferences in different fields of engineering as mentioned in this programme book.

The participants of the Congress, I believe, are well aware of the many issues, and arduous challenges faced by us as a global family. The challenges of economic slavery, hate, global inequalities and monetary systems that intend to perpetuate such inequalities; effects of climate change, horrendous sufferings due to multiple wars, human arrogance and ignorance have and are causing massive disturbances and suffering worldwide.

Modern technologies such as AI, high speed communications are being used for the benefit as well as destruction of societies. Unethical usages of all modern technologies are spreading hatred, disinformation, misguiding the youth, and sometimes being used unethically by big business for profits. This highly educated body of specialists from around the world can certainly make a difference, a positive change, provided each one realizes, and understands his or her responsibilities and works towards positive changes to alleviate the sufferings of all humanity. Surely Allah swt, our Creator wants us to behave in the capacity of *Rahmah*, the man of blessing and compassion for the entire humankind.

Although we as an educational body, think and discuss ideas for the betterment of our societies; the sufferings, by and large, all over the world, do not seem to diminish, not even close. Perhaps we educators need to seriously think about our role as elements and drivers as well as catalysts of positive change in our respective societies. We need to introspect within ourselves. We need to get ready to answer to our Creator on the Judgement day.

Before we move to the landscape and SOP of the next life in the hereafter, it always comes upon us the intellectual and the means of high frequency of thinking and contemplation to position ourselves to live and function at our current time. As much as we need to celebrate the legacy and past achievement, we need to embrace the future. At some point, the future wouldn't ever be enough. Instead, we need to create the future or rather a better future. Using our own mould this is the very desired rule and function of the conscious intelligence all the time. Scanning the chosen topics and themes to be mooted and discussed in this IIUM Engineering Congress 2021, I am very pleased to note that we have covered all the ground for the future.

We cannot change things and surely, we cannot win the battle if we cannot fight from the high ground. I am confident and I reckon you are too. Together, we shall fight our battle from the high ground intellectually and emotionally.

# MESSAGE FROM THE PRESIDENT

I am equally pleased to see that the congress underscores the critical importance of ethics and perhaps best practices. The role of ethics in the modern decision-making process in almost every organized section of the society seems to have lost its importance. Ethical behaviour by individuals, organizations, and societies are expected only from others, but rarely sincerely practised by everyone else. Instead legal frameworks and loopholes are pervasive so much so that most if not all unethical conduct can be easily justified legally. This closely relates to the power of communication. Speed and real time communication have enabled us to know one another better. Now we are really wired and connected to one another. The more we are connected to one another, the better would be for the world. All the unnecessary and artificial gaps that divide human will be demolished. Islam urges for the open communication as well as smart communication. One word that can describe fully the face of the 21st century is the word of connectivity.

At the end I need to emphasize that IIUM as an institution plans to play its role as an institution of higher learning which produces graduates with enlightened souls, having the *taqwa* of Allah SWT internally and externally both the hardware and the software. I hope our academic staff play their role to their fullest capacity in achieving the IIUM vision and mission. I pray that our staff and graduates sincerely observe the academic excellence and ethical conduct only for the sake of Allah SWT and be always passionate to take the road to *istiqamah*, consistence progress and *alfalaah*, the ultimate victory.

Allow me to end by quoting Martin Luther King "*If I can't do great things I can do small things in a great way".* I wish you all and the congress a resounding success.

*Wassalamu'alaikum wrt. wbt.*

**Datuk Dr. Mohd Daud Bakar**
President of International Islamic University Malaysia

# MESSAGE FROM THE RECTOR

**Professor Emeritus Tan Sri Dato' Dzulkifli Abdul Razak**
Rector
International Islamic University Malaysia

*Assalamu'alaikum Warahmatullahi Wabarakatuh*

A warm welcome to the IIUM Engineering Congress 2021 keynote speakers and participants,

This year, the IIUM Engineering congress features four (4) parallel conferences as mentioned in this programme book. The main objective of organizing this congress is to provide an international technical forum for engineers, academicians, scientists and researchers to present results of ongoing research in different areas related to Mechanical, Automotive and Aerospace Engineering, Computer and Communication Engineering as well as Biotechnology Engineering.

The primary focus of the conference is to create an effective medium for institutions and industries to share ideas and knowledge, exchange information, innovations and products. On top of those, the congress will act as a medium in disseminating engineering research and innovation to interested parties. I do hope this discussion will be interconnected with one another in trying to make meaning of what education is all about not only within engineering but beyond engineering. I think the realization is basically that engineering needs to serve other sectors at the same time given the technology that is pervasive. Today we need to study whether this technology in engineering that you are talking about is relevant to the ethics of life and more importantly is relevant to the foreseeable world.

Often when we use technology, we are not mindful of the down side of it because it's often driven by the market. The market will tell us this technology is good, we invested money around it and suddenly we find that the ill-effect of this technology is something that we have not predicted and therefore we are suffering from the consequences.

This is not a wishful thinking, if we think of the Industrial Revolution 300 years ago when we first introduce theme engine we thought it is fantastic without even realize that it would damage the world with pollution that we encounter now and it is getting worse in the context of global warming and climate change and all the rest of it. Thus, when we welcome engineering and technology, we must also be more conscious that there is no complete solution.

Having said that, I would hope that this conference will also pay attention to the preservation of human kind not only among human beings but also all the creation of God, that is the concept of *Rahmatan lil-'Alamin*. The university is very much in focus to avoid the evolution of the Anthropocene era, but it is right in front of our eyes when we talk about Covid-19. If you are not careful, given all the sophisticated technologies that we have, we are beginning to dismantle our own civilization, when human beings cannot work together, when human beings cannot trust one another. Moreover, when technology is not evenly distributed, when we talk about vaccines today, which is the consequence of the technology that we find there is notion of vaccine nationalisme, notion of vaccine appetite, notion of vaccine being suspicious as to where it's started and where it is originated. All these issues which are not being well discussed as it has been bulldozed into the community as such because scientists like us do not take interest in time to articulate some of these major issues that will affect human kind in the long run.

# MESSAGE FROM THE RECTOR

University is about creating better human being, creating better civilization and creating more aware and more conscious human being in the context of *insan Kamil*, people who are more responsible for the thing that they do because Allah SWT had given them this mind and wisdom and knowledge for them to create a new environment for them to move on.

This IIUM Engineering Congress 2021 is not just about technology but we also want to bring in the framework of *Maqasid Ash-Shari'ah* which aims to protect and preserve mankind's faith, life, intellect, progeny, and property. Certainly I hope this would be also the concern of this congress way forward in making IIUM a better centre of education for all mankind.

On that note, I would like to congratulate the Kulliyyah of Engineering and I do hope your resolution will be of use to all of us, as we move towards our mission to create a better university 20 years from now.

I wish everyone a good deliberation and we pray to Allah SWT for His Blessing and His *Hikmah* will be on us that we will be benefiting the rest of the UMMAH.

*Wassalam*

**Prof. Emeritus Tan Sri Dato' Dzulkifli Abdul Razak**
Rector of International Islamic University Malaysia

# MESSAGE FROM THE CONGRESS CHAIRMAN

**Assoc. Prof. Dr. Sany Izan Ihsan**
Dean
Kulliyyah of Engineering

*Bismillahirrahmanirrahim*
*Assalamualaikum warahmatullahi wabarakatuh*

It is my utmost pleasure to welcome all participants to the IIUM Engineering Congress 2021 (IEC 2021). This year the IIUM Engineering congress features four conferences in different fields of Engineering. These are the 8th International Conference in Computer and Communication Engineering (ICCCE 2021), the 6th International Conference in Biotechnology Engineering (ICBioE 2021), the 5th International Conference on Mechanical, Automotive, Aerospace and Mechanical Engineering (ICMAAE 2021), and the 4th International Conference on Engineering Professional Ethics and Education (ICEPEE 2021). The participants will have the privilege to gather and exchange knowledge, and establish networking across various disciplines in a single platform.

The main objective of organizing this congress is to provide a medium for institutions and industries to share ideas and knowledge, exchange information, innovations and problem solving techniques. We are proud to have good expertise in many engineering areas and look forward to establish meaningful collaborations for mutual benefits.

For the first time in our history, this year congress will be conducted in virtual form, due to the Covid-19 pandemic situations that is affecting the whole world since 2020. We hope that this virtual congress will run smoothly to meet its objectives and all participant will be able to get full benefit.

I would like to take this opportunity to express my heartfelt appreciation to all parties who have directly and indirectly contributed towards the success of this auspicious event, especially the committed and passionate committee members. Special mention also to all our sponsors especially the Malaysian Timber Council for the generosity and support. May Allah SWT reward you greatly for your good efforts.

Thank you very much for your participation and we welcome you again to IIUM Engineering Congress 2021.

**Assoc. Prof. Dr. Sany Izan Ihsan**
Chairman
IIUM Engineering Congress 2021

# CONGRESS ORGANIZING COMMITTEES

| | |
|---|---|
| **CHAIRMAN** | Sany Izan Ihsan |
| **SECRETARY** | Shahrizad Sa-Idul Haj |
| **TREASURER** | Siti Zubaidah Mohamed Yusof |
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## EMPOWERING SUSTAINABILITY WITH BEYOND 5G NETWORKS

**Abstract:** This speech discusses several scenarios for the beyond 5G generation societies and how sustainability in envisioned future smart cities and societies is empowered using new and emerging cutting-edge technologies. These key disruptive technologies that will guarantee the desired quality of physical experience to achieve ubiquitous wireless connectivity are expected in such futuristic envisioned societies. The speech provides a foundational background on the evolution of different wireless communication standards to have a proper insight into the vision and requirements of beyond 5G network. Then, it provides a panoramic view of the enabling technologies proposed to facilitate the beyond 5G and introduce emerging 6G applications such as multi-sensory–extended reality, digital replica, and more. Next, the technology-driven challenges, social, psychological, health and commercialization issues posed to actualizing 6G, and the probable solutions to tackle these challenges are discussed extensively. Additionally, it presents new use cases of the beyond 5G technology in agriculture, education, media and entertainment, logistics and transportation, and tourism. Furthermore, we discuss the multi-faceted communication capabilities of these future networks that will contribute significantly to global sustainability and how they will bring about a dramatic change in the business arena. Finally, we highlight the research trends, open research issues, and key take-away lessons for future research exploration in beyond 5G wireless communication.

**Prof. Dr. Sonia Aïssa** received her Ph.D. degree in Electrical and Computer Engineering from McGill University, Canada, in 1998. Since then, she has been with INRS (Institut National de la Recherche Scientifique), Montreal, Canada, where she is a Full Professor and known as one of its most distinguished professors for her excellence in research, education, and outreach. Prof Aïssa's research interests are in the broad area of wireless communication systems and networks and include modelling, design and performance analysis, and wireless power technology. Her awards include the NSERC University Faculty Award 1999, the FRQNT Strategic Faculty Fellowship 2001-2006, the INRS Performance Award for outstanding achievements in research, teaching and outreach multiple times since 2004, the FRQNT-SYTACom Technical Community Service Award 2007, NSERC Discovery Accelerator Supplement Award 2013, and multiple Best Paper Awards in the IEEE and the Japanese IEICE. She was a Distinguished Lecturer of the IEEE Communications Society (ComSoc) 2013-2016. She is a Fellow of the IEEE and a Fellow of the Canadian Academy of Engineering.

Prof. Aïssa has an outstanding record of service to the IEEE. She was a Member-At-Large of ComSoc's Board of Governors 2014-2016 and serves regularly on many of its standing committees. Her editorial activities include: Area Editor of IEEE Transactions on Wireless Communications 2014-2019, Editor of IEEE Transactions on Wireless Communications 2004-2012, Associate Editor and Technical Editor of IEEE Communications Magazine 2004-2015, Technical Editor of IEEE Wireless Communications Magazine 2006-2010, and Associate Editor of Wiley Security and Communication Networks Journal 2007-2012. She currently serves as Editor-At-Large for the IEEE Transactions on Communications. She has been involved in organizing many flagship conferences of the IEEE and is currently serving as the TPC Chair of the 2021 IEEE International Conference on Communications. She is active in promoting women in engineering and is the Founding Chair of the IEEE Women in Engineering Affinity Group in Montreal.

## THE ROLE OF POWER ELECTRONICS IN PROVIDING A SUSTAINABLE ENERGY SUPPLY

**Abstract:** Power electronics (PE) is an application-oriented and interdisciplinary area. It uses power semiconductor devices to perform switching actions in order to achieve the desired conversion strategy. The PE plays a crucial role of the conversion and control of electrical power. The effective use of electrical energy is a key technique for achieving energy efficiency, and power electronics technologies that can convert electric power into the optimum characteristics for each application are an essential part of this approach. Power electronics systems have attracted attention as key components for building a sustainable energy supply. PE-based power converters are also widely used in conventional and renewable energy systems.

The advancement of semiconductor technology, including the power devices and other components that support power electronics and control techniques, has led to a smaller size, higher efficiency, and higher performance. In this lecture, I will describe some examples where power electronics and power devices are used in renewable energy and industrial applications and also highlight the role of PE in providing sustainable energy supply for the future generation.

**Prof. Dr. Saad Mekhilef** is an IET Fellow and IEEE senior member. He is the associate editor of IEEE Transaction on Power Electronics and Journal of Power Electronics. He is a Professor at the Department of Electrical Engineering, University of Malaya, since June 1999.

He is currently the Director of Power Electronics and Renewable Energy Research Laboratory-PEARL- and the dean of faculty of engineering, University of Malaya. He is the author and co-author of more than 300 publications in international journals and proceedings and 5 books with more than 27000.

He is frequently invited to give keynote lectures at international conferences. Prof. Saad is listed by Thomson Reuters (Clarivate Analytics) as one of the Highly Cited (Hi Ci) engineering researchers in the world and included in the Thomson Reuters' The World's Most Influential Scientific Minds: 2018, 2019, and 2020. He is actively involved in industrial consultancy for major corporations in power electronics projects. His research interests include power conversion techniques, control of power converters, renewable energy, and energy efficiency.

## RECENT RESEARCH ON DETECTION OF VULNERABLE PLAQUE IN CORONARY ARTERY ULTRASOUND IMAGES USING MACHINE LEARNING ALGORITHMS

**Abstract:** Atherosclerotic plaque rupture is the most common mechanism responsible for the majority of sudden coronary deaths. The precursor lesion of plaque rupture is thought to be a thin cap fibroatheroma (TCFA) or "vulnerable plaque". Virtual Histology Intravascular Ultrasound (VH-IVUS) image is clinically available for visualizing this colour coded coronary artery tissue. However, it has limitations in providing clinical relevant information for identifying the vulnerable plaque. In this talk, we discuss on the recent research on the detections of vulnerable plaque in virtual histology intravascular ultrasound images using machine learning algorithms. We proposed how to improve the identification of TCFA in VH-IVUS image by developing a set of algorithms for segmentation, feature extraction, and plaque type classification to accurately identify vulnerable plaque. To develop the algorithms two approaches comprising of optimization and semi-supervised models were adopted. Besides, K-means and Fuzzy c-means (FCM) were improved by Particle Swarm Optimization (KMPSO and FCMPSO). Next, semi-supervised models were developed by means of hybrid FCM with k-Nearest Neighbor (FCM-kNN), minimum Euclidean distance (FCM-mED), and Support Vector Machine (FCM-SVM). For the extraction, two algorithms were adopted: Close Lumen Tracing (CLBT) and Open Lumen Tracing (OLBT) to extract luminal features. In addition, three algorithms were explored for extracting significant features from plaque component consisting of Extracting Confluent Component (ECC), Necrotic Core Layering (NCL), and Plaque Burden Assessment (PBA). For plaque type classification, the extracted features from VH-IVUS were integrated with textural features to enhance the efficiency.

**Prof. Ts. Dr. Ali Selamat** is currently a professor at the School of Computing, Faculty of Engineering, Universiti Teknologi Malaysia (UTM) and serving as a Dean of Malaysia Japan International Institute of Technology (MJIIT), Universiti Teknologi Malaysia. He is currently elected as a Chair of IEEE Computer Society, Malaysia Section under the Institute of Electrical and Electronics Engineers (IEEE), USA, and a Malaysia Engineering Deans Council member. He is a fellow under Academy Professor Malaysia and a research fellow at Magicx - Media and Games Center of Excellence, Universiti Teknologi Malaysia. He is also a visiting professor at Hradec-Kralove University, Czech Republic, and Kagoshima Institute of Technology, Japan. He also serves as the Editorial Boards of International Journal of Knowledge-Based Systems Elsevier, Netherlands, International Journal of Information and Database Systems (IJIIDS) under Inderscience Publications, Switzerland, and Vietnam Journal of Computer Science under Springer Publications. His research interests include data analytics, digital transformations, knowledge management in higher educations, key performance indicators, cloud-based software engineering, software agents, information retrievals, pattern recognition, genetic algorithms, neural networks, and soft-computing.

## EXPLORING THE METABOLISM OF *METHANOCOCCUS MARIPALUDIS* S2 FOR CARBON UTILIZATION

**Abstract:** Carbon capture and fixation via microbes is a potential pathway for carbon utilization to address the global issues of decarbonization and climate change. *Methanococcus maripaludis S2*, a fast-growing autotrophic methanogen, is an attractive microbe that can convert $CO_2$ and renewable $H_2$ into a useful fuel methane ($CH_4$) as a necessary energy-producing component of its metabolism. This talk will summarize our work over the last few years on exploring and understanding this metabolism. We constructed iMM518, the first axenic genome-scale metabolic model for *M. maripaludis* S2 and validated it with experimental data. This helped us elucidate quantify the impacts of nitrogen source (ammonia and dinitrogen) on the rates of $CO_2$ fixation and methane generation. Then, to enhance our understanding further, we were the first to examine the aqueous phase of its growth culture, which has surprisingly been neglected in the literature so far. Our work has shown the first experimental evidence of the acetate switch in any autotroph so far, which is well established in several heterotrophs (e.g. *Escherichia coli*). This and other investigations have helped us identify new genes and enzymes and improve the rigor of our genome-scale model.

**Iftekhar A Karimi** is a Professor of Chemical & Biomolecular Engineering at the National University of Singapore. He is a leading expert on process systems engineering and optimization with a unique blend of experience from academia and industry. His current research interests include process modeling, process simulation, process optimization, energy integration, systems biology, carbon capture and utilization, decarbonization, hydrogen, and natural gas. He has worked on a variety of complex and practical issues related to the optimization of chemical, biological, and environmental systems, and led several industry-collaborative research projects. He led the efforts on Singapore's first roadmap for CCSU, and is now working on a roadmap on hydrogen for Singapore.

## GREEN TECHNOLOGY AND NANOMATERIAL APPLICATIONS FOR THE MITIGATION OF GREENHOUSE GASES (GHGS)

**Abstract:** Routine anthropogenic emissions of Greenhouse Gases (GHGs) continue the inexorable rise of atmospheric GHGs levels. In particular, $CO_2$ makes up a significant fraction of GHGs due to the widespread burning of carbon-based fossil fuels for power and transportation. This accumulation of atmospheric $CO_2$ has rendered global warming which stresses the ecosystem and leads to catastrophic consequences. Thus, to curb global emissions, Malaysia, as a signatory to Paris Agreement, are committed to reduce $CO_2$ emissions to 45% by 2030. In this respect, catalyst-driven $CO_2$ re-utilization routes have emerged as an appealing reduction strategy and will likely play a vital role in meeting this mitigation challenge. Processes such as light-driven $CO_2$ conversions, $CO_2$ reforming and $CO_2$ hydrogenation are all stimulating possibilities for $CO_2$ re-utilization which helps in closing the carbon loop. Furthermore, the incorporation of nanomaterials in the catalyst design has promoted efficiencies and further raises the prospect of these processes, essentially making nanomaterials as powerful enabler in the mitigation of GHGs.

**Professor Dato' Ir. Dr. Abdul Rahman bin Mohamed, FASc,** is the Deputy Vice-Chancellor of Research & Innovation, Universiti Sains Malaysia and currently the Director of USM Sciences and Arts Innovation Space (sains@usm).His research interests span across the areas of reaction engineering and catalysis, air pollution, wastewater treatment, fuel technology and nanotechnology. His collaboration with international researchers includes those from Osaka University and Nagaoka University of Technology in Japan; and with the University of Lorraine (France) where he has also broadened his research influence.

He has received more than 80 research grants from various national/international organisations, amounting to more than RM20 million and has published more than 400 research papers in international/national journals and conference proceedings with Scopus bibliographic database recorded H–Index of 77 and total citation of more than 19,000. He has also graduated more than 40 Master's and PhD students.

At the national level, Prof. Abdul Rahman serves as the Technical Advisor for the Public Private Research Network (PPRN) and Evaluation Panel for Translational Research@MOHE under the Ministry of Higher Education Malaysia. He is a Field Expert in the Nanotechnology Area and Project Leader of National Graphene Consortium under the National Nanotechnology Centre. As a fellow of the Academy of Sciences Malaysia (ASM), he has been appointed by ASM as the Industry Focus Group Leader for the Malaysia Science, Technology, Innovation Master Plan (STIMP) 2020-2030 and recently appointed as Chairman of the Task Force on National Nanotechnology Policy and Strategy (NNPS) 2021-2030. As a result of his excellent research achievements, he has received more than 60 national/ international awards, honors and recognitions, viz; Malaysia Toray Science Foundation Award and Top Research Scientists Malaysia (TRSM) (2012); Malaysia's Rising Star Award (2015); MARA/MRSM Icon (2017) and Highly Cited Researcher (2018 and 2019).

## HALEA NATURAL SKINCARE: UNLOCKING RESEARCH POTENTIAL FROM LAB TO MARKET

**Abstract:** HALEA Natural Skincare is a premium research-based product from wild ginger which is a species of plant in the ginger family that can be found in tropical forest. Through HALEA Natural Skincare, it is proven scientifically through R&D conducted in local universities to nourish the skin and provide an anti-ageing effect naturally. To commercialize research products from lab to market, the technology maturity should be evaluated between TRL 8 and 9 for commercialization. The research-based product should undergo the basic analysis including alpha and beta testing to be accepted at the market level. In HALEA case, the required testing has been conducted prior to the release to the market. It includes basic analysis to register with the Ministry of Health, Malaysia (KKM) and receive certified HALAL by Jakim. In expediting the process of product commercialization, the company should engage with the experienced people as their mentor, besides the team cooperation. Unique selling proposition of the product should be highlighted and business strategy should be planned from the beginning of the commercialization stage. Through research commercialization, collaborative networks are also important to be highlighted as it is significant to achieve bigger impact that leads to great benefit to society.

**Dr. Mariam Firdhaus**, is a senior lecturer at the Malaysia-Japan International Institute of Technology, UTM Kuala Lumpur. She is a Ph.D. graduate from Universiti Kebangsaan Malaysia (UKM) and has experience conducting research in the equipment design and optimum extraction method for agriculture at McGill University in Quebec, Canada. In addition to teaching and research activities in universities, her experience also covers involvement with the industry as well as community skills enrichment and empowerment initiatives through various knowledge transfer programs. She has received in total about RM 1,806,120 research grants from several agencies as project leader.

Dr. Mariam has founded AM Zaideen Ventures Sdn. Bhd., a spin-off company from Universiti Teknologi Malaysia (UTM) in June 2018. HALEA Natural Skincare is the first product launched in January 2019. She has also received several commercialization awards including Research Entrepreneur during Malaysia Commercialization Year 2019. In addition, HALEA is also the recipient of NanoVerify Certification Programme under NanoMalaysia Berhad. Her goal with HALEA is to offer affordable premium quality skincare products which is at par with premium global brands in terms of product safety, quality, efficacy and Halal. With a vision of creating a premium Halal skin care product, HALEA has set a more holistic objectives as a guidance of its existence which are: To commercialize research products from natural resources that have been carried out in Malaysian universities particularly UTM, promote development and production of more quality halal products to the market, explore and encourage spirit of entrepreneurship among students and lecturers towards job creations instead of employment, and share the entrepreneurship experience and economic benefits with the society.

## THE POSITIVE IMPACT OF DISRUPTIVE TECHNOLOGY IN AVIATION MRO INDUSTRY

**Abstract:** The aviation MRO industry is experiencing unprecedented penetration of leading-edge technologies which are aimed at improving efficiency, quality, cost, safety, and productivity in all phases of maintenance. As such the impact of disruptive technologies in aviation MRO industry is inevitable. This paper presentation provides a broad overview of the technologies being explored currently and prioritized them for immediate introduction in Malaysia aviation mro industry in order to be competitive as the technologies undeniably have the positive impact.

**Prof. Dato' Ir. Ts. Dr. Mohamad Dali Isa, DIMP**
BEng(Hons)Aero, MSc, PhD, PEng, DES CAT 1/II (DCA-AN96), MSET, MMIM, MTAM, AET, MBOT

Mohamad Dali Isa has been in the aviation industry for more than 28 years. Mohamad Dali is a Professor of Aerospace Engineering and led the Universiti Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT) as a Dean/Head of Campus from August 2016 until July 2020. He was also an Accountable Manager for both Department of Civil Aviation and European Aviation Safety Agency Ab-Initio Training Organization Part 147 together with Directorate General Technical Airworthiness of State Authority based in Armed Forces. He obtained his B.Eng. and M.Sc. degrees in Aeronautics and Advanced Materials from University of Technology, Malaysia (1992) and Surrey University, United Kingdom (2000) respectively.He has completed a PhD program in Aerospace Engineering at RMIT University and also serves as a Professional Engineer (Ir., P.Eng.) in Mechanical Discipline since year 2002 until 2009. He worked with Malaysia Airlines (MAS) as a Technical Services Engineer for almost 13 years. In MAS, he was a Category I and II (Department of Civil Aviation – AN96) signatories responsible for any minor and major structural design alteration to narrow and wide-body aircrafts including repair and modification. He was a leading engineer for first Malaysia in-house B747 heavy maintenance overhaul and pylon modifications. He was also a MAS Technical Representative for Airbus, A300 and Boeing, B747-300 heavy maintenance visits and special repairs conducted at British Aerospace (BAe) and Qantas Engineering. Ir. Mohamad Dali was the first Malaysian being the member of Airbus Structures Working Group (ASWG). In 2001, he was promoted as a Head of Engineering for KLIA and line operations. He joined UniKL MIAT in early 2005. Dr. Mohamad Dali research interests include aircraft structures particularly composite materials, damage tolerance and fail-safe design. He has authored numerous numbers of industrial technical or engineering reports (approx. more than 400 reports), and also authored technical publications in leading journals. He has also lectured in several invited industrial short courses to Airlines, Royal Malaysian Airforce, Airod, Sepang Aircraft Engineering (SAE) etc and giving regular talks and comments on MH370 and MH17 incidents in the media i.e. RTM 1, Bernama Astro Awani and leading newspapers. He was the first Chairman of Malaysian Society of Engineering Technologist (MSET) founded in 2008 and now a professional member of ASEAN Engineering Technologist.

## UNDERSTANDING THE REQUIREMENT OF MANUFACTURING AEROSPACE WORKFORCE

**Abstract:** The Covid-19 pandemic-induced lockdowns and related global recession of 2020 have created a highly uncertain outlook for the labour market and accelerated the arrival of the future of work. The talk will hopefully provide expected outlook for technology adoption jobs and required soft skills requirement for future engineers in Aerospace Manufacturing in Malaysia. This will include the various job responsibility and the employer's expectation. The insight on the skill requirement is based on the speaker's experience on developing the SMEs in global aerospace manufacturing industry programme with SMECorp Malaysia.

**Muhamad Khalizi BIN Abdul Razak**
Managing Director – NALURI CINDAI SDN BHD

Khalizi Razak has more than 25 years of experience in manufacturing and corporate world. He is currently the Managing Director of Naluri Cindai Sdn Bhd. He has degree in Aeronautical Engineering in 1991 from Queen Mary College, University of London. He was part of the pioneering group which started the composites aerospace manufacturing in Malaysia through Eagle Aircraft Malaysia Sdn Bhd in 1997 and was involved in the certification of E150B in Perth, Australia and manufacturing transfer program of E150B from Perth Australia to Melaka Malaysia. In 1999, he was transferred to CTRM Aero Composites, serving various position with the last position as the CEO of CTRM Aero Composites Sdn Bhd from 2009 through 2012 Over the last 7 years, he has coached more than 30 SMEs companies intended to embark the journey to become part of aerospace supply chain eco system.

## VEHICLE SAFETY IN MALAYSIA AFTER 14 YEARS OF MIROS ESTABLISHMENT

**Abstract:** The presentation will show the reform of total vehicle safety system in Malaysia after the establishment of MIROS in 2007. It will include the success story of MIROS Pc3, the one and only crash laboratory in Southeast Asia. Presentation will also include the establishment of ASEAN NCAP and the latest Malaysia Motorcycle Assessment Program (MyMAP) together with others successful programs executed by the institution.

**Khairil Anwar Bin Abu Kassim** (Ir. Ts. Dr.),
Adjunct Prof.

Director General – Malaysian Institute of Road Safety Research (MIROS)
Secretary General – ASEAN NCAP
Adjunct Professor, UTM KL
Advisor – Society of Automotive Engineers (SAE) International, Malaysia
Editor-in-chief
– Journal of the Society of Automotive Engineers Malaysia.
– International Journal of Road Safety

Khairil Anwar Abu Kassim is the Secretary General of ASEAN NCAP, one of ten NCAP's in the world that encourage safer cars development in the market. In MIROS, he is the Director General of MIROS, one of the leaders in road safety area that help researchers & engineers to realize their full potential in the safety system. To date, he has been supervising and developing multiple International and local research and development grants and projects in MIROS with a total worth RM 40 Million.

On February 25th, 2010, MIROS has created the nation history by conducting Passenger Car Outdoor Crash Test, the first in Malaysia and South East ASEAN, this success story spread out to Europe, USA and others ASIAN countries. It was never in their mind, that country like Malaysia able to execute a crash test. Currently, the MIROS PC3 has conducted more than 100 crash tests since May 2012 and it is one of the official crash laboratories for ASEAN NCAP.

In his junior years, Khairil left Okayama University of Science to devote his energies to several companies in Japan and Malaysia. It was his third job at Autoliv Hirotako that makes he choose the career of saving people life through safety equipment's. The vision than brought to MIROS, in a broader position, to enhance manufacturer's performance to produce a safer vehicle.

Under Khairil's leadership, ASEAN NCAP mission continually improves towards establishing a reliable independent consumer information for safer cars. More manufacturers have increased their vehicle safety capacity and ability as a result of safety rating and strategies implemented by the team. It is well accepted that to enter the ASEAN market, the minimum required rating is now 4 star which confidently translate to reduction of road fatality. MIROS has recognized his commitment by awarding him the Excellent Service Award in his first full-service year in 2009 and 2016 together Most Impact Researcher Award in 2010. He is also receiving special awards for his dedicated works and commitment throughout his tenure.

The opportunities to work at several corners of the world has given him a chance to expand his professional capacity throughout his life and career. However, the privilege comes with immense responsibilities and exciting challenge set by MIROS. Admittedly, he will devote himself until vehicle safety becomes standard, not as an option.

## OPPORTUNITIES AND CHALLENGES IN THE NEXT GENERATION LIGHT DUTY VEHICLE PROPULSION SYSTEMS

**Abstract:** Internal combustion engines have been around for more than one hundred years. Throughout all these years, countless amount of time and money have been invested in technology, infrastructures and capabilities to reach the level of maturity that have benefited us all. Unfortunately, there are obvious shortcomings in terms of greenhouse gases and tailpipe emissions that are deemed to be unacceptable to policymakers in major markets. In addressing these shortcomings, policymakers are inclined to move towards the mass applications of battery powered electric vehicles and hydrogen fuel cell. In the mass applications of battery powered electric vehicles, challenges exist in terms of limited availability of non-fossil electricity, charging stations and rare earth metals. Similarly, there are also challenges for hydrogen fuel cell applications in terms of hydrogen production, precious metals and onboard hydrogen storage. For automakers like Proton, the high costs that come with both electric vehicles and hydrogen fuel cell will certainly affect the market acceptance and business sustainability. This presentation highlights both the opportunities and challenges of the competing propulsion systems from the global perspective and more importantly from the perspective of the developing countries like Malaysia.

**Ir Azmi Osman** is currently the Deputy Head of Learning and Development at Proton. He has more than 20 years of industry experiences in the area of engine product development and research in Malaysia, Europe and Japan. These include few years as the Head of Powertrain at Lotus Cars in the United Kingdom. Azmi has published many peer reviewed papers and holds more than a dozen granted international patents. He obtained his mechanical engineering degree from the United States and has been a Professional Engineer with practicing certificate since 2006.

## NEW DISCOURSE OF SUSTAINABILITY IN ENGINEERING EDUCATION

**Abstract:** In a digital era that is framed by global changes including climate change, Covid-19, and poverty the engineering profession has a mandate to instill a sense of direction towards shaping a sustainable human civilization. In this context, sustainability in engineering education entails the following dimensions:

1. Transforming higher education institutions to learning organizations which implies having a shared vision and team leaning.
2. Embedding the notion of sustainability in education to enhance system thinking and global citizenship.
3. Embracing human-ethics to ensure accountability and responsible circular growth.
4. Fostering action learning through eco-innovation labs.

The challenges that humanity is facing in the digital era requires new engineering ethics that ensure harmony and balance between society, economy and ecology. The linear model for innovation and growth needs to be revisited to embody institutional learning and global ethics. Framing technology policy to address the social and environmental issues is crucial for ensuring a sustainable human civilization. This implies that engineering education in the 21st century should be informed and reformed by cultural perspectives to help in re-defining what constitutes a good life and how we define new enlightenment and progress in the 21st century. The key attributes for sustainability in engineering education entail people-centered development, a transition to a culture of sustainability, and global human ethics and code of conduct that promotes equity and progress.

**Professor Odeh Al-Jayyousi** is the head of Technology and Innovation Management at the Arabian Gulf University in Bahrain. He was the vice president for science and research at the Royal Scientific Society (RSS) in Jordan during 2011-2013. He was the regional director for IUCN – The International Union for Conservation of Nature (Headquarters in Switzerland) – West Asia regional office during 2004-2011. Previously, he was a university professor in water resources and environment during 1994-2004. He was an academic director for M.Sc. Programme in transformational management in UK. He was a consultant with UN ESWCA on Technology for Sustainable Development. He is the author of several books including three recent books; i.e., Islam as sustainable development (2012), UK and Renewable Energy and Knowledge Management, 2015; and Integral Innovation, 2017, Ruteledge, UK. He was the Dean of Scientific Research at Applied Science University, Jordan. A member of UNEP GEO6 Global Advisory Panel; WANA Think Tank, and Arab Thought Forum.

## ADDRESSING WP AND EA IN THE TLA OF ENGINEERING PROGRAMME

**Abstract:** Engineering problem is a problem that can be solved by the application of engineering knowledge and skills, and professional skills; and engineering activities include but are not limited to: design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; engineering operations and maintenance; project management; research, development and commercialization (IEA, 2011). Students' ability to deal with complex engineering problems is emphasized in seven (out of the twelve) associated Washington Accord's programme outcomes, namely Engineering Knowledge, Problem Analysis, Design or Development of Solutions, Investigation, Modern Tools Usage, Engineer and Society, and Environment and Sustainability; and their ability to undertake complex engineering activities is emphasized in the Washington Accord's programme outcome, communication skills (IEA, 2013; EAC, 2020).

Complex engineering problems are often encountered in design-based projects (Johri & Olds, 2011; Hotaling et al., 2012; IEA, 2014b). Regrettably, in most cases, these projects often lack real issues of industry environment; and engineering educators often fail to design complex engineering problems in assessing students' mastery of the skill (Fatin et al., 2016). These are largely due to the poor understanding of the attributes of complex engineering problems among engineering educators thus preventing them from constructing design projects that simulate real industry scenarios (Liew et al., 2020). Hence the ability of engineering graduates to solve complex problems and undertake complex activities could be negatively affected. Due to the importance of this ability, in 2013, IEA released the attributes of complex engineering problems and complex engineering activities to guide the signatory countries of the Washington Accord in their implementation of complexity in engineering curriculum (as illustrated in Table 1 and Table 2 respectively) which can be used by the Higher Learning Institutions (HLIs) to compare and contrast the problems in the classrooms with those in the industry.

**Prof Ir. Dr. Siti Hawa Hamzah**
Professor of Civil & Structural Engineering,
UiTM Shah Alam (1961 – present)
sitihawabthamzah@gmail.com

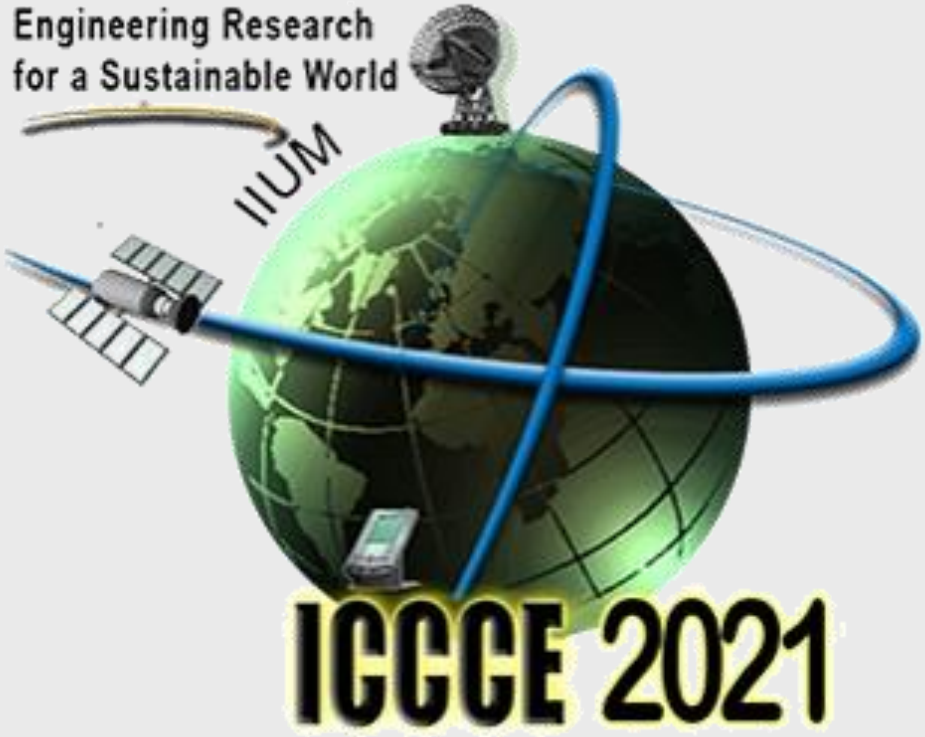
Currently – Director (EAD BEM) (2020 – 2022).
IEM Council Member (2021/2022, 2022/2023, 2023/2024).
International Engineering Alliance (IEA) Mentor to **Bangladesh** into Washington Accord Full Signatory Membership (2016 – ongoing).
Past Associate Director (Civil) EAC, Past Associate Director (Structural) EAC, Past Council Member IEM, Past Excomm IEM
OBE Trainer, Ministry of Higher Education **Afghanistan** (World Bank Project), Kabul (2016 – 2019)
Academic Programme Reviewer, Master of Science in Civil Engineering, **Qatar** University (2019).

Ir. Dr. Siti Hawa Hamzah is a retired Professor in Civil and Structural Engineering from UiTM Shah Alam. Currently, she is the Director of the Accreditation Department, BEM. She specializes in load bearing wall panel structures and engineering education. She has been providing extensive trainings on OBE and engineering education. She has provided impactful contributions to Afghanistan, Bangladesh and Qatar on OBE and quality assurance. Awarded with the Hon. MAFEO, IEM Woman Engineer and more than 20 research accolades. Ir. Dr. Siti published 14 books in structural engineering and more than 175 technical papers. She holds bachelor and master degrees, and certificate of education from the USA. She completed her PhD from UKM. She's a PEPC, FIEM, MRM and PSWM.

## TEACHING ENGINEERING ETHICS: CHALLENGES AND FUTURE THOUGHTS

**Abstract:** In this paper, the author is drawing from his own experience teaching the subject for many years for engineers and also drawing from the international experience of many who wrote and taught the subject. The paper will address the challenges of teaching theories of ethics and moral philosophy to engineers and will address the challenges of putting these concepts in application that the Engineering-mindset can understand and use in everyday life. The ethical decision making is the main objective of such courses and how it should be approached to be meaningful and realistic in a time of moral fluidity and decline of traditions. The paper will also address some recommendations to teach these courses.

**Professor Waleed Fekry Faris** received the B.Sc. degree in mechanical engineering with a specialization in construction equipment and off-road vehicles and the M. Sc. degree in applied mechanics from Zagazig University, Zagazig, Egypt, in 1989 and 1996, respectively, and the Ph.D. degree in nonlinear dynamics from Virginia Tech, Blacksburg, in 2003. He is currently the director of International Institute of Muslim Unity, and has been a Professor with the Department of Mechanical Engineering, Kulliyyah of Engineering, International Islamic University Malaysia since 2012. He is also the technical advisor for MIT Technologies, Malaysia since 2010. His main interests for the past 20 years whilst teaching and researching in particular has been a field he had been privileged to be able to work in ever since 1991, in several different countries and with people of varying backgrounds. He has to his credit three books and more than 80 technical papers in reputed journals and refereed conference proceedings in vehicle, structural, and system dynamics and control and Noise, Vibration, and Harshness (NVH).,Dr. Faris is a member of the Japanese Society of Automotive Engineers and a technical committee member and reviewer of several international journals and conferences worldwide.




# 2021 8th International Conference on Computer and Communication Engineering

# ICCCE 2021

# MESSAGE FROM THE CHAIRMAN OF ICCCE 2021

**Mohamed Hadi Habaebi**

**Chairman**

**8th International Conference on Computer and Communication Engineering (ICCCE 2021)**

*Assalamualaikum warahmatullahi wabarakatuh,*

I would like to extend my warmest welcome to the participants of the 8th International Conference on Computer and Communication Engineering 2021 (ICCCE 2021) organized by the Department of Electrical and Computer Engineering (ECE), Faculty of Engineering, International Islamic University Malaysia (IIUM). The theme of this conference is "Engineering Research for a Sustainable World". The conference provides a good platform for fellow colleagues, researchers, policy makers and students to share, discuss, and collaborate on knowledge and findings while expanding networks. The past ICCCE conferences, as well as the current one, has followed a strict regime of IEEE guidelines of blind-review process seconded by the technical committee scrutiny to update the papers based on reviewers' comments and to comply with the template guidelines. The ICCCE2021 conference received more than 120 submissions through EDAS from around 20 countries.

I would like to express my sincere gratitude to the organizing committee and everybody who have worked very hard to make this conference a reality and success. I would like to express my deepest gratitude to the distinguished keynote speakers, International Advisory Board members and sponsors. I am also grateful to all the reviewers, as without their effort the high-quality standard for the conference could not have been maintained.

Finally, due to Covid-19 restrictions on travel and social distancing, the conference venue was converted to virtual to observe the IEEE, as well as the Malaysian Government, guidelines on safety during the event. I wish all of you a pleasant virtual experience and we hope that ICCCE 2021 will be a successful and enjoyable event for all participants.

*Wassalam.*

**Prof. Dr. Mohamed Hadi Habaebi**
**Head of Electrical and Computer Engineering Department**
**Kulliyyah of Engineering**
**Chairman of ICCCE 2021**

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# TECHNICAL SESSION ICCCE 2021

*Details at* ***https://www.iium.edu.my/iccce/21/USB21***

| Day 1: Tuesday 22 June 2021 | | |
|---|---|---|
| 8.30 – 9.00 | **Online attendance to the Congress IEC 2021** **Zoom Room - Congress** | |
| **Opening**<br>9.00 – 9.45 | **Opening Ceremony of the IIUM Engineering Congress 2021**<br>**Welcoming Remarks**<br>**by**<br>**The Dean, The Rector and The President**<br>**Zoom Room - Congress** | |
| 9.45 – 10.00 | **Online attendance to ICCCE 2021** **Zoom Room – ICCCE K** | |
| **Keynote**<br>10.00 – 10.45 | **Title**: Empowering Sustainability with beyond 5G networks<br>**Presenter**: Prof. Sonia Aissa, INRIA, Quebec, Canada<br>**Chairperson**: Prof. Md. Rafiqul Islam, IIUM, Malaysia<br>**Zoom Room – ICCCE K** | |
| 10.45 – 11.00 | **Break & Networking** **Zoom Room – ICCCE K** | |
| 11.00 – 12.45 | **Parallel Sessions** **Zoom Room – ICCCE A & B** | |
| | **1A** - Signal and Image Processing | **1B** - Internet of Things and Big Data |
| 13.00 – 14.00 | **Lunch Break** | |
| 14.00 – 15.45 | **Parallel Sessions** **Zoom Room – ICCCE A & B** | |
| | **2A** - Smart Grid and ICT | **2B** - Instrumentation and Control |
| 15.45 – 16.00 | **Break & Networking** **Zoom Room – ICCCE A & B** | |
| 16.00 – 17.30 | **Parallel Sessions** **Zoom Room – ICCCE A & B** | |
| | **3A** - Antennas and Propagation | **3B** - Computer Networks and Security |

# TECHNICAL SESSION ICCCE 2021

*Details at* ***https://www.iium.edu.my/iccce/21/USB21***

| Day 2: Wednesday 23 June 2021 | | |
|---|---|---|
| **Keynote**<br>9.00 – 9.45 | **Title:** The Role of Power Electronics in Providing a Sustainable Energy Supply<br>**Presenter**: Prof. Dr. Saad Mekhilef, University of Malaya, Malaysia<br>**Chairperson**: Prof. Mohamed Hadi Habaebi, IIUM, Malaysia<br>**Zoom Room – ICCCE K** | |
| 9.45 – 10.00 | **Break & Networking** | **Zoom Room – ICCCE K** |
| **Keynote**<br>10.00 – 10.45 | **Title:** Recent Research on Detection of Vulnerable Plaque in Coronary Artery Ultrasound Images Using Machine Learning Algorithms<br>**Presenter**: Prof. Ts. Dr. Ali Selamat, Universiti Teknologi Malaysia<br>**Chairperson**: Prof. Othman Omran Khalifa, IIUM, Malaysia<br>**Zoom Room – ICCCE K** | |
| 10.45 – 11.00 | **Break & Networking** | **Zoom Room – ICCCE K** |
| 11.00 – 12.45 | **Parallel Sessions** | **Zoom Room – ICCCE A & B** |
| | **4A** - Signal and Image Processing | **4B** - Agents, Knowledge-Based Technologies |
| 13.00 – 14.00 | **Lunch Break** | |
| 14.00 – 15.45 | **Parallel Sessions** | **Zoom Room – ICCCE A & B** |
| | **5A** - RF and Microwave Circuits and Devices | **5B** - NextGen Mobile Communications |
| 15.45 – 16.00 | **Break & Networking** | **Zoom Room – ICCCE A & B** |
| 16.00 – 17.30 | **Parallel Sessions** | **Zoom Room – ICCCE A & B** |
| | **6A** - Internet of Things and Big Data | **6B** - Optical Communications and Photonics |


# 6th International Conference on Biotechnology Engineering

# ICBioE 2021

# MESSAGE FROM THE CHAIRMAN OF ICBioE 2021

**Nor Fadhillah Bt. Mohamed Azmin**

**Chairman**

**6th International Conference on BiotechnologyEngineering (ICBioE 2021)**

*Assalamualaikum warahmatullahi wabarakatuh,*

Welcome to the 6th International Conference on Biotechnology Engineering 2021 (ICBioE 2021), organised by the Department of Biotechnology Engineering, Faculty of Engineering, International Islamic University Malaysia from 22nd to 23rd June 2021. The theme for this conference is 'NURTURING INNOVATION FOR SUSTAINABLE FUTURE'. The International Conference on Biotechnology Engineering is held every other year and this year's conference is a deferment from year 2020 due to the Covid-19 pandemic. It serves as an international forum for researchers to exchange and share their experiences, ideas and latest research results and innovations on all aspects of biotechnology engineering including, but not limited to, bioenergy, materials, chemical engineering, environmental engineering, and bioprocess engineering.

This is the first time the ICBioE is held virtually. All of the submissions were rigorously reviewed through a blind-review process by at least two experts comprising of non-members and members of the organizing committee. I would like to express my sincere gratitude to the members of the organizing committee for their hard work and continuous support; plus, my sincere appreciation to all participants, members of the advisory committee, keynote speakers and sponsors that have contributed to making this conference a successful one. On behalf of the organizing committee, I welcome you to our ICBioE 2021 virtual conference.

We sincerely hope you will enjoy ICBioE.

**Assoc Prof. Dr. Nor Fadhillah Bt Mohamed Azmin**
**Head of Biotechnology Engineering Department**
**Kulliyyah of Engineering**
**Chairman of ICBioE 2021**

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# TECHNICAL SESSION ICBioE 2021

Details at https://conference.iium.edu.my/icbioe2021/conference-schedule/

| Day 1: Tuesday 22 June 2021 | | |
|---|---|---|
| 8.30 – 9.00 | **Online attendance to the Congress IEC 2021** **Zoom Room - Congress** | |
| **Opening**<br>9.00 – 9.45 | **Opening Ceremony of the IIUM Engineering Congress 2021**<br>**Welcoming Remarks**<br>**by**<br>**The Dean, The Rector and The President**<br>**Zoom Room - Congress** | |
| 9.45 – 10.00 | **Online attendance to ICBioE 2021** **Zoom Room – ICBIOE Lobby** | |
| **Keynote**<br>10.00 – 10.45 | **Title**: Exploring the metabolism of *Methanococcus maripaludis* S2 for carbon utilisation<br>**Presenter**: Prof. Iftekhar A Karimi, National University of Singapore<br>**Chairperson**: Prof. Md. Zahangir Alam, IIUM, Malaysia<br>**Zoom Room – ICBIOE Lobby** | |
| 10.45 – 11.00 | **Break & Networking** **Zoom Room – ICBIOE Lobby** | |
| 11.00 – 12.30 | **Parallel Sessions** **Zoom Room – ICBIOE A & B** | |
| | **1A** - Biotechnology Engineering | **1B** - Bioprocess Engineering |
| 12.30 – 14.00 | **Lunch Break** | |
| 14.00 – 15.30 | **Parallel Sessions** **Zoom Room – ICBIOE A & B** | |
| | **2A** - Chemical Engineering | **2B** - Food Technology and Engineering |
| 15.30 – 15.45 | **Break & Networking** **Zoom Room – ICBIOE Lobby** | |
| 15.45 – 17.15 | **Parallel Sessions** **Zoom Room – ICBIOE A & B** | |
| | **3A** - Biomaterials and Nanotechnology | **3B** - Environmental Engineering and Bionergy |

# TECHNICAL SESSION ICBioE 2021

| Day 2: Wednesday 23 June 2021 | | |
|---|---|---|
| **Keynote**<br>9.00 – 9.45 | **Title:** Green technology and nanomaterial applications for the mitigation of greenhouse gases (GHGs)<br>**Presenter**: Prof. Dato' Ir. Dr. Abdul Rahman Mohamed, Universiti Sains Malaysia<br>**Chairperson**: Prof. Ma'an Fahmi Rashid Al Khatib, IIUM, Malaysia<br>**Zoom Room – ICBIOE Lobby** | |
| 9.45 – 10.00 | **Break & Networking** | **Zoom Room – ICBIOE Lobby** |
| **Keynote**<br>10.00 – 10.45 | **Title:** HALEA natural skincare: Unlocking research potential from lab to market<br>**Presenter**: Dr. Mariam Firdhaus, AM Zaideen Ventures Sdn. Bhd, Malaysia<br>**Chairperson**: Prof. Faridah Yusof, IIUM, Malaysia<br>**Zoom Room – ICBIOE Lobby** | |
| 10.45 – 11.00 | **Break & Networking** | **Zoom Room – ICBIOE Lobby** |
| 11.00 – 12.30 | **Parallel Sessions** | **Zoom Room – ICBIOE A & B** |
| | **4A** - Biotechnology Engineering | **4B** - Environmental Engineering and Bioenergy |
| 12.30 – 14.00 | **Lunch Break** | |
| 14.00 – 15.30 | **Parallel Sessions** | **Zoom Room – ICBIOE A & B** |
| | **5A** - Biotechnology Engineering | **5B** - Agricultural and Natural Biotechnology |
| 15.30 – 15.45 | **Break & Networking** | **Zoom Room – ICBIOE Lobby** |
| 15.45 – 17.15 | **Parallel Sessions** | **Zoom Room – ICBIOE A & B** |
| | **6A** – Biomaterials and Nanotechnology | **6B** – Food Technology and Engineering |
| 17.15 – 17.45 | **Closing and Best Presentation Awards**<br>**Zoom Room – ICBIOE Lobby** | |


# 5th International Conference on Mechanical, Automotive and Aerospace Engineering 2021

ICMAAE 2021

# MESSAGE FROM THE CHAIRMAN OF ICMAAE 2021

**Meftah Hrairi**

**Chairman**

**5th International Conference on Mechanical, Automotive and Aerospace Engineering 2021 (ICMAAE 2021)**

*Assalamualaikum warahmatullahi wabarakatuh,*

While we regret that the Covid-19 pandemic prevented us from holding our conference in Kuala Lumpur in June 2020, we are excited about the opportunities of holding an innovative virtual conference a year later. So, it is my great honour and pleasure to welcome all participants attending the virtual 5th International Conference on Mechanical, Automotive and Aerospace Engineering (ICMAAE 2021) that will take place from the 22nd to the 23rd of June 2021. The conference organizers have put together excellent scientific programs that encompass both the latest research in mechanical engineering and provide an opportunity to renew old friendships and make new acquaintances.

The online scientific conference will enable participants to interact amongst peers through keynote presentations, parallel sessions, exchange of ideas over debates and panel discussions, and acquire new skills. We carefully chose the Zoom® platform to support our event, offering you enhanced discussion and networking capabilities. Zoom® channels will ensure large audience discussion stability and smaller meetings will be possible using the breakout room of your choice.

Mechanical, Automotive and Aerospace engineering form the backbone of much of the industrialised world and play a vital part in steering the national goal of self-reliance and marching forward towards competitiveness in all areas of science and technology. With a theme of 'Engineering Research for a Sustainable World', it is hoped that the conference would provide a unique opportunity for academics, engineers and postgraduate students to meet, present and discuss the latest research developments, challenges and trends in mechanical, automotive and aerospace engineering as well as collaborate on knowledge and findings while expanding networks.

The success of ICMAAE 2021 depends completely on the effort, talent, and energy of researchers in the field of Mechanical, Automotive and Aerospace engineering who have submitted papers on a variety of topics. We are indeed glad at the favourable response received from the scientific community around the world. I would like to extend my thanks to the members of the organizing committee for their hard work in organising this excellent event. I would like to take this opportunity to express my sincere gratitude and appreciation to all the reviewers who have helped in maintaining the high standard of the conference. My thanks go to all the sponsors and all participants in making this conference a success.

We hope that you enjoy our virtual conference, and that you've a chance to enjoy the city of Kuala Lumpur in the next edition of ICMAAE.

*Wassalam.*

**Prof. Dr. Meftah Hrairi**
**Head of Mechanical Engineering Department**
**Chairman of ICMAAE 2021**

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# TECHNICAL SESSION ICMAAE 2021

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<tr><th colspan="5">Day 1: Tuesday 22 June 2021</th></tr>
<tr><td>8.30 – 9.00</td><td colspan="4">Online attendance to the Congress IEC 2021<br>Zoom Room - Congress</td></tr>
<tr><td>Opening<br>9.00 – 9.45</td><td colspan="4">Opening Ceremony of the IIUM Engineering Congress 2021<br>Welcoming Remarks<br>by<br>The Dean, The Rector and The President<br>Zoom Room - Congress</td></tr>
<tr><td>9.45 – 10.00</td><td colspan="4">Break & Networking Zoom Room - ICMAAE Lobby</td></tr>
<tr><td>Keynote 1<br>10.00 – 10.45</td><td colspan="4">Title: The Positive Impact of Disruptive Technology in Aviation MRO Industry<br>Presenter: Prof. Dato’ Ir. Ts. Dr. Mohamad Dali Isa, UniKL MIAT, Malaysia<br>Chairperson: Prof. Dr. Meftah Hrairi, IIUM, Malaysia<br>Zoom Room - ICMAAE Lobby</td></tr>
<tr><td>10.45 – 11.00</td><td colspan="4">Break & Networking Zoom Room - ICMAAE Lobby</td></tr>
<tr><td>Keynote 2<br>11.00 – 11.45</td><td colspan="4">Title: Opportunities and Challenges in the Next Generation Light Duty Vehicle Propulsion Systems<br>Presenter: Ir. Azmi Osman, Proton Holdings Berhad, Malaysia<br>Chairperson: Prof. Ir. Dr. Masjuki Hassan, IIUM, Malaysia<br>Zoom Room - ICMAAE Lobby</td></tr>
<tr><td>11.45 – 12.00</td><td colspan="4">Break & Networking Zoom Room - ICMAAE Lobby</td></tr>
<tr><td rowspan="2">12.00 – 13.00</td><td colspan="4">Parallel Session 1 Zoom Room – ICMAAE Room A, B, C & D</td></tr>
<tr><td>ICMAAE Room A<br>Aerodynamics & Aeroelasticity I<br>Paper ID:<br>50, 58, 1</td><td>ICMAAE Room B<br>Structures & Materials I<br>Paper ID:<br>41, 102, 97</td><td>ICMAAE Room C<br>Vehicle Dynamics & Control I<br>Paper ID:<br>24, 84, 118</td><td>ICMAAE Room D<br>Thermo-Fluids I<br>Paper ID:<br>79, 39, 87</td></tr>
<tr><td>13.00 – 14.00</td><td colspan="4">Lunch Break</td></tr>
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# TECHNICAL SESSION ICMAAE 2021

| Day 1: Tuesday 22 June 2021 | | | | |
|---|---|---|---|---|
| 14.00 – 15.40 | **Parallel Session 2** | | **Zoom Room – ICMAAE Room A, B, C & D** | |
| | **ICMAAE Room A**<br>Aerodynamics & Aeroelasticity II<br>**Paper ID:**<br>**56, 103, 82, 72** | **ICMAAE Room B**<br>Aerospace Structures I<br>**Paper ID:**<br>**33, 124, 98, 122, 111** | **ICMAAE Room C**<br>Dynamics & Controls I<br>**Paper ID:**<br>**46, 16, 100, 28** | **ICMAAE Room D**<br>Combustion & Emission Control<br>**Paper ID:**<br>**47, 55, 76, 63, 64** |
| 15.40 – 16.00 | **Break & Networking** | | **Zoom Room – ICMAAE Lobby** | |
| 16.00 – 17.20 | **Parallel Session 3** | | **Zoom Room – ICMAAE Room A, B, C & D** | |
| | **ICMAAE Room A**<br>Green Energy I<br>**Paper ID:**<br>**73, 114, 89, 115** | **ICMAAE Room B**<br>Vehicle Structures & Crashworthiness<br>**Paper ID:**<br>**35, 90, 44** | **ICMAAE Room C**<br>Structures & Materials II<br>**Paper ID:**<br>**68, 32, 71, 23** | **ICMAAE Room D**<br>Thermo-Fluids II<br>**Paper ID:**<br>**38, 93, 94, 15** |

# TECHNICAL SESSION ICMAAE 2021

<table>
<tr><th colspan="5">Day 2: Wednesday 23 June 2021</th></tr>
<tr><td>Keynote 3<br>9.00 – 9.45</td><td colspan="4">Title: Understanding the Requirement of Manufacturing Aerospace Workforce<br>Presenter: Muhamad Khalizi Bin Abdul Razak, Naluri Cindai Sdn Bhd, Malaysia<br>Chairperson: Prof. Dr. Waqar Asrar, IIUM, Malaysia<br>Zoom Room - ICMAAE Lobby</td></tr>
<tr><td>Keynote 4<br>9.45 – 10.30</td><td colspan="4">Title: Vehicle Safety in Malaysia After 14 Years of MIROS Establishment<br>Presenter: Khairil Anwar Bin Abu Kassim (Ir. Ts. Dr.), Adjunct Prof., Malaysian Institute of Road Safety Research (MIROS), Malaysia<br>Chairperson: Assoc. Prof. Dr. Fadly Jashi Darsivan, IIUM, Malaysia<br>Zoom Room - ICMAAE Lobby</td></tr>
<tr><td>10.30 – 10.45</td><td colspan="4">Break & Networking Zoom Room - ICMAAE Lobby</td></tr>
<tr><td rowspan="2">10.45 – 11.45</td><td colspan="4">Parallel Session 4 Zoom Room – ICMAAE Room A, B, C & D</td></tr>
<tr><td>ICMAAE Room A<br>Aerodynamics & Aeroelasticity III<br>Paper ID:<br>67, 108, 91</td><td>ICMAAE Room B<br>Aerospace Structures II<br>Paper ID:<br>70, 127, 95</td><td>ICMAAE Room C<br>Green Energy II<br>Paper ID:<br>52, 74, 18</td><td>ICMAAE Room D<br>Internet of Things<br>Paper ID:<br>88, 62</td></tr>
<tr><td>11.45 – 12.00</td><td colspan="4">Break & Networking Zoom Room – ICMAAE Lobby</td></tr>
<tr><td rowspan="2">12.00 – 13.00</td><td colspan="4">Parallel Session 5 Zoom Room – ICMAAE Room A, B, C & D</td></tr>
<tr><td>ICMAAE Room A<br>Aerospace Propulsion<br>Paper ID:<br>119, 106, 101</td><td>ICMAAE Room B<br>Structures & Materials III<br>Paper ID:<br>17, 14, 96</td><td>ICMAAE Room C<br>Vehicle Dynamics & Controls II<br>Paper ID:<br>21, 51, 105</td><td>ICMAAE Room D<br>Special Topics<br>Paper ID:<br>19, 37, 86</td></tr>
<tr><td>13.00 – 14.00</td><td colspan="4">Lunch Break</td></tr>
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# TECHNICAL SESSION ICMAAE 2021

| Day 2: Wednesday 23 June 2021 | | | | |
|---|---|---|---|---|
| 14.00 – 15.40 | **Parallel Session 6** | **Zoom Room – ICMAAE A, B, C & D** | | |
| | **ICMAAE Room A**<br>Aerodynamics & Aeroelasticity IV<br>**Paper ID:**<br>**113, 80, 92, 85** | **ICMAAE Room B**<br>Structures & Materials IV<br>**Paper ID:**<br>**78, 60, 130, 20, 22** | **ICMAAE Room C**<br>NDT<br>**Paper ID:**<br>**61, 121, 123, 116, 125** | **ICMAAE Room D**<br>Special Topics<br>**Paper ID:**<br>**66, 77, 53, 126, 54** |
| 15.40 – 16.00 | **Break, & Networking** | **Zoom Room – ICMAAE Lobby** | | |
| 16.00 – 17.20 | **Parallel Session 7** | **Zoom Room – ICMAAE Room A, B, C & D** | | |
| | **ICMAAE Room A**<br>Modelling & Simulation<br>**Paper ID:**<br>**65, 45, 42, 69** | **ICMAAE Room B**<br>Aerospace Structures III<br>**Paper ID:**<br>**109, 110, 128, 112** | **ICMAAE Room C**<br>Structures & Materials V<br>**Paper ID:**<br>**27, 57, 34, 83** | **ICMAAE Room D**<br>Structures & Materials VI<br>**Paper ID:**<br>**75, 59, 104, 81** |


# 4th International Conference on Engineering Professional Ethics and Education

# ICEPEE 2021

# MESSAGE FROM THE CHAIRMAN OF ICEPEE 2021

**Ali Sophian**

**Chairman**

**4th International Conference on Engineering Professional Ethics and Education (ICEPEE 2021)**

*Assalamu'alaikum warahmatullahi wabarakatuh.*

Sincere greetings to all.

Praise be due to Allah the Lord of the Universe. We are pleased and grateful to convey that ICEPEE has been revitalized following some hibernation, where the last one, the 3rd ICEPEE, was held back in 2013. International Islamic University Malaysia (IIUM) is a strong supporter of value-and-ethics-based education that will produce not just good professionals and scholars but also those who value and observe ethics in both their professional and personal lives. ICEPEE is one of the examples of the commitment shown by the university in this integrative, holistic education.

After the hibernation, this year ICEPEE is revived by the Faculty of Engineering of IIUM with a humble restart and we are aiming high *inshaAllah* for the future and will contribute more significantly towards integrative engineering education internationally. This year, we have received nearly 20 abstract submissions that involve authors from five different countries.

With the rise of digital transformation and other disruptive technologies and the concern over sustainability in social, economic and environmental aspects, new teaching and learning approaches and technologies are an inevitable future for all educators. This is even more true as the world has been hit by the current Covid-19 pandemic that has forced us to adapt our pedagogical systems quickly and effectively. With this in mind, ICEPEE 2021 was launched with the theme “Redesigning Teaching and Learning for Sustainable Education”.

I would like to thank the Conference Committee who have worked hard for the success of this conference. I would also like to extend my sincere gratitude to our distinguished keynote speakers, to all presenters and participants.

Finally, on behalf of the Organizing Committee, I welcome you all and wish you an enjoyable and fruitful virtual conference.

Best regards,

**Ali Sophian**
**Chairman, ICEPEE 2021**

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# TECHNICAL SESSION ICEPEE 2021

| Day 1: Tuesday 22 June 2021 | |
|---|---|
| 9.00 - 9.45 am | **Opening Ceremony of the IIUM Engineering Congress 2021**<br>**Welcoming Remarks**<br>**by**<br>**The Dean, The Rector and The President**<br>**Zoom Room - Congress** |
| 9.45-10.00 am | **Online registration for ICEPEE 2021** **Zoom Room - ICEPEE** |
| **Keynote**<br>10.00 - 10.45 am | **Keynote Session 1**<br>**Title:** New Discourse of Engineering Education<br>**Presenter:** Prof. Dr. Odeh R. Al-Jayyousi, Head of Technology and Innovation Management, Arabian Gulf University, Bahrain.<br>**Chairperson:** Prof. Dr. Maan Al-Khatib, IIUM, Malaysia.<br>**Zoom Room - ICEPEE** |
| 10.45 - 11.00 am | **Break, Registration & Networking** **Zoom Room - ICEPEE** |
| 11.00 - 12.45 pm | **Parallel Session 1A**<br>Islamization of Engineering Studies and Education – IESE<br>Humanising Engineering Education – HEE<br>E-Learning Technologies and Methodologies in Education - ETME<br>**Zoom Room - ICEPEE** |
| 12.45 – 2.00 pm | **Lunch Break** |

# TECHNICAL SESSION ICEPEE 2021

| Day 1: Tuesday 22 June 2021 | |
|---|---|
| **Keynote**<br>2.00 - 2.45 pm | **Keynote Session 2**<br>**Title:** Addressing WP and EA in the TLA of Engineering Programme<br>**Presenter:** Prof. Ir. Dr. Siti Hawa Hamzah Director of the Accreditation Department, Board of Engineers Malaysia (BEM).<br>**Chairperson:** Prof. Ir. Dr. Zuraida Ahmad, IIUM, Malaysia.<br>**Zoom Room – ICEPEE** |
| 2.45 - 3.00 pm | **Break, Registration & Networking** **Zoom Room – ICEPEE** |
| 3.00 - 5.00pm | **Parallel Session 2A**<br>Engineering and Safety– ES<br>Enhancing Innovation in Research and Education -SEER<br>Professionalism and Ethics in Engineering and Engineering Education - PEEE<br>**Zoom Room – ICEPEE** |

# TECHNICAL SESSION ICEPEE 2021

| Day 2: Wednesday 23 June 2021 | |
|---|---|
| **Keynote**<br>9.00 - 9.45 am | **Keynote Session 3**<br>**Title:** Teaching Engineering Ethics: Challenges and Future Thoughts<br>**Presenter:** Prof. Dr. Waleed Fekry Faris, director of International Institute of Muslim Unity, IIUM, Malaysia.<br>**Chairperson:** Dr. Ali Sophian, IIUM, Malaysia<br>**Zoom Room - ICEPEE** |
| 9.45-10.00 am | **Break, Registration & Networking** **Zoom Room - ICEPEE** |
| 10.00-12.45 pm | **Parallel Session 3A**<br>Engineering Education Policies and Practice – IEEPP<br>Engineering Education for Sustainable Development – EESD<br>Engineering and Environment –EE<br>Sustainability in Engineering Education and Research – SEER<br>Technology Transfer –TT<br>Social Responsibility in Engineering - SRE<br>**Zoom Room - ICEPEE** |

# INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA (IIUM)

IIUM was established in 1983 to fulfill one of the major aspirations of the contemporary global Muslim community. This yearning of the Ummah is a key element in IIUM's vision statement: "To become a leading international center of educational excellence which seeks to restore the dynamic and progressive role of the Muslim Ummah in all branches of knowledge and intellectual discourse."

IIUM operates under the direction of a Board of Governors with representatives from the eight sponsoring governments and the Organization of Islamic Conference (OIC). Currently, IIUM is home to over 24,000 students (18,000 undergraduates and 6,000 Postgraduates) students including students from more than 117 countries and 3,000 teaching and administrative staff members.

The university's current physical facilities are located at five sprawling campuses in Gombak, Kuala Lumpur, Kuantan, Gambang and Pagoh. This was a far cry from its humble beginnings in 1983 when it operated from temporary quarters with 153 students and a handful of lecturers and administrators.

IIUM offers a wide range of academic programs through its faculties of Science, Laws, Medicine, Engineering, Islamic Revealed Knowledge and Human Sciences, Economics and Management, Nursing and Allied Health Sciences and Architecture and Environmental Design. These are geared towards both skill-building and scholastic attainments and designed by IIUM‟s philosophy, which is built upon the belief that knowledge must be pursued and propagated in the spirit of tawhid, as an act of worship, in full recognition that it is a trust which Allah has placed upon mankind. Malaysian graduates of IIUM have performed well in both the public and private sectors. Since 1987 IIUM has been producing about 3,000 graduates annually.

# KULLIYYAH OF ENGINEERING, IIUM

The mission of the Faculty of Engineering is to provide quality engineering education, with sufficient scope to include fundamental and specialized knowledge and practice in engineering and a broad base in management, ethics, and humanities. This will enable our graduates to be ready to serve the current and emerging needs of the society.

Besides being professionally qualified and competent, the graduates will acquire spiritual, intellectual, moral and ethical characteristics towards the development of an integral and harmonious relationship with Allah (the Creator), fellow human beings and with the natural environment. The interdisciplinary approach to engineering education not only allows the graduates to solve industrial and human problems; it will also enable them to bring about and manage changes in conformity with the worldview based on the principles of Islam.

Currently, there are nine programs being offered: Aerospace Engineering, Chemical Engineering, Civil Engineering, Electrical and Electronics Engineering, Manufacturing Engineering, Materials Engineering, Mechanical Engineering and Mechatronics Engineering. The faculty is also offering postgraduate engineering programs leading to MSc. and Ph.D. degrees. At the moment the student population at the undergraduate level stands around 2200 and more than 200 at the postgraduate level.

Research and development are one of the primary activities in the Kulliyyah of Engineering which is harnessed by excellent facilities, qualified and competent academic staff, and holistic ‘Garden of Knowledge and Virtue’ ecosystem that elevate active participations in research activities in multi-disciplinary engineering areas. To foster research collaboration amongst faculty members, research units and research groups have been established towards broader Quintuple-Helix interactions for problem solving and solutions. Presently, there are three research units and fifteen research groups spanning over various areas of engineering, encompassing both conventional and emerging fields. There are also well equipped Advanced Laboratories to support research and development activities and postgraduate studies.

The Faculty of Engineering offers a wide range opportunity of postgraduate studies with Ph.D. and Masters degree programmes. With the Kulliyyah’s philosophy that is based on systems approach, the engineering programmes offer an integrated and comprehensive education that transcends the boundaries of various disciplines. The Ph.D. programme is by research whereas the Master degree program is conducted in three different modes, namely, research only, mixed mode (equal number of credits for both taught courses and research element), and coursework mode.

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The Mixed-mode and Coursework mode programmes are offered in the following nine (9) programmes respectively: Automotive Engineering, Biotechnology Engineering, Communication Engineering, Computer and Information Engineering, Electronic Engineering, Manufacturing Engineering, Material Engineering, Mechanical Engineering and Mechatronics Engineering.

In addition to its teaching role, the Kulliyyah has the responsibility to conduct strong research programmes that contribute to the advancement of knowledge. Fourteen (14) cutting edge specialisations are offered under the MSc in Engineering (Full Research) programme, that are Automotive Engineering, Biochemical Engineering, Biotechnology Engineering, Communication Engineering, Computer and Information Engineering, Chemical Engineering, Civil Engineering, Electronics Engineering, Engineering Mathematics, Engineering Science, Manufacturing Engineering, Material Engineering, Mechanical Engineering and Mechatronics Engineering.

# ACKNOWLEDGEMENT

The organizing committee acknowledges the efforts of all those who have contributed their valuable time and efforts as reviewers in ensuring high-quality technical papers for the IIUM Engineering Congress 2021.

Deepest appreciation to all faculty members of the Kulliyyah of Engineering, International Islamic University Malaysia (IIUM) for their sincere cooperation in making the conference successful. Appreciation also goes to all parties who have contributed to the success of the IIUM Engineering Congress 2021.

Finally, the organizing committee would like to express their thanks to the following companies for sponsoring this congress:




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