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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*
LAURA LEE • *laura@dimensionpublishing.com*

SENIOR GRAPHIC DESIGNER
SUMATHI MANOKARAN • *sumathi@dimensionpublishing.com*

GRAPHIC DESIGNER
SOFIA • *sofia@dimensionpublishing.com*

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COVER NOTE

by Ir. Assoc. Prof. Dr Mohamed Thariq bin Haji Hameed Sultan
Chairman, Engineering Education Technical Division

First, I would like to extend my heartfelt congratulations to the Engineering Education Technical Division for successfully preparing, strategising, coping with and ensuring learning continuity during the Covid-19 crisis.

The Covid-19 pandemic has caused severe disruptions to the global education system and created huge challenges for those involved. We have had to learn to adapt to new ways of learning to ensure and support the continuity of teaching and learning throughout this difficult period.

Like many other fields, education in engineering never stops. During these exceptional times, we have not given up on producing engineers of the highest quality.

The rise of online learning via digital platforms and the sudden shift away from classroom learning has never really jeopardised education in engineering. We are constantly trying to establish a robust education plan that will benefit learners, especially to support their career paths and to help them adjust to remote learning.

This month's issue of *JURUTERA* presents an interview with Prof. Ir. Ts. Dr Vinesh Thiruchelvam, the Deputy Vice Chancellor for Asia Pacific University of Technology & Innovation (APU), on the "New Norm in Engineering Education". The views and opinions of Dr Vinesh will be of great benefit to all engineering educators and learners. ■

EDITOR'S NOTE

RE-IMAGINING ENGINEERING EDUCATION

by Ir. Dr Bhuvendhraa Rudrusamy
Bulletin Editor

As engineers, we are taught that innovation is the way forward for the nation's growth and the current situation has provided us with an opportunity to push forward the use of technology to replace many traditional tasks, including education.

As an educator, I have adopted to the new normal in teaching and learning activities. An overarching work in preparing recorded lectures with enhanced course assessments was completed over the mid-year break to ensure that the flipped classroom concept could be introduced, in which students were expected to view weekly lectures prior to classroom engagement.

On the other hand, in consideration of restrictions placed on travel, students are given the flexibility to either attend lectures physically or go online. Today, both students and course instructors are adjusting to new experiences in teaching and learning activities to ensure that the learning outcome is met and that the quality of education is uncompromised.

While focusing on the education outcome, the well-being of both students and educators should also be observed. With virtual classrooms, students are exposed to online activities much longer, and the threat of privacy, security, cyber-bullying, etc. should be considered in providing a safe learning environment. The so-called new normal, with the adoption of efficient teaching and learning platforms will, sooner or later, replace conventional teaching methods by providing high-quality education. But this can only be achieved with the collaboration of students, parents, teachers, education leaders and external partners. ■

Prof Ir. Ts. Dr Vinesh Thiruchelvam was previously Chairman of Engineering Education Technical Division (E2TD) at IEM. He is also Deputy Vice Chancellor for Asia Pacific University of Technology & Innovation (APU), Chief Innovation Officer for the APIIT Education Group as well as academic advisor and external examiner for four Malaysian public universities.

THE NEW NORM IN ENGINEERING EDUCATION

After more than 9 months and even as 2020 draws to a close, the Covid-19 pandemic shows no sign of slowing down or dissipating. Globally, many sectors have been hard hit and among those severely affected is the education sector. The disruption of face-to-face and hands-on learning between educators and students, has led to a multitude of impacts on students globally, tertiary level education notwithstanding.

The pandemic has inadvertently accelerated online learning in the local higher education scene. University students are exposed to a new paradigm shift and they must learn to make use of various resources, including that in the public domain.

Unsurprisingly, the shift exposes the digital divide in teaching and learning methodology between developed countries and developing nations and the gap in access to information and technologies such as personal computers and the Internet and available infrastructure.

"Like all other fields in tertiary education, engineering students and academicians have had to adapt to the new shift in teaching and learning as well as in research methodology," said Prof. Ir. Ts. Dr Vinesh Thiruchelvam, Deputy Vice Chancellor for Asia Pacific University of Technology & Innovation (APU).

HERE TO STAY

Prof. Dr Vinesh said that all modules in universities are now taught online via Online Distance Learning (ODL) and that the move from conventional teaching and learning practices to an online delivery mode should be done by taking into consideration both the opportunities and drawbacks of the online medium.

"Academicians are encouraged to consider including students as stakeholders in designing the best delivery methods to ensure effective, engaging and meaningful learning experiences for the learners," he added.

He said ODL design must be based on learning objectives and outcome-based education. It must also promote inclusiveness to set the stage for successful interaction between academicians and students. "It is vital to impart clear rules of interaction between educator and learner here," he said, adding that there is a need to deploy asynchronous communication tools on a secured platform which utilises current technologies for ODL implementation. The goal is not to try to re-create face-to-face classrooms. "Online and blended learning provide opportunities for learners to work more independently and to learn

to use tools and strategies that they otherwise might not have," he said.

Prof. Dr Vinesh said that while it is not recommended to experiment in emergency situations, innovation, creativity and resilience are required to make things work. Academicians will also discover the need to be adaptive and to think fast so as to ensure that learning continues in a healthy way.

CREATIVE WAYS TO DELIVER ODL

To attract the interest of students, academicians will have to deploy creative methods when delivering ODL for engineering core subjects, with more focus on solving problem using formulas and calculations.

"A pure e-learning alternative must be developed to provide students with an independent learning option to support live sessions," said Prof. Dr Vinesh, adding that academicians should break down each lesson and make the content digestible. They should also set the learning objectives right in the beginning.

Another way to creatively engage students is to adapt in-class activities to the virtual classroom. Academicians can then lead online engagements to ensure students are actively participating in class rather than just in for the ride. When students lag behind or are unable to fully follow the lectures/classes, academicians can make available the recorded live sessions for them to review.

At APU, Moodle or Teams is used to distribute lecture notes along with activities that not only cover immediate course requirements but also real-world implications of the subject. "This will augment the existing 'required' content and, hopefully, provide a richer and more complete experience for students," he said, adding that MOOC systems often serve as a useful template for this process.

PROJECT-BASED MODULES

In essence, to carry out project-based modules such as capstone projects during the pandemic, universities can collaborate with the industry. Prof. Dr Vinesh said: "Universities can communicate with the industry via video conferencing to discuss the current issues to solve and the industry can organise virtual tours to help students understand the industry and the nature of their business. The industry can also organise webinar presentations to explain the process and the problems."

He said creativity can be infused in engineering projects in various ways which include writing a long-form essay, starting a blog, starting a website, starting an email newsletter, making a video (film/animated), conducting an interview, creating a work of art (painting, drawing, sculpting, etc), developing a software program or app, developing animation and creating unique data visualisation.

CONDUCTING SIMULATION BASED OR VIRTUAL LABORATORY

In 1928, Edwin Link developed the "Link Trainer" (Flight Simulator), believed to be the first simulation program used in "Blue Box". The simulator was used to train thousands of military pilots before and during WW II.

So, when asked about the most effective way to conduct simulation based or virtual laboratory sessions so that the outcomes meet the criteria as conducted in physical laboratory sessions, Prof. Dr Vinesh said that online engineering education presents a challenge for educators to convert real to virtual labs but simulation software has become a vital tool in substituting the physical lab.

"Simulations play a vital role in engineering education especially in laboratory exercises," he said. "Simulation environments can train and expose students to practical knowledge, for example in Virtual Experimentation."

Simulations are well-known educational tools in computer technology programs too. "Simulation laboratories are primarily used either for pre-lab experience to give students some idea of what they will encounter in actual experiment. It will help students to familiarise themselves with the experiment, improve their skills and be able to predict the outcome before performing the experiment in a real lab," he said.

In addition, he said, simulations enable students to compare the work with traditional labs. "Students

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with simulation experiences were able to grasp theoretical knowledge easily when performing experiments. Substitution is done when the system studied is dangerous, expensive or is large and not practical for a typical educational laboratory," he added.

ENSURING FAIR ASSESSMENT

During the Covid-19 pandemic and the MCO, most universities conducted courses/subjects/units online. Students were also assessed online without any invigilation, in contrast to sitting for an exam in the usual examination hall.

So how can academicians ensure the students are assessed fairly and that they have taken the examination without any assistance? "The answer is that we can't," admits Prof. Dr Vinesh. "But we can put in place certain mechanisms to make the assessment valid while encouraging students to become more used to unsupervised assessments."

The best way to explain this is to look at the advantages and disadvantages of online assessments. "Firstly, online examinations are more secure. You can create an online question bank. Every student gets a random selection from the question bank. Automation also allows for real time marking so it lessens the lecturer's load on marking," he said.

Secondly, online examinations save real time as students take the online examinations at their own time. "Finally, an online examination saves paper. This contributes to efforts to make the environment green, subsequently leading to sustainable development," added Prof. Dr Vinesh.

On the flip side, he said, academicians have to keep in mind that the students will take the exam on their own device and in their own time with nobody to monitor them. Therefore, academicians must also alter their questions diligently to fit the situation.

"They will need to set questions where answers cannot be easily retrieved from books or the internet within a short period. Additionally, they can set a timer to each question so time becomes an essence towards exam completion, thus not allowing search time," he said.

Open text questions are possible, said Prof. Dr Vinesh, but they do not auto-grade, so academicians have to raise the difficulty level to suit their needs. When all is said and done though, it cannot be denied that an online/virtual exam system is a little bit more susceptible to dishonesty. Therefore, he said that proctoring exams is pivotal here.

DESIGNING OPEN-ENDED QUESTIONS TO SOLVE PROBLEMS USING FORMULAS AND CALCULATIONS

"In designing open-ended exams or test questions for subjects that require students to solve problems using formulas and calculations, it is imperative to have information on the methods in which their achievements will be measured and the relative weighting of units, modules or elements of the module in respect of the assessment overall," said Prof. Dr Vinesh. "All these should be defined in the very first class of the semester."

He added that timely formative assessment on their academic performance will also be able to provide a basis for individual constructive feedback and guidance and to illustrate the

awarding expectations for summative assessment.

In the case of open-ended questions, a significant concept in a related field is involved. "The assessment items convey to the students what needs to be emphasised and what is of primary importance," explained Prof. Dr Vinesh. "It can also have several objectives, thus giving students the chance to show their understanding by linking the entire topic and how it can lead to real-world problem solving."

There can be multiple answers to open-ended questions, so when a question requires one correct answer, students often conclude there is only one way to solve the problem, but this is not necessarily true. Therefore, academicians need to communicate the reasoning process to their students in an open-ended examination, said Prof. Dr Vinesh. "One strong point of using open-ended questions is that students have the opportunity to communicate what is in their minds and this is part of critical thinking," he said.

Also, open-ended questions should be clearly stated. "The fact is that open-ended questions should not be incomprehensible. Questions should have a clear purpose even if there are many different answers. This is because many students are not used to explaining their thoughts in writing and it is important to help them improve their skills in communications as well as analytical and critical thinking," said Prof. Dr Vinesh. "Have a scoring rubric. Each item evaluated must have at least a 2-point rubric: Yes or no. But the purpose of open-ended questions is to provide students with an opportunity to communicate their understanding in something other than the scenario of exactly right or wrong answer."

As for continuous assessment, there are several focus areas which an academician needs to take into consideration. These are:

- Component for weekly evaluation for 'continuous' engagement
- Consisting of 20% of the total module
- 'Online friendly' formats that permit automated evaluation
- Design relevant and real-world learning activities
- Types of assessments
- Assess for deeper understanding and competency
- Emphasis on project and problem-based learning
- Feedback loop
- Submission policy
- Storage
- Plagiarism

ADVANTAGES & DISADVANTAGES

Prof. Dr Vinesh listed five advantages of ODL. He said: "Firstly, ODL results in reduced operational teaching and learning costs both for the educators and the learners."

With ODL, the lecturer's role also changes as classes go online. There is increased convenience and flexibility which allows for blended learning approaches. "This is where academicians need to stay abreast with technology for skills and knowledge re-scaling," he said.

As a teaching and learning tool, ODL also allows students to revise easily as they can always replay the recorded T&L sessions. ODL also results in ease of real time content updates and deployment.

As for disadvantages, Prof. Dr Vinesh said that with ODL, students need to have self-discipline and time management skills. It also diminishes social interaction among students and academicians as well as among the students themselves.

Furthermore, for academicians, it means tweaking or adapting the content of their classes to suit their needs, as well as those of their students in place of face-to-face learning.

Carrying out classes online logically translates to a lack of practice-based learning too. As much as technological advancements aid humans to reach their goals faster or more easily, the reliance on technology has many potential negative impacts, especially in terms of network security breaches.

WELL-BEING OF ACADEMICIANS & STUDENTS

When asked about how the sudden, forced adoption of technology-delivered instruction affects the well-being of academicians and students, Prof. Dr Vinesh said that in as much as they feel overwhelmed by the social isolation caused by the lack of face-to-face communication and interaction, students have no choice but to adopt technology-delivered instructions.

This sense of isolation can be further impounded by accessibility issues, for instance a lack of hands-on technical training and poor bandwidth/connectivity. These, as well as one-way delivery of knowledge by the academicians, can present a psychological barrier in students with learning limitations.

"Data privacy and security issues can also severely affect both academicians and students as they tend to get exposed to suspicious links, websites, emails, apps," said Prof. Dr Vinesh who believes that ODL also encourages plagiarism and other methods of academic dishonesty by students when they think no one can "see" what they are doing.

CONCLUSION

Even as students are slowly being eased back to campus during the RMCO, it will still be more economical in terms of cost and time for universities and academicians to maintain ODL for some modules/courses. Despite the setbacks experienced initially, Prof. Dr Vinesh said both academicians and students will find that the currency of technology used will, over time, create adoption and adaptability in totality. "The new shift towards the use of ODL may very well become the new norm in engineering education," he concluded. ■

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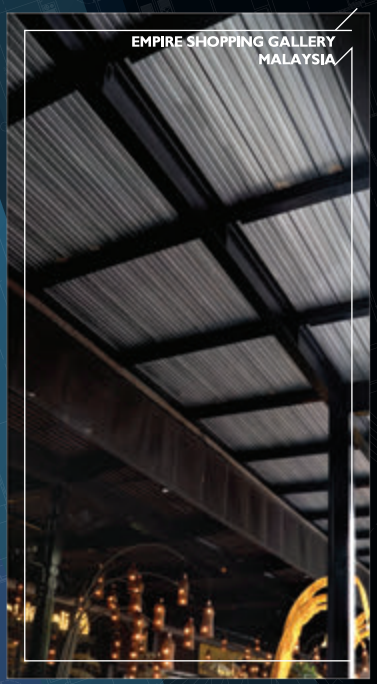
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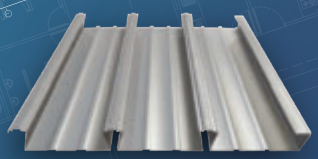
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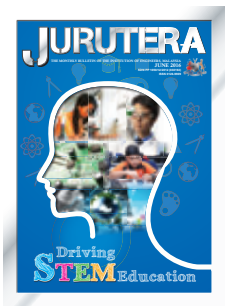

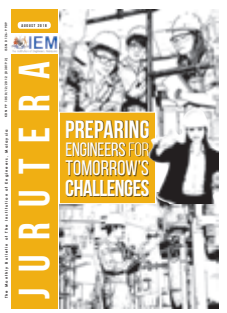

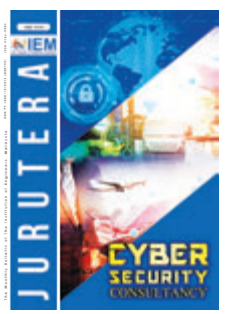

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Joseph How : +6011 1234 8181
Shirley Tham : +6016 283 3013

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LEADERSHIP: PERSPECTIVE OF AN ENGINEER

by Ir. Rocky H.T. Wong

Over the years, through practice & observation of peers' conduct, I am of the belief that 3 important characteristics – Character, Judgement and Courage – possessed by engineers of good standing, define true leadership in the fraternity and society at large.

CHARACTER

Engineers, like all regulated professionals, are educated people who should be informed, literate, well-read, knowledgeable, learned, enlightened and cultured. Those who have gone through an engineering education are deemed to have acquired the breadth and depth of knowledge in Science, Technology, Engineering, Arts & Mathematics (STEAM), attained the habit of in-career, life-long learning (i.e. CPD) which will help them solve complex problems now and in the future, to create new processes and develop modern technologies, e.g. engineers create and run Operation & Maintenance and Repair of Wealth Creation Assets including facilities supporting welfare, public health and wellness of humans and animals.

Planned deliverables require that the engineer leading/coaching/mentoring an engineering and technological team consisting of downline Professional Engineers (PE)s, 3rd party experts and allied professionals, graduate engineers, engineering technologists, engineering technicians, Inspector of Works (IOW)s, skilled/semi-skilled workers, work as one entity with a shared purpose and goal to attain planned outcomes.

By the time they are peer-certified to be licenced (registered) Professional Engineers, these engineers would have been duly adjudicated for their earned and gained competencies, built on those engineers' earlier (12) graduate attributes, which have since been enhanced and enriched proving certified/registered/licensed PE [1].

In the Knowledge, Skill & Attitude (KSA) domain, engineers would have demonstrated and proven their engineering and technological knowledge and competencies. Furthermore, engineers will have to put their people-to-people, social & economic and other soft skills to practice, motivating the team to give its best while accepting that strength in one direction compensates for weakness in another, delivering fit-for-purpose outputs, generating amazing outcomes that in turn gives rise to an impact beyond anticipation and expectation. That's Engineering, Technology & Innovation (ETI) service for you!

Do a good job. Learn from the past to do a better job the next time. Don't accept that your last job was your best job. Why? Because in this case, the next one will not be the best anymore. It should always be a better job the next time, the essential basis of incremental improvements by the "S curve" process where job-deliverables will still be a ramping-up on the linear part of the "S" and wherein the knee point is not reached.

There are various methods to manage the team which the engineer-leader may choose to implement, including top down, command and control and transactional in

nature (where there is the carrot and stick approach). Things get done but under a set of circumstances where no favour is given or asked for. All are expected to perform… or else! On the other hand, there is the gentler Coach-style Democratic leadership approach. Each mode of managing has its pros and cons, so the engineer-leader shall determine the mode of managing as per prevailing circumstances and his/her own read of the "landscape/terrain". Or this may have been determined according to Company Policy such as that often adopted by multi-national companies or Engineering, Procurement, Construction & Commissioning (MNC-EPCC) type of companies in the Energy (O&G) and Power Sectors.

But it's the team leader who chooses his/her style of management, notwithstanding the various modes of management. This is where real Character comes into the picture. Does the team leader believe in empathy and compassion? Or is the team leader an "I, me & myself" person? Character is "for real"; no play acting when the chips are down.

The "I, me & myself" leadership usually demonstrates a narcissistic and ungenerous nature, one that will not take any responsibility for the shortcomings or mistakes of team members but will take praises when a job is done well. Reason: Downliners who do well are compensated and those who cannot keep up are replaced. It is a transactional, "willing buyer, willing seller" arrangement! Darwinic in nature! Everyone for oneself. Floating Gig "body-shoppers" fit into this mode.

Conversely, a magnanimous leader believes the buck stops at the top. Towards that end, he/she is responsible for all mistakes that downliners make, believing he/she should have prepared them well through coaching, training and counselling and perhaps even conduct pastoral care (for those with challenges). That is care for all and no one is left behind. There is Encouragement, Enthusiasm & Empathy, the 3Es of Character and the "A (attitude) part" of KSA. We often hear "Hire attitude and train skills".

Character is "Your moral self". We know it when we see it. Maybe more importantly, we know when it is missing. Character is nature and nurture. It can be cultivated. Character builds over time and is additive. It is demonstrated in what we do, how we do and why we do. Therefore, engineers who wish to assert leadership of the team should mindfully direct their mission in life by appreciating and understanding that Character is nature, culture and discipline that natural tendencies are brought under the sway of moral motive. In my mentoring of engineering undergraduates and graduate engineers, I would introduce the Rotary 4-way Tests, reproduced below:

1. Is it the truth?
2. Is it fair to all concerned?
3. Will it bring goodwill and better friendship?
4. Will it be beneficial to all concerned?

This 4-way test is not a Code of Ethics (CoE). I personally find it a good and constant self-check on one's own actions and decisions. Most people believe that truth matters, fairness matters, goodwill cum friendship matters and that our efforts should generate outcomes which will benefit all concerned. People of good standing subscribe to aforesaid: They are of Character. Character is destiny.

JUDGEMENT

This is the ability to make considered decisions, form valuable opinions and make good decisions as well as make sensible guesses about a situation or sensible decisions on what to do. When judgement is about adjudication, it means evaluation of evidence to make a decision. Engineers often have to make judgement calls. That's part of our duty.

We are expected to make judgement calls on delivery methodologies on engineered or built outputs that will generate the desired outcomes. The same applies to engineers in Operation & Maintenance and ROM (Repair, Overhaul & Maintenance) which are part of integrated engineering services.

When the delivery process needs a change of alignment, or a reevaluation requiring a reset to prevent a mishap or pending disaster, it is the team engineer-leader who must make the judgement call, and the consequences can be serious. Does the said engineer-leader have the judgement to call? After all, he/she has proved to have professional competencies in the K&S domain to do so and the buck stops with the engineer-leader who may also seek advice and/or guidance from peers and experts. Notwithstanding, the judgement call is his/her's alone to make. One can delegate duties, but not responsibilities.

Making a difficult decision/judgement needs personal Courage. What then is Courage?

COURAGE

The state or quality of mind or spirit that enables one to face danger, fear or vicissitudes with self-possession, confidence and resolution. Courage is NOT brashness, incautiousness or temerity. Courage is a virtue. Without it, honour, integrity, empathy and other such leadership virtues have no base which we can build upon.

You will have the courage to make the judgement call with the right experiences (gained by doing and learning from others), conducted peer-review and you are confident the job hasn't been compromised (i.e. job is in compliance with specifications, standards, regulations, and verification tests done and in order. You then make the judgement call to "turn it on".

In due course, an unforeseen event happens. You, as the leader, have to explain why you made that call. It may seem like you're in trouble for having made the "wrong call". Are you? When you have done what is expected of a PE, i.e. exercised "due skill, care and diligence" and addressed all essential Occupational Safety & Health (OSH) requirements such as Safety, Health & Well-being of humans, plants and animals, properties and the environment, then you shouldn't fear any enquiry. A forensic review will be carried out as part of the due process. It may turn out the "mistake" is not the fault of the team but rather, a latent defect of an outsourced equipment or due to an Act of God.

Should such an experience cause a PE to lose his confidence and courage to make a final judgement call? No. The PE has exercised "due skill, care and diligence" and addressed all OSH essential requirements. Engineers do not guarantee unless a PI insurance is taken by client.

One must have the courage to get out of the comfort zone, especially when the project delivery system has worked well so far and is still on the ramping up zone of the "S" but the knee point is fast approaching. Do you have the courage to initiate a paradigm shift and take a quantum leap to reset and recalibrate your team's delivery process to suit contemporary circumstances? When the knee point is reached and you are on the top plateau of the "S", it will be marginal gain for double the effort which will be neither efficient nor beneficial. Missing a timely shift of the paradigm will cause a hero to drop to zero. Beware!

Like all professionals and mortals, engineers can make mistakes but lessons are learnt and experiences gained. Just don't make the same mistake twice! Just because one makes a mistake, is it correct to adopt the approach of "the less I do, the fewer mistakes I make"? That is not courage. In fact, it is irresponsibility on the part of the PE, who shouldn't be a PE in the first place.

To minimise or avoid mistakes, adopt a Zero Defect approach in your work such as ensuring all members of the team are trained/mentored to apply due skill, care and diligence, address public interest matters, and subject outputs to peer-review of checking and verification.

Keep a "paper trail" and document all systems and processes. Most importantly, make no compromises on the integrity of the project delivery. When Character is compromised, Judgement will most likely be biased with an excuse to pass the buck. It happens.

"Character is destiny" is a profound statement, the main primer to any engineer making a good judgement call without fear or favour, done with personal courage. Character is respect and it is respect earned rather than demanded. Respect comes with the flow.

CONCLUSION

Engineers with the requisites of professional competencies and who are subjected to Regulator's Code of Conduct (CoC), the CoE of the Fraternity and who order their moral conduct in the right direction (without giving in to greed) will have the just characteristics of Character, Judgement and Courage to assert leadership in the fraternity and society at large. Lastly, the leader "eats last" but when action starts, the leader is "first in, last out", accountable for all. ■

REFERENCES

[1] "Graduate Attributes and Professional Competencies," I. E. Alliance, Ed., 3 ed, 2013, p. 16.

Author's Biodata

Ir. Rocky H.T. Wong graduated as an Electrical Engineer in 1965. He may have retired 15 years ago, Ir. Rocky H.T. Wong continues to serve as a volunteer and mentor to undergraduates and young engineers.

UPCOMING ACTIVITIES

2-Day Course On "Ways to Success in Design & Build Contract"

Date	: 1 - 2 October 2020 (Thursday to Friday)
Time	: 9.00 a.m. – 5.00 p.m.
Venue	: Wisma IEM
Approved CPD	: 14
Speaker	: Ir. Lai Sze Ching

Pre-AGM Talk on Engineering Competency in Relation To Professional Registration – An Engineer's Dilemma

Date	: 3 October 2020 (Saturday)
Time	: 9.00 a.m. – 11.00 a.m.
Venue	: Wisma IEM
Approved CPD	: 2
Speaker	: Y.Bhg. First Admiral Dato' Ir. Hj. Ahmad Murad bin Hj. Omar (Retired)

9th Annual General Meeting of the Marine Engineering & Naval Architecture Technical Division, IEM

Date	: 3 October 2020 (Saturday)
Time	: 11.01 a.m. – 1.00 p.m.
Venue	: Wisma IEM
Approved CPD	: 1

Webinar - 1-Day Course On "Introduction to Metocean Applications for Offshore Facilities Engineering"

Date	: 6 October 2020 (Tuesday)
Time	: 9.00 a.m. – 5.30 p.m.
Venue	: Digital Platform
Approved CPD	: 7
Speakers	: Prof. Ir. Dr Mohd Shahir Liew, Ir. Dr Lim Eu Shawn

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IEM EMPLOYMENT SURVEY 2019

Ir. Dr Tan Chee Fai

Associate Professor
Dr Yong Chen Chen

The IEM Employment Survey was conducted between 1 and 29 February 2020. A total of 1379 IEM members responded. After data cleaning, a total of 728 respondents were included for further analysis. The respondents excluded were mainly due to incomplete information, unreliable information, students, those working abroad, the self-employed and retirees. The analysis included those who were currently working as engineers (aged 21-65) in Malaysia.

Table 1 is a summary of the respondents' profile. It was noted that 66% (479/728) of the respondents were aged 40 and below and who were working engineers. Of the total number of respondents, 88% (642/728) were male. Selangor topped the list with 42.9% (312/728) working respondents, followed by Kuala Lumpur (15.4%) and Sarawak (7.7%).

Table 1: Profile of respondents

Age Group	Number of respondents	Percentage distribution
21-25	20	3%
26-30	127	17%
31-35	195	27%
36-40	137	19%
41-45	96	13%
46-50	59	8%
51-55	38	5%
56-60	38	5%
61-65	18	2%
Total	**728**	**100%**
Gender		
Male	642	88%
Female	86	12%
Total	**728**	**100%**
State (Working location)		
Selangor	312	42.9%
Kuala Lumpur	112	15.4%
Sarawak	56	7.7%
Johor	44	6.0%
Sabah	42	5.8%
Penang	40	5.5%
Negeri Sembilan	32	4.4%
Perak	31	4.3%
Melaka	16	2.2%
Kedah	12	1.6%
Terengganu	9	1.2%
Pahang	7	1.0%
Putrajaya	7	1.0%
Kelantan	5	0.7%
Labuan	2	0.3%
Perlis	1	0.1%
Total	**728**	**100%**

Table 2: IEM Membership information

IEM membership by grade	Number of respondents	Percentage distribution
Graduate Member	357	49.0%
Member	315	43.3%
Companion	15	2.1%
Incorporated Member	15	2.1%
Associate Member	10	1.4%
Fellow	8	1.1%
Senior Member	4	0.5%
Affiliate Member	3	0.4%
Honorary Member	1	0.1%
Total	**728**	**100%**

Registration with Board of Engineers Malaysia		
Graduate Engineer	372	51.1%
Professional Engineer	173	23.8%
Professional Engineer with Practising Certificate	155	21.3%
Engineering Technologist	5	0.7%
Inspector of Works	2	0.3%
None	21	2.9%
Total	**728**	**100%**
Engineering Consultancy Practices (Board of Engineers Malaysia)		
Sole Proprietor	45	6%
Body Corporate	44	6%
Multi-disciplinary Practice	40	5%
Partnership	33	5%
None	566	78%
Total	**728**	**100%**

Table 2 shows that 49% (357/728) of respondents were Graduate Members of IEM and 51.1% (372/729) were Graduate Engineers. However, only 22% (162/728) had engineering consultancy practices.

Table 3: Distribution by Industry and MASCO (Malaysia Standard Classification of Occupations)

Industry	Number of respondents	Percentage distribution
Construction	229	31.5%
Professional, scientific & technical activities	112	15.4%
Other service activities	75	10.3%
Electricity, gas, steam & air-conditioning supply	46	6.3%
Manufacturing	43	5.9%
Education	35	4.8%
Water supply, sewerage, waste management & remediation activities	20	2.7%
Real estate activities	15	2.1%
Mining & quarrying	13	1.8%
Information & communication	8	1.1%
Transportation & storage	8	1.1%
Administrative & support service activities	6	0.8%
Wholesale & retail trade, repair of motor vehicles & motorcycles	5	0.7%
Agriculture, forestry & fishing	4	0.5%
Financial & insurance/ takaful activities	2	0.3%
Accommodation & food service activities	1	0.1%
Arts, entertainment & recreation	1	0.1%
No response	105	14.4%
Total	**728**	**100%**
MASCO (2 digit)		
21 - Science & Engineering Professionals	474	65.1%
11 - Chief Executives, Senior Officials & Legislators	74	10.2%
12 - Administrative & Commercial Managers	61	8.4%
13 - Production & Manufacturing Managers	46	6.3%
25 - Information & Communications Technology Professionals	24	3.3%
31 - Science & Engineering Associate Professionals	18	2.5%
24 - Business & Administration Professionals	12	1.6%
16 - Services Managers	6	0.8%

15 - Information & Communications Technology Managers	3	0.4%
23 - Teaching Professionals	2	0.3%
33 - Business & Administration Associate Professionals	2	0.3%
14 - Hospitality, Retail & Other Services Managers	1	0.1%
26 - Legal Professionals	1	0.1%
28 - Social & Cultural Professionals	1	0.1%
34 - Legal Associate Professionals	1	0.1%
35 - Information & Communications Technicians	1	0.1%
76 - Other Craft Workers	1	0.1%
Total	**728**	**100%**

Table 4: Education Attainment

Qualification	Number of respondents	Percentage distribution
Degree	484	66%
Master	189	26%
PhD	35	5%
Others (STPM, Certificate, Diploma, Advanced Diploma)	11	2%
No response	9	1%
Total	**728**	**100%**

Table 3 shows that 31.5% of the respondents (229/728) were working in the construction industry in Malaysia, followed by 15.4% (112/728) in professional, scientific and technical activities industry. It also indicated that construction, professional, scientific & technical activities, other service activities, electricity, gas, steam & air-conditioning supply and manufacturing were the top 5 industries which provided job opportunities for engineers.

By referring to the distribution by Malaysia Standard Classification of Occupations (MASCO), 65.1% of the respondents (474/728) were working as Science & Engineering Professionals (MASCO 21), followed by 10.2% (74/728) as Chief Executives, Senior Officials and Legislators (MASCO 11). There were 8.4% (61/728) working as Administrative and Commercial Managers (MASCO 12), 6.3% (46/728) as Production & Manufacturing Managers (MASCO 13) and 3.3% (24/728) as Information & Communications Technology Professionals (MASCO 25).

Table 4 shows that 96% (708/728) of the respondents obtained at least a bachelor degree qualification and above.

From Table 5, the top 5 industries with the highest median monthly basic salary were 1) Transportation & storage, 2) Information & communication, 3) Electricity, gas, steam & air-conditioning supply, 4) Other service activities and 5) Professional, scientific & technical activities.

To ensure the reliability of the results, the analysis focused on the category with minimum number of respondents at 20 and above. The survey also shows that median for monthly basic and total salary for MASCO 21 - Science & Engineering Professionals (Basic: RM5,500, Total: RM6,200) and MASCO 25 - Information & Communications Technology Professionals (Basic: RM5,050, Total: RM5,600) fall below the aggregate median for monthly basic (RM6,500) and total (RM7,270) salary. This implied that the monthly median basic and total salary for these 2 categories was below the aggregate median (of monthly basic and total salary of overall respondents - engineers).

Similarly, engineers working in Johor (Basic: RM6,207, Total: RM7,007), Perak (Basic: RM5,500, Total: RM6,000), Negeri Sembilan (Basic: RM6,100, Total: RM6,245), Penang (Basic: RM6,025, Total: RM6,750) and Selangor (Basic: RM6,318, Total: RM7,025) were receiving monthly median basic and total salaries less than the median for monthly basic (RM6,500) and total (RM7,270) salary for engineers as a whole (Table 5).

With the exception of Kuala Lumpur, it was found that engineers who were working in states where economic development was concentrated (i.e., Selangor, Penang, Johor, Negeri Sembilan and Perak) received a monthly median salary below than the national median salary (assuming the overall survey was well-representative of all engineers in Malaysia).

Table 5 shows that the average number of working hours per week ranged between 45 and 49 (for occupations with number of respondents of 20 and above). This shows that on average, engineers worked overtime for 5-9 hours per week.

Table 6 shows that engineering was the career choice for 95% of respondents. Only 15% were paid for overtime, 72% felt that the salary of engineers was not reasonable, 7% reported dissatisfaction with their job, 69% received encouragement to attain Professional Engineer status and 20% intended to move away from engineering as a career.

Table 5: Monthly Salary Information and Working Hours per Week

	Median Monthly Allowance (RM)	Median Monthly Basic Salary (RM)	Median Monthly Total Salary (RM)	Average Working Hours per Week
Overall	235	6,500	7,270	45
Age Group				
21-25	150	5,519	6,000	49
26-30	150	6,000	6,933	44
31-35	250	7,000	7,800	45
36-40	300	6,200	7,000	45
41-45	235	7,000	8,025	44
46-50	200	6,000	6,500	40
51-55	0	7,000	8,050	45
56-60	300	8,300	9,850	45
61-65	250	5,749	6,598	42
Qualification				
Degree	205	6,500	7,325	45
Master	250	6,000	6,500	45
PhD	180	7,700	8,500	45
Others	550	6,000	7,450	45
Industry				
Accommodation & food service activities	0	6,000	6,000	45
Administrative & support service activities	275	5,350	5,950	48
Agriculture, forestry & fishing	1675	6,050	7,725	40
Arts, entertainment & recreation	2000	6,800	8,800	50
Construction	250	6,100	7,000	45
Education	400	6,000	7,000	42
Electricity, gas, steam & air-conditioning supply	500	8,000	8,650	48
Financial & insurance/takaful activities	0	6,750	6,750	50
Information & communication	750	8,750	9,650	45
Manufacturing	100	5,500	6,000	44
Mining & quarrying	0	6,500	6,500	45
Other service activities	300	7,000	8,000	45
Professional, scientific & technical activities	200	6,900	7,435	41
Real estate activities	80	6,300	6,380	43
Transportation & storage	663	11,000	12,513	40
Water supply, sewerage, waste management & remediation activities	298	5,800	6,750	45
Wholesale & retail trade, repair of motor vehicles & motorcycles	0	3,500	3,500	40

Table 5: Monthly Salary Information and Working Hours per Week (Continue)

	Median Monthly Allowance (RM)	Median Monthly Basic Salary (RM)	Median Monthly Total Salary (RM)	Average Working Hours per Week
State				
Johor	338	6,207	7,007	45
Kedah	100	4,800	5,000	44
Kelantan	0	10,000	10,000	50
Kuala Lumpur	300	7,325	7,593	45
Labuan	0	15,500	15,500	44
Melaka	290	4,750	5,450	45
Negeri Sembilan	230	6,100	6,425	49
Pahang	0	6,000	8,100	44
Perak	250	5,500	6,000	45
Perlis	2600	32,500	35,100	44
Penang	150	6,025	6,750	45
Putrajaya	1300	6,500	8,000	45
Sabah	250	7,900	8,400	45
Sarawak	150	8,000	8,250	43
Selangor	250	6,318	7,025	44
Terengganu	200	10,000	10,000	40
MASCO				
11 - Chief Executives, Senior Officials & Legislators	250	10,000	10,900	48
12 - Administrative & Commercial Managers	350	10,000	10,500	40
13 - Production & Manufacturing Managers)	500	9,000	9,875	48
14 - Hospitality, Retail & Other Services Managers	0	6,000	6,000	45
15 - Information & Communications Technology Managers	0	6,500	6,500	50
16 - Services Managers	1500	14,965	16,088	40
21 - Science & Engineering Professionals	200	5,500	6,200	45
23 - Teaching Professionals	4750	7,000	11,750	45
24 - Business & Administration Professionals	450	5,100	5,350	45
25 - Information & Communications Technology Professionals	50	5,050	5,600	40
26 - Legal Professionals	0	20,000	20,000	50
28 - Social & Cultural Professionals	0	23,000	23,000	39
31 - Science & Engineering Associate Professionals	300	6,000	7,250	40
33 - Business & Administration Associate Professionals	2075	9,200	11,275	55
34 - Legal Associate Professionals	0	3,000	3,000	50
35 - Information & Communications Technicians	120	9,000	9,120	40
76 - Other Craft Workers	0	10,000	10,000	84
Gender				
Male	250	6,500	7,395	45
Female	200	6,050	6,440	45

Table 6: Feedback on Welfare Aspects (Total respondents: 618)
Note: Only 618 of the 728 respondents responded to the questions for this section.

	Number of respondents	Percentage of distribution
Is engineering your career choice?		
No	33	5%
Yes	585	95%
Are you paid for overtime work?		
No	528	85%
Yes	90	15%
Are engineers' salaries reasonable?		
No	447	72%
Yes	171	28%
How do you perceive your job?		
Dissatisfied	42	7%
Neither satisfied nor dissatisfied	151	24%
Satisfied	338	55%
Very dissatisfied	16	3%
Very satisfied	71	11%
Did you receive encouragement to attain Professional Engineer status?		
No	193	31%
Yes	425	69%
Do you intend to move away from engineering?		
No	496	80%
Yes	122	20%

CONCLUSION

Based on the sample size of minimum respondents of at least 20 and above, it was found that the median monthly total salary was generally higher for those in the older age group. This implied that working experience played a vital role in salary growth. Besides, it was observed that the rate of investment for education was worth it only when complemented with working experience.

This was reflected in the low minimum monthly basic salary received by entry level employees with PhD (RM2,800), Master (RM2,000) and Degree (RM1,500) qualifications. The minimum monthly total salary for entry level employees with PhD, Master and Degree qualification were RM3,000, RM2,000 and RM1,800 respectively.

This could be one of the reasons for dissatisfaction among engineers who had invested in education. From the survey, it was found that 72% (447/618) of the respondents stated that the salary for engineers was not reasonable (Table 6). ■

Authors' Biodata

Ir. Dr Tan Chee Fai is Chairman of the Standing Committee on Admission & Practical Training (2020/2021) and Chairman of Standing Committee on Welfare & Service Matters Session 2019/2020.

Associate Professor **Dr Yong Chen Chen** is with the Department of Economics, Faculty of Economics and Administration, University of Malaya.

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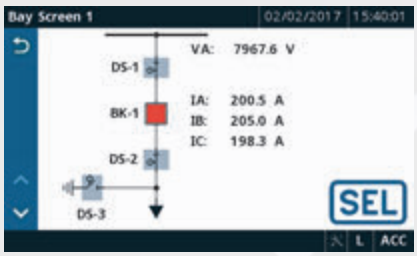
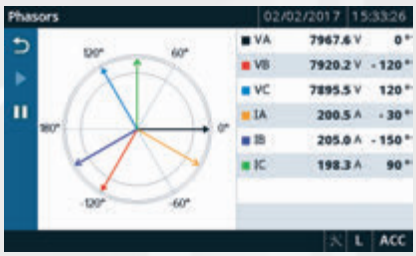
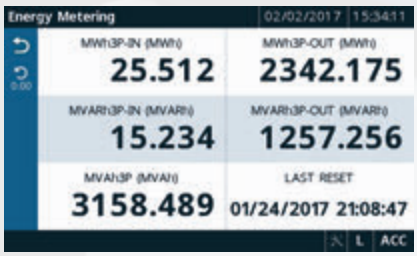
- ***Mimics a one-line diagram for bay control and monitoring***. With it, you can view metered quantities, phasor diagrams, relay settings, event summaries, target statuses, and Sequential Events Recorder (SER) data as shown below.
- ***Suited for harsh environments*** - capacitive touchscreens are ideal for industrial and utility power systems.
- ***Greater user satisfaction*** - touchscreens are faster and more comfortable input devices.
- ***Avoidance of repetitive strain injuries from mouse use*** - the use of a computer mouse is associated with higher rates of carpal tunnel syndrome.







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TRANG TIEN BRIDGE: BUILT TO LAST

Ir. Dr Oh Seong Por

Ir. Dr Oh Seong Por *is the chairman of IEM Negeri Sembilan Branch.*

In 1899, during the reign of Emperor Thanh Thai, the Trang Tien Bridge was constructed over the Huong River (or Perfume River) in the ancient royal capital of Hue in Central Vietnam. The designer was architect Gustave Eiffel who had also designed the Eiffel Tower in Paris, France, and the Statue of Liberty in New York, USA.

The European Gothic architecture design and steel structure bridge consisted of 6 steel girders. Its total length is 402.6m and it is 5.4m wide. There are 6 comb-shaped arches with a height of 5.45m. The view of the arches reflected in the river is a smooth and gentle curved look that is said to represent the gentle behaviour of the people of Hue.

In 2002, a lighting system installed on the bridge turned it into a colourful scene when lighted up at night.

Built over a century ago, Trang Tien Bridge had survived several destructions caused by devastating storms (1904), mine explosions during the Vietnam-France War (1946) and bomb strikes during the Vietnam War (1968). Each time, it was repaired and remodelled. Today, it continues to stand elegantly, allowing the people of Hue to cross the Huong River. ■

CONCEPT OF ENTREPRENEUR AND ENTREPRENEURSHIP, BASIC BUSINESS STRATEGY, BUSINESS PLANNING AND MANAGEMENT

by Ir. Dr Baljit Singh a/l Bhathal Singh

On 13 July 2020, the Engineering Education Technical Division (E2TD) organised a webinar on "The Concept of Entrepreneur And Entrepreneurship, Basic Business Strategy, Business Planning and Management" through online webinar platform Zoom. Hosted by the IEM secretariat, it had 29 participants.

The 9 a.m. talk was delivered by Ir. Dr Baljit Singh a/l Bhathal Singh and was moderated by E2TD Chairman Ir. Prof. Dr Mohamed Thariq bin Haji Hameed Sultan.

First, Ir. Dr Baljit gave a briefing on the concepts, starting with the definition of entrepreneur and entrepreneurship and the reasons why people become involved in entrepreneurship. Risks and rewards associated with the entrepreneurship were discussed in depth. He presented the entrepreneurial mindset as a way of thinking that enabled anyone to overcome challenges, be decisive, and to accept responsibility for outcomes. It is a constant need to improve skills, learn from mistakes and take continuous action on ideas.

Entrepreneurs are free to work on tasks which are likely to fail but generate learning about their comparative advantages at different tasks. The participants were exposed to failure value cycles and there was a discussion on learning from failure. The concept of opportunity was presented to the participants, a situation in which new goods, services, raw materials, markets and organising methods could be introduced through the formation of new means, ends or means-ends relationships.

In practice, the entrepreneurial process involves emergence (discovery and creation) of opportunities, evaluation of opportunities as well as organisation of opportunities. An entrepreneur discovers/creates an opportunity.

Important traits of entrepreneurship and the importance of entrepreneurship were discussed. The participants were told that the study of entrepreneurship benefitted students and learners from different social and economic backgrounds because it taught them to cultivate unique skills and to think outside the box. It also created opportunity, instilled confidence, ensured social justice and stimulated the economy. Famous engineering entrepreneurs and their works which had impacted the world were showcased and the relationship between engineering and entrepreneurship was presented.

This was followed by a session on business strategy. The definition of business strategy was discussed, based on a master plan that the management of a company implemented to secure a competitive position in the market, to operate, to please customers and to achieve the desired ends of the business.

In business, it is the long-range sketch of the desired image, direction and destination of the organisation. It is the scheme of corporate intent and action, which is carefully planned and with flexibility. A business strategy is a set of competitive moves and actions which a business uses to attract customers, compete successfully, strengthen performance and achieve organisational goals. It outlines how business should be carried out to reach the desired ends.

A brief introduction was presented on the SWOT analysis to be used as a tool for business strategy. This was followed by a short introduction on business plans

and management. The participants were informed that a business plan was a written description of the future of a business, a document that showed which plan to do and how to do it. If a paragraph was jotted down on the back of an envelope describing a business strategy, then that would be a written plan, or at least the germ of one. Business plans are inherently strategic.

Then the objectives and processes of business plans were presented briefly, followed by an interactive Q&A session where participants engaged with the presenter to gain more insights on the topic. The webinar session ended at 10.40 a.m. ■

UPCOMING ACTIVITIES

1-Day Course On "Fire Control Concepts & Design of Active Wet Systems" – Rescheduled from 02 September 2020

Date	: 7 October 2020 (Wednesday)
Time	: 9.00 a.m. – 5.30 p.m.
Venue	: Wisma IEM
Approved CPD	: 6.5
Speaker	: Ir. Gary Lim Eng Hwa

WEBINAR - "How To Protect Your Assets With The Right Paint System"

Date	: 8 October 2020 (Thursday)
Time	: 2.00 p.m. – 4.00 p.m.
Venue	: Digital Platform
Approved CPD	: 2
Speakers	: En. Effendy bin Salim, Mr. Zechariah Lim Keng Moh

WEBINAR - Flow Assurance, from Asphaltenes to Zinc Bromide

Date	: 10 October 2020 (Saturday)
Time	: 9.00 a.m. – 11.00 a.m.
Venue	: Digital Platform
Approved CPD	: 2
Speaker	: Julio Fernando Jover Azpurua

WEBINAR - Project Management Modes For Different Project Procurement Types 2.0

Date	: 10 October 2020 (Saturday)
Time	: 11.00 a.m. – 1.00 p.m.
Venue	: Digital Platform
Approved CPD	: 2
Speaker	: Ir. Faizal A. Sanusi

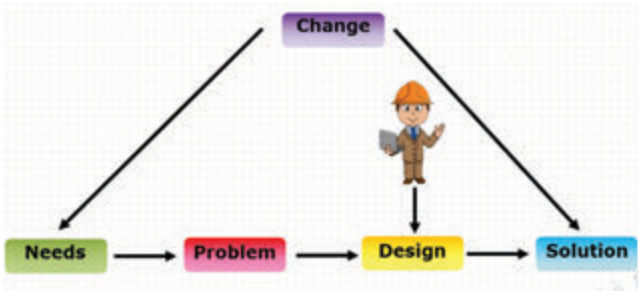
CREATIVITY IN ENGINEERING DESIGN

by Ir. Chua Yaw Long

The Engineering Education Technical Division (E2TD) organised a webinar recently on Creativity in Engineering Design, chaired by its chairman, Ir. Prof. Dr Mohamed Thariq bin Haji Hameed Sultan.

The presenter was Ir. Chua Yaw Long, a lecturer in the Mechanical Engineering Department, Universiti Tenaga Nasional. Ir. Chua graduated from Universiti Putra Malaysia in 2000 with a BEng in Aerospace Engineering and completed his Masters Degree in Control Systems in University of Sheffield in 2004. He is currently a candidate for PhD in Creative Studies, Universiti Pendidikan Sultan Idris.

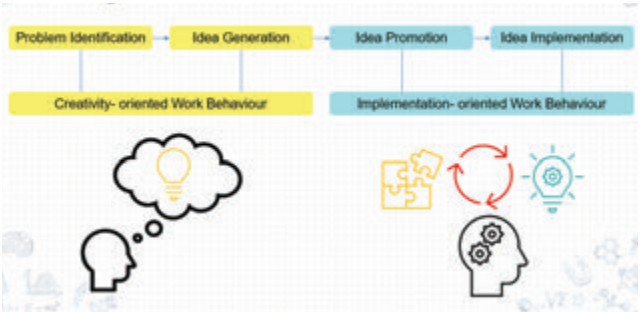
After the session chairman introduced him as the speaker, Ir. Chua started with a brief history of creativity and the various definitions. He also talked about the role of engineers in society and how changes in society created new problems that demanded new needs. Engineers could then be the main solution provider by designing their products or solutions accordingly to meet these new problems and new needs.



Changes in society give rise to new problems and new needs

Sometimes, these new needs are not always well defined and can be complex in nature. He gave as example the COVID-19 pandemic that had hit the world by storm. Such changes definitely required a lot more from engineers than pure technical knowledge.

Creative and innovative abilities are vital skills that engineers need to survive when facing challenges in the 21st century. As such, it is of vital importance that education providers (in this case, engineering education providers) train and equip undergraduates with these necessary skills before the latter can venture into the industry market.



Stages of the innovative process in solving engineering problems

Ir. Chua provided a theory of creativity that was relevant to engineering and where creativity consisted of the 4Ps: Person, Press, Process and Product. He pointed out that creative thinking was categorised as a Process occurring in the brain which processed information acquired and said it was a skill that could be taught. Various creative thinking skills were available and students were encouraged to acquire and practise these during their time spent in institutions of Higher Learning.

Product, on the other hand, is the manifestation of the creative ability of the designer/engineer. According to Ir. Chua, a creative product should be relevant and effective in providing solutions as the compulsory initial assessment criteria before it could be considered for its novelty. He then provided a few examples of creative products and discussed the creativity involved.

The 4 Ps of Creativity

The Person in creativity is related to the attitude, motivation and psychological aspects of the engineer/ designer. Press is related to the impact or effects the environment has on the engineers during the design process.

Ir. Chua also shared with participants the instruments available for assessing creative thinking as well as the creativity of product. The Process of creative thinking can be assessed by using the Torrance Test of Creative Thinking and Product can be assessed by using the revised Creative Solution Diagnosis Scale.

He then concluded his presentation by encouraging participants to choose to be creative instead of limiting one's self capability. ■

UPCOMING ACTIVITIES

WEBINAR - IEM AER NMC - ASEAN Engineering Register – Pathway to ASEAN Mobility

Date	: 10 October 2020 (Saturday)
Time	: 11.30 a.m. to 1.30 p.m.
Venue	: Digital Platform
Approved CPD	: 2
Speaker	: Ir. Yau Chau Fong, Ir. Dr Tan Chee Fai Ir. Rusnida Talib, Mr. Kuugan Thangarajoo, Ir. Ng Win Siau

WEBINAR - Why Modular - Utilisation of Shipyard Construction Technology

Date	: 14 October 2020 (Wednesday)
Time	: 3.00 p.m. to 5.00 p.m.
Venue	: Digital Platform
Approved CPD	: 2
Speaker	: Ir. Roslin bin Ramli

WEBINAR - "Managing Stress - In An Engineering & Maintenance Environment"

Date	: 15 October 2020 (Thursday)
Time	: 3.00 p.m. to 5.00 p.m.
Venue	: Digital Platform
Approved CPD	: 2
Speaker	: Dr Ravinthran Mariappan

WOMEN IN ZCIENCE (WiZ) 2020

by Ir. Mah Siew Kien

Assoc. Prof. Dr Zahiraniza Mustaffa

Ir. Noorfaizah Hamzah

The fourth edition of Women in Zcience (WiZ) was held on 17 July 2020 to mark International Women's Day. IEM Women Engineers (WE) Section is a strong supporter of the project by Tech Dome Penang and Penang Women's Development Centre as its aim is to promote gender equality in STEM education.

Because of Covid-10 and the SOP observed, only 40 students could take part physically in the event at Tech Dome Penang but 900 students from 20 schools joined in via online workshops.

Participants enjoyed the Facebook Live sessions, with VIPs in attendance giving speeches and presentations at Tech Dome Penang while workshops were done online at respective venues.

Students took part online from various locations (library/ science labs/halls) in their respective schools

WE members managed the online workshop from Kuala Lumpur, Petaling Jaya and Perak, together with the WiZ team in Tech Dome Penang

The keynote speaker was Permatang Pauh MP Nurul Izzah Anwar while the two main speakers were the Immediate Past Chairman of WE, Ir. Mah Siew Kien, and Intel engineer Yeoh Khai Chein.

There were 4 virtual workshops by WE, Trix, Dell and Coblix. WE committee members held many late-night meetings to prepare for their first virtual science workshop which was hosted from the IEM headquarters in Petaling Jaya.

It attracted 200 students from SMJK Convent Datuk Keramat, SMJK Perempuan Cina, SMJK Phor Tay, SMJK Jelutong, SMJK Bukit Gambir, SMJK Jit Sin and SMJK Berapit. Adhering to the current Covid-19 SOP of allowing a limited number of people in a single venue, it was held online from classrooms, libraries, laboratories and school halls.

With the theme of GoEngineer, IEM WE showcased two activities: Marble Run and GoEngineer video competition.

ON-/OFFLINE MARBLE RUN

For Marble Run, students were divided into groups of 4-5 each. They were given 30 minutes to build marble run tracks with newspapers and other waste materials.

The students showed off their creative designs and the winning track not only allowed a marble to travel downwards smoothly without being thrown out but it was also the tallest and the most inventive.

The judges, comprising IEM WE Committee Members, had a tough time picking the winners but eventually the top three prizes were awarded to SMJK Perempuan Cina, SMJK Convent Datuk Keramat and SMJK Berapit. The first, second and third prizes were participation certificates and RM350, RM200 and RM100 in cash respectively.

Marble Run allowed the students to think outside the box, implementing the basic concepts of science and translating them into an engineering application.

GO ENGINEER GO

The GoEngineer video competition is aimed at opening the minds of students to what it is that engineers do and how engineers can benefit society. Entries were posted online from 13 July 2020 until the closing time of 9.00 a.m. on 17 July 2020. The videos were to be less than 3 minutes in duration and had to include elements relating to the GoEngineer theme, with a sense of "humour", "inspiring" or "touching" that must be original as well as contain the word "engineers".

The first prize was awarded to Natalie Lim Wei Xing (solo entry) from SMJK Convent Datuk Keramat Georgetown, Penang and the 2nd prize went to a group video submission by @hafizulmuiz, @nr.farrin and @anisahhhh_12 from SMK Bukit Gambir, Penang. They all took home entry passes to Penang Tech Dome and certificates.

This successful first-time IEM WE online activity was the result of great team effort to put together the STEM Workshop virtually for students in Penang. ■

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IEM UTM STUDENT SESSION 2020/2021

by Goh Yong Shen

The IEM UTM Student Section carried out the recruitment of new committee members for 2020/2021 recently. The registration and recruitment exercise ended on 15 June 2020. Upon nomination closure, an online interview session was conducted on 26-27 June for the new committee selection.

The candidates had to prepare a simple slide presentation which included all the criteria requested as per student section guidelines. The interview was held after the slide presentation.

Past supreme members then had a discussion with their advisor to decide on which candidates to pick as the new supreme members and the results were announced via email on 16 July 2020. The new committee for IEM UTM Student Session was then formed.

Taking over the baton as president from Oscar Ling Fang Jack, is Nurelisya Suraya binti Mohd Sukri. Under her leadership, and with the collaboration of all new supreme members, we hope that IEM UTM student session will continue to serve the student communities. ■

COURTESY CALL ON DIRECTOR OF JKR NEGERI SEMBILAN

by Ir. Dr Oh Seong Por

On 3 July 2020, Ir. Dr Oh Seong Por, chairman of the Institution of Engineers Malaysia Negeri Sembilan Branch or IEMNS, together with Ir. Chong Chee Yen (Hon Treasurer), Ir. Tiong Ngo Pu (Past Chairman), Ir. Mohd Firdaus and Ir. Azizi Ahmad, paid a courtesy call on the new Director of Jabatan Kerja Raya Negeri Sembilan (JKRNS), Ir. Haji Masri bin Baharuddin in Wisma Negeri, Seremban.

Ir. Haji Masri, a graduate in Civil Engineering from University Technology Malaysia in 1992, worked in an engineering consultant firm in Kuala Lumpur for two years. Then he joined JKR where he held different positions in various departments in Selangor, Sarawak and Putrajaya before he was assigned as head of JKRNS.

He was actively involved in mega infrastructure projects such as the Kuala Lumpur International Airport and Pan Borneo Highway. Currently, he oversees infrastructure development projects, especially those linked to the Malaysian Vision Valley 2.0 initiatives.

In JKRNS, he manages several divisions, including Mechanical Division, Electrical Division, Asset Division, Building Division, Road Division, Architectural Division, Military Technical Division, Federal Project Division and 7 District JKR Divisions. Each division is headed by a district engineer. The 7 District JKR Divisions are in Seremban, Kuala Pilah, Tampin, Rembau, Jelebu, Jempol and Port Dickson.

During the meeting, we explained to Ir. Haji Masri that IEMNS champions engineering to develop the nation and to bring betterment to mankind. We briefed him on our activities such as implementing technical training for young engineers and students, organising technical talks or visits to upgrade the competencies of practising engineers, conducting professional interviews to elevate candidates to professional engineer status and pursuing social activities with the surrounding communities and agencies.

Ir. Haji Masri said he was glad that IEMNS had been actively serving fellow engineers and the community. He hoped IEMNS will continue to contribute and cooperate with JKRNS to develop infrastructures in Negeri Sembilan. He encouraged all the young engineers (about 30 persons) in JKRNS to attain adequate engineering competencies and to become professional engineers. As such, he requested that IEMNS provide training/guidance for these engineers, to which we gladly acceded.

The visit strengthened the understanding between IEMNS and JKRNS and created opportunities for further collaboration. Before we left, Ir. Dr Oh presented a souvenir to Ir. Haji Masri, followed by a group photograph session. ■

From left: Ir. Chong Chee Yen, Ir. Tiong Ngo Pu, Ir. Haji Masri bin Baharuddin, Ir. Dr Oh Seong Por, Ir. Azizi Ahmad and Ir. Mohd Firdaus

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TT5: REMNANT OF OUR GLORIOUS PAST

Ir. Chin Mee Poon

***Ir. Chin Mee Poon** is a retired civil engineer who derives a great deal of joy and satisfaction from travelling to different parts of the globe, capturing fascinating insights of the places and people he encounters and sharing his experiences with others through his photographs and writing.*

After being housebound for 4 months since 8 March, 2020, when the government imposed the Movement Control Order to curb the spread of Covid-19, I decided to embark on a motoring holiday to the northern part of Peninsular Malaysia with my wife and two friends, shortly after the inter-state travel ban was lifted.

Among the many interesting places we visited in Perak, Kedah and Penang, was a truly unique museum which I believed was the only one of its kind in the world – a tin dredge that once played an important role in making Malaya (and later Malaysia) the largest tin producing country in the world.

Large tin deposits discovered in Perak and Selangor in the first half of the 19th century, attracted many wealthy Chinese merchants from the Straits Settlements to mine tin in the two states and large numbers of immigrants from southern China came to work in the tin mines.

With an increasing world demand for the mineral for the manufacture of "tin cans" for the food industry, Malaya overtook Britain in tin production in the later part of the 19th century. By 1904, Malaya was producing more than 50,000 tons of tin annually, more than half of the total world output. Later British companies plunged into tin mining in Malaya in a big way with the introduction of the dredging machine in 1912. By 1931, they had overtaken the Chinese miners and accounted for more than 65% of the country's tin production.

WWI, the Great Depression and WWII affected Malaya's tin mining industry adversely. Production bounced back somewhat after the Second World War, but the relative importance of tin to the national economy steadily declined as the country's exports increasingly diversified, dropping from 20% of gross export earnings in 1970 to 10% in 1980, and then to less than 1% in the 1990s.

The advent of aluminium containers, coupled with the use of polymer lacquers inside cans, and increased recycling by the industry, gradually brought about a decline in demand for tin. 1985 saw the collapse of the International Tin Agreement which Malaysia signed in 1954 as one of the 6 initial producer member states. The collapse, the result of the International Tin Council becoming insolvent and therefore unable to regulate the price of tin in the international market, tolled the death knell of our tin mining industry.

At the height of our tin mining industry, 123 tin dredges were in operation in the country, mostly in the Kinta Valley in Perak. TT5 or Tanjung Tualang Tin Dredge No. 5, is located beside the Tanjung Tualang-Batu Gajah road. It was designed by FW Payne & Sons of England, manufactured there and brought to Malaya in 1938. It was upgraded in 1963 but ceased operation in August 1982. In 1997, ownership of the dredge was passed from Southern Malayan Tin Dredging (M) Sdn. Bhd. to the Perak State Government which turned it into a museum in 2015. The pontoon that keeps the 4500-tonne dredge afloat in the mining pool measures 75m by 35m, and is 3.1m in depth. The dredging arm with a chain of 115 cast iron buckets, each of 0.51 cubic metres capacity, could reach a depth of 33m. Tin bearing alluvial soil scooped up was emptied in the dredge at the top of the arm for processing by jetting and screening. After tin was extracted, the tailings were discharged at the rear end of the dredge.

Other tin mining methods included gravel pump extraction, dulang washing, open-cast mining and underground mining. Each method was adapted to a specific set of conditions and they complemented each other.

As senior citizens, it cost us only RM5 each to join the 45-minute guided tour of the interior of TT5 to learn more about the industry that was once our national pride. ■

TEMUDUGA PROFESSIONAL

Tarikh: 10 September 2020

Kepada Semua Ahli,

SENARAI CALON-CALON YANG LAYAK MENDUDUKI TEMUDUGA PROFESIONAL TAHUN 2020

Berikut adalah senarai calon yang layak untuk menduduki Temuduga Profesional bagi tahun 2020.

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 2020.

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.

Ir. Dr David Chuah Joon Huang
Setiausaha Kehormat, IEM
(Sessi 2020/2021)

PERMOHONAN BARU

Nama	Kelayakan
KEJURUTERAAN MEKANIKAL	
ASMADIB BIN YUSOFF@ADNAN	BE HONS (UTP) (MECHANICAL, 2004) MSc (UTM) (MECHANICAL, 2018)
NG HAN PEI	BE HONS (UPM) (AEROSPACE, 2012) ME (MALAYA) (MECHANICAL, 2016)

PERMOHONAN BARU / PERPINDAHAN MENJADI AHLI KORPORAT

Nama	Kelayakan
KEJURUTERAAN ELEKTRIKAL	
HOI WEI CHUN	BE HONS (UTP) (ELECTRICAL & ELECTRONICS, 2008)

PERPINDAHAN AHLI

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
101036	CHUAH RUN EN	BE HONS (UKM) (CIVIL & ENVIRONMENTAL, 2015)
43791	JULIANA BINTI ABDULLAH	BE HONS (UTHM) (CIVIL, 2006)
26620	MUHAMMAD YAZID BIN OMAR	BE HONS (MALAYA) (CIVIL, 2006)
KEJURUTERAAN ELEKTRIKAL		
70488	FAZILEE BIN IBRAHIM	BE HONS (UTM) (ELECTRICAL, 2012)
48462	HAFIZI BISRULHAFI BIN MOHAMAD ZIN	BE HONS (UTM) (ELECTRICAL, 2007)
48523	KOK CHIN CHAI	BE HONS (WARNBOROUGH) (ELECTRICAL, 2001) ME (UTAR) (ELECTRICAL, 2016)
62095	MUHAMMAD FADZLY BIN ABDUL MALEK	BE HONS (UTP) (ELECTRICAL & ELECTRONICS, 2016)
71105	THIAN KEE FONG	BE HONS (UNIMAS) (ELECTRONICS & COMPUTER, 2009)
KEJURUTERAAN MEKANIKAL		
94323	KHOR LING SI	BE HONS (UPM) (MECHANICAL, 2012)
95818	PERABU A/L MOORTY	BE (UMP) (MECHANICAL, 2013)

PERMOHONAN BARU / PERPINDAHAN MENJADI AHLI KORPORAT

No. Ahli	Nama	Kelayakan
KEJURUTERAAN ELEKTRIKAL		
87360	CHAN JEE HENG	BE HONS (MMU) (ELECTRICAL, 2013)
27977	KWOK YEW HOE	BE HONS (MALAYA) (ELECTRICAL, 1998)
52820	MUHAMMAD NURZUHAILI BIN ZAINUDI	BE (UMP) (POWER SYSTEMS, 2012) ME (MALAYA) (2017)

Pengumuman yang ke-143

SENARAI PENDERMA KEPADA WISMA DANA BANGUNAN IEM

Institusi mengucapkan terima kasih kepada semua yang telah memberikan sumbangan kepada tabung Bangunan Wisma IEM. Ahli-ahli IEM dan pembaca yang ingin memberikan sumbangan boleh berbuat demikian dengan memuat turun borang di laman web IEM http://www.iem.org.my atau menghubungi secretariat di +603-7968 4001 / 5518 untuk maklumat lanjut. Senarai penyumbang untuk bulan Ogos 2020 adalah seperti jadual di bawah:

NO.	NO. AHLI	NAMA
1	16288	Ir. PUAN NOR'IN BT MAN
2	88954	MR. MOHD KHAIROL ANUAR BIN MOHD DAUD
3	49547	MS. ROBIA ANAK LIMAN

UPCOMING ACTIVITIES

Pre - AGM Talk on "Health Care...In The Age of Disruption"

Date : 17 October 2020 (Saturday)
Time : 9.00 a.m. – 11.00 a.m.
Venue : Wisma IEM
Approved CPD : 1
Speaker : Dr Fazilah

8th Annual General Meeting of the Public Sector Engineers Special Interest Group, IEM

Date : 17 October 2020 (Saturday)
Time : 11.01 a.m. – 1.00 p.m.
Venue : Wisma IEM
Approved CPD : 1

WEBINAR - IEM-Standards Malaysia-PETRONAS : IECEx National Virtual Conference 2020

Date : 20 October 2020 (Tuesday)
Time : 8.00 a.m. – 5.00 p.m.
Venue : Digital Platform
Approved CPD : 6
Organised By : Technical Division - Electrical Engineering (EETD)

WEBINAR - Half Day Course On A Comparative Study Of Project Management Approaches – Part 1

Date : 21 October 2020 (Wednesday)
Time : 9.00 a.m. – 1.00 p.m.
Venue : Digital Platform
Approved CPD : 3.5
Speaker : Robert Gan

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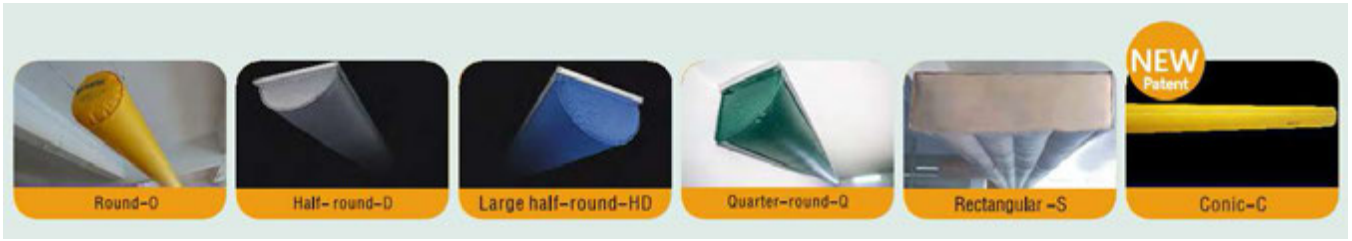

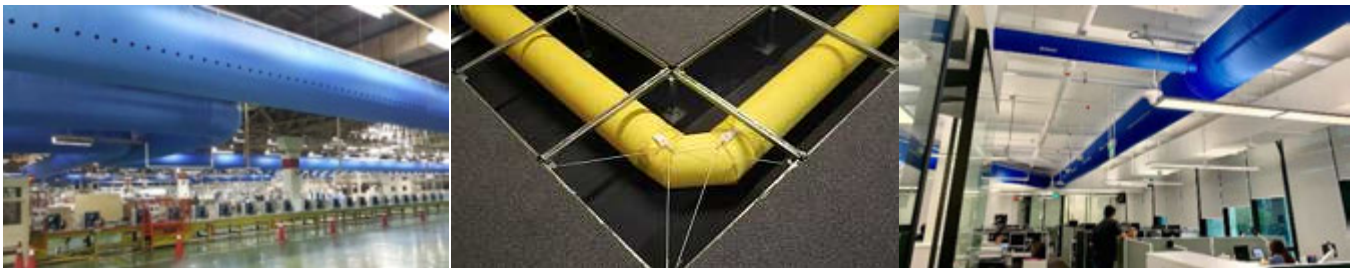

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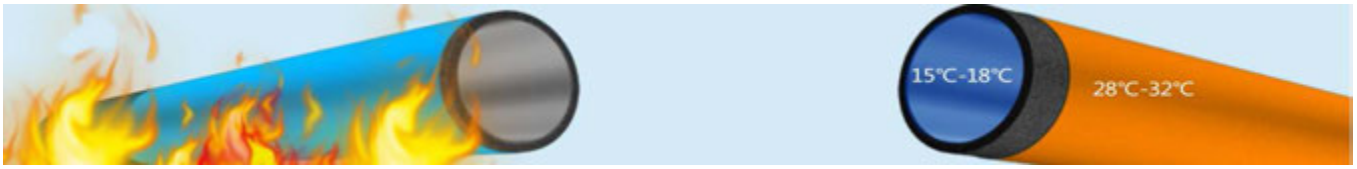

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CONTINUATION FROM SEPTEMBER ISSUE 2020

PERMOHONAN MENJADI AHLI KORPORAT

Nama	Kelayakan
KEJURUTERAAN ELEKTRIKAL	
EVENDY CHONG	BE HONS (UMS) (ELECTRICAL & ELECTRONIC, 2008)
MOHD AZLAN BIN AZIZ	BE HONS (UKM) (ELECTRICAL & ELECTRONIC, 2005)
MUHAMMAD FADHIL BIN SAAD	BE HONS (UNITEN) (ELECTRICAL POWER, 2013)
NORLIZA MATASAN	BE HONS (UPM) (ELECTRICAL & ELECTRONICS, 2002)
PETER KENSIL	BE HONS (SUNDERLAND) (ELECTRICAL & ELECTRONIC, 1993)
SHARAL AIDA BINTI IBRAHIM	BE HONS (UiTM) (ELECTRICAL, 2009)
KEJURUTERAAN ELEKTRONIK	
MOHAMAD ZAIDI BIN NORDIN	BE HONS (UiTM) (ELECTRICAL, 2006)
MOHD RUDZUAN BIN MOHD NOR	BE HONS (HIROSHIMA) (ELECTRICAL & INDUSTRIAL, 1998)
NORFARIZA BT ZAKARIA	BE HONS (UiTM) (ELECTRICAL, 2007)
TAY ERN LYE, DANIEL	BE HONS (CANTERBURY) (ELECTRICAL & ELECTRONICS, 2013)
KEJURUTERAAN GEOTEKNIK	
GOH KOK BING	BE HONS (MALAYA) (CIVIL, 2008)
KEJURUTERAAN KAWALAN	
MOHD FAUZI BIN AB RAHMAN	BE (TOKAI) (CONTROL, 2001) ME (UTeM) (ELECTRONIC SYSTEM, 2011)
KEJURUTERAAN KIMIA	
JEGALAKSHIMI A/P JEWARATNAM	BE HONS (MALAYA) (CHEMICAL, 2003) MSc (MALAYA) (CHEMICAL, 2007) PhD (NEWCASTLE UPON TYNE) (2013)
KEJURUTERAAN LEBUHRAYA	
MOHD SHUKRI BIN MOHD RUBI	BE HONS (UiTM) (CIVIL, 2001)
KEJURUTERAAN MEKANIKAL	
NOR AZIRA BINTI MOHD ZAINUDDIN	BE HONS (MALAYA) (MECHANICAL, 2006)
NORAINI BINTI MOHD RAZALI	BE HONS (STRATHCLYDE) (MECHANICAL, 1997)
SEAH WOON BIN	BE HONS (UiTM) (MECHANICAL, 2009)
KEJURUTERAAN POLIMER	
NADRAS BINTI OTHMAN	BE HONS (NORTH LONDON) (POLYMER, 1996) PhD (USM) (2007)

PERMOHONAN MENJADI AHLI (MELALUI PEPERIKSAAN PENILAIAN PROFESIONAL)

Nama	Kelayakan
KEJURUTERAAN AWAM	
MUHAMMAD AYATOLLAH BIN ZAINI	BE HONS (UiTM) (CIVIL, 2004)
WAN NAZRI BIN WAN ARIA	BE HONS (UiTM) (CIVIL, 2004) MSc (STUTTGART) (COMPUTATIONAL MECHANICS OF MATERIALS & STRUCTURES, 2009)
KEJURUTERAAN MEKANIKAL	
OMAR BIN MAT PIAH	BE HONS (MALAYA) (MECHANICAL, 1985)
RIZAL ASLAN BIN HASSAN	BE HONS (UNITEN) (MECHANICAL, 2001)

PEMINDAHAN KEPADA AHLI 'COMPANION'

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
24073	LIM VIN HONG	BE HONS (UNIVERSITY OF MALAYA)(CIVIL, 2007)
KEJURUTERAAN ELEKTRONIK		
101915	DR AZNIDA BINTI ABU BAKAR SAJAK	B.E.HONS.(UNITEN) (ELECTRICAL & ELECTRONICS, 2002) M.Sc.(THE UNI. OF LIVERPOOL) (MICROELECTRONIC SYSTEMS TELECOMMUNICATIONS, 2006) PhD.(THE UNI. OF LIVERPOOL)(2019)
42055	MOHD IMRAN BIN MOHAMAD SALIM	B.E.HONS.(UMIST) (ELECTRICAL & ELECTRONIC, 2003)
KEJURUTERAAN MEKANIKAL		
23069	RAW CHEE MENG	B.E.HONS.(UNITEN) (MECHANICAL, 2002) M.E.(UNI. OF MALAYA) (COATING TECHNOLOGY, 2009)

PERMOHONAN MENJADI AHLI 'COMPANION'

No. Ahli	Nama	Kelayakan
KEJURUTERAAN AWAM		
106112	FELICIA ANAK MICHAEL MULOK	B.E.HONS.(UTHM)(CIVIL-CONTRUCTION, 2006)
KEJURUTERAAN ELEKTRIKAL		
106115	MOHAMAD FADLY BIN AHMAD	B.E.HONS.(UTM) (ELECTRICAL, 2003)
106117	MOHD INDRA BIN KAMARUDDIN	B.E.HONS.(UniMAP) (ELECTRICAL SYSTEM, 2008)
106114	NUR SYAZANA BINTI SHAHIRUDDIN	B.E.HONS.(UNITEN) (ELECTRICAL & ELECTRONICS, 2008)
106110	TAN CHUAN SAN	B.E.HONS.(UNITEN) (ELECTRICAL & ELECTRONICS, 2005)
KEJURUTERAAN ELEKTRONIK		
106118	CHIN KUI FERN	B.E.HONS.(UNIMAS) (ELECTRONIC & TELECOMMUNICATIONS, 2000) M.E.(UNIMAS)(DIGITAL ELECTRONICS, 2004)
105798	LIM LEE KWANG	B.E.HONS.(UTM) (ELECTRICAL, 2000)
106119	MAH NAN WOEI	B.E.HONS.(USM) (ELECTRICAL & ELECTRONIC, 1995)
106116	ROZI BIN RIFIN	B.E.HONS.(USM) (ELECTRONIC, 2005) M.Sc.(UKM) (MICROELECTRONICS, 2013)
KEJURUTERAAN MEKANIKAL		
106120	AL-HAMZEE BIN IDROSE	B.E.HONS.(UTM) (MECHANICAL, 2008)
106113	GOAY WEI SIN	B.E.HONS.(UNI. OF MALAYA) (MECHANICAL, 1997)
105799	HASRUN IZRA BIN HASMI	B.E.HONS.(UTM) (MECHANICAL-AERONAUTICS, 2007) M.Sc.(THE UNI. OF NOTTINGHAM) (MECHANICAL, 2011)
107590	KOO CHUN WING	ME HONS (THE UNI. OF BATH)(MECHANICAL, 2004)
106111	TAN YEK GUANG, CLIFFORD	B.E.HONS.(UTAR) (MECHANICAL, 2010)
106112	TOH CHUN F'NG	B.E.HONS.(THE UNI. OF SHEFFIELD) (MECHANICAL, 2009) M.Sc.(THE UNI. OF SHEFFIELD)(MECHANICAL ENGINEERING & INDUSTRIAL MANAGEMENT, 2010)

PERMINDAHAN KEPADA AHLI SISWAZAH

No. Ahli	Nama	Kelayakan
KEJURUTERAAN ALAM SEKITAR		
89442	KONG YI HANG	BE HONS (UTAR KAMPAR) (ENVIRONMENTAL, 2019)
90197	WONG ROU HUI	BE HONS (UTAR KAMPAR) (ENVIRONMENTAL, 2019)
85555	YAP JIAN TONG, BRANDA	BE HONS (UTAR KAMPAR) (ENVIRONMENTAL, 2019)
KEJURUTERAAN AWAM		
77503	AHMAD MUZHAFARRUDDIN BIN ABD MALEK	BE HONS (UTM)(CIVIL, 2018)
99324	ANG JEN SHEN	BE (NATIONAL KAOSIUNG UNI. OF APPLIED SCIENCES)(CIVIL, 2017) MSc (NATIONAL KAOSIUNG UNI. OF APPLIED SCIENCE & TECH.)(CIVIL, 2018)
77182	CHEAH YI BEN	B.E. HONS.(USM)(CIVIL, 2018)
84714	CHIA YU HUAT	BE HONS (UNI. OF MALAYA) (CIVIL, 2018)
77895	DORA EDIBA ANAK LUCAS	B.E. HONS.(UNIMAS)(CIVIL, 2018)
80204	FARIS SHAZANI BIN SUHAIZAN	BE HONS (THE UNI. OF NOTTINGHAM)(CIVIL, 2016) ME (UKM)(CIVIL, 2017)
99354	FATIN NADHIRAH BINTI MUHAMMAD ROYANI	BE HONS (IUKL)(CIVIL, 2017)
47347	FATIN NORNABILAH BINTI IDRIS	BE HONS (UTP)(CIVIL, 2013)
64922	HARITHARAN A/L MANIAM	BE HONS (UTHM)(CIVIL, 2016)
86966	HENG YING HAO	BE HONS (UTAR SG LONG) (CIVIL, 2019)
84774	HOI THENG WAI, THOMAS	BE HONS (UNI. OF MALAYA) (CIVIL, 2018)
47907	LIEW PENG	BE HONS (UNIMAS)(CIVIL, 2013)
74824	LIEW ZHENG JIA	B.E. HONS.(UTM)(CIVIL, 2018)
89312	LIM YAN SHEN	BE HONS (UTAR SG LONG) (CIVIL, 2019)
104634	LING MING SENG	BE HONS (CURTIN UNI.) (CIVIL & CONSTRUCTION, 2019)
89783	LING TECK PING	B.E. HONS.(CURTIN UNI.) (CIVIL & CONSTRUCTION, 2019)
26306	LIZA BINTI TAJUL ARIPIN	BE HONS (UiTM)(CIVIL, 2005)
77299	LOM GUO XIN	BE HONS (UTHM)(CIVIL, 2018)
23749	LOO HONG SIM	BE HONS (UTM)(CIVIL, 2005)
69003	MOHD AZREQ KHAN BIN MOHD AZHAR	BE HONS (UiTM)(CIVIL, 2015)
69067	MUHAMMAD RIDHWAN B. AHMAD FADZLI	B.E. HONS.(UiTM)(CIVIL, 2016)
64055	MUHAMMAD ZAHIRUDDIN B. SULAIMAN	BE HONS (UTHM)(CIVIL, 2017)
60443	NISHANTI A/P PACHIYAPPAN	BE HONS (UTP)(CIVIL, 2015)
65816	NOOR AZLEE B. IZANI	BE HONS (UiTM)(CIVIL, 2014)
52209	NURFIZA BINTI TAHIR	B.E. HONS.(UNIMAS)(CIVIL, 2015)
59282	NURUL FATYHAH BT. BAHARUDDIN	BE HONS (UMP)(CIVIL, 2016)
56728	NURUL SAFIQAH BINTI MUHAMAD	BE HONS (UiTM)(CIVIL, 2015)
94776	OOI KAI JING	BE HONS (UTAR SG LONG) (CIVIL, 2019)
97776	PENG KIEN WEI	B.E. HONS.(IUKL)(CIVIL, 2018)
94055	RIDZUAN BIN MOHAMMED	B.E. HONS.(UTM)(CIVIL, 2018)
71355	SITI NUR MULIYANI BT ISMAIL	BE HONS (UTHM)(CIVIL, 2015)
78799	TAN YEONG YU	BE HONS (UMP)(CIVIL, 2015) MSc (UMP)(CIVIL, 2018)
64663	TARIQ HOMOUD AL-TRAIFI	BE HONS (UNITEN)(CIVIL, 2015)
55061	TE HI CHONG	BE HONS (UTHM)(CIVIL, 2016)
81708	VOON SZE LEE, FELIX	BE HONS (UMP)(CIVIL, 2018)
66307	WAN HENG LOON	BE HONS (IUKL)(CIVIL, 2014)
78723	YAP HIEW THONG	BE HONS (UMP)(CIVIL, 2015) MSc (UMP)(CIVIL, 2018)
KEJURUTERAAN BIO-PERUBATAN		
89295	NG YING HUEY	BE HONS (UTAR SG LONG) (BIOMEDICAL, 2019)
KEJURUTERAAN ELEKTRIKAL		
39103	ELANGESHWARAN A/L PATHMANATHAN	BE HONS (UTP)(ELECTRICAL & ELECTRONICS, 2010) MSc (UTP)(ELECTRICAL & ELECTRONICS, 2012)
79712	KESHANRAJ A/L BALAKRISHNAN	BE HONS (UNITEN) (ELECTRICAL POWER, 2018)
86960	LEE CHEE HIUN	BE HONS (UTAR SG LONG)(ELECTRICAL & ELECTRONIC, 2019)
86963	LEE JAI HUA	BE HONS (UTAR SG LONG)(ELECTRICAL & ELECTRONIC, 2019)
80393	LEE SHENG KAI	BE HONS (UTAR SG LONG)(ELECTRICAL & ELECTRONIC, 2019)
88345	MUHAMMAD ASHIQ MARECAN BIN HAMID MARECAN	B.E. HONS.(A.P.U) (ELECTRICAL & ELECTRONIC, 2018)
73620	NG SIEW LING	BE HONS (UMP) (ELECTRICAL-ELECTRONICS, 2017)
28743	RIJALUR RAHIMI BIN MOHD ROSELI	BE HONS (UTHM) (ELECTRICAL, 2010)

KEAHLIAN

63173	SABIQ SAFIUDDIN BIN MOHAMAD	BE HONS (UTeM) (ELECTRICAL-INDUSTRIAL POWER, 2016)
86964	S'NG YEE YUN	BE HONS (UTAR SG LONG)(ELECTRICAL & ELECTRONIC, 2019)
80426	TAN WERN-JYAN, GEOFFREY	BE HONS (A.P.U) (ELECTRICAL & ELECTRONIC, 2019)
85044	TAYALAN A/L RAMACHANDRAN	BE HONS (UTAR SG LONG)(ELECTRICAL & ELECTRONIC, 2019)
81427	YEO JUE CHUAN	B.E. HONS.(UNI. OF SUNDERLAND) (ELECTRONIC & ELECTRICAL, 2015) M.E.(UNI. OF MALAYA) (POWER SYSTEM, 2018)

KEJURUTERAAN ELEKTRONIK

55318	AHMAD IKHWAN HAZWAN BIN IBRAHIM BEY	BE HONS (UTHM) (ELECTRONIC, 2017)
66478	DINESH KUMAR MADHAVAN	BE HONS (MMU) (ELECTRONICS-TELECOMMUNICATIONS, 2015)
58345	EZRA SUNGKI ANAK PAUL	B.E. HONS.(UNIMAS) (ELECTRONICS-TELECOMMUNICATIONS, 2017)
94443	LIM JUN YAN	BE HONS (UTAR KAMPAR) (ELECTRONIC, 2019)
101954	LIM SIEW KEE	BE HONS (UTAR KAMPAR) (ELECTRONIC, 2019)
68835	MUHAMMAD HANIFF BIN S.M. JOHAN	BE HONS (UTHM) (ELECTRONIC, 2015) ME (UTHM)(ELECTRICAL, 2017)
81023	NEOH HOCK EE	BE HONS (UTAR KAMPAR) (ELECTRONIC, 2019)
53309	RHEESHAALAEN A/L SABAPATHY	BE HONS (UniMAP) (ELECTRONIC, 2014)
81025	TAN BOON KAI	BE HONS (UTAR KAMPAR) (ELECTRONIC, 2019)
89251	TAY SHI JUN	BE HONS (UTAR SG LONG) (ELECTRONIC, 2019)

KEJURUTERAAN KIMIA

86984	CHAI YI DING	BE HONS (UTAR SG LONG) (CHEMICAL, 2019)
87196	CHARNDEEP K. SINGH SANDHU	BE HONS (UCSI)(CHEMICAL, 2019)
36114	DR ONG PEI YING	BE HONS (UTM)(CHEMICAL-BIOPROCESS, 2010) PhD (UTM)(BIOPROCESS, 2017)
23798	DR RAHIMAH BINTI OTHMAN	BE HONS (UKM) (CHEMICAL, 2006) MSc (UKM)(CHEMICAL & PROCESS, 2010) PhD (LOUGHBOROUGH UNI.)(2017)
75406	DR VIKNESH ANDIAPPAN A/L MURUGAPPAN	M.E. HONS.(THE UNI. OF NOTTINGHAM) (CHEMICAL, 2013) PhD.(THE UNI. OF NOTTINGHAM)(2016)
89435	KUCK JINN KHEAN	BE HONS (UTAR KAMPAR) (PETROCHEMICAL, 2019)
68464	LEE CHIA CHEAN	BE HONS (MONASH UNI.) (CHEMICAL, 2018)
93722	LEE KWANG HOW	BE HONS (UTAR KAMPAR) (PETROCHEMICAL, 2019)
86981	LEE YUEN HUNG	BE HONS (UTAR SG LONG) (CHEMICAL, 2019)
81040	PHUANG KE SHONG	BE HONS (UTAR KAMPAR) (PETROCHEMICAL, 2019)
85360	RAMESH RAO A/L R SUBARAU	B.E. HONS.(MIU)(CHEMICAL, 2017)

KEJURUTERAAN MEKANIKAL

80416	CHIN YU HONG	BE HONS (UTAR SG LONG) (MECHANICAL, 2019)
97133	CHOONG HOW SERN	B.E. HONS.(TARC) (MECHANICAL, 2018)
80339	GAN KA SENG, JAMES	BE HONS (UTAR SG LONG) (MECHANICAL, 2019)
69932	HILLARY ASSAN ANAK LIAM	BE HONS (UNIMAS) (MECHANICAL & MANUFACTURING, 2017)
74380	JACQUELYNE ANNE BOUDEVILLE	BE HONS (UTHM) (MECHANICAL, 2018)
90294	LAM CHEE YANG	BE HONS (UNI. OF BRIGHTON) (MECHANICAL, 2016) MSc (THE UNI. OF SHEFFIELD)(ADVANCED MECHANICAL ENGINEERING, 2017)
73541	LEE JIA YI	BE HONS (UTeM) (MECHANICAL, 2018)
73539	LIM KENG SHAWN	BE HONS (UTeM) (MECHANICAL, 2018)
86949	LIM PIN JIE	BE HONS (UTAR SG LONG) (MECHANICAL, 2019)
73536	LOH CHOON YONG	BE HONS (UTeM) (MECHANICAL, 2018)
69956	MOHAMMAD SYAFIQ B. MANAFFERY	BE HONS (UNIMAS) (MECHANICAL & MANUFACTURING, 2017)
63322	MOHD FIRDAUS B. AHMAD NORDIN	BE HONS (UTeM) (MECHANICAL-DESIGN & INNOVATION, 2017)
59566	MUHAMAD HAKIM B. HASSAN	BE HONS (UiTM) (MECHANICAL, 2016)
67583	MUHAMMAD ABDUL HADI BIN SHAM	BE HONS (UiTM) (MECHANICAL, 2018)
38274	MUHAMMAD AHLAM SYAZWANI BIN MOKTAR	BE HONS (UiTM) (MECHANICAL, 2013)
51618	MUHAMMAD RIDZUAN BIN ISMAIL	B.E. HONS.(UTeM) (MECHANICAL-STRUCTURE & MATERIAL, 2012)
69979	NAZRUL IRFAN B. ABDUL RAHMAN	BE HONS (UNIMAS) (MECHANICAL & MANUFACTURING, 2017)
72306	NGOI KOK KWONG	BE HONS (UTAR) (MECHANICAL, 2017)
63430	NISALLINI A/P PILVAMANGALAM	BE HONS (UTeM) (MECHANICAL-STRUCTURE & MATERIAL, 2017)
67709	NUR FAHIMAH BINTI MAT SALLEH	B.E. HONS.(UiTM) (MECHANICAL, 2017)
31476	NURUL SYUHADAH BINTI KHUSAINI	B.E. HONS.(UiTM) (MECHANICAL, 2011) M.Sc.(UiTM)(MECHANICAL, 2015)
80765	TAN DAI MIN, CALLUM	B.E. HONS.(CURTIN UNI.) (MECHANICAL, 2019)
80292	TAY CHIH CHIA	BE HONS (UTAR SG LONG) (MECHANICAL, 2019)
58177	TEO JHUN XIONG	BE HONS (UTeM) (MECHANICAL-THERMAL FLUIDS, 2016)
50103	THARASYAN A/L JANARTHANAN	BE HONS (UNITEN) (MECHANICAL, 2016)
65181	UMI SALMAH BT. SERAJ	BE HONS (TAYLOR'S UNI.) (MECHANICAL, 2018)
53910	VIGNESWARA RAO A/L RAMACHANDRAN	BE HONS (UNI. OF MALAYA) (MECHANICAL, 2014)
75980	WAN AMIRUL HAFIZ BIN WAN ALWI	BE HONS (UiTM) (MECHANICAL, 2017)
33101	WAN MOHD EFFENDI BIN WAN MAHMOOD	BE HONS (UTHM) (MECHANICAL, 2009)
70993	WAN MUHAMMAD NAZMI BIN WAN AHMAD	BE HONS (UTP) (MECHANICAL, 2018)
70481	WOON JEE SIANG	BE HONS (NILAI UNI.) (MECHANICAL, 2017)
49795	WOON WEN LEONG	BE HONS (MONASH UNI.) (MECHANICAL, 2014)
60784	YEAP JIA MING	BE HONS (UTP) (MECHANICAL, 2016) MSc (CRANFIELD) (COMPUTATIONAL FLUID DYNAMICS, 2017)
94759	YEO TEE SERN	BE HONS (UTAR SG LONG) (MECHANICAL, 2019)

KEJURUTERAAN MEKATRONIK

74881	LORIZKA XALFINA SIMON	B.E. HONS.(UTeM) (MECHATRONICS, 2017)
77130	TEO SHUN YANG	BE HONS (USM) (MECHATRONICS, 2018)

KEJURUTERAAN SUMBER MINERAL

57967	YANG IZATUL SHAQEREEN BT AB RAHAMAN	BE HONS (USM)(MINERAL RESOURCES, 2016)

PERMOHONAN MENJADI AHLI SISWAZAH

No. Ahli	Nama	Kelayakan

KEJURUTERAAN AEROANGKASA

107646	HABIBAH HANIM BINTI MOHMED @ SALLEH	BE HONS (IIUM) (AEROSPACE, 2015) MEM (UPM)(MANAGEMENT, 2017)

KEJURUTERAAN ALAM SEKITAR

105797	AMMAR AKMAL BIN AZIZI	B.E. HONS.(UniMAP) (ENVIRONMENTAL, 2018)
105788	PAN YU YEAN	B.E. HONS.(UniMAP) (ENVIRONMENTAL, 2015)

KEJURUTERAAN AWAM

105693	ABDUL HAKAM BIN AB HAMID	B.E. HONS.(UTM)(CIVIL, 2011)
105779	AWANG DASUKI BIN AWANG DOL	B.E. HONS.(UiTM)(CIVIL, 2012)
105785	BONG YIN YIN, DOREEN	B.E. HONS.(UniMAP) (CIVIL, 2014) M.E.(UNIMAS)(CIVIL, 2016)
107655	CATHY AQUNIA RODERICK SUBE	BE HONS (UNIMAS)(CIVIL, 2005)
106138	CHAN CHIA YAM, LENIS	BE HONS (UTP)(CIVIL, 2010)
105672	CHEAH WEI JIE, RYAN	M.E. HONS.(THE UNI. OF NOTTINGHAM)(CIVIL, 2018)
107627	CHEE YUAN WEN	BE HONS (MONASH UNI.) (CIVIL, 2019)
105768	CHEN KAR WENG	B.E. HONS.(UTP)(CIVIL, 2016)
105790	CHIA UEI YING, STANLEY	M.E. HONS.(THE UNI. OF NOTTINGHAM)(CIVIL, 2014)
106139	CHIN YUNG HONG	ME HONS (CARDIFF UNI.) (CIVIL, 2017)
107621	CH'NG WEI EN	BE HONS (UPM)(CIVIL, 2018)
105755	CHONG WENG YU	M.E. HONS.(THE UNI. OF NOTTINGHAM)(CIVIL, 2013)
107619	CHOW YEE FOO	BE HONS (INTI INT. UNI.) (CIVIL, 2019)
105921	DR LIM SIN MEI	B.E. HONS.(UTHM) (CIVIL, 2010) PhD.(UTHM)(CIVIL, 2015)
105673	DR SIM HUI HUI, JACKIE	B.E. HONS.(THE UNI. OF WESTERN AUSTRALIA)(CIVIL, 2002) PhD.(UNI. OF OXFORD) (2006)
107649	FIRAS ANOWR ALHADI BAL ASHHAR	BE HONS (SEGi UNI.)(CIVIL, 2019)
106125	FRANKLIN BANTIN ANAK ATAN	BE HONS (UTM)(CIVIL, 2018)
105778	FUNG YUET CHER	B.E. HONS.(UNIMAS) (CIVIL, 2014) M.E.(UNIMAS)(CIVIL, 2015)
107624	HERDA HAZIQAH BINTI SEKARIA	BE HONS (UTM)(CIVIL, 2012)
107626	INNAZ SHARUL EZWAN BIN INDAH	BE HONS (UTHM)(CIVIL, 2013)
107635	KHOO SHENG HSUAN	BE HONS (UTAR)(CIVIL, 2008)
105782	KIING TECK YUING	B.E. HONS.(UTM)(CIVIL-ENVIRONMENTAL, 2001)
107647	LEE HAW FUI	BE HONS (CURTIN UNI.) (CIVIL & CONSTRUCTION, 2017)
107613	LEE KING YAP	BE HONS (THE UNI. OF NEWCASTLE)(CIVIL, 2015)
105694	LIM CHING YEONG	B.Sc.(THE UNI. OF MELBOURNE)(CIVIL SYSTEMS, 2017) M.E.(THE UNI. OF MELBOURNE)(CIVIL, 2017)
107632	LIM CHUNG JEN	BE HONS (USM)(CIVIL, 2009)
107642	LIM WAI LOON	BE HONS (UTP)(CIVIL, 2018)
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