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> CHAIRMAN ROBERT MEBRUER

**CEO/PUBLISHER** PATRICK LEUNG

**GENERAL MANAGER SHIRLEY THAM** • *shirley@dimensionpublishing.com* 

**HEAD OF MARKETING & BUSINESS DEVELOPMENT** JOSEPH HOW • joseph@dimensionpublishing.com

**PRODUCTION EDITOR** TAN BEE HONG • bee@dimensionpublishing.com

**CONTRIBUTING WRITERS** PUTRI ZANINA • putri@dimensionpublishing.com HANNA SHEIKH MOKHTAR • hanna@dimensionpublishing.com

> SENIOR GRAPHIC DESIGNER **SOFIA HANIS** • *sofia@dimensionpublishing.com*

**GRAPHIC DESIGNER** NICOLE THENG • nicole@dimensionpublishing.com

ADVERTISING CONSULTANTS THAM CHOON KIT • ckit@dimensionpublishing.com

ACCOUNTS CUM ADMIN EXECUTIVE YEN YIN • yenyin@dimensionpublishing.com

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by Ir. Dr Aidil Chee Tahir Chairman, Mechanical Engineering Technical Division (METD)

### **COVER** — NOTF

### **Malaysia's Aviation Industry:** Through the Lens of an Engineer

nce again, METD is honoured to be championing the publication of IEM's JURUTERA Monthly Bulletin for January 2023. In this issue, we focus on the aviation industry of Malaysia from an engineering perspective.

With Covid-19 behind us, the local aviation

industry has started to open up again, gaining momentum and spurring economic growth both locally as well as across the world. One of the most significant milestones for the industry was the regaining of the Federal Aviation Administration (FAA) Category 1 safety rating on 1 October 2022 which enables Malaysia-based air carriers to establish flight services with the US and to carry the code of US carriers. This represents a very important achievement for the nation as well as the Malaysian aviation fraternity as a whole.

For the cover story, we have the privilege of interviewing Datuk Captain Chester Voo, the former CEO of the Civil Aviation Authority of Malaysia (CAAM) where he shares with us the challenges he has faced in the journey to regain the FAA Category 1 safety rating and how he inspired and mobilised his team in order to successfully achieve this momentous outcome. We also feature two articles:

- 1. Advancing Licensed Aircraft Engineer's Career with Professional Engineer Certification via BEM/IEM.
- 2. Moving the masses in an Airport the Automated People Mover (APM).

In the forums, we go behind the scenes to explore the mechanics of how an airport Baggage Handling System (BHS) works and learn more about the operations of the Air Traffic Control System (ATC) at the CAAM Tower West of KLIA2.

### **EDITOR'S** NOTE -

### **Engineering and Aviation**

et me start by wishing everyone "Happy New Year 2023". May you have a wonderful year ahead.

In this issue of JURUTERA, brought to you by the Mechanical Engineering Technical Division (METD), we will learn more about the latest developments in our country's aviation industry as well as how engineers are playing their roles.



by Ir. Dr Siow Chun Lim Principal Bulletin Editor

Not going to divulge anything further. Happy reading!





## Regaining Credibility of Malaysia's Civil Aviation Safety Standard

The Civil Aviation Authority of Malaysia (CAAM) took the bull by the horns to regain a Category 1 rating of the international aviation safety assessment (IASA) accorded by the Federal Aviation Administration (FAA), bringing Malaysia's aviation safety standard back on par yet again with some of the world's best. Its CEO, Datuk Captain Chester Voo, talks about how CAAM successfully steered its team to achieve this after being downgraded to Category 2 in 2019.



CAAM CEO Datuk Captain Chester Voo

When the United States Federal Aviation Administration (FAA) downgraded Malaysia's International Aviation Safety Assessment (IASA) air safety rating from Category 1 to Category 2 in 2019, it was a slap in the face, not only for the nation but also for the country's aviation sector in particular.

This was the first time that Malaysia's air safety rating was downgraded since we achieved Category 1 status in 2003. The FAA's air safety rating is based on an assessment of a country's aviation safety oversight capability by the civil aviation authority.

However, the Civil Aviation Authority of Malaysia (CAAM) did not take the downgrading sitting down. Two years after, on 1 October 2022, we regained the top rating.

How did CAAM do it?

Recalling the journey to regain Category 1 status, CAAM CEO Datuk Captain Chester Voo says CAAM sprang into action and rallied all staff members at every level, from management and administration to air traffic controllers, engineers, pilots and other personnel, to address weaknesses and turn the situation around. Together with the firm support of the Ministry of Transport and CAAM's Authority Members (Members of the Board of Directors), the team did it!

Attaining Category 1 means CAAM can maintain effective safety oversight with clear directives, processes, implementation and evidence of this ability. It reinforces Malaysia's civil aviation authority's compliance with the standards set by the FAA. It also allows CAAM to resume adding new routes to and from the United States or to enter into new code sharing agreements that involve flying to the US. Undoubtedly, regaining Category 1 status was a national mission that must be carried out and, as the national aviation authority, CAAM did it!

CAAM was previously known as the Department of Civil Aviation (DCA), a government agency under the purview of the Ministry of Transport Malaysia. CAAM became a statutory body on 19 February 2018, with its own Authority Members.

### **Time for Transformation**

The past two years were indeed crucial for CAAM as the whole organisation was restructured. Efforts were carried out to strengthen its workforce and to establish more effective standards of compliance and guidance documentations, as well as to develop a comprehensive training policy for CAAM inspectors to enhance safety oversight for Malaysia's civil aviation industry. An extensive transformation took place in CAAM to better manage operational and regulatory complexities.

"The downgrading in 2019 was very unfortunate. I joined CAAM together with Tan Sri Mohd Khairul Adib Abd Rahman, the former Director-General of the Public Services Department. He was appointed Chairman and I became the CEO on 1 June 2020," says Datuk Voo.

He recalled noticing everyone in CAAM feeling demotivated by the downgrading which was the result of the auditing of safety standards which covered Annex 1, 6 and 8, listed under The Convention on International Civil Aviation. Three areas of major weaknesses surfaced during the audit: Flight operations, aircraft airworthiness and personnel licensing. Under the Convention's personnel licensing, there are standards and practices recommended for the licensing of flight crew members (pilots, flight engineers and flight navigators), air traffic controllers, aeronautical station operators, maintenance technicians and flight dispatchers as provided by Annex 1.

"The downgrade meant that Malaysia, through CAAM as safety oversight regulator, had not complied with certain things, either in terms of effective safety oversight processes due to manpower issues or the lack of training, for example," explains Datuk Voo.

"With everyone demoralised back in 2019, I knew it was time to take a





hard look at ourselves and to accept the changes that would be required for recovery. One of the first things I told my management team when I came in as CEO in June 2020 was that we needed to be humble and to take a sincere look at ourselves. We needed to be realistic and to look deeply at the root causes of this downgrade. Once we opened our hearts and admitted that we did indeed have flaws, then the process of fixing the flaws holistically could begin."

CAAM had assistance from various quarters while the Ministry of Transport also appointed a Task Force to look at proposed solutions for the 33 open findings which resulted in the downgrade. Dato' Kok Soo Choon, former Director-General of DCA, headed the Task Force, which also comprised a co-ordinator and 4 industry experts, all focused on formulating comprehensive and workable solutions. The Task Force termed these Corrective Action Plans (CAPs), which became instrumental in ensuring strong and formidable solutions.

"We were also grateful for a very supportive Transport Minister and the support of the Ministry's Secretary General and the Aviation Division. The Authority Members of CAAM also guided us and were very supportive, right from the word go," says Datuk Voo. The Transport Minister at the time was Datuk Seri Ir. Dr Wee Ka Siong.

Datuk Voo also credits aviation industry players who gave their support through their involvement in discussions, sharing of ideas and secondment of technical writers which allowed CAAM to complete a comprehensive transformation on time.

"I will always remember and be grateful to US Embassy officials, FAA regional office in Singapore and the FAA Flight Standards team in Washington DC who allowed collaborative discussions on flight safety oversight and on ways that we could work together and share ideas, all in the interest of a greater goal in achieving the highest level of flight safety for all," he says, adding that as the Civil Aviation Authority of Malaysia, CAAM must have a complete and well-structured documentation in the form of directives, processes, implementation methods and evidence that show its staff's adherence to the documents.

"We need to fix and build an entire sustainable eco-system that will be robust and comprehensive. We must build a CAAM that is clear and concise, facilitative through service delivery, one that strives to facilitate a huge industry and one that is competent through merit and competency. In short, we need to fix our documentation, processes, implementation methods and evidence as well as to build a great culture that is based on trust, merit and competency," he adds.

The management team started small, with dedicated work teams driving initiatives fast and hard. Then it began extensive, frequent townhall sessions with all staff members to rally support and build positive perception all around. It also engaged all stakeholders from the industry and published CAAM's Client Charter as a commitment to the industry.

"In our journey to re-attain Category 1, we carried out a major transformation of CAAM. In our improvement process, we also created a whole new culture with the sincere hope of being better. We achieved a lot more than we ever dreamed possible," says Datuk Voo.

### Positive Progress during Pandemic

He also says that the CAAM management had a little breather when the Malaysian Government imposed Movement Control Orders (MCO) due to the Covid-19 pandemic which saw the closing of borders; this was also a time when almost the entire aviation industry came to a halt. It represented an opportune time to re-look at the numerous activities, including procedures and processes within CAAM.

"The pandemic period gave us the opportunity to do all that was necessary, including hiring people to fill vacancies. It was a period when many people were looking for jobs, so we had a little bit of the power of choice. But we also planned to promote our people internally, to give them a chance to assume higher roles on condition that we stay aligned and focused on the tasks at hand. So, we strengthen our management team and filled in vacant positions through promotions," he says.





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After that, Datuk Voo says, CAAM started to assess its auditing process, adding that as a regulator, CAAM was more used to conducting audits but not to being audited.

"When we audit, one of the things we look at is the documentation system. CAAM's Quality & Standards Division was established and tasked to align and standardise all documents to ensure we meet international and ICAO standards. Previously, CAAM published documents and issued directives based on relevant Acts and regulations. However, we needed check and balance, hence the establishment of the Quality & Standards Division led by a director empowered to ensure an effective, comprehensive and streamlined documentation system. The division's tasks include technical writing; the input may come from the engineers, pilots or traffic controllers but the quality of the documents and the check and balance come from the Quality & Standards Division. Basically, it was a total realignment of our documentations. We needed to fix the process and to rebuild it," says Datuk Voo.

Previously, Malaysia only had the Civil Aviation regulations as well as directives based on it, but the country did not produce civil aviation directives and guidance materials.

"So, started producing we directives and guidance materials. We have introduced a procedure that requires every directive issued to be accompanied by the relevant civil aviation guidance materials. This is to ensure that our personnel and the industry are guided on how to comply with standard procedures. At the same time, we want to avoid as many different definitions as possible which may lead to misunderstandings by technical personnel and others. It also means that concurrently, there is standardisation of guidance materials and internal audit checklist," says Datuk Voo.

In the process of completing the guidance materials, not only did CAAM address the 33 findings of the FAA's audit, but it also found solutions to a total of 301 protocol questions based on Annexes 1, 6 and 8.

"Many people thought the regaining of FAA's Category 1 was based only on addressing the 33 findings. Actually, we were reaudited and re-assessed on 301 protocol questions and 403 critical elements responses, which involved a very technical audit process and we managed to clear them all," he adds.

After completing the above, Datuk Voo and his team assessed the entire CAPs to see if there were gaps and elements that they might have missed out and conducted a thorough analysis to complete all answers. The process took about a year, following which they started to complete the documentation process.

"We have issued 315 documents to date and that, in itself, is one of our biggest achievements. Many had supported us in our transformation and the drive to change, from the Ministry of Transport and Authority Members to our staff members. CAAM Authority Members, in particular, were very supportive in allowing us to recruit the best candidates. We reached a point where all our recruitments were based on facts and data, calculated on a ratio that would effectively fulfill the different requirements within CAAM."

### **Manpower Training**

"As we went along, CAAM staff members began to see that it was possible to regain the FAA's Category 1, so their motivation began to rise," says Datuk Voo.

After CAAM had addressed all its manpower needs, it started to focus on training, sparing no effort to enhance the knowledge and skills of its staff members. CAAM has a total of 1,359 employees.

Datuk Voo says CAAM not only intensified internal training but also spent money, for the first time, on special external training for several of its inspectors. With this, they became professionally certified inspectors and qualified trainers. In turn, they trained other CAAM inspectors under the Train The Trainer programme. Subsequently, CAAM built on its internal training policy, complete with a policy manual that could be used to train new inspector recruits.

"This also became а documentation process which served as 'evidence' of the efforts we had put in. It also showed that we needed to align everything to remove silos or barriers and to get everyone to work together and understand that the failure of one division could mean the failure of the whole organisation. In a nutshell, that was what the CAAM management did to get everyone to unite and work towards the common cause of achieving our Category 1 status again," says Datuk Voo.

Related to training are the advancement and development of professional careers, including those of engineers licensed by CAAM. Datuk Voo recognised the role played by the Board of Engineers Malaysia (BEM) which, in 2018, accepted CAAM Aircraft Maintenance Engineer Licence (AMEL) as a recognised qualification under the Registration of Engineers Act. Consequently, this provided a pathway for CAAM-Licensed Aircraft Engineers (LAE) to embark on future professional assessments and certifications under the Act.

'CAAM would like to thank BEM for the thorough assessment leading to the recognition of the CAAM-LAE qualification, making these engineers eligible and qualified as professional engineers under the Act. I highly encourage CAAM-LAEs who want to advance in their career, to take this new path paved by BEM to get qualified as professional engineers and be accorded the technical titles Ir. or PEng," says Datuk Voo. These credentials will demonstrate that an LAE has the expertise, experience and ability to meet the technical and engineering needs of the aviation industry and will provide a better career prospect and employability for the LAE. In addition, these will give high recognition and honour to the engineers and promote the growth of the aviation engineering profession for the progress of the nation.

Ir. Dr Aidil Chee Tahir, Chairman of IEM's Mechanical Engineering Technical Division (METD), says the BEM move was also in line with IEM's efforts to enhance the professionalism of the engineering sector in Malaysia. He compliments BEM for its efforts in looking into outcome-based assessment an system and awarding recognition to the competency and proficiency of CAAM-LAE to allow them to become professional engineers. He stresses that IEM also wants more local professional engineers to have the competency to compete internationally and gain strong recognition from foreign countries.

Ir. Ricky Liew Chee Leong, Honorary Secretary of METD, says he was a member of the group formed by BEM to study the LAE syllabus of the-then DCA. Prior to 2018, Malaysia's licensed aircraft engineers were already beina recruited for jobs and projects overseas although they were yet to be recognised by BEM as there was then no provision for a policy to get these engineers recognised by the Board. After studying the syllabus for several months, the BEM group concluded that the LAE gualification was equivalent to that of graduate engineers, engineering technologists and technicians accordingly. Hence, on 1 June 2018, BEM accorded its recognition of the LAE gualification which served to encourage the aviation engineering fraternity to continue developing its capabilities.

Datuk Voo concurs. He thanked both BEM and IEM for the assistance and recognition accorded to CAAM-LAEs.

"We encourage our LAEs to take the opportunity to build on this recognition. Don't be satisfied with just a licence rating or qualification. Keep progressing. The idea is to move further up while adding knowledge and increasing competency," says Datuk Voo.

### **Setting Priorities**

Now that CAAM has regained Category 1 status, Datuk Voo's current priorities are to reinforce CAAM's roles as not only a regulator but also as a service provider for the nation's aviation industry.

"The most important thing here is that CAAM and the industry players are a team. We are all a part of a huge, thriving industry. We don't want to be restricting the industry. Rather, we want it to grow especially in terms of certification of competency and most importantly, in the usage of high technology. As a regulator, we must facilitate these," says Datuk Voo who adds that CAAM can do so in two ways.

First is providing guidance to the industry. "No industry would deliberately want to do the things wrongly. Perhaps industry players need more guidance on how to align with compliance requirements, so we choose to embark on the guiding approach. Second is reinforcing the CAAM Client Charter, which is our commitment to serving the industry. Our Client Charter is published on our website for everyone's reference," he says.

"Now that our organisational pillars and structures are set, I want to continue building a strong, resilient and robust regulatory agency. Any leader who comes into CAAM and finds a strong, robust process, pillars and structure, can then take the organisation higher."

### **Cast in Memory**

Helming CAAM for slightly over two years had been an unforgettable journey for Datuk Voo, who had previously served in the private sector.

"To be honest, coming from the industry and joining the civil service, I find every day to be memorable. Every day is a new experience and for the past 21/2 years, I have come to accept and embrace the government processes. There are lots of checks and balances in civil service governance which I appreciate and like. But I must say the most memorable event was definitely the moment when we were told that CAAM had regained the Category 1 status and that we had done it on our own merit, with the support of all that I had mentioned earlier," he savs.

"Another point I want to highlight is that despite the MCOs and closing of borders all around the world, we still had continuous communication and collaboration with the FAA. Our communication was very transparent. We acknowledged that CAAM had



weaknesses which caused the downgrading. To me, it's okay to have weaknesses and to make mistakes. What's more important is how we respond to our weaknesses and mistakes by correcting them. I'm not worried about making mistakes; I'm more worried about not wanting to correct them.

"We communicated constantly with the FAA office in Singapore and Washington, updating them on our efforts to take corrective measures. This transparent communication was helpful, not just for the purpose of the audit, but more importantly, to also achieve the goals concerning flight safety. It doesn't matter what airline one chooses (whether Malaysian or not), the most important aspect is that the flight is safe. Effective flight safety oversight overall is important."

### **Eye on the Future**

Moving forward, Datuk Voo would like CAAM to embark on enhanced training for greater compliance of all its professionals to licensing requirements.

"We don't want our training to remain stagnant. We want to address questions like how we can enhance human factor elements, how to enhance situational awareness, how to add elements of evidencebased training or EBT, how we effectively take safety incidences or serious incidents or accidents and to determine the root causes as well as to address them. These are some of the elements that we want to include in our training," says Datuk Voo.

"It is not about punishing someone; it is about learning from what happens so that everyone can put in the best effort to not repeat the same mistake. We want our staff to go through repetitive training so they can avoid making certain key mistakes and be more aware of safety promotion. Safety resolutions should be the end process; it should not end at the investigation stage with no solution in sight."

He adds that CAAM wants to put all these elements into its operations and has enhanced SOPs. "With new training elements that enhance the human factor, safety and operational SOPs, our license holders will not only become more competent but they can also build greater confidence. With this approach, I believe we can be one of the best in the world," he says.

Datuk Voo also has his eyes focused on the next five years.

"We want to focus on digitalisation and I am moving CAAM towards compliance with oversight surveillance methods. In terms of our auditing role in the aviation industry, we don't want to maintain the method of using a manual checklist. We want the whole industry to have the full set of compliance questions and we want them to build their plans accordingly. We will build a more effective oversight platform with compliance questions and digital methods, including risk-based methods. Some have higher risks and some are more robust, so we need to agree on a datum for more effective safety oversight surveillance governing different standards. The goal is to bring everybody above the datum line to contribute towards the industry growth," he says.

Apart from the above, Datuk Voo says, CAAM plans to launch Malaysia's digital e-licensing by the end of Quarter 1 next year. CAAM is now embarking on an end-to-end process where everything concerning it will be available on an app. Datuk Voo hopes that CAAM will be one of the first in the world to do this.

"When we complete the whole process, we will inform foreign operators and make them aware of the progress in our new licensing method which will simplify and allow proper digital tracking. We will keep very important data in our servers with multiple backups, instead of maintaining the manual way of using filing rooms," he says.

"We also want to transform our professional exams into e-exams with proper governance methods. The next immediate two years will be interesting for CAAM and the industry as we start to embrace new technologies. There are lots of things we can do faster and better, such as pilot inspections, aircraft engines diagnosis and troubleshooting, to name a few.

"The industry has just emerged from a terrible two-year pandemic. This is the time we need to be more facilitative and transparent with each other. I look forward to helping the industry regain its pre-pandemic growth and then start growing at a good percentage, year on year."



CAAM CEO Datuk Captain Chester Voo (centre) with Ir. Dr Aidil Chee Tahir, Chairman of Mechanical Engineering Technical Division (METD) of IEM (left) and Ir. Ricky Liew Chee Leong, Honorary Secretary of METD (right)





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### Advancing the Career of a Licensed Aircraft Engineer with Professional Engineer Certification

#### Written and Prepared by:



### Ir. Liew Chee Leong

Head of engineering at an aircraft engineering and maintenance services company, Ir. Liew has been in the industry for 33 years. Currently, he is Honorary Secretary/Treasurer of the Mechanical Engineering Technical Division.

n 2018, the Board of Engineers Malaysia (BEM), after completing the study of the Civil Aviation Authority of Malaysia (CAAM) Aircraft Maintenance Engineers License (AML) qualification, announced on its website that CAAM AML had been accepted for registration at BEM. This was a significant breakthrough for CAAM licensed aircraft maintenance engineers (LAE) as it provided professional registration as well as a future continuous professional development pathway for LAEs.

This positive development benefits the holders of AML Category B without type-rating, Category B with typerating and Category C with type-rating. In 2022, another milestone was recorded when an LAE passed BEM's professional assessment examination (PAE) for the first time. This also laid down the precedence for future LAEs who might want to be certified as a professional engineer (PEng.) In future, passing the PAE allows an LAE to register as a BEM-certified PEng. or more commonly known as "Ir." or Ingenieur (pronounced Insinieur).

Like any other discipline of the engineering profession, an individual who aspires to become an LAE needs to study very hard. Burning the midnight oil for 4-5 years is normal if one intends to obtain the basic CAAM AML licence. LAEs are highly trained experts in the aircraft engineering and maintenance (E&M) field. The Malaysian CAAM AML system was based on the British Civil Airworthiness Requirements (BCAR) aircraft engineer licensing system that was implemented in 1919. This system had been adopted by many nations in the world due to its high standards and comprehensive aircraft E&M training system.

After the Wright Brothers' successful flights in 1903, the development of aircraft grew exponentially. The UK Civil



Aviation Authority (UKCAA) mandated that only highly trained and competent LAEs could release an aircraft to service conforming to the airworthiness standards. Similarly, the CAAM Part 66 AML system consisted of stringent training and examinations to develop competent LAEs that were known to be one of the best in the world. This has also kept the Malaysian aircraft and aviation industry operating at high standards.

Today, it is not common to find individuals who take 5-6 years of studying and gathering relevant experience to become type-rated LAEs. It is more common to encounter individuals who take 7-8 years if not more, to be typerated CAAM LAEs. I often said in jest that the duration of learning is almost similar to that of a doctorate scholar's in university. By the time one is established as a typerated LAE, one is akin to an aircraft "surgeon". Part 66 AML syllabus of CAAM is laid down clearly in the Civil Aviation Directive. In addition to strong theoretical knowledge, good practical hand skills are required to be a complete and outstanding LAE. Kelly Johnson, the legendary engineer of Skunk Works who designed the SR-71 Blackbird, was not only good in theoretical knowledge of aerodynamics and aircraft systems, but he was also good in floor skills, including sheet metal work. Similarly, LAEs are trained to be not only good in the principles of aircraft engineering but also strong in maintenance skills on aircraft.

A noble profession deserves privileges and this applies to all engineers including the LAEs.

### Privilege

Since the Malaysian aviation industry began in 1946 with Malayan Airways Limited, LAEs have been the backbone of our aviation industry. Under the International Civil Aviation Organisation (ICAO) Annexes and aviation authority guidelines, an aircraft can only be dispatched for flight with a release from a type-rated LAE. These ICAO licences are recognised by the signatory nations of Chicago Convention 1944, which consists of 193 countries in the world up to now.

BEM recognition of the LAEs is a privilege. The responsibility is immense as the LAEs' judgement of whether an aircraft or system integrity is acceptable, lies very much on their ability to synthesise their fundamentals of engineering and application of type-rating knowledge in the complex operations of an aircraft. Aircraft E&M is also an extension of the main engineering disciplines under BEM and the Registration of Engineers Act, 1967 (REA).

There are cases where engineering degree graduates are not able to gain recognition or be registered with BEM despite having spent huge financial resources to study in universities. Their frustration at not being able to practise engineering under the REA is demoralising and many have had to acquire additional costs to be able to register with BEM.

In contrast, today's LAEs who have studied hard to obtain CAAM Part 66 AML have the privilege of registering with BEM. Some senior LAEs might recall that there had been several unsuccessful attempts earlier to obtain the LAE recognition and registration with BEM. LAEs were also not able to join the Institution of Engineers Malaysia (IEM) before 2018 and missed the continuous professional development avenues of a learned society. Today, more and more LAEs have joined IEM and are actively participating in various activities, committees, talks, networking functions, and others. The privilege of registering with BEM and being a member of IEM may be capitalised on by current and future LAEs. The privilege of being able to register with BEM allows LAEs to exercise an entitlement that all engineers have if and only if one is registered with BEM as a graduate engineer (GE) at the very beginning.

### Entitlement

During a recent IEM interview with the CAAM CEO, Datuk Captain Chester Voo encouraged fellow CAAM LAEs to continue their career progression with an Ir. certification. Any individual may start the journey to be certified as an Ir. through the submission of PAE directly to BEM (Route A) or through IEM Enhanced Professional Interview (PI) process (Route C).

This is also why LAEs are encouraged to be a member of IEM as IEM has a mentoring system to support the "freshie" who intends to be an Ir. Individuals registered as GE are entitled to submit for PAE after attaining 3 years of relevant engineering and management experience after they have registered with BEM. Experience prior to the BEM registration is not considered. Therefore, it is crucial that LAEs register themselves with BEM as soon as they obtain their CAAM AML to ensure the experience clock starts at Day One.

It is quite unfortunate that there are many graduates who have studied certain branches of engineering but are not able to be certified as an Ir., primarily because they do not have the entitlement as their qualification is not recognised by BEM. Any PAE or Enhance PI submission starts with the mandatory BEM registration as GE first. BEM regulates the engineering profession well in Malaysia and there are standards and benchmarks that BEM upholds to protect the safety of the public and to regulate the engineering profession with good standards.

I had reviewed and discussed this with certain individuals; I found that they desired to be certified as Ir. but were not entitled or qualified to do so because they were not able to register with BEM.

Their frustrations remind me of the blessings that LAEs have today. With such privilege and entitlement, every LAE should plan for career development in addition to the standard daily working routine. The entitlement and privilege obtained today did not come easy. It had gone through many challenges for 46 years. I have witnessed the frustrations experienced by pioneer LAEs who had fought for our recognition back then. I believe many agree that the pinnacle of an engineering profession, regardless of the discipline, is to be certified as Ir.

### **Expert to Professional**

Being an expert in a certain field may not necessarily mean that one has attained a professional level. We may have noticed from some reports and incidents that some technical experts just do not have the professional code of ethics, leadership and management capabilities to deliver engineering services appropriately.

Some technical experts may not even be concerned with the issues of environment, sustainability and pollution while practising their field of engineering. Ignorance due to lack of continuous professional learning and development, failure to act upon critical issues and ignoring some "minute" matters accumulate over time and eventually affect one's livelihood. The absence of commitment to the engineering profession through proper code of conducts, contribution back to the society and CPD can easily shatter the nobility of the profession.



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When a nation lacks self-developed engineering and technology capabilities, national security becomes vulnerable. Relying on defence assets through external purchase instead of self-designed and developed technology, we may end up with air-show versions instead of true combat versions. This is why we need professionals and not just technical experts to support a nation's development. Future generations of engineers may miss out on the true spirit of engineering professionalism especially due to the lack of professional engineers to pass on the essence of engineering in a much wider perspective.

During the 33 years of my career in aircraft E&M, I made the choice that, in addition to being a competent LAE, I must be tested to find out if I had obtained the professional level beyond my daily routine. It would not only be on my engineering competencies but also on the code of ethics, leadership, management, and commitment to the public and society. I sought an independent regulatory engineering professional avenue in Malaysia to test my professional attainment. As the only independent regulatory engineering profession avenue in Malaysia was BEM, that was where I started my PAE journey.



### **PAE Journey**

For me, the rigorous PAE journey was a very enriching experience. The required reports were meticulous and the examinations difficult. But I have no regrets at all! Through the journey, I acquired a strong appreciation for the importance of an engineer to self, family, public, company, industry and the nation, something I never thought of before.

In my personal opinion, the PAE or Ir. journey is something that every qualified engineer should go through, regardless of whether one needs an Ir. certification or not. I have heard people saying that being an Ir. is of "no use" because their work doesn't need it. Prior to going through the PAE process, I might have agreed but after going through the PAE process, I think otherwise.

The whole process and passing of the PAE generates a lot of self-reflection that helps improve oneself and develops an individual to another level which I call "a professional level". The mindset is adjusted toward a different perspective, especially in our responsibilities as engineers, commitment to the engineering profession and our duty to give back to society. It generates a lot of realisation and satisfaction. It also tends to make one feel qualified to represent the engineering profession, especially in the branch of engineering that one is in.

While some are inclined to be a PEng. because of the Ir. title, I feel that the focus should not be on the title but rather, one should prepare well and go through the process genuinely. A genuine walkthrough means building our competencies in the areas of engineering knowledge, engineering practices, code of conduct, leadership, management, commitment to the engineering profession and giving back to society... no shortcuts and filling up the gaps just to improve the areas where we are lacking to meet the standards of an Ir.

A lot of time and effort is required to move ourselves up. Recognising one's self-weakness during the selfassessment prior to submission was something that made me feel happy. I would not have realised this if not for the PAE journey. The correction took time and resources. The realisation of my competency gaps and weaknesses made me pursue courses to strengthen my weaknesses. Attending additional courses gave me the confidence to design products or equipment. Preparing the details of the reports (in my case, these would be the working experience report and technical project report) strengthened my skills, particularly in the meticulous nature of design work. Both the written and oral examinations truly tested a person's professionalism thoroughly.

Whether the journey is via route A or route C, each has its own merits and one should treasure the entitlement by going through it one step at a time. The fulfilling experience helps a person mature in his/her role as an engineer.

I was very fortunate that through my affiliation with several learned societies such as IEM, Malaysian Society for Engineering & Technology (MySET) and Technological Association Malaysia (TAM), I developed a strong network with many professionals, some of whom willingly offered me guidance. They supported me in my walk on the journey to be an Ir. and I would like to take this opportunity to thank them (the name list is too long to be mentioned here). Currently, both BEM and IEM are working hard to ensure all engineering team members including engineering technicians and engineering technologists have a professional pathway just like the GE.

### Conclusion

Lastly, I would like to echo the advice given by Datuk Captain Chester Voo, which is that LAEs should continue their career progression beyond LAE and be certified as an engineering professional. LAEs who are certified as Ir. comply strongly with the professional code of conduct that supports CAAM and organisational objectives well. This leads to a domino effect which benefits the individual, engineering profession, organvisation, aviation industry and eventually the nation. Only we, the engineers, can protect the nobility of our profession. All the best in your journey.

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### Moving the Masses in an Airport: The Automated People Mover (APM)

#### Written and Prepared by:



#### Ir. Yeoh Jit Shiong

A Project Director involved in the LRT3 Project, he has served as an engineer for the railway industry for the last 14 years. Currently, he is a committee member of the Mechanical Engineering Technical Division.

n 1998, KLIA took over from Subang Airport as the international transit hub for Malaysia. It comprises multiple terminals, including Satellite Terminal A which is located some distance away from the Main Terminal Building. This is where the Automated People Mover (APM) comes into the picture.

The uninitiated may be more familiar with the term Aerotrain as the APM is fondly called and is a type of small-scale automated guideway transit system. Malaysians are no strangers to terms like LRT (Light Transit System), MRT (Mass Transit System), Monorail etc. These transit systems move small groups of people from one destination to another. The difference between these systems and the APM is that the latter is generally used to describe unmanned train systems serving relatively small areas, such as airports and theme parks.



Figure 1: Automated People Mover (APM) in KLIA

### **Current State of the APM**

The APM at KLIA has seen its fair share of disruptions over the years, with even more happening in the past 10 years. As Malaysian and international travellers arrive or depart from the satellite terminal, it is very frustrating when the Aerotrain breaks down, especially when one needs to reach the departure gate quickly. The Aerotrain has been in service since 1998, which means it would be 24 years old today. Based on a study carried out in 2017, the current Aerotrain is rated at 57% (fair) but below the level required by APM standards. That said, Malaysia Airports Holdings Bhd. had announced that it would be upgrading the Aerotrain system in December 2021 and it was scheduled for completion in 2025 with new trains and track system.

### The Upgrade

The new APM system promises improvement in terms of safety, comfort, appearance, energy consumption and diagnostics, among others. The project to upgrade the APM is for the replacement of the existing system. The system comprises a Central Control System, an Automatic Train Operation (ATO) System, a Power Distribution System (PDS), Back-up Power Supplies, Maintenance Facilities and Equipment, Station Equipment, Guideway Equipment, Guideway Repair Works and 3 APM vehicles. While these works are being carried out, the old APM service will continue to be operated to allow passengers to move between the Main Terminal and Satellite Building A. The replacement will be carried out in such a way that one line of the current APM system will always be in service, causing minimal disruption to operations.

The current APM, Innovia APM 100 (formerly known as CX-100), was supplied by train maker Bombardier. Pestech won the bid in partnership with Canada-based Bombardier, so the vehicles are expected to be replaced with the latest Innovia APM 300 from the same train maker. As APM 300 shares the same dimensions as APM 100, this will reduce the number of modifications required. The key difference between the two is the propulsion system: APM 300 operates on an AC system with regenerative capability while APM 100 operates on a DC system with no regenerative ability. Besides, the



Figure 2: Automated People Mover geographic location

maximum speed of APM 300 is 65 km per hour, while APM 100 has a lower maximum speed of 50 km per hour.

The existing power for the APM is supplied by 2 independent primary sources: Satellite A Substation and Contact Pier Substation. There is an Emergency Diesel Generator plant to support the power supply in case of a breakdown. The whole system will be replaced in sequence and a total switchover to the new power supply system will be done once the new equipment is installed and ready to go. There will also be a dismantling and decommissioning of the old power supply system.

The latest CITYFLO 650 Communication Based Train Control (CBTC) signalling system from Bombardier is expected to be used for the upgrade. This is the same system that is currently in use in MRT Line 1 and MRT Line 2. The system is designed as a Fully Automatic Operation (FAO) system, capable of meeting the Operational Headway requirement of 6 minutes and a maximum of 150 seconds of platform headway during synchronised double shuttle mode. Bombardier's CITYFLO 650 system is also designed for high availability and low maintenance operation.

Guideway equipment such as switch machines, power rail, signalling and communication antennas, CCTVs, respective enclosures and associated accessories will be replaced. The sequence of works will be carried out by isolating one guideway while operating shuttle mode in the other guideway.

The brain of the system, the Centre Control Room (CCR) will be where supervising, monitoring and control of the APM are carried out. This is also where the Station Automatic Control, Vehicle automatic train control, Power Distribution System, Operation Radio System, Maintenance Radio System, Public Address System, Closed Circuit Television System, Emergency telecom and telephone system are controlled. As each system is upgraded, there will be migration and staging of works to ensure a seamless transition between the old and new systems.

### **Better Aerotrain**

The ageing APMs at KLIA have been shuttling more than 300 million passengers between the main terminal building and the satellite building since it began operations in 1998. No doubt the three-year upgrade period may cause inconveniences to passengers, but this will be a small sacrifice for a better future.

As we bid goodbye to and thank the Innovia APM 100 for its service for the past 24 years, the new Innovia APM 300 and new track system should solve the problem of frequent service disruptions. This will ultimately improve efficiency and reduce the inconveniences caused to travellers who would otherwise have to use the alternative bus service.



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### **Upcoming Activities**

Virtual 1-Day Course on Project Constraints – PMBOK Guide to Scope, Schedule, Risk and Cost Management (Rescheduled from 22 December 2022)

Date	:	4 January 2023 (Wednesday)
Time	:	9.00 a.m. – 5.00 p.m.
Venue	:	Digital Platform
Approved CPD	:	6
Speaker	:	Ir. Assoc. Prof. Dr Abang Annuar Ehsan

#### Workshop (Physical) on Dispute Avoidance No.6 (Rescheduled from 8 October 2022)

Date	:	7 January 2023 (Saturday)
Time	:	9.00 a.m. – 11.30 a.m.
Venue	:	Wisma IEM
Approved CPD	:	2.5
Speakers	:	Ir. Zafrul Mahmood
	:	Ir. Dr Ooi Teik Aun

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### The Nightingale Floor



Written and Prepared by:

### Ir. Dr Oh Seong Por

The Past Chairman of IEMNS and Director of Samsung SDI Energy (M). Sdn. Bhd.

hen I was a student at Hanyang University in Seoul Korea, I visited my Japanese friend in Osaka during one of the winter semester breaks. From Osaka, we travelled to Kyoto to tour the ancient Nijo Castle.

The construction of Nijo Castle was ordered by the first Shogun, Tokugawa leyasu, in 1603 and was completed in 1626 during the reign of the third Shogun, Tokugawa lemitsu. Inside the castle are the original Ninomura Palace (Picture 1), the reconstructed Honmura Palace (Picture 2), Ninomura Garden (Picture 3) and other wellpreserved structures.



Picture 1: Ninomura Palace



Picture 2: Honmura Palace



Picture 3: Ninomura Garden

The wooden floor from the entrance of Ninomura Palace to the grand chamber, squeaks and creaks when a person steps on it. Stepping on the floor causes the clamp system underneath to move up and down and this creates friction with the nails that hold them (Figure 1). As a result, a bird-like sound is generated, earning it the name Nightingale Floor.



Figure 1: Design of Nightingale Floor

This is an amazing, well-considered design of an old alarm system to warn of intruders or assassins attempting to enter the palace. Till today, the Nightingale floor still works. ■



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### Technical Visit to CAAM KLIA Tower West (KLIA 2)

Written and Prepared by:



Ts. Nor Azilan

n 30 August 2022, the Mechanical Engineering Technical Division (METD) organised a technical visit to Kuala Lumpur International Air Traffic Control Tower (KLIA2 CAAM Tower West).

Air traffic controllers monitor the location of aircrafts in their assigned airspace by radar and communicate with the pilots by radio. This is to prevent collisions, to organise and expedite the flow of traffic and to provide information and other forms of support for pilots.

Standing at 133.8m, CAAM (Civil Aviation Authority of Malaysia) KLIA Tower West is the tallest of its kind in the world (Figure 1). It has 33 floors and a rooftop where the Surface Movement Radar is located. It was awarded by the Guinness World Records in 2013 and the Malaysia Book of Records. There are 3 Air Traffic Controllers (ATC) at KLIA. Besides Tower East which controls the air traffic of KLIA and Tower West for KLIA2, there is a third tower, called Apron Tower or R2-D2, located in the airside area of KLIA.



Figure 1: Certificates from Guinness World Records and Malaysia Book of Records for the tallest airport control tower in 2013

Upon arrival at KLIA2 Tower West office at 9.00 a.m., IEM members were welcomed by Mr. Thomas and Encik Arshad, the CAAM management crew in charge. After a short safety briefing, they proceeded to the 33rd floor of the traffic control room. According to Mr. Thomas, there are 3 types of Air Traffic Controllers (ATC) in Tower West as listed below.

 Area Controllers – Operator ATC will direct airplanes on the most efficient route to their destination. The radar and computer can track the exact position of each aircraft.

- 2. Approach Controllers Operator ATC will take control of communication from Area Controllers as the aircraft approaches the airport. They are responsible for deciding when and where each airplane should land and will guide them in the most efficient order.
- 3. Aerodrome Controllers Operator ATC are in charge of aircraft landing and departing and they also manage the movement of aircraft on the ground.

At the air traffic control room, IEM members had a beautiful panoramic view (Figure 2) of the entire KLIA area. According to En. Arshad, ATCs are stationed at the control centre in KLIA East Tower, West Tower, Subang, Kuching and Kota Kinabalu airport. Figure 3 shows the interior of the air traffic control room.



Figure 2: (a) Mr. Thomas explaining the KLIA West Tower operation system. Behind him is a panoramic view of the KLIA runway and East Tower Air Traffic Control (b) Panoramic view of KLIA2 from West Tower Air Traffic Control Room



Figure 3: Interior view of Air Traffic Control Room

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Mr. Thomas said the KLIA2 West Tower operates round the clock, including weekends and public holidays. The controllers work shift hours and each shift spreads over 2 working days, one resting day and one day off. The working scope of ATCs involves manning a workstation, gathering and interpreting data using computers and radar displays, including communicating with pilots using radio equipment. He also said applications for the job of an ATC goes through Suruhanjaya Perkhidmatan Awam (SPA), including sitting for 4 tests (IQ, Voice, English and Psychology) and interviews. Successful candidates will then undergo training over a maximum of 66 weeks at the Academy of Civil Aviation Malaysia. This is followed by On Job Training (OJT) to acquire live ratings.

According to Mr. Thomas, there are some improvements for West Tower as compared to East Tower in terms of design. There is a maintenance access for replacement work for large spare parts, such as the main glass can be easily lifted from the ground floor to the top tower. He also said most of the flight progress strips in KLIA2 West Tower utilises computerised modern technology. However, there are also manual strips of flight progress for backup and emergency. With the increase in air traffic and modern technology, the modernisation of air traffic equipment at KLIA will be implemented in line with other developed countries. The visit officially ended at 1.30 p.m.



Figure 4: Group photo of the IEM members and CAAM Management Team

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### **Upcoming Activities**

Half-Day Course on "Soil Stabilisation with Mechanically Stabilised Layers (MSL)"

Date	:	7 January 2023 (Saturday)
Time	:	9.00 a.m 1.00 p.m.
Venue	:	Wisma IEM
Approved CPD	:	4
Speaker	:	Ir. Lau Joe Jiunn

Technical Talk on "Distributed Pumping System - Smarter Way to Chilled Water Distribution"

Date	:	11 January 2023 (Wednesday)
Time	:	5.30 p.m 7.30 p.m.
Venue	:	Wisma IEM
Approved CPD	:	0
Speaker	:	Ms. Lee Siew Wee





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### Behind the Scenes of a Baggage Handling System

Written and Prepared by:



Ts. Nor Azilan

n 6 September 2022, the Mechanical Engineering Technical Division (METD) organised a technical visit to Kuala Lumpur International Airport 2 Baggage Handling System (KLIA2 BHS).

The BHS is a type of logistic system installed at airports that transfers passenger bags from the source to the destination or, for example, from the check-in counter to departure area. Since BHS is a restricted area, registration must first be done at the Security Pass Counter at KLIA2 in order to acquire an access pass to the BHS area.

IEM members arrived at the BHS office at 9.00 a.m. and were welcomed by Ir. Abdul Rahim bin Sidek (Engineering Manager BHS KLIA2), Encik Mohd Hashriq (Senior Executive Maintenance) and Puan Nurliana (Senior Executive Operation). X-ray scanning was also conducted at the security checkpoints.

According Encik Mohd Hashriq, there are 3 types of baggage routes: Outbound, Inbound and Transfer. The total

length of conveyor belts at KLIA2 BHS is 12.8 km, with a width of 1,000-1,500 mm. He said the conveyor system consists of 940 pcs of AC motor and the fastest speed it can run is 120m per minute. The current updated system can process up to 32,000 pieces of baggage per hour and serves 30-45 million passengers annually.

At the check-in desk, the airline check-in operator registers and tags baggage with generated barcode labels according to the boarding pass. There is a short conveyor that consists of a check-in conveyor baggage scale, which is designed to check the weight of the baggage. Then the baggage will be released to the takeaway conveyor via the induction conveyor before being transferred to the Outbound BHS. It takes about four to six minutes from the Check-in Counter (CIC) to the Make Up Loop (MUL) Station. In general, KLIA2 BHS has 10 conveyor MUL stations and four levels of bag screening processes (Figure 1).



Figure 1: Departure Process Flow



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- Construction solutions (heavy lifting, ILM, etc)
- Monitoring, repairing and strengthening for structures







At Level 1, baggage will pass through an automatic X-ray detection machine up to manual security checks in Level 4. At the sorting station, the baggage travels through an Automatic Tag Reader (ATR) and X-ray screening is conducted at the Tilt Tray Sorter (TTS). However, Manual Encode (ME) will be carried out for baggage categorised as Not Valid Identification (NO), Baggage Source Message (BSM) or failure on barcode reading by ATR and multi-read barcode. Oversized (OOG) baggage will be X-ray scanned at the entrance and loaded onto the OOG Loading conveyor. The allowable weight is 75 kg, with a maximum dimension of 3000 x 1250 x 850 mm. The total transfer time from domestic and international to lateral is about 7-9 minutes.

Arrival (Inbound) baggage is transported from the Breakdown Satellite Terminal Building (STB) conveyor to the reclaim carousel, where the baggage can be reclaimed at Sector 2, Level 2. The total transfer time from Breakdown (BR) to the domestic reclaim carousel is about 4-6 minutes and just one minute longer if the baggage is to be transferred to the international reclaim carousel. General baggage processing time:

- Check in to aircraft outbound (maximum 17 m
- 1. Check-in to aircraft outbound (maximum 17 minutes)
- 2. Baggage processing for transit (13-16 minutes)
- 3. Arrival aircraft inbound, from unloading to baggage reclaim (17-20 minutes)

Encik Mohd Hashriq explained that the KLIA2 BHS is equipped with CCTV in the Control Room in multiple areas such as CIC, ATR before X-ray, after X-ray, Induction To TTS, make-up chute, inbound breakdown and reclaim carousel etc. The visit ended at 1.30 p.m. ■



Figure 2 (a): Group Photo of IEM Group and KLIA2 BHS team



Figure 2 (b): Control room at KLIA2 BHS

### Visit to Batu Berendam Regional Sewage Treatment Plant

Written and Prepared by:



Ir. Sures Kumar Ganesan

n 26 October 2022, IEM Melaka organised an industrial technical field trip for 19 engineers to the regional sewage treatment plant (RSTP) Batu Berendam in Batu Berandam. Constructed by Jabatan Perkhidmatan Pembetungan (JPP) from March 2017 to March 2020, the plant was handed over to Indah Water Konsortium Operation Unit Melaka on 13 December 2021 for operations and maintenance. It is the largest of all the functioning plants in Melaka adopting the Extended Aeration (EA) with an Odour Control process system. It was built to serve the Batu Berendam catchment which has a population of 140,000.

RSTP Batu Berendam treats an average 126,000 cubic metres of sewage a day. The ultimate design capacity of RSTP is 560,000 Population Equivalent (PE) and it treats sewage from 3 different sub-catchments (Table 1):

Table 1: Details of Sub-Catchment served by RSTP Batu Berendam

Sub-Catchments	Total Population Equivalent (PE)
Batu Berendam	230,134
Bandar East	138,917
Sungai Putat	187,151
TOTAL PE	560,000

This RSTP has had a huge positive environmental impact. The effluent (treated sewerage water) complies with the newly-set effluent discharged standard by the Department of Environment (DOE) to discharge at Standard Para (1), Standard B and it is discharged into Sungai Putat. With RSTP Batu Berendam in operation, 71 existing standalone sewerage treatment plants (STP) which computes to 129,612 PE, will be connected to it via a network of newly-built sewers totalling 25km and the existing STP facilities will be decommissioned and demolished.

We were briefed by IWK Treatment Manager Encik Azeem and had the opportunity to see "live" the sewerage treatment of an Extended Aeration process (Figure 1).

There are 2 treatment processes: Primary and Secondary Treatment. The Primary process starts when raw sewage enters an inlet wet sump for primary treatment



Figure 1: Extended Aeration (EA) process

to distribute visible solid waste and liquid waste before it is sent to the grit removal section where large settleable particles are removed; the overflow is sent to aeration tanks.

The Secondary process starts at the aeration tanks where organic materials are digested by microorganisms with air supplied by Fine Bubbles Diffuse Aeration (FBDA). The partially treated water then flows into clarifiers where microorganism cells settle and are separated from the treated water. The excess activated sludge in the aeration tanks is washed by the surplus activated sludge pumps and sent directly to the dewatering section. The remaining sludge is flocculated by polymer to form larger particles to help with the thickening and dewatering process. The final product has 90% solid content.

The main sources that result in odour formation are the pump, screening collection chamber and sludge treatment section. The plant is equipped with an air collector which channels the air to a bio-scrubber through a forced ventilation air ducting system for odour removal.

The visit ended at noon with the presentation of a token of appreciation and souvenirs from IEM Melaka to Encik Azeem. ■



Figure 2 : A token of appreciation and souvenirs from IEM Melaka to Encik Azeem





Inspiring Young Engineers

Here, Ir. Dr Ooi Teik Aun shares his life story, including his rich experiences garnered over five decades of engineering practice as a

 Practising Engineer - Engineering Consultant and Expert in Geotechnical Engineering. Soil Mechanics and Tunnelling -Arbitrator - Prolific Researcher and Writer - Educator/Trainer Volunteer in numerous activities related to engineering

are a budding engineer, an er dent, a profe engineer in building construction and other fields or simply some with big dreams to succeed in life, this book is for you. The author nt stages of his life sionate journey th is pa

from a poor young boy to a suc of contributions that he made t Ir. Dr Ooi is a rare engineer wit nd who is selfless in nity to tap his mind

bly engaging and any a book." — Ir. Dr Wong Fo ingineers & A

ny will be an

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### **Engineers Dig Archeology**

he last few years have taught me that life can be so unpredictable. For instance, a journey we were not prepared for turned out to be one of the best trips ever. For a trip to Cambodia, our group of 4 chose a different route to understand the deeper meaning of its history and culture.

Set against a backdrop of impressive monuments, rice fields and tranguil lotus farms, Cambodia is a mesmerising tropical wonderland of culture, cuisine and heritage. Sadly, it's also a country with a dark past. In memory of the victims of the Khmer Rouge Regime in the late 1970s, a memorial with a Buddhist stupa was built in the Killing Fields at the Choeung Ek Genocidal Centre, 15km from Phnom Penh. Over 20,000 men, women and children tortured at Tuol Sleng Genocide Museum (Prison S21) were killed here.

In 1975, Pol Pot turned Tuol Svay Prey High School into a building with small cells and torture rooms while the yard was surrounded by barbed wire and electrified fences. I had visited Auschwitz Concentration Camp many years ago which, while unforgettable, wasn't a pleasant experience. The Khmer Rouge though, was way more primitively brutal and the place was a chilling reminder of the brutalities.

Today, Phnom Penh is a modern, bustling city of noisy streets jammed with people zipping around on motorbikes and tuk-tuks. We visited the Royal Palace, Central Market and Russian market. We also spent a nice evening enjoying the cool breeze and delicious Khmer staples at the riverfront restaurant at Sisowath Quay, a promenade which runs along the Tonle Sap, the largest freshwater lake in South-East Asia.

It would have been a gross oversight to not visit Angkor Wat. So we hopped on a puddle-jumper flight to Siem Reap. The Angkor Archaeological complex is nearly 1,000 years old, a relic of the ancient Khmer Empire. We went full-on Lara Croft fashion to explore the temple complex hidden deep in the lush jungle.

The temple of Ta Prohm (dubbed Tomb Raider Temple) lies in a semiruined state with muscular roots of towering trees spilling over the ramparts; the leaves, dappled in the afternoon sunlight, shaded the crumbling temple pieces that lay where they had fallen many centuries ago. It is a maze with several doorways and windows while some alleyways lead to a dead end, blocked by jumbled piles of stones. There are thousands of huge stone statues, each one

#### Written and Prepared by:



### Appointed Corporate Member of Women

Engineers Section and Dean of Faculty of Engineering and Computing, First City University College.

unique with different poses as well as broken walls. Overgrown tree roots and jungle foliage consumed the once impressive temple building.

Angkor Wat is the largest religious monument in the world. It was a long walk in the hot sun with uneven surfaces everywhere. We made a short stop at the giant artificial reservoir constructed during the Khmer Empire (8x2.2km), also called West Baray.

Travelling about is new and experiences this includes experiencing it through food! We tried local dishes such as fish amok, kuy teav, nom banh chok, Cambodia coffee and delicious ice cream. As Cambodia used to be a French colony, the French influence was still evident in much of its cuisine.



Picture 1: The world-famous Ta Prohm temple aka "Tomb Raider" temple



Picture 2: Angkor National Museum, a state-of-the-art showpiece on the Khmer civilisation and the majesty of Angkor

Tarikh: 14 Disember 2022

Kepada Semua Ahli,

### SENARAI CALON-CALON YANG LAYAK MENDUDUKI TEMUDUGA PROFESIONAL TAHUN 2023

Berikut adalah senarai calon yang layak untuk menduduki Temuduga Profesional bagi tahun 2023.

Mengikut Undang-Undang Kecil IEM, Seksyen 3.8, nama-nama seperti tersenarai berikut diterbitkan sebagai calon-calon yang layak untuk menjadi Ahli Institusi, dengan syarat bahawa mereka lulus Temuduga Profesional tahun 2023.

Sekiranya terdapat Ahli Korporat yang mempunyai bantahan terhadap mana-mana calon yang didapati tidak sesuai untuk menduduki Temuduga Profesional, surat bantahan boleh dikemukakan kepada Setiausaha Kehormat, IEM. Surat bantahan hendaklah dikemukakan sebulan dari tarikh penerbitan dikeluarkan.

#### Prof. Ir. Dr Zuhaina binti Zakaria

Setiausaha Kehormat, IEM

		PERN	IOHONAN BARU		
Nama		Kelay	yakan		
KEJUI	RUTERAAN AWAM				
GANES	AN A/L K. BALAKRISHNAM	BE HO	BE HONS (UTM) (CIVIL, 2003)		
MOHD S	SAUFI BIN MOHD SARIP	BE HO	DNS (UITM) (CIVIL, 2012)		
KEJUI	RUTERAAN ELEKTRI	KAL			
MOHAN IDIN	IAD ADHA BIN MOHAMAD	BE HC MSc (I	DNS (UITM) (ELECTRICAL, 2004) JSM) (ELECTRONIC SYSTEMS DESIGN, 2009)		
MOHD S	SATARI BIN MOHAMAD	BE HO	ONS (UNITEN) (ELECTRICAL POWER, 2018)		
KEJUI	RUTERAAN MEKANIK	AL			
AHMAD	FIKRI BIN MUSTAFFA	BSc (ł	(OREA) (MECHANICAL, 2013)		
		ME (K	OREA) (MECHANICAL, 2015)		
		BSc H	ONS (TRESTATE) (MECHANICAL 1998)		
MONDI		MESc	(LEEDS) (MECHANICAL, 2001)		
		PERI	PINDAHAN AHLI		
No. Ahli	Nama		Kelayakan		
KEJUI	RUTERAAN AWAM				
106138	CHAN CHIA YAM, LENIS		BE HONS (UTP) (CIVIL, 2010)		
108449	DINESH KUMARAN A/L PALANIANDY		BE HONS (UTP) (CIVIL, 2012) MSc (UTP) (CIVIL, 2015)		
63914	GEOFFERY RANGGU ANA THOMAS	K	BE HONS (UTHM) (CIVIL, 2016)		
116128	KHAIRUL NAJAH BINTI ISI	HAK	BE HONS (UITM) (CIVIL, 2008)		
31108	KU SAFIRAH BINTI KU SULAIMAN		BE HONS (UTM) (CIVIL, 2009) ME (UTM) (CIVIL - STRUCTURE, 2010)		
47251	MUHAMMAD AL SHAFIE B	IN	BE HONS (UKM) (CIVIL & STRUCTURAL, 2013)		
	MOHAMMAD AZAN		ME (UTM) (CIVIL, 2020)		
115992	MUHAMMAD AMIRUL ASY BIN ABDUL HADI	RAF	BE HONS (UTM) (CIVIL, 2019)		
91033	SOH WEE SZUAN		ME HONS (NOTTINGHAM) (CIVIL, 2013)		
30549	TAN MUI LIANG		BE HONS (UTM) (CIVIL, 2003)		
KEJURUTERAAN ELEKTRIKAL					
45296	AMIR HAMZAH BIN OTHM	AN	BE HONS (UITM) (ELECTRICAL, 2009)		
100688	BIN AZMI		BE HONS (UTHM) (ELECTRICAL, 2015)		
44956	44956 SAIFUL MOHAMMAD IEZHAM BIN SUHAIMI		BE HONS (UTM) (ELECTRICAL, 2014) MPhil (UTM) (ELECTRICAL, 2017)		
			· · · · · · · · ·		
KEJUI	RUTERAAN ELEKTRO	NIK			
48723	23 GOH ZAI PENG		BE HONS (UTHM) (ELECTRICAL, 2013) PhD (UPM) (2017)		

KEJUF		
29428	NOR ILIA ANISA BINTI ARIS	BE HONS (MALAYA) (CHEMICAL, 2011) BE (UMP) (CHEMICAL, 2009)
KEJUF	RUTERAAN MEKANIKAL	
69385	KOH JIAN XIANG	ME HONS (NOTTINGHAM) (MECHANICAL, 2017)
100886	LEE CHEONG YOONG	ME HONS (NOTTINGHAM) (MECHANICAL, 2014)
117058	LEE CHING HENG	BE HONS (MALAYA) (MECHANICAL, 2015)
37559	MOHD AMRI BIN MOHAMED KHAIRI	BE HONS (UTeM) (DESIGN & INNOVATION, 2009)
42076	WONG YIK HOE	BE HONS (UCSI) (MECHANICAL, 2013)
KEJUF	RUTERAAN MEKATRONIK	
93693	SAZWAN SYAFIQ BIN MAZLAN	BE HONS (UniMAP) (MECHATRONIC, 2012) MSc (USM) (ELECTRONIC SYSTEMS DESIGN, 2014) PhD (UniKL) (ELECTRICAL & ELECTRONIC, 2019)
	PERPINDAHAN	MENJADI AHLI KORPORAT
No. Ahli	Nama	Kelayakan
KEJUF	RUTERAAN AWAM	
38570	MARDHIYAH SYAHIDA BINTI BERHANUDDIN	BE HONS (UTM) (CIVIL, 2011)
35916	SEAH WEI CHENG	BE HONS (UTM) (CIVIL, 2010) ME (UPM) (STRUCTURAL ENGINEERING & CONSTRUCTION, 2013)
KEJUF	RUTERAAN ELEKTRIKAL	
64720	VELLAN A/L GUNASEKARAN	BE HONS (UNITEN) (ELECTRICAL POWER, 2015)
KEJUF	RUTERAAN KIMIA	
87703	CHEW JIUAN JING	BE HONS (CURTIN) (CHEMICAL, 2007) PhD (MONASH) (2016)
KEJUF	RUTERAAN MEKANIKAL	
87330	AMARES SINGH GILL A/L SEGAR SINGH	BE HONS (MMU) (MECHANICAL, 2012) MESc (MMU) (2016)
70540		PhD (UTAR) (ENGINEERING, 2021)
24993		BE HONS (UKM) (MECHANICAL, 2013)
24000		BE HONG (ONW) (MEON WHOME, 2007)
KEJUF	RUTERAAN MEKATRONIK	
21901	YANG CHUAN CHOONG	BE HONS (IIUM) (MECHATRONICS, 2004) ME (UNIVERSITY OF APPLIED SCIENCES EMDEN) (TECHNICAL MANAGEMENT, 2007) PhD (UTAR) (ENGINEERING, 2018)
PER	MOHONAN BARU MENJ	ADI AHLI TEKNOLOGI KEJURUTERAAN
No. Ahli	Nama	Kelayakan
KEJUF	RUTERAAN KOMPUTER	

### **CONTINUATION FROM NOVEMBER ISSUE 2022**

115300 KHOO BOO KEAN

	PERMOHONAN MENJADI AHLI 'ASSOCIATE'			
No. Ahli	Nama	Kelayakan		
KEJ	KEJURUTERAAN AWAM			
11593	3 ADLI HAFETZ BIN ABD HALIM	DIPL.(POLITEKNIK MERLIMAU)(CIVIL, 2015)		
11494	6 MEOR MISBAHUL MUNIR BIN MUSAIMIN	DIPL. (UITM)(CIVIL, 2000)		
KEJI	JRUTERAAN MEKANIKAL			
11593	4 MOHAMMAD MASRI BIN MOHAMMAD MUSTAFFA	DIPL. (INST. TEK. MARA)(MECHANICAL, 1997)		

B.TECH HONS (UNI. UTAMA M'SIA), (INFORMATION, 2004)

MSc Eng (UTP) (MECHANICAL, 2011) PHD (UTP) (MECHANICAL, 2016)

### **PERMOHONAN BARU / PEMINDAHAN AHLI**

Persidangan Majlis IEM yang ke-428 pada 18 Oktober 2021 telah meluluskan sebanyak 887 ahli untuk permohonan baru dan permindahan ahli. Berikut adalah senarai ahli mengikut disiplin kejuruteraan:

	GRED KEAHLIAN											
DISIPLIN	FELO	SENIOR	AHLI	SENIOR GRADUATE	SISWAZAH	"INCORPORATED"	"AFFILIATE"	"ENGINEERING TECHNOLOGIST GRADUATE MEMBER"	"ENGINEERING TECHNICIAN GRADUATE MEMBER"	"ASSOCIATE"	SISWA	JUMLAH
Aeronautikal				5				2	1			8
Aeroangkasa				2	2			3			12	19
Arkitek								3				3
Automotif											2	2
Bioperubatan					5			1			1	7
Perkhidmatan Bangunan								1	3			4
Bangunan										1		1
Kimia				3	44						54	101
Awam			1	14	130	3		4	4		76	232
Komputer						1					4	5
Elektrikal & Elektronik				7		1		1			6	15
Elektrikal			2	4	68	1		16	2		32	125
Elektronik					23			4			39	66
Tenaga								1				1
Alam Sekitar					15						2	17
Industri											3	3
Sistem Maklumat											1	1
Kawalan & Instrumentasi								1				1
Pembuatan				1	5			2				8
Sistem Pembuatan											12	12
Marin									1			1
Bahan					3						13	16
Metallurgi					2							2
Mekanikal	1			8	73			3	3		80	168
Mekatronik				1	11	1		8	1		19	41
Sumber Mineral											7	7
Petroleum					5							5
Polimer											9	9
Telekomunikasi										1	2	3
Sumber Air											1	1
Pengangkutan											1	1
Lain-lain								1				1
"Offshore"											1	1
JUMLAH	1	-	3	45	386	7	-	51	15	2	377	887

Senarai nama ahli dan kelayakan adalah seperti di bawah. Institusi mengucapkan tahniah kepada ahli yang telah berjaya.

11602

### Ir. Assoc. Prof. Dr David Chuah Joon Huang

Setiausaha Kehormat, Institusi Jurutera Malaysia, Sesi 2021/2022

PE	RMINDAHAN AHLI KEP	ADA AHLI FELLOW
No. Ahli	Nama	Kelayakan
KEJU	RUTERAAN MEKANIKA	\L
22249	AIDIL BIN CHEE TAHIR	ME (HONS) (LONDON, IMPERIAL COLLEGE OF SC, TECH & MEDICINE, 2001) PhD (OXFORD) (2007)
PEN	IINDAHAN AHLI KEPAD	A AHLI KORPORAT
No. Ahli	Nama	Kelayakan
KEJU	RUTERAAN AWAM	•
93930	HO FOOK MING	BE HONS (SWINBURNE UNI OF TECHNOLOGY) (CIVIL, 2014)
KEJU	RUTERAAN ELEKTRIK	AL
70488	FAZILEE BIN IBRAHIM	BE HONS (UTM) (ELECTRICAL, 20212)
24758	LIM CHI YEE	BE HONS (NOTTINGHAM TRENT) (ELECTRICAL, 2002)

	PERMOHONAN KEPADA AHLI 'SENIOR GRADUATE'				
No. Ahli	Nama	Kelayakan			
<b>(EJU</b>	RUTERAAN AEROANG	KASA			
15883	DANIEL JOSEPH PILLAI	DCAM PART - 66 CATEGORY C HOLDER			
15447	JEFFREY PEREIRA BIN ABDULLAH	DCAM PART-66 CATEGORY C HOLDER			
16021	KOH KIA HONG	BE HONS (UPM) (AEROSPACE, 2001)			
15448	LEAU CHIN YIK	DCAM PART-66 CATEGORY C HOLDER			
15880	SAMSUDIN HO BIN ABDULLAH	DCAM PART - 66 CATEGORY C HOLDER			
<b>KEJU</b>	RUTERAAN AERONAU	TIKAL			
15887	IBRAHIM HELMI BIN AHMAD LABIB	DCAM PART - 66 CATEGORY C HOLDER			
15888	SIVAKUMAR SANDIRAJAH	DCAM PART - 66 CATEGORY C HOLDER			
(F.JUI	RUTERAAN AWAM				

6	AL FIRDAUS BINTI MOHD	BE HONS (UITM) (CIVIL,
	HASHIM	2007)

115453	LAI ZHIMIN, MELVIN	BE HONS (IUKL) (CIVIL, 2013) MEM (UTM) (2017)
116027	LOH KUNG KHIN	BE HONS (MONASH) (CIVIL, MAY 2011) ME (MEBOURNE) (MINING DECEMBER 2011)
115451	MD FAIDZAL BIN MD YUSOP	BE HONS (NEW SOUTH WALES) (CIVIL, 2006)
115460	MOHD DHIYA HAFREEZ BIN KAMIL	BE HONS (UTM) (CIVIL, 2008)
115890	MOHD ROSLI BIN HAININ	BSc (CLEMSON) (CIVIL, 1990) MSc (KANSAS) (CIVIL, 1996) PhD (AUBURN) (2004)
115886	Muhammad zaid ab Hamid Pahmi	BE (UMP) (CIVIL, 2008)
116028	NAVEENTHIRAN ANNAMALAI	BE HONS (UTM) (CIVIL, 2008)
115879	OTHMAN BIN CHE PUAN	BE HONS (MIDDLESEX POLYTECHNIC) (CIVIL, 1987) MPhil (WALES) (1991) PhD (WALES) (1999)
115449	RAJATHURAI A/L P SABAPATHY	BE HONS (USM) (CIVIL, 1999)

116025 RAUDHAH BINTI AHMADI	BE HONS (UNIMAS) (CIVIL, 2006) MSc (SHEFFIELD) (STRUCTURAL, 2008)
115455 SIM CHEE SIANG, GALVIN	BE HONS (MELBOURNE)
115457 SYED NUR AIZUDDIN BIN	BE HONS (UTM) (CIVIL, 2008)
116024 TAN JIA XIANG	BE HONS (CURTIN) (CIVIL & CONSTRUCTION, 2012)
KEJURUTERAAN ELEKTRIK	AL BE HONS (UNISEL)
BAHARUDDIN 115458 ASRUL NIZAR BIN AHMAD	(ELECTRICAL, 2009) BE HONS (UTP)
	(ELECTRICAL & ELECTRONICS, 2006)
115450 JURI @ CLARE BIN	BE HONS (MALAYA)
115881 LEE HOCK CHUAN	BE HONS (UNITEN)
	(ELECTRICAL POWER, 2007) DE LIONS (UITM)
116018 RAHMAH BINTI ADNAN	(ELECTRICAL, 2009)
116019 REDZUAN BIN OMAR	BE HONS (UTM) (ELECTRICAL, 2004)
115882 SAMSUNAR BIN MOHD BANI	BE HONS (UMS) (ELECTRICAL &
	ELECTRONICS, 2010)
KEJURUTERAAN ELEKTRO 115452 KHAIRUN NISA' BINTI MIHAT (MINHAD)	NIK BE HONS (UTM) (ELECTRICAL (MICROELECTRONICS),
	1998) MSc (UKM)
	(MICROELECTRONICS, 2013)
	PhD (UKM) (ELECTRICAL, ELECTRONIC & SYSTEM,
116016 LOH CHEE KEONG	2019) BE HONS (UNITEN)
	(ELECTRICAL & ELECTRNICS, 2003)
115765 MOHD RADHI BIN RAZALI	BE HONS (UNITEN) (ELECTRICAL &
	ELECTRONICS, 2007) MSc (UTM) (ENGINEERING
	BUSINESS MANAGEMENT, 2016)
115456 NOH HAIDIR BIN ISMAIL	BE HONS (UTM) (ELECTRICAL -
	TELECOMMUNICATIONS, 2002
KEJURUTERAAN KIMIA	
115459 HAFSHA LUGARD ANAK RANSON MALAKA	ME HONS (MANCHESTER)
116020 MISS HASIMAWATY BINTI	BE HONS (UTM)
	ME (UTM) (GAS, 2014)
115446 PARIMALA MUNIANDY	BE HONS (UTM)
	(CHEIMICAL, 2002) ME (MALAYA) (SAFETY HEALTH AND
	ENVIRONMENT, 2015)
KEJURUTERAAN MEKANIK	AL
115885 `AMMAR BIN MUHAMMAD	BSc (SUNGKYUNKWAN) (MECHANICAL, 2012)
116022 FREDRICK AIDAN ANAK JOHN	BE HONS (UTM) (MECHANICAL-
115454 MOHD ALHAM BIN MOHD	MATERIALS, 2011) BE HONS (UTP)
JOHAN 115461 MOHD BURHANUDDIN BIN	(MECHANICAL, 2005) HND (WALES)
MOHAMAD 116017 MOHD HEIDI BUYONG BIN	(MECHANICAL, 2005) BE HONS (UTM)
ABD RAHMAN	(MECHANICAL-MARINE TECHNOLOGY, 2010)
115889 NAZIF BIN MOHD AZHAR	BSc (NORTHEASTERN) (MECHANICAL 2001)
	MSc HONS (NORTHEASTERN)
116015 SYAMSUL AZRY BIN	(MECHANICAL, 2003) BE (UNIVERSITY OF
MD ESA	APPLIED SCIENCE HOCHSHULE
	NIEDERRHEIN) (MECHANICAL, 2010)
	MSc (UTM) (MECHANICAL, 2018)
115884 TANG CHEE CHOY	BE HONS (UTM) (MECHANICAL, 1988)
	NUC
115892 LIM CHI DICK	BE HONS (UCSI)
	(MECHATRONICS, 2011)
KEJURUTERAAN PEMBUAT	AN BAppSc HONS (WINDSOR) (INDUSTRIAL, 1996)

F		CALLEI SISWAZALI
No. Ahli	Nama	Kelayakan
KEJU	RUTERAAN ALAM SEK	
94437	ALLEN TAN HENG KUANG	BE HONS (UTAR) (ENVIRONMENTAL, 2021) BE HONS (UTAR)
104653	CHIN YUN TONG	(ENVIRONMENTAL, 2021) BE HONS (UTAR)
105329	LEW YU SHENG	(ENVIRONMENTAL, 2021) BE HONS (UTAR)
94440	NG CHE HENG	(ENVIRONMENTAL, 2021) BE HONS (UTAR)
97872	NG WANN LI	(ENVIRONMENTAL, 2021) BE HONS (LITAR)
105328	NG YEE EN	(ENVIRONMENTAL, 2021) BE HONS (UTAR)
97871	NG YI LIN	(ENVIRONMENTAL, 2021) BE HONS (UTAR)
105337	TAN WEI TIAN	(ENVIRONMENTAL, 2021) BE HONS (UTAR)
94439	TAN YAN MING	(ENVIRONMENTAL, 2021) BE HONS (UTAR)
104656	TEOH ZHE HAN	(ENVIRONMENTAL, 2021) BE HONS (UTAR)
97875	TOH CHUN KIT	(ENVIRONMENTAL, 2021) BE HONS (UTAR) (ENVIRONMENTAL, 2021)
<b>KEJU</b>		
90902	ELNAGAR	(CIVIL, 2020)
30124	ADDI RAFEQ BIN ABDUL RAHMAN	BE HONS (UNITEN)(CIVIL, 2012)
92985	AHMAD SYAKIR BIN	BE HONS (UTM)(CIVIL, 2020)
72737	AIMAN HADI BIN YAHAYA	BE HONS (UNITEN)(CIVIL, 2016)
95276	BIANTI SHEANON LOJITAN	BE HONS (UNIMAS)(CIVIL, 2019)
92421	CASSANDRA CAROLINE SENDY	BE HONS (UTHM)(CIVIL, 2019)
21189	CHAN YORK LIN	BE HONS (UTM)(CIVIL, 2003)
92856	CHONG CHEE WEI	BE HONS (UTM)(CIVIL, 2020)
54181	CHONG YEN FONG, VIVIAN	BE HONS (UTAR)(CIVIL, 2016)
84365	CHRISTINE NERISHA ANAK STEPHEN LIAT	BE HONS (UTM)(CIVIL, 2019)
97931	CHUAH PEI LIM	BE HONS (UTAR)(CIVIL, 2021)
96144		2021)
105884		2021)
05072	DI. CHIN CHEE ECONG	2017) PhD (UTM)(CIVIL, 2020)
45630	Dr. MUHAMMAD SHAZRIL IDRIS BIN IBRAHIM	BE HONS (USM)(CIVIL, 2013)
47022		QUEENSLAND, 2020)
47033	HASHIM	2012) MSc (USM)
		(ENVIRONMENTAL, 2013) PhD (UTM)(2017)
95168	FANTHY MOOLA ANAK MALEK	BE HONS (UNIMAS)(CIVIL, 2020)
95179	FUNG KWONG MENG	BE HONS (UNIMAS)(CIVIL, 2020)
77880	JACQUELINE AK RICHARD	BE HONS (UNIMAS)(CIVIL, 2018)
99093	LEE HSIEN FOONG, JORDAN	BE HONS (SWINBURNE UNI. OF TECH.)(CIVIL, 2024)
85102	LEE HUAN BOON	BE HONS (UTM)(CIVIL,
33004	LEE KAH SOO	BE HONS (UTHM)(CIVIL,
84092	LEE YUAN JUN	BE HONS (UTM)(CIVIL, 2018)
69784	LEONG GEOK TENG	BE HONS (UNIMAS)(CIVIL, 2017)
88540	LIEW CHO KEAT,	BE HONS (UCTS)(CIVIL, 2019)
96158	LING KING EE	BE HONS (UTAR)(CIVIL, 2020)
92706	MADZALAN MASINGKA	BE HONS (UTM)(CIVIL, 2020)
77305	MOHD NOORHALISAFIQ BIN MOHAMAD RIZAL	BE HONS (UTHM)(CIVIL, 2017)
77857	MOHD SYAMIL BIN SANAI DUNDANG	BE HONS (UNIMAS)(CIVIL, 2019)
82758	MUHAMAD TAUFIQ BIN MAT RASLI	BE HONS (UTHM)(CIVIL, 2019)
85691	MUHAMMAD FARIS QUSYAIRI BIN HAMAT	BE HONS (UITM)(CIVIL, 2018)

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	45612	MUHAMMAD FIRDAUS BIN RAZALI	BE HONS (USM)(CIVIL, 2013) ME (UPM)(STRUCTURAL &	
			CONSTRUCTIONS, 2018)	
	59266	MUHAMMAD HAIKAL	BE HONS (UMP)(CIVIL,	
	75570	AKMAL B. ZULKEFLI		
75576 MUHAMMAD KHAIRUL BIN JOHN		BIN JOHN	2018)	
	83940	MUHAMMAD KHIR BIN ABD HALIM	BE HONS (UTM)(CIVIL, 2019)	
	28309	MUHAMMAD NOOR	BE HONS (UTM)(CIVIL,	
	69071	MUHAMMAD SAMERIN B.	BE HONS (UTM)(CIVIL.	
		MOHD SHAHARI	2016)	
	54905	NEW ENG SING	BE HONS (UTHM)(CIVIL, 2016)	
	90596	NG KAH HOE	BE HONS (UMP)(CIVIL, 2020)	
	99536	NOR HISHAM BIN HASSAN	BE HONS (IUKL)(CIVIL,	
	101824	SAKUL NUR AQILAH BINTI MOHD	BE HONS (UNITEN)(CIVIL,	
		NAZARUDIN	2020)	
	95511	NUR FARZANA IZZATI BINTI MORNI	BE HONS (UNIMAS)(CIVIL, 2019)	
	48331	NUR ILYANA BINTI MOHD	BE HONS (UITM)(CIVIL,	
	81644	AMRAN NUR SYAHIRA BINTI CHE	2011) BE HONS (UMP)(CIVII	
	01044	MOHD NAWI	2019)	
	72006	PANG SHENG YANG	BE HONS (IUKL)(CIVIL, 2018)	
	64165	RAJA AKMAL SHAH B.	BE HONS (UTHM)(CIVIL,	
	60167	RAJA YATIMI		
	00157	RTININELD B. RINU	2014)	
	99355	SHARON HII YIIK WEI	BE HONS (CURTIN UNI.) (CIVIL & CONSTRUCTION, 2021)	
	97945	SOH SEI YUAN	BE HONS (UTAR)(CIVIL,	
	99098	SONG WEN YI. JACINDA	2021) BE HONS (SWINBURNE	
		,	UNI. OF TECH.)(CIVIL,	
	94770	TAN YEE JIN	2021) BE HONS (UTAR)(CIVIL.	
			2021)	
	102147	TANG HOU JING	BE HONS (UTAR)(CIVIL, 2021)	
	112774	VALERIE THIEN LY CHING	BE HONS (UNIMAS) (CIVIL 2020)	
	99021	YAP SENG HAW, BRYAN	BE HONS (UTAR)(CIVIL,	
	92761	YAP YI JIAN	BE HONS (UTM)(CIVIL,	
	97940	YEE JUN EENG	2020) BE HONS (LITAR)(CIVII	
	57 540	TEE JOINT ENG	2021)	
	76854	YOU JIN WEI	BE HONS (UTP)(CIVIL, 2018)	
			-	
	88171	HASAN BIN MARZUKI	BE HONS (III IM)	
	00171		(MATERIALS, 2019)	
	94875		BE HONS (UNIMAS)	
	0.010	YUNUS	(ELECTRONICS -	
	82532		COMPUTER, 2020)	
	02002	KERIYA	(ELECTRONIC, 2019)	
	83166	FATINI DIYANA BINTI	BE HONS (UTHM)	
	37421	FONG YEN HONG	BE HONS (MMU)	
			(ELECTRONICS -	
			2011)	
	88003	LIM HONG YANG	BE HONS (UCSI UNI.)	
	1010/8		(ELECTRONIC, 2019)	
	101040	MOHD ZAINI	(ELECTRICAL -	
	04906		MECHATRONICS, 2020)	
	34090	AZMANNUDDIN	(ELECTRONICS -	
	00000		COMPUTER, 2020)	
	66622	MOHD SAADON	ELECTRONICS, 2019)	
	KEJUI			
	40144	KAMARUDDIN	(ELECTRICAL, 2012)	
	95696	ALOYSIUS PALLIS A/L	BE HONS (UNITEN)	
		GERAD	(ELECTRICAL POWER,	

	KAMARUDDIN	(ELECTRICAL, 2012)
95696	ALOYSIUS PALLIS A/L GERAD	BE HONS (UNITEN) (ELECTRICAL POWER, 2017)
82261	AMZANI BIN AIDRUS	BE HONS (UTHM) (ELECTRICAL, 2019)
86962	ANIS AKILAH BINTI AMEER ALI	BE HONS (TAYLOR UNI.)(ELECTRICAL & ELECTRONIC, 2020)
96889	DEYL ALVINE LAJUMIN	BE TECH HONS (UNIKL) (ELCETRICAL, 2013) BRIDGING COURSE
102136	EDDY SII YAO ING	BE HONS (UTAR) (ELECTRICAL AND ELECTRONIC, 2021)
74233	FATIN NADHIRAH BINTI KHALIT	BE HONS (UTeM) (ELECTRICAL, 2018)

96311

AIDIL BIN AB RAHMAN

		(ELECTRICAL &
102134	LEE YAO DONG	BE HONS (UTAR)
		(ELECTRICAL AND ELECTRONIC, 2021)
107758	LIEW PEI MEI	BE HONS (UTAR) (ELECTRICAL AND
34019	LIM PHIN SHEN	BE HONS (UTM)
104389	LUI YIXI	BE HONS (UTAR) (ELECTRICAL &
33806	MOHAMAD HAFISZI BIN	BE HONS (UTeM)
37795	MUHAMAD NAZRIN BIN MD YASIN	BE HONS (UNITEN) (ELECTRICAL POWER, 2019)
34820	MUHAMMAD AIZAT BIN MAT NOR	BE HONS (UITM) (ELECTRICAL, 2019)
76643	MUHAMMAD ANAS SYAFIQ BIN ISHAK	BE HONS (UTHM) (ELECTRICAL, 2018)
97481	MUHAMMAD HAKIM BIN SALIM	BE TECH HONS (UNIKL) (ELECTRICAL, 2015)
37831	MUHAMMAD KHALID BIN JALIL	BE HONS (UNITEN) (ELECTRICAL POWER, 2019)
39859	NG JIA SEN	BE HONS (UTAR) (ELECTRICAL AND ELECTRONIC, 2021)
51080	NORAZZUWA BINTI MOHAMAD RAZALI	BE HONS (USM) (ELECTRICAL, 2015)
38884	NUR HUDA MUNIRAH BINTI TAMBI	BE HONS (SWINBURNE UNI. OF TECH.) (ELECTRICAL & ELECTRONIC, 2019)
79616	NUR SYAHIRAH BINTI MOHD RAZALI	BE HONS (UNITEN) (ELECTRICAL POWER, 2018)
30808	NUR YASMIN BINTI YUSERI	BE HONS (UITM) (ELECTRICAL & ELECTRONIC 2018)
79604	OEH ZHE HAN	BE HONS (UNITEN) (ELECTRICAL POWER, 2018)
38456	SABARUDDIN BIN SARIPUDDIN	BE HONS (UTM) (ELECTRICAL, 2020)
51748	THINAL RAJ	BE HONS (UKM) (COMMUNICATION & COMPUTER, 2015)
74020	UNGKU AFIZAN HUSSAINI BIN UNGKU HUSSIN	BE HONS (UITM) (ELECTRICAL, 2017)
KF.JU	RUTERAAN KIMIA	
		BE HONS (UTP)
60761	ANOAR BIN ABDULLAH	(CHEMICAL 2016)
60761 97950	ASWWINYY A/P	(CHEMICAL, 2016) BE HONS (MANIPAL INT.
60761 97950 85024	ASWWINYY A/P MARIMUTHU CHAN DUN HUANG	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR)
60761 97950 85024 29913	ANUAR BIN ADULLAH ASWWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (USM)
50761 97950 35024 29913 76211	ANDAR BIN ADUCLAH ASWWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (USM) (CHEMICAL, 2008) BE HONS (UTP)
50761 97950 35024 29913 76211 34530	ANGAR BIN ADUCLAH ASWWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (USM) (CHEMICAL, 2008) BE HONS (UTP) (CHEMICAL, 2018) BE HONS (UTM)
60761 97950 85024 29913 76211 84530 92971	ANDAR BIN ABJULLAH ASIWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2008) BE HONS (UTM) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTM)
50761 97950 35024 29913 76211 34530 92971 102122	ANDAK BIN ADUCLAH ASWWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (USM) (CHEMICAL, 2020) BE HONS (UTP) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTM) (CHEMICAL, 2020) BE HONS (UTAR)
60761 97950 85024 29913 76211 84530 92971 102122 88601	ANDAK BIN ABJULLAH ASIWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE LIM KAH SOON, GODWIN	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (USM) (CHEMICAL, 2020) BE HONS (USM) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTM) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (MONASH UNI.)
60761 97950 35024 29913 76211 34530 92971 102122 38601 29420	ANDAR BIN ABJULLAH ASIWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE LIM KAH SOON, GODWIN ONG BOON HAU	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTM) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTM) (CHEMICAL, 2021) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE (UMP)(CHEMICAL -
50761 97950 35024 29913 76211 34530 92971 102122 38601 29420 94600	ANDAK BIN ABJUCHAH ASWWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE LIM KAH SOON, GODWIN ONG BOON HAU POOJA GIRISH NAIR	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTP) (CHEMICAL, 2018) BE HONS (UTP) (CHEMICAL, 2019) BE HONS (UTM) (CHEMICAL, 2021) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MONASH UNI.) BE HONS (MONASH UNI.) BE HONS (MONASH UNI.)
50761 37950 35024 29913 76211 34530 32971 102122 2988601 29420 994600	ANDAR BIN ABJUCHAH ASWWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE LIM KAH SOON, GODWIN ONG BOON HAU POOJA GIRISH NAIR PREDAARSHAN V.CHANDRAN	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTM) (CHEMICAL, 2020) BE HONS (UTM) (CHEMICAL, 2018) BE HONS (UTP) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTM) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MANIPAL INTER, UNI.)(CHEMICAL, 2021)
50761 97950 35024 29913 76211 34530 92971 102122 838601 29420 94600 94531	ANDAK BIN ABJULLAH ASUWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE LIM KAH SOON, GODWIN ONG BOON HAU POOJA GIRISH NAIR PREDAARSHAN V.CHANDRAN RAANNESH A/L	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTMR) (CHEMICAL, 2020) BE HONS (UTM) (CHEMICAL, 2018) BE HONS (UTP) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTM) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MANIPAL INTER. UNI.)(CHEMICAL, 2020) BE HONS (MAI)
50761 37950 35024 29913 76211 34530 92971 102122 38601 29420 94600 94531 94532 102124	ANDAK BIN ABJULLAH ASUWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE LIM KAH SOON, GODWIN ONG BOON HAU POOJA GIRISH NAIR PREDAARSHAN V.CHANDRAN RAANNESH A/L JEYAKUMAR SI SO JIE TING	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (USM) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTM) (CHEMICAL, 2021) BE HONS (UTAR) (CHEMICAL, 2021) BE (UMP)(CHEMICAL - GAS TECHNOLOGY, 2010) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MANIPAL INTER. UNI.)(CHEMICAL, 2020) BE HONS (MIU) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020)
50761 97950 35024 29913 76211 94530 92971 102122 38601 29420 94600 94531 102124 30605	ANDAR BIN ABJUCHAH ASWWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE LIM KAH SOON, GODWIN ONG BOON HAU POOJA GIRISH NAIR PREDAARSHAN V.CHANDRAN RAANNESH A/L JEYAKUMAR SI SO JIE TING TEOH WEI JIAN	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTM) (CHEMICAL, 2020) BE HONS (UTP) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTM) (CHEMICAL, 2021) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MIU) (CHEMICAL, 2021) BE HONS (UTAR)
50761 37950 35024 29913 76211 384530 322911 102122 38601 294200 944531 02122 30605 30605	ANDAK BIN ABJUCLAH ASWWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE LIM KAH SOON, GODWIN ONG BOON HAU POOJA GIRISH NAIR PREDAARSHAN V.CHANDRAN RAANNESH A/L JEYAKUMAR SI SO JIE TING TEOH WEI JIAN VISAAL BALASANDAR	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTM) (CHEMICAL, 2018) BE HONS (UTP) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTM) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MANIPAL INTER. UNI.)(CHEMICAL, 2020) BE HONS (MIU) (CHEMICAL, 2021) BE HONS (MIU) (CHEMICAL, 2021) BE HONS (MIU) (CHEMICAL, 2021) BE HONS (MIU) (CHEMICAL, 2021) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (UM)(CHEMICAL, 2019)
50761 37950 35024 29913 76211 384530 922971 102122 388601 294200 94600 94531 102124 30605 112770 37248	ANDAK BIN ABJULLAH ASUWINYY A/P MARIMUTHU CHAN DUN HUANG FOO CHEE YEW, HENRY GEOH SEW YIN KANG SZE YIN, JASMINE KUMANAN A/L ESWARAN LAI JIA YEE LIM KAH SOON, GODWIN ONG BOON HAU POOJA GIRISH NAIR PREDAARSHAN V.CHANDRAN RAANNESH A/L JEYAKUMAR SI SO JIE TING TEOH WEI JIAN VISAAL BALASANDAR ZOEBELLE TEO ZIN	(CHEMICAL, 2016) BE HONS (MANIPAL INT. UNI.)(CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTAR) (CHEMICAL, 2020) BE HONS (UTM) (CHEMICAL, 2018) BE HONS (UTP) (CHEMICAL, 2018) BE HONS (UTM) (CHEMICAL, 2019) BE HONS (UTAR) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MONASH UNI.) (CHEMICAL, 2021) BE HONS (MANIPAL INTER. UNI.)(CHEMICAL, 2020) BE HONS (MIU) (CHEMICAL, 2021) BE HONS (MIU) (CHEMICAL, 2020) BE HONS (MIU) (CHEMICAL, 2020) BE HONS (MONASH UNI.) (CHEMICAL, 2020) BE HONS (MONASH UNI.) (CHEMICAL, 2021)

SHRAF IZWAN BIN	BE HONS (IIUM)
MDAN	(MANUFACTURING, 2014)
IISHATA ROYAN A/P	BE HONS (UKM)
RAJENDRAN ROYAN	(MANUFACTURING, 2009)

#### KEJURUTERAAN MEKANIKAI 85067

57881

37459

92999

- ADAM MAXWELL DOUMIN BE HONS (UTM) (MECHANICAL, 2018) AHMAD EIMRAN BIN BE HONS (UTM) KAMANUDIN (MECHANICAL AUTOMOTIVE, 2020)
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