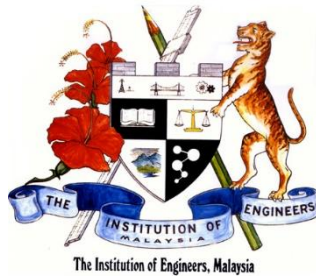


# ENGINEERS INSIGHT



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OF INFORMATION TECHNOLOGY

**SCHOOL OF ENGINEERING**

**JULY 2015**

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## Double Win @ ITEX 2015

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### In this volume

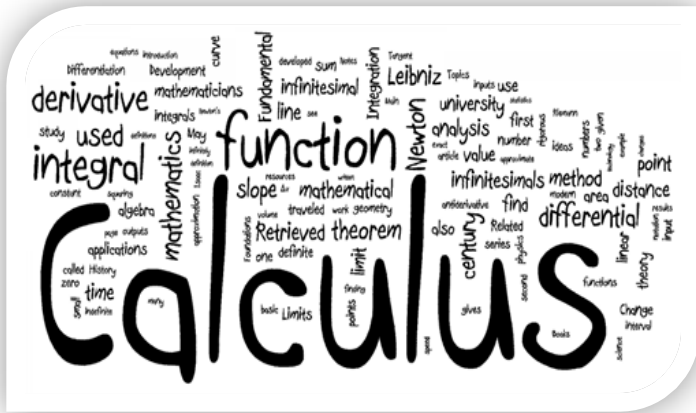
- Importance of Mathematics in Engineering
- Carbon Footprints
- IEM Seminars & Workshops
- IEM Industrial Visits
- SoE Competitions
- SoE Final Year Projects
- SoE Articles

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'Engineers Insight' is a quarterly issue by the School of Engineering for the reading pleasure of the staff and students allowing for knowledge sharing and capturing of events for the benefit of engineering education.

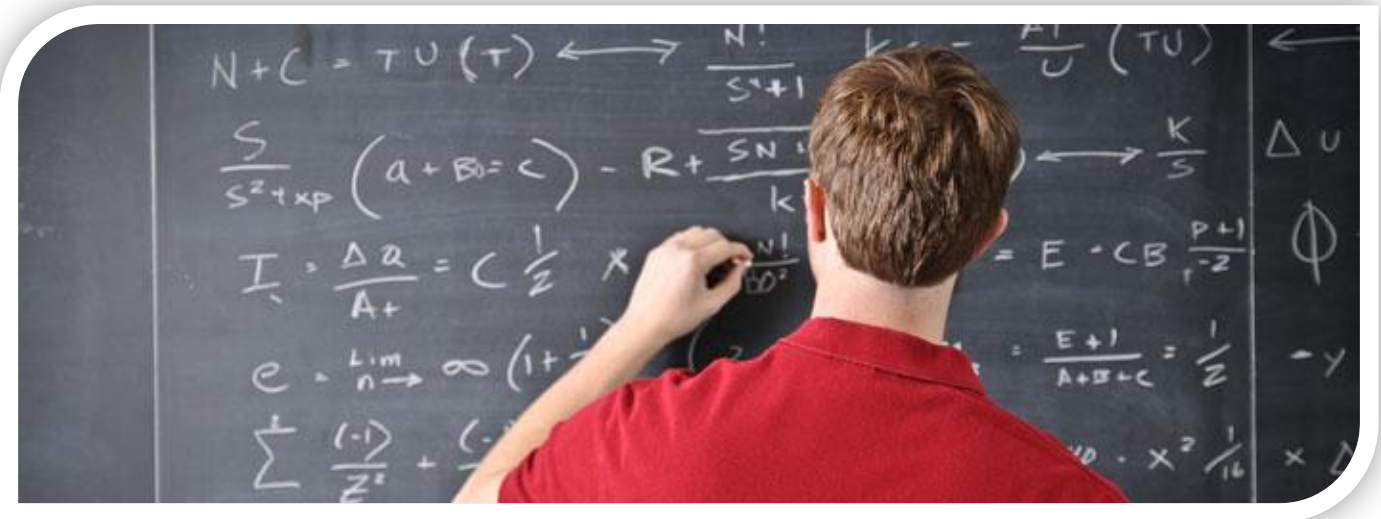
# IMPORTANCE OF MATHEMATICS IN ENGINEERING

Dr. Thang Ka Fei



Engineering is a field of applied physics that primarily looks at utilising knowledge in physics for usage in solving technical problems. Mathematics is the language of physics and therefore has a direct linkage to and is inseparable from engineering. Hence, mathematics is normally taught to engineering undergraduates in order to enhance their knowledge of concepts in calculus, algebra, trigonometry, numerical methods and as well as in statistics. Mathematics modules that are taught in engineering are usually illustrated with practical applications and are carefully tailored to convey problem-solving skills that would be of direct use by future engineers.

Nevertheless, most engineering students often find mathematics to be intimidating and question the need to study it; they always think that most practical problems can be easily solved by using modern computing tools and hence manual formulation is not required. Consequently, the loss of interest has led to high failures in assessment. In reality, if a particular problem can be easily solved by plugging numbers into computer software, that is only a technician's task, not that of an engineer's. On the contrary, engineers are expected to demonstrate competency in complex problem-solving, which involves skills in problem formulation, solution design, implementation and testing; all these would not be possible without knowledge acquired from mathematics modules. To be more precise, by learning Engineering Mathematics, students would acquire logical thinking and analytical skills that will enable them to translate the practical problems into mathematical formulae and proceed to utilise modern computing tools to solve them. Hence, even though most of the mathematical concepts will be forgotten after graduation, most engineering graduates would have bagged "logical-thinking" and "scientific-analysis" as their life long skills.



At universities, most mathematics lecturers will make it easy for students to be trained gradually with the aforementioned skills by incorporating practical problems into the syllabus. For example, solving linear equations via matrices can be illustrated via electrical circuits, most statics and dynamics phenomenon can be easily formulated and solved via calculus and product and structural design can be approached by utilising trigonometry concepts. To make the most of the lectures, students are expected to work on additional tutorial questions provided, or to even seek out more problems from referenced materials in the library or on-line.

If one is aspiring to be a skilled-qualified engineer, having a good grasp in Engineering Mathematics would be a push in the right-direction. Happy studying!

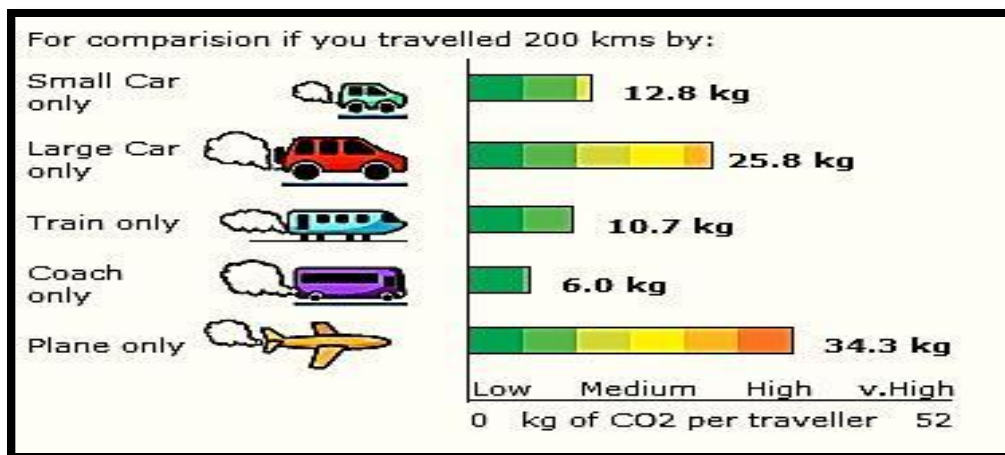
## CARBON FOOTPRINT



Carbon footprint is a representation of the effect human activities have on the climate in terms of the total amount of greenhouse gases produced (measured in units of carbon dioxide). Therefore carbon footprint is the direct effect of our actions and lifestyle towards the environment in terms of carbon dioxide emissions.

The two biggest contributors to the carbon footprint are our travelling needs and the use of electricity at home. All our actions have a direct and indirect impact on climate change. The indirect impact would be the distance our food has to travel before it is consumed by us or how far away the clothes we wear are originally made. The direct impact would be the carbon emissions of cars, buses, aeroplanes and our personal electricity needs that generally come from fossil fuel burning power plants.

We have a moral and social responsibility to do something about reducing our own carbon emissions. We need to protect the planet that we expect so much from not just for ourselves but for the future generations. Reducing our carbon emissions is important in slowing down climate change. We may even reverse it. Besides stepping up the pressure on governments and big organisations to change their environmental policies and practices, we as individuals can take the necessary actions needed on a personal level. We need to act now. A typical example of carbon footprint of different transportation when it is used by 2 people to travel 200kms to the same location is shown in **Figure 1**.



**Figure 1: Carbon foot print of transportation by 2 people for 200kms**

Let's relate the carbon footprint to our daily life. The example below might be an eye opener for many and knowledge sharing for some.

### Example 1:

- Beef cheeseburger  
2.5 kg (5.5 lbs) CO<sub>2</sub>e
- Veggie Burger  
1 kg (2.2 lbs) CO<sub>2</sub>e



If you ate nothing but cheeseburgers for a year, your carbon footprint from food alone would be 4.6 tons CO<sub>2</sub>e.

**Example 2:**

1 minute cell-to-cell phone call has the same carbon footprint as an apple.

**Example 3:**

Taking an international flight of 10 hours flight, where one trip is equivalent to 340,000 disposable plastic bags.

Economy class

3.4 tons CO<sub>2</sub>e

Average

4.6 tons CO<sub>2</sub>e

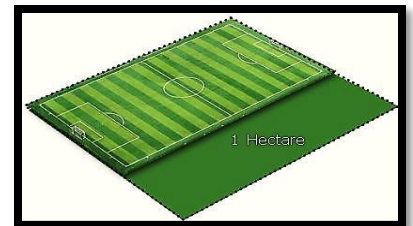
First class

13.5 tons CO<sub>2</sub>e

**Example 4:**

Deforesting 2.5 acres of land is equivalent to 1 Hectare of land which is similar to driving the average car 28 times around the world.

500 tons of CO<sub>2</sub>e

**Example 5:**

Leaving the lights "ON" for a 1 year for Low energy and 100 watt bulb

Low energy bulb

90 kg (198 lbs) CO<sub>2</sub>e

100-watt incandescent bulb

500 kg (1,100 lbs)



Everyone has a responsibility to reduce their individual carbon footprint and simple changes in our everyday lives can help slow climate change, and there are lots of ways to do so. Let us start with 15 simple ways to reduce your personal carbon footprint:

**Turn your lights off when you leave a room.** - generally you can save 11% of the utility bills.

**Buy in bulk.** - reduce trips and saving fuel.

**Use rain water or filter backwash for garden plant watering** – save around 2 gallons of water a day

**Practice patience when baking/grilling** - stop opening the oven while the food is baking/grilling

**Turn the water off while you wash your kitchen item or brush your teeth or shave.** - can save another 8 gallons a day per person.

**Switch to paperless billing.** – save a tree.

**Skip the paper coffee cup.** – save another tree

**Reduce the opening and closing of the fridge.** – saving on utility bills again.

**Use ECO/ Inverter based electrical appliances** – once again a save on the utility bills

**Replace one business trip with a video call.** – save a trip means saving fuel and tolls too

**Laundry, always wash a full load** – save energy and water

**Take showers instead of bath** – again save water and energy

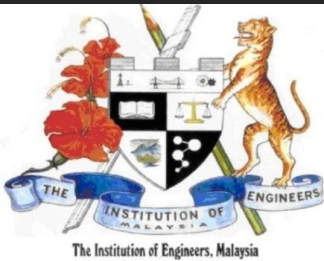
**Use LED lighting** – save energy and utility bills

**Take public transport** – reduce tonnes of carbon emission

**PLANT TREES** – save the earth, save Mother Nature.

Whether your aim is to reduce your footprint by one tonne, or to shrink it to one tonne, the information above should be useful. With the right knowledge and motivation you may be able to combat climate change that has an effect far beyond your own footprint.

**Vickneswari Durairajah**



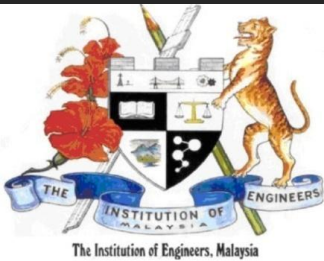
# SEMINARS & WORKSHOPS

## INTRODUCTION TO ALTAIR HYPERWORKS SOFTWARE



An invited talk on 'Introduction to Altair Hyper Works Software' by ORS Technologies Sdn Bhd was held on April 23, 2015. The talk was focused on the unique features of software in CAD/CAM engineering. The talk was attended by 50 students and 5 staf.





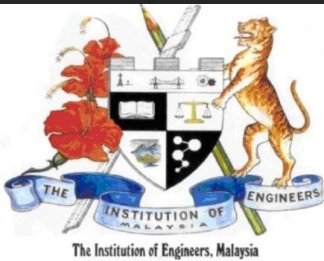
# SEMINARS & WORKSHOPS

## MICROSTRIP ANTENNA DESIGN BY UNIMAP



An invited technical guest talk on 'Microstrip Antenna Design' by faculty members at APU's invitation from University Malaysia Perlis was delivered on April 24, 2015. The talk was focused on the research in microstrip antenna engineering design for wireless communication. It was attended by 20 students and 10 SoE staff.





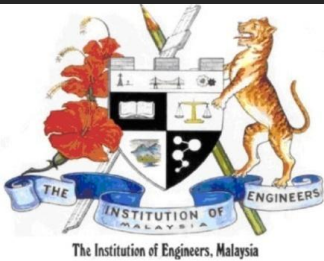
# SEMINARS & WORKSHOPS

## MULTIPLE DESCRIPTION CODING



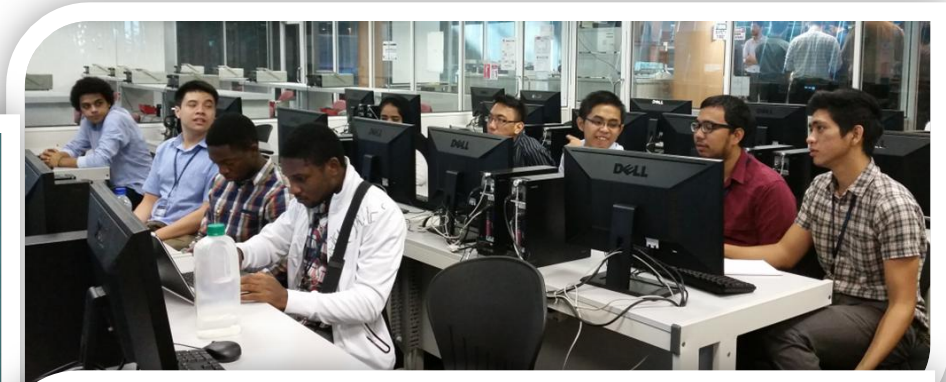
An invited technical guest talk on 'Multiple Description Coding' by Dr. M Abdur Razzak from Independent University in Bangladesh was delivered on April 28, 2015. The talk focused to the research in coding techniques and signal processing . It was attended by 28 students and 7 SoE staff members.





# SEMINARS & WORKSHOPS

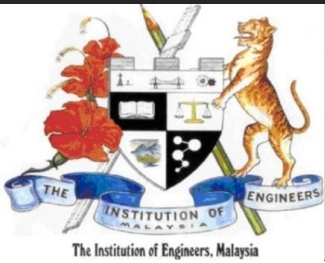
## WORKSHOP ON ALTAIR HYPERWORKS SOFTWARE



A workshop on 'Altair Hyperworks Software by ORS Technologies Sdn Bhd, was held on April 30, 2015. Students had a hands on experience with the software related to CAD/CAM design. The workshop was attended by 27 students and one SoE staff member.

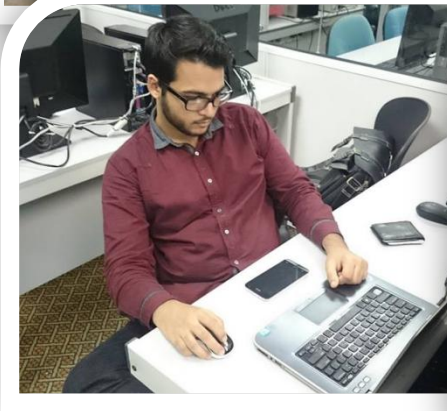






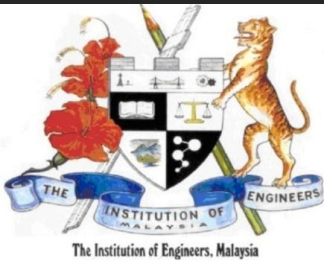
# SEMINARS & WORKSHOPS

## ANALYSIS OF CIRCUITS USING MATLAB & SIMULINK



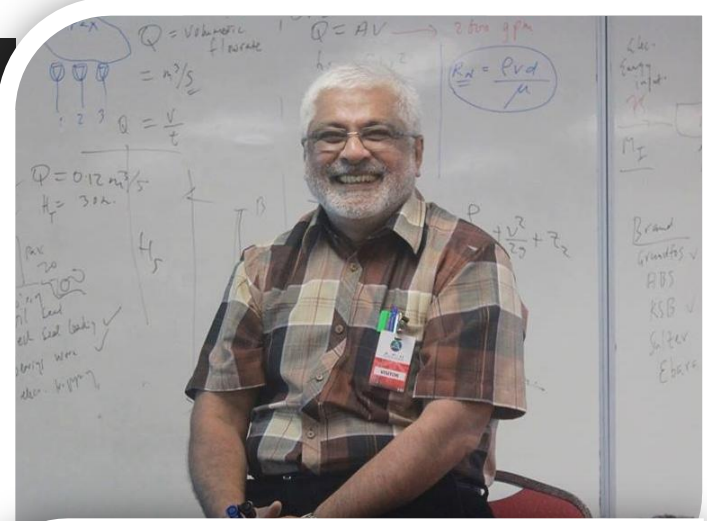
A workshop on Analysis of Circuits Using MATLAB and Simulink by Mr Shankar Duraikannan, was held on May 09, 2015. The students had a hands-on training session on circuit analysis using MATLAB and Simulink. The 15 students and 1 SoE staff member that attended did pick up good exposure in building circuits using computational tools.





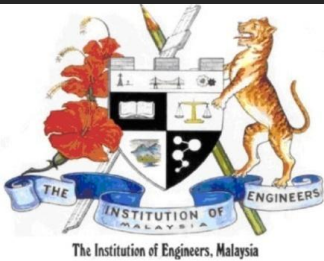
# SEMINARS & WORKSHOPS

## CENTRIFUGAL PUMP CURVE DESIGN



On May 15, 2015 a talk on 'Centrifugal Pump Curve Design' was presented by Ir. N. Jayaseelan, a seasoned IAP member of the School of Engineering. Ir Jayaseelan's very interactive workshop was an eye opener for the 70 students and 12 SoE staff members who attended the talk.





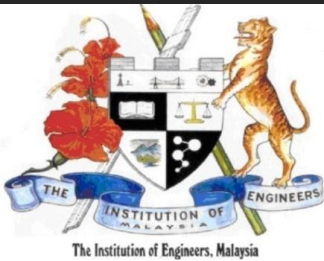
# SEMINARS & WORKSHOPS

## STUDY FOR A MASTERS IN ENGINEERING AT STAFFORDSHIRE & MASTER DISSERTATIONS



On May 19, 2015 Prof. Dave Cheshire and Dr Russell Champion from Staffordshire University shared with the FCET students on 'Studying MS in Staffordshire University'. It was attended by 30 students and 12 academic staff members. Another great session resulting from the proven academic relationship between academicians from both universities.





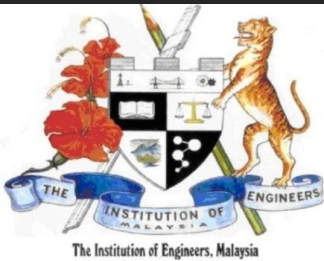
# SEMINARS & WORKSHOPS

## IC DESIGN & A CASE STUDY OF PERMANENT MAGNET SYNCHRONOUS MOTOR CONTROLLER IC



On June 18, 2015 a talk on 'IC Design and A Case Study of Permanent Magnet Synchronous Motor Controller IC' was presented by Mr. Chia Chieu Yin, Senior Staff Engineer, Mimos Berhad. From FCET 10 students and 4 staff members attended the talk.





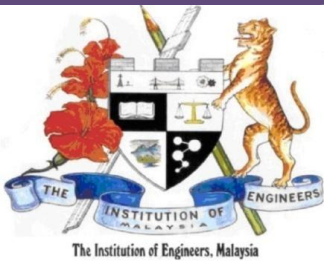
# SEMINARS & WORKSHOPS

## MANUFACTURING ECONOMICS AND COSTING



On June 24, 2015 a talk on 'Manufacturing Economics and Costing' was presented by Mr. Lim Yew Kee, CEng. Mr Lim was entertaining in his talk and also brought in related industry references which were beneficial to our 56 students and 6 staff who attended the talk.





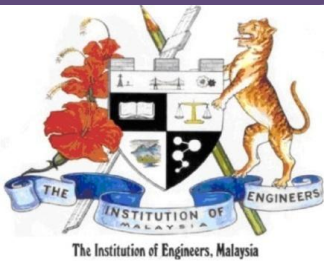
# INDUSTRIAL VISITS

## DANCOM SDN BHD



Dancom Sdn Bhd is a telecommunication solution provider in Malaysia specialized in Sales & Distribution, Telecommunication Engineering Services & IT Solutions. On June 11, 2015 15 students of the Telecommunication Engineering programme accompanied by 3 staff visited the Dancom office & service centre.





# INDUSTRIAL VISITS

## MEASAT CYBERJAYA



MEASAT, Cyberjaya, is a worldclass teleport and broadcast center. On June 19, 2015 20 students accompanied by 2 staff members visited MEASAT Sdn Bhd, Cyberjaya.





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# SOE COMPETITIONS

**APRoC 2015**



APRoC which was in its 3<sup>rd</sup> year running and this year for the first time it was held as an inter-university competition. Mrs. Vickneswari and Mr. Suresh mentored the APU students towards the competition. This competition was held on 11 June 2015. The competition was divided into 3 categories, which were the Terrain, fire-fighting robot, and sumo robot competitions. TARUC swept away all three categories' grand prize. While IIUM team B took up the second place for Fire fighting and Terrain categories. UNITEM team Bella won third place for the fire fighting categories. Last but not least APU managed to obtain third place for the Terrain category and second place for Sumo category A day earlier on 10<sup>th</sup> June 2015 we had the Robot Day which was organized in collaboration with SoE and IASS.







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# SOE COMPETITIONS

## ITEX 2015



ITEX is an annual effort by the Malaysian Invention & Design Society (MINDS) to provide an international platform for inventors and research scientist to present their inventions and innovations to a business community, who is keen on commercializing unique inventions. APU students have had a track record of successes at ITEX, as our students had also won several gold and silver medals at ITEX 2013 and ITEX 2014.

Our students from the Faculty of Computing, Engineering & Technology (FCET) successfully bagged the Gold and Bronze medals at the 26<sup>th</sup> International Invention, Innovation and Technology Exhibition (ITEX) 2015, which was held at the Kuala Lumpur Convention Centre (KLCC) on Thursday, 21 May 2015 and Friday, 22 May 2015.

This year, Reza Najafzadeh, PG student of FCET, brought pride to APU, together with his mentors, Seyed Amir Hossein and Prof Dr Ir Vinesh Thiruchelvam. He won the Gold medal with his innovative design, 'Green University Management System (GUM)' while Kudzai Nigel Chitewe, Haw Wai Kit, Huang Jiann Jer and Halima Muhammed won the Bronze medal, by proposing the 'Building and Energy Control System', under the guidance of their mentor, Pang Jia Yew from the School of Engineering





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# SOE COMPETITIONS

**ICISCA 2015**



Two student teams from the School of Engineering successfully achieved the Gold and Bronze Awards at the International Conference on Information, System and Convergence Applications (ICISCA), which was held from 24<sup>th</sup> June (Wednesday) to 27<sup>th</sup> June (Monday), at the Royale Chulan Hotel, Kuala Lumpur and Everly Hotel, Putrajaya.

At the conference, a Student Poster Competition was held, in which participating students were required to design a 100cm x 140cm poster based on any work related to the ICISCA 2015. Cleopatra Musa and Syed Abdullah, mentored by Prof Dr Ir Vinesh Thiruchelvam, achieved the Gold Award with their outstanding poster design, and walked away with a cash prize of RM1,000. On the other hand, Lee Chii Jun, mentored by Mr Chandrasekharan Nataraj, attained the Bronze Award and walked away with a cash prize of RM300

Apart from taking part in the competition, the students also gained valuable eye-opening experiences while attending the conference, as they were exposed to conference paper presentations on several engineering technologies, such as electromagnetic sensing, intelligent systems and control, artificial intelligence, smart sensors and so on.





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# SOE FINAL YEAR PROJECTS



Final Year Project  
Presentation  
UC4F1407

## Building Things That Matter

Quazi Maizha

Asia Pacific University in executive collaboration with Incitement and Liter of Light came together to make something wonderful happen. With a combined goal to get individuals to be more positive and inspire them to build more meaningful things that matter. Incitement and Liter of Light managed a three-day event, 'Building Things that Matter'. It was part of an international humanitarian movement bringing renewable light to poverty stricken areas while complementing the clean up efforts of the towns and villages post the worst flooding tragedy in Malaysia. The event was aimed empower the affected villages by bringing in solar powered water bottle lights.



The main purpose of this program was to create interest, curiosity, awareness and inspire volunteers and participants to passionately grow initiatives by creating more light bulbs made out of bottles throughout the whole nation via a ripple effect. This can be achieved by lighting up as many energy lacking areas in Malaysia as possible, creating a renaissance of social change and to spread positivity through tangible social impact projects and to spark more social innovators throughout the country so that individuals can replicate similar social impact inventions.



With the help of 80 volunteers (40 from APU while the rest were from many different backgrounds) helped build 30 functioning solar-powered bottled lights on Saturday (13.06.2015) working tirelessly for hours in APU premises. Among which only 40 volunteers qualified for the installation held on Sunday (14.06.2015) in an Orang Asli settlement in Kampung Lemoi, Cameron Highlands. After a long journey participants tested the bottled solar lights which were then installed in several spots. Besides the 30 street lights, 12 solar powered torches were also created by the volunteers and handed to the villagers.



When the sun set, the true joy was brought to the faces of the villagers as the entire village lit up with the solar powered lights; a united determined effort of many volunteers had finally shown colors. The villagers cried tears of joy and that was an unparalleled feeling of accomplishment.

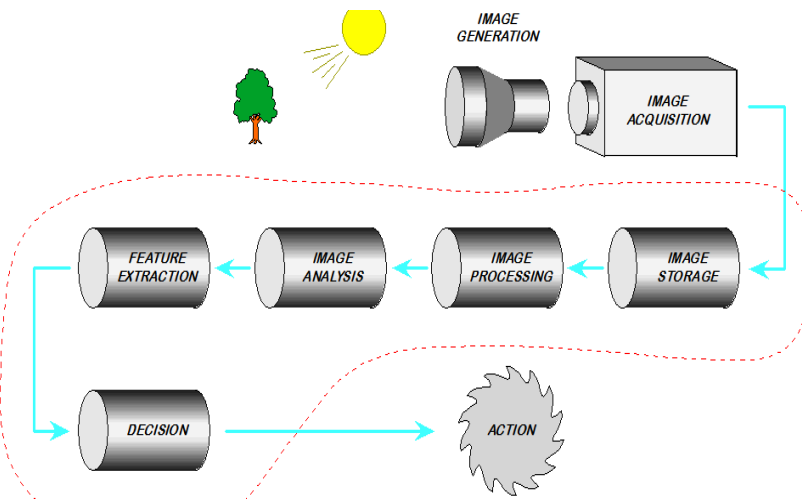


During the project, many clubs and societies came forward to help out IEM APU Student Section (IASS), Rotaract Club of APU and APU Volunteers & Community Service Group (VCG). As this will continue, Illac Diaz, the founder of Liter of Light and 2015 brand ambassador for UNESCO will be making sure to bring the eco-bottle light to as many communities as possible living without electricity.



*The smiles are priceless. Now the children can go out at night or read their books at home.*

## Design & Development of Plastic Sorting System Using Machine Vision Approach for Object Identification Vincent Liew Yun Shin & Ir Dr Dhakshayani



Solid waste management has been paid much attention globally to ensure quality of lifestyle and safeguard the environment and habitat. Poor waste management will ultimately lead to an increase in landfills, incineration/open burning or disposal at sea. Government encourages recycling among citizens for recyclable waste such as glass, aluminum cans, paper and plastics. Plastic is manufactured by extracting natural non-renewable petroleum gases. More than 5% of natural gases are used for plastic manufacturing purposes in a global scale. Continuously doing so may mitigate the conservation of the limited supply of natural gases. Therefore recycling of plastic is considered a critical activity. For the past decades, sorting different types of plastic is compulsory for recycling due to contamination and harmful gases that may be generated if mistakenly mixed during the recycling process. The sorting operation persist of manual and auto sorting process. Manual sorting to perform operation whereas auto sorting mostly involve advanced and sophisticated machineries. Automatic plastic sorting machine has significantly being drawn attention as it is capable of performing faster, precise and reliable as in contrary to human controlled operation. There are several types of automatic sorting machine being proposed by other researchers such as X-ray radiation, Near-infrared spectroscopic (NIR), Optical Inspection and others. These technologies mostly employ complex algorithms, installation, expensive sensors and components which require higher investment.

The aim of this project is to propose a cost effective and reliable automatic sorting machine. Machine vision technology is the core idea of this project that utilizes image processing approach incorporated with a designated image acquisition device that capture the detected object of interest. Further steps are taken by retrieving the pre-processed image that utilizing appropriate image processing techniques and the result is memorized and computed by the algorithm used to enhance the detection accuracy. Once object is recognized, a particular electrical signal will be sent to the microcontroller to perform physical action. Physical action can be of any mechanical parts such as actuator, pneumatic, electrically powered motor, pump and so on. The project was successfully implemented with the proposed approach and methodology. The interest of the project was to concentrate on majority of recyclable plastics in Malaysia which are Polyethylene Terephthalate (PETE) and High Density Polyethylene (HDPE). Both plastic materials are mostly recycled for manufacturing household, toys, furniture, electronic and utensil products. The system was able to detect the plastic objects based on its physical properties such as shape and curve. Traditional image processing techniques were found not suitable for the system as it may be affected by other properties such as opaqueness, reflectiveness, color, label and clearness. Therefore, a novel processing technique was proposed as a solution to overcome the problem.

Finally the system was able to achieve an accuracy of 86% while 14% was technically due to ambient lighting, processing unit and material feeding speed. The project may still persist of limitations as the proposed method may still be sensitive towards the physical properties of the plastic. However, it can be further improved by replacing the image acquisition device to NIR spectroscopic imaging device which is proven to have the ability to further improve the speed of detection and accuracy of the system.