

**A . P . U**

ASIA PACIFIC UNIVERSITY  
OF TECHNOLOGY & INNOVATION  
SCHOOL OF ENGINEERING

# ENGINEERS INSIGHT

OCTOBER 2014 VOL. 8

## Contents

**Engineering Modeling and  
Simulation Software**

**Green Building in Malaysia**

**IEM Seminars &  
Workshops**

**IEM Industrial Visits**

**SoE Competitions**

**SoE Collaborations**

**SoE FYP Presentations**

**SoE Articles**

**SoE Events**

*'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*

### Lead Editor

Shankar Duraikannan

### Editorial Team

Assoc. Prof. Ir. Dr. Vinesh  
Thiruchelvam

### Contributors

Dr. Thang Ka Fei

Ms. Shamini Patpanavan

Ir. Dr. Dhakshyani Ratnadurai

Mr. Ajmal Hussain Shah

Mr. Sathish Kumar

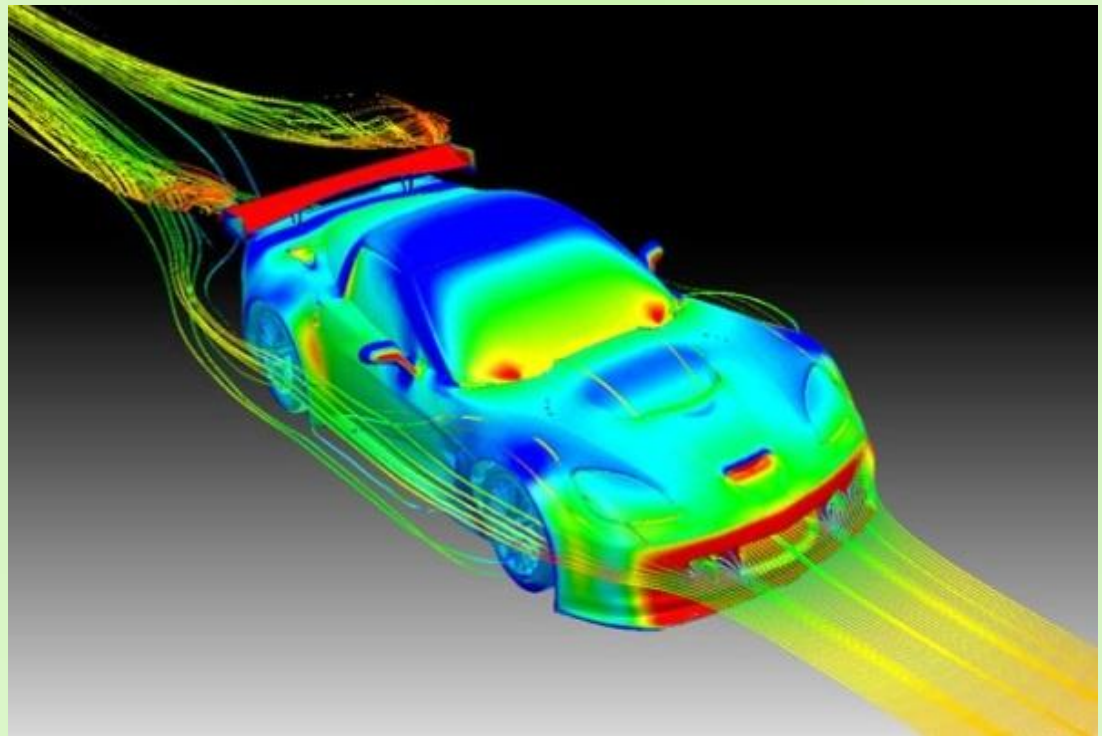
Selvaperumal

Mr. Willy Tong Chen Hung

## Engineering Modeling and Simulation Software

Engineering products have evolved to be more complex, multi-disciplinary and require inter-operability between various sub-systems. For instance, the design of a hybrid-vehicle requires complex inter-operability between electrical, electronic, mechanical and aero-dynamical domains, yet the final product has to meet stringent legislative requirements in terms of safety and sustainability.

Under such a competitive world market, it is no longer sufficient to rely on physical-prototyping in the design and development of such engineering products. Rather, with continuing advancement in computing capability it is now feasible to develop highly realistic simulated-prototypes of the engineering systems. With that, software enables a realistic analysis of the system performance under various operating scenarios thereby shortening the product development life-cycle.



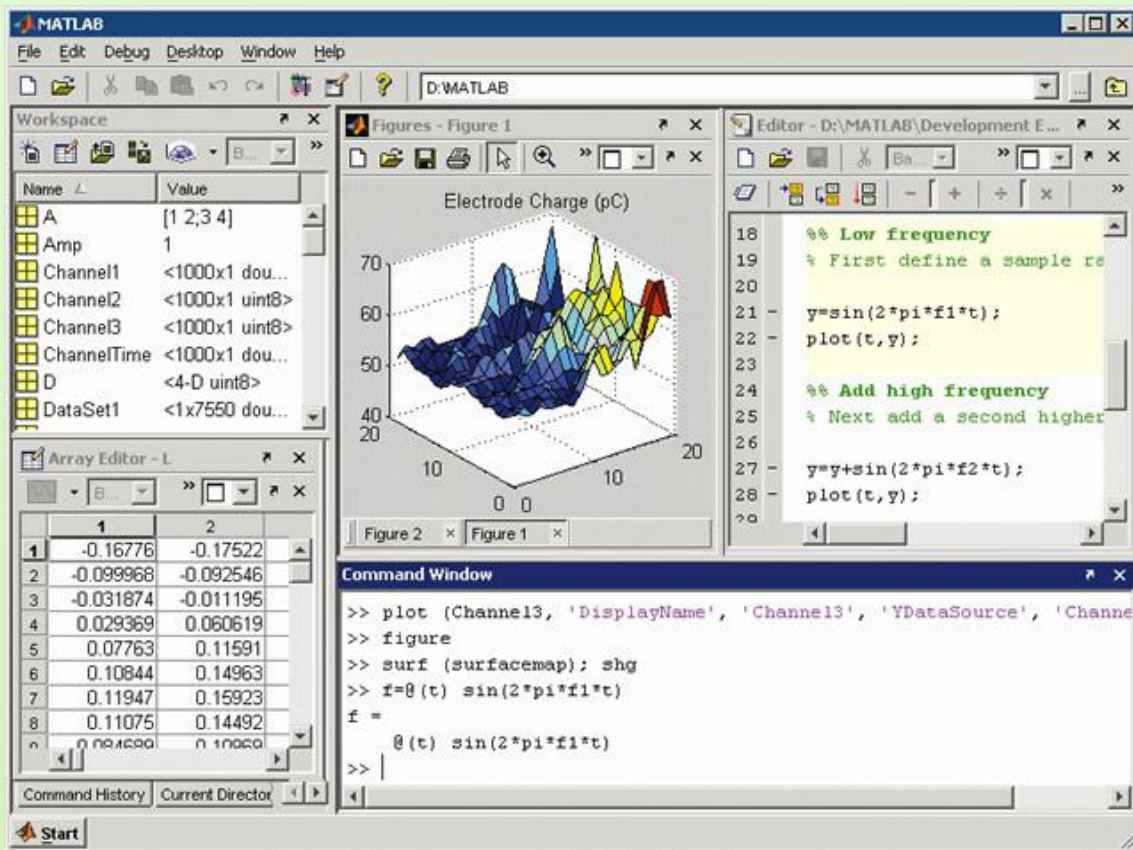
Simulation of aerodynamics of a race car (<http://www.racecar-engineering.com>)

Engineers have now in their hands software that provides tools for algorithm-development, system-level modeling, CAD/CAM and finite-element simulation. These software tools have provided a powerful and convenient environment for engineers to accelerate engineering product development by virtue of modeling and simulation, without resorting to physical-prototyping early in the product development life-cycle. A sampling of these tools is further illustrated below.

### Algorithm-Development

The process of developing, testing and validation of feasible solutions for a given engineering problem. The development of algorithm is normally performed off-line with programming.

**MATLAB®** - High-level language and interactive environment for numerical computation, visualisation, and programming. MATLAB enables data-analysis, algorithm and application-development. MATLAB can be used for a range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, among many others.



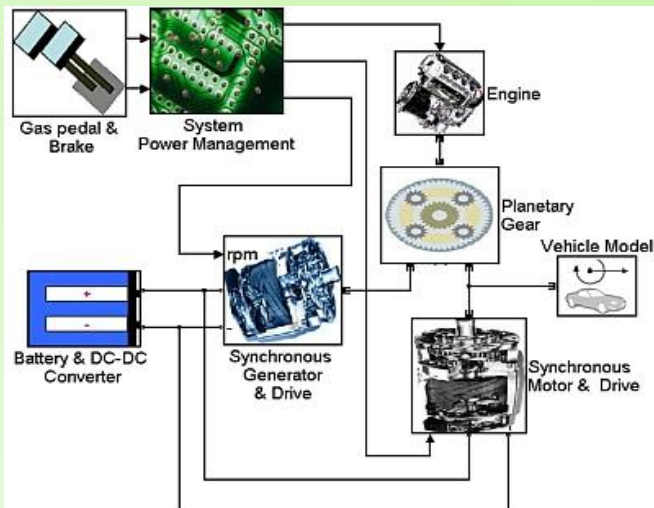
Prediction of Electrode Charging Using Matlab  
[www.azoquantum.com/images/software/SoftwareImage\\_7.jpg](http://www.azoquantum.com/images/software/SoftwareImage_7.jpg)

## System-Level Modeling

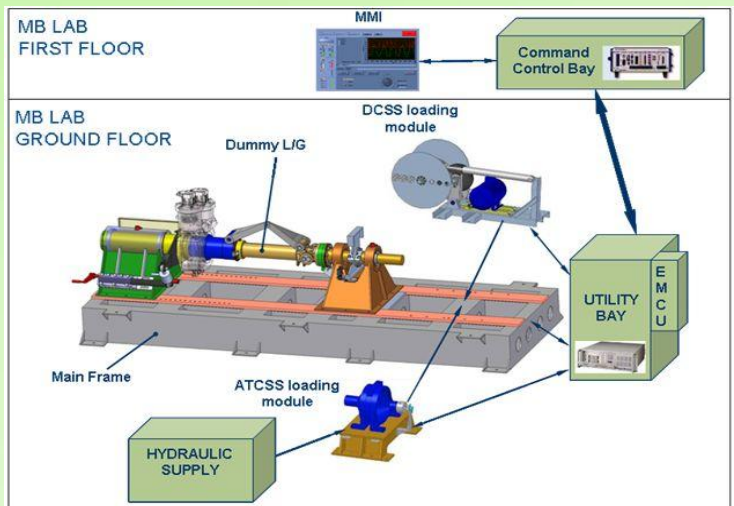
The process of modeling the hierarchical structure and inter-dependency of various sub-systems that form the main engineering product. The modeling focus will be on functionality of each sub-system rather than implementation details. The two options for modeling is shown below;

**Simulink®** - Block diagram environment for multi-domain simulation and Model-Based Design. It supports simulation, automatic code generation, and continuous test and verification of embedded systems. Simulink provides a graphical editor, customizable block libraries, and solvers for modeling and simulating dynamic systems

**LabVIEW** - Graphical programming platform that helps engineers scale from design to test and from small to large systems. It provides comprehensive tools for engineers to build any measurement or control application. LabVIEW software can be combined with modular, reconfigurable hardware systems to provide total solution.



System-level model realization of the hybrid electric vehicle design Using Simulink  
[www.mathworks.com](http://www.mathworks.com)



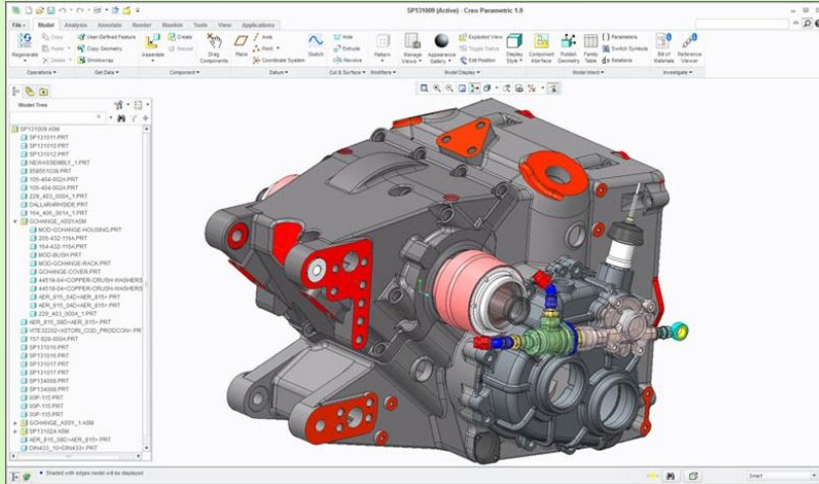
Using LabVIEW and PXI to Design and Implement a Test Rig for an Electrical Steering System Prototype for Airplane Nose Landing Gear  
<http://sine.ni.com/cs/app/doc/p/id/cs-13321>

## CAD/CAM

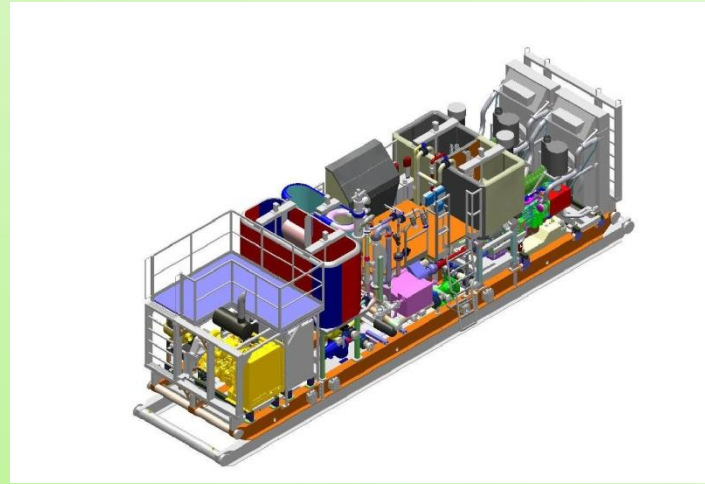
The use of software to create, modify, analyse and optimise the product design, as well as to control machine tools in the manufacturing of the components. Two samples of software that can be utilized is shown below;

**PTC Creo®** - A scalable, inter-operable suite of product design software that provides apps for 2D design, 3D CAD parametric feature solid modeling, 3D direct modeling, Finite Element Analysis and simulation, schematic design, technical illustrations, and viewing and visualisation.

**SOLIDWORKS®** - A platform that allows creation, simulation, communication, and management of product designs with an extensive range of 3D design solutions. By integrating design tools, assembly and drawing capabilities, built-in simulation, cost estimation, rendering, animation, and product data management, it enables the development and sharing of design ideas faster and simpler.



3D Model Using Creo  
([www.creo.ptc.com](http://www.creo.ptc.com))



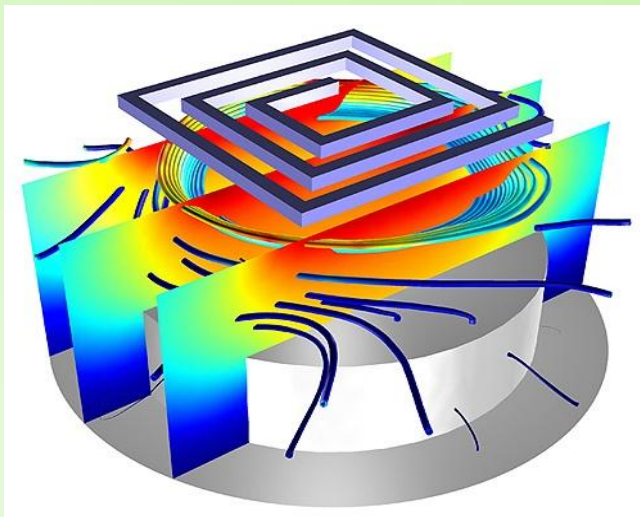
Sanjel Corporation Case Study  
([www.solidworks.com](http://www.solidworks.com))

## Finite-Element Simulation

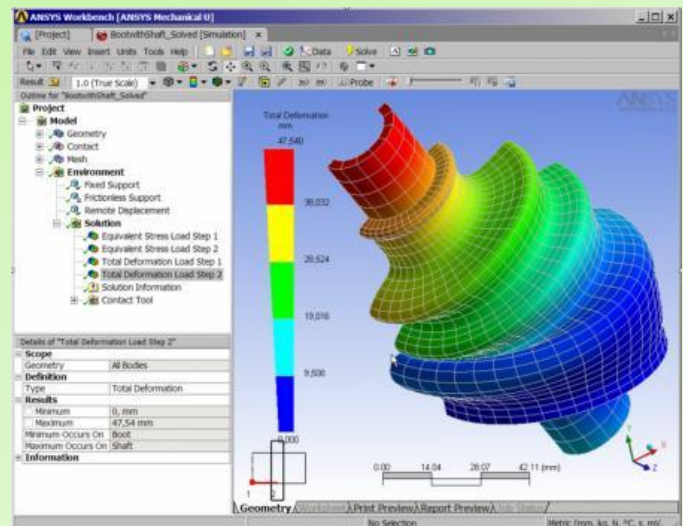
A computational tool that uses mesh generation to divide a complex problem into small elements and uses numerical methods to solve each element with partial differential equation solvers. Two sample computational tools are as shown below;

**COMSOL Multiphysics®** - A general-purpose software platform, based on advanced numerical methods, for modeling and simulating physics-based problems. Engineers will be able to account for coupled or multi-physics phenomena for electrical, mechanical, fluid flow, and chemical applications. It provides additional interfacing solutions to connect simulations with technical computing and CAD software .

**ANSYS** - A general purpose software, used to simulate interactions of all disciplines of physics, structural, vibration, fluid dynamics, heat transfer and electromagnetic for engineers. ANSYS enables simulation of tests or working conditions, testing in virtual environment before manufacturing of products. ANSYS can integrate with other engineering software by adding CAD and FEA connection modules.



Electron temperature inside an Argon ICP reactor used for the fabrication of semiconductor devices using COMSOL Multiphysics Plasma ([www.designworldonline.com](http://www.designworldonline.com))



Deformation Analysis using Ansys software  
([www.pixhst.com](http://www.pixhst.com))

- Dr. Thang Ka Fei

# Green Building In Malaysia

- Ms. Shamini A/P Patpanavan

'Going Green' is in. Going Green in industries (automotive, manufacturing, etc.), Going Green in education, Going Green in buildings. Why is 'Going Green' gaining so much of popularity in every industry? Global warming, depletion of natural resources and deprivation of clean air/water are some of the main reasons. By 2050 the world's population is expected to be between 9 and 9.5 billion, and about 5 billion of them will be in the middle-class category. Since the middle class population usually live in cities, this also means that by 2050 a large percentage of the world's population will live in cities. [1]. This leads to more development in cities which increases building constructions. Building construction uses a lot of natural resources. Material such as steel, glass, prefabricated parts and recyclable substitutes for concrete are examples of sustainable materials. Energy from fossil fuels such as coal, oil and natural gas used for heating, ventilation, etc has to be reduced and replaced with energy saving methods. Water is used excessively and construction also causes damage to the landscape and destroying flora and fauna. Construction also pollutes the water, air and the environment. In Malaysia, almost 41% of carbon dioxide emission is from the building sector [2].



<http://blog.procore.com/blog/bid/384163/Go-GREEN>

The Malaysian government has taken few initiatives to promote the green building sector. Various governmental institutions such as CIDB (Construction Industry Development Board) and EECAM (Energy Efficiency and Conservation Agency Malaysia) were created to promote green building projects [2]. How is a building classified as a 'Green building'? What is the criteria for a 'Green Building'? Are the steps taken by the government to promote green building effective for Malaysia?

Green buildings are also called 'Sustainable Buildings'. Green buildings are designed to save energy and resources, use recycled materials and minimize the emission of toxic substances throughout its life cycle. Green buildings are able to sustain and improve the quality of human life whilst maintaining the capacity of the ecosystem at local and global levels [1]. To achieve a sustainable building status, the whole life cycle or process taken from designing the building to the demolition or refurbishment of the building has to be taken into account. This includes choosing the material, distribution and assembly/usage (maintenance, operation, retrofit) of the building once completed. The aim of a green building is also to reduce the negative impact of the building on the environment. A green building provides a comfortable and healthy working or living environment to occupants and also minimizes environmental impacts throughout its life cycle.

In Malaysia, developers and owners follow the framework of the Green Building Index (GBI) as a guideline for designing and constructing a green and sustainable building. The Green Building Index (GBI) developed by the Malaysian Institute of Architects and the Association of Consulting Engineers Malaysia is Malaysia's green rating tool for buildings and towns. This index is created to promote sustainability in the built environment and raises awareness of environmental issues amongst developers, architects, engineers, planners, designers, contractors as well as the public. The GBI rating is based on six key criteria [6]:

a) *Energy Efficiency*

Improvement of energy consumption by optimizing building orientation, harvesting of natural lighting and using renewable energy

b) *Indoor Environmental Quality*

Achievement of good quality performance in air quality, acoustics, visual and thermal comfort with application of quality air filtration, proper control of air temperature and humidity

c) *Sustainable Site & Management*

Appropriate sites with planned access to public transportation, community services, open spaces and landscaping, avoiding and conserving environmentally sensitive areas.

d) *Materials & Resources*

Usage of environment friendly materials sourced from sustainable sources, recycling, implementation of proper construction waste management with storage, collection and re-use of recyclables

e) *Water Efficiency*

Utilization of rainwater harvesting, water recycling and water saving fittings

f) *Innovation*

Innovate design and initiatives that meet the objectives of the GBI

Each criterion is assigned a different weightage depending on the type of structure, whether it's residential or commercial. A total score of 50 is required to achieve certification. Developments that receive more than 80 points will obtain a 'Platinum' classification, 76-85 points get the 'Gold' classification, 66-75 get 'silver' whereas 50-65 will obtain basic certification [6]. The path for achieving 'Green Building' through sustainable construction is shown in Figure 1.

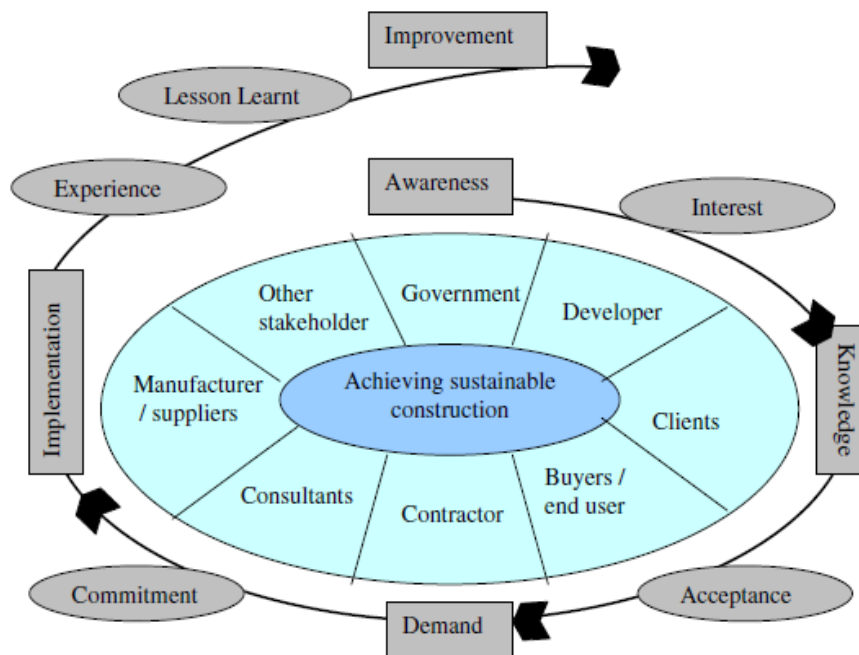


Fig. 1. The path for achieving sustainable construction.

Presently, 'Green Building' in Malaysia is still at the stage of awareness and knowledge. There are many obstacles in the adoption of green buildings in Malaysia. The lack of awareness from architects, consultants and clients is the key issue of the slow progress and reluctance in getting involved in green buildings [8]. Presently only large developers are implementing sustainability in their projects. This is due to limited understanding and lack of knowledge among developers and owners and also due to the cost factor and poor enforcement of legislation [3]. Awareness campaigns have to be intensified not only for upper management but also for site workers [7].

Several factors deter an organization from achieving a green building implementation during the maintenance stage. The maintenance stage includes repair, replacement, renewals, modification, protection for basic materials and internal surface of building (eg. painting) and cleaning [4]. Among the factors highlighted, the main factor was found to be technical defects which include design problems, construction related defects and maintenance-related defects. This is followed by managerial defects such as decisions made during any part of the life cycle and the failure to consider the aspect of maintainability during the design stage. Technical and managerial mistakes can lead to expensive reworks which include usage or wastage of resources.

A change of mindset is possible through examples of successful sustainable projects that add value to its development [3]. Presently, quite a handful of organizations in Malaysia have been awarded the GBI (Green Building Index) certification. To name a few, Menara Sarawak Energy, the first green building in East Malaysia to be awarded the 'Green Building' certification in July 2013. Others include Ken Bangsar, a condominium in Bangsar, GTower in the Kuala Lumpur Golden Triangle area; the Zeo Building and the Energy Commission's Diamond Building in Putrajaya. The Energy Commission's Diamond Building was named the most energy-efficient building at the Asean Energy Awards (AEA) 2012 held in Phnom Penh, Cambodia. Rainwater harvesting saved about 70% to 80% on water usage while solar power supplies about 10% of the energy used in this building.



Fig 2 The Zeo Building Putrajaya

(<http://invirotech.com/blog/wp-content/uploads/2012/09/suruhanjaya-tenaga1.jpg>)



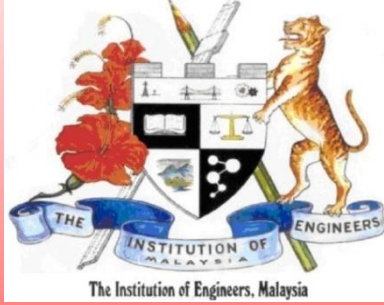
Fig 3 The Energy Commission's Diamond Building Putrajaya

Other actions that could be taken are to ensure sustainable construction materials and products are available locally. This is to encourage small and medium companies into implementing sustainable building construction. Small and medium companies are afraid to build expensive buildings due to the risk of producing unsellable units as they have limited capabilities in terms of capital, experience and expertise compared to large companies [3]. Therefore, the announcement from Prime Minister Datuk Seri Najib Razak that the government would offer a 100% tax exemption to owners for any additional costs incurred to get the 'Green Building' certification for new and upgraded buildings was a much needed encouragement for the small and medium companies to achieve 'Green Building' status. [5].

'Green Building' in Malaysia is moving towards the right direction, with more companies embracing it. To achieve the 'Green Building' status in Malaysia, the government has to enforce strict regulations to developers and owners. Malaysian developers especially the small and medium companies need some encouragement and need to be shown examples of successful 'Green Projects' globally.

#### References:

1. The Malaysian Reserve (7 March 2014) Low Carbon City Framework – Is Malaysia ready? [Online]. Available from: <<http://www.themalaysiareserve.com/main/secorial/green-growth>> [Accessed: 25/9/2014]
2. Report on the Green Development of Malaysia with a Focus on the Building Sector (August – September 2012) [Online]. Available from: <http://www.mblbc.org/mblbc/images/business/Report%20on%20the%20green.pdf> [Accessed: 25/9/2014]
3. Nazirah Zainul Abidin (2010) Science Direct. Investigating the Awareness and Application of Sustainable Construction concept by Malaysian Developers [Online]. Available from: <<http://www.mesym.com/.../Investigating-the-Awareness-Application-of-Sustainable-Construction-Concept-by-Malaysian-Developers-2010-Nazirah.pdf>>
4. Nurul Nadiyah Zainol et al. (2013) Proceeding of the Global Conference on Business, Economics and Social Sciences. Barriers Of Implementing Green Building Maintenance: A Preliminary Survey [Online]. Available from: <<http://www.worldresearchconference.com/gbsr2013/eproceeding/YG%20DAH%20PDFkan/131.pdf>> [Accessed: 24/9/2014]
5. New Straits Times (16 April 2012) More Applying for Green Building Status [Online]. Available from: <<http://www2.nst.com.my/nation/general/more-applying-for-green-buiding-status>> [Accessed: 25/9/2014]
6. CB Richard Ellis (August 2010). Special Report on Going Green Malaysia [Online]. Available from: <<http://www.cbre.com.my/uploads/CBRE-Special-Report-Going-Green-Malaysia.pdf>> [Accessed: 24/9/2014]
7. Suhaida Mohd. Sood et al (2011) Sustainable Development in the Building Sector: Green Building Framework in Malaysia. [Online]. Available from: <<http://www.uniten.edu.my/newhome/uploaded/admin/research/centres/iepre/papers/Sustainable%20Development%20in%20the%20Building%20Sector%20Green%20Building%20Framework%20in%20Malaysia.pdf>> [Accessed: 23/9/2014]
8. Mohd Reza bin Esa et al (2011) Australian Journal of Basic and Applied Sciences. Obstacles in Implementing Building Projects in Malaysia. [Online]. Available from: <<http://ajbasweb.com/old/ajbas/2011/December-2011/1806-1812.pdf>> [Accessed: 23/9/2014]



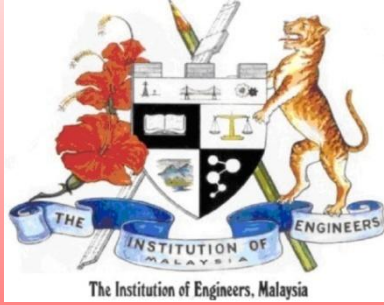
# Seminars & Workshops

## Passive Optical Networks and Optisystem Software



Broadband service providers like Unifi, Maxis and Astro Beyond of Malaysia have moved into fiber broadband service named FTTH to increase the speed of broadband communication. TM R&D have signed an MOU with ZTE Corp Bhd, to collaborate on Next Generation Passive Optical Networks to enable higher bandwidth for TM customers. On May 8, 2014 an industrial demonstration on "Passive Optical Networks and Optisystem Software" was conducted by Abex Kumpulan Sdn Bhd. 20 students and 3 staff attended the industrial demo. The demonstration provided an opportunity for the students to understand the operation of a Passive Optical Network and simulation of networks using the Optisystem software.





# Seminars & Workshops

## DC Machines Operations

DC machines are electromechanical energy converters based on electromagnetic principles. The hands on workshop on DC Machines Operation was conducted by Mr. Ravi Lakshmanan on July 18, 2014. 10 students attended the workshop. The students had an hands on experience on operations of the entire universal power supply, running of D.C shunt, series and compound machines as a motor. It also included exposure to generators and Testing of D.C generators. The main advantage of a DC motor over an AC motor is that it can operate directly from a battery. The speed of a DC motor can be controlled with a less complicated control unit than the unit required for an AC motor. Only the armature voltage needs to be controlled. With a small motor, the same can be done by inserting a resistor in series. The speed control units that provide the best performance with AC motors are those that electronically control both the frequency and voltage supplied to the motor. They are called variable frequency drives (VFDs). AC motors with VFDs can match the performance, price and efficiency of DC motors with armature voltage control units. AC motors are more rugged and reliable, can operate at higher speeds and are available in larger power ratings. DC motors are better for very small precision motion control applications.

Advantages of DC motors:

### **Speed control over a wide range both above and below the rated speed**

The attractive feature of the DC motor is that it offers a wide range of speed control both above and below the rated speeds. This can be achieved in DC shunt motors by methods such as armature control method and field control method. This is one of the main applications in which DC motors are widely used in fine speed applications such as in rolling mills and in paper mills.

### **High starting torque**

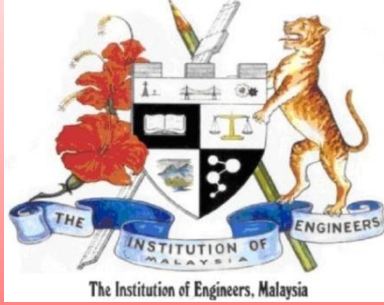
DC motors are termed as best suited drives for electrical traction applications used for driving heavy loads in starting conditions. DC motors will have a starting torque as high as 500% compared to normal operating torque. Therefore DC motors are used in the applications such as in electric trains and cranes.

### **Accurate steep less speed with constant torque**

Constant torque drives is one such the drives will have motor shaft torque constant over a given speed range. In such drive shaft power varies with speed. Quick starting, stopping, reversing and acceleration are application benefits.





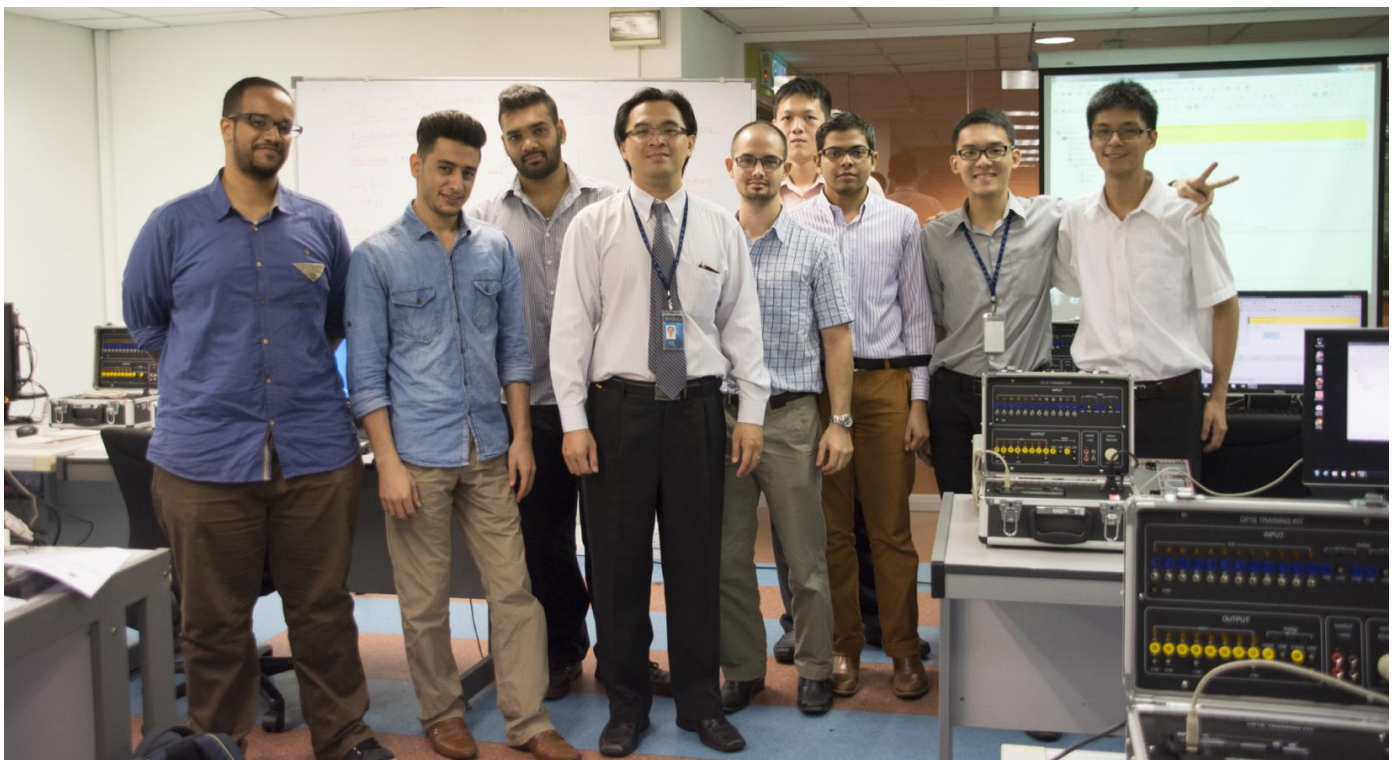


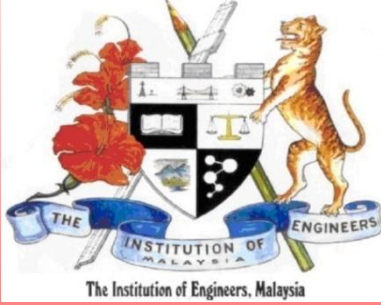
# Seminars & Workshops

## PLC Programming and Application



A Programmable Logic Controller, or PLC, is more or less a small computer with a built-in operating system (OS). This OS is highly specialized to handle incoming events in real time. The PLC is primarily used to control machinery. A program is written for the PLC which turns on and off outputs based on input conditions and the internal program. A One day workshop on PLC Programming and Application conducted by Mr. Yap Chee Wei Alvin on August 4, 2014 was attended by 8 students.



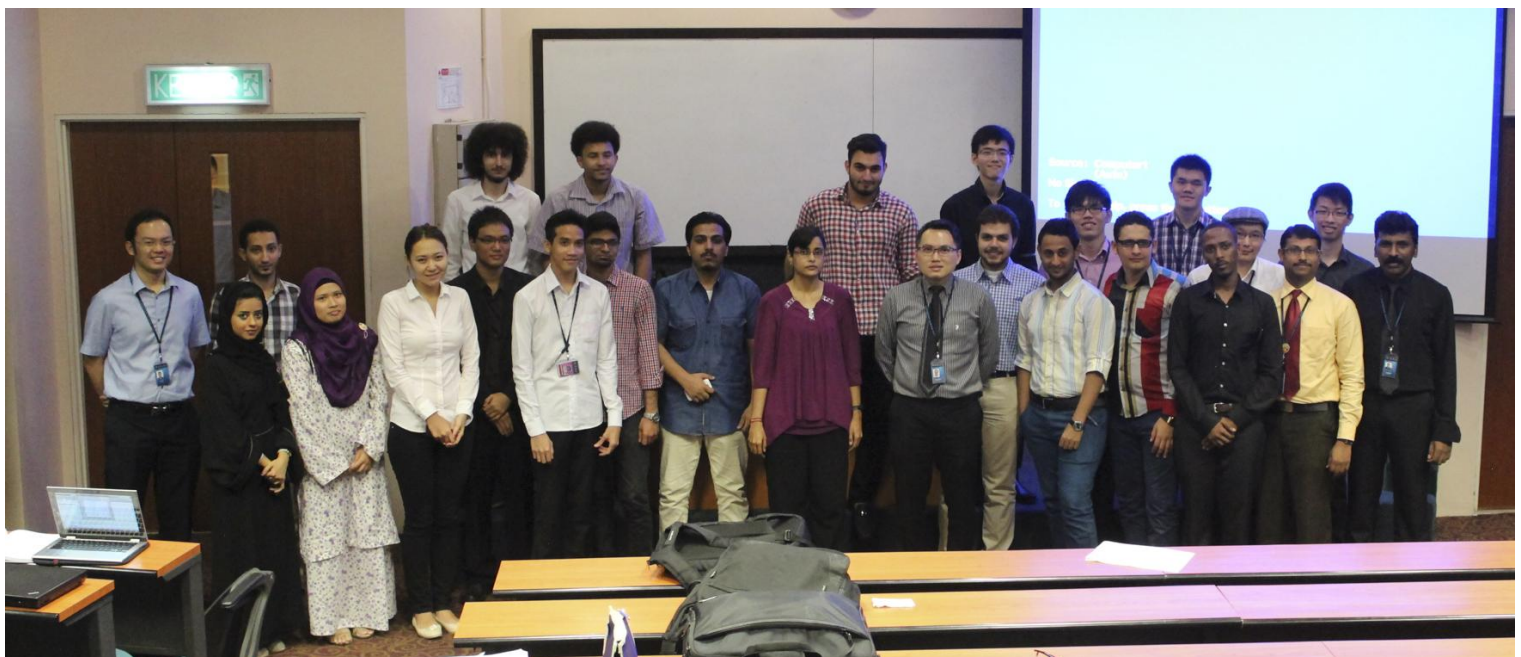


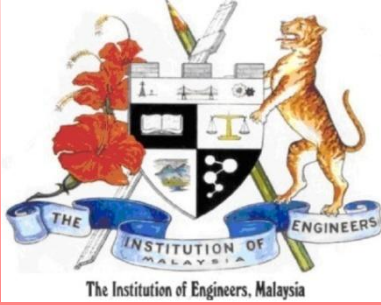
# Seminars & Workshops

## Engineering



The American Engineering Council for Professional Development has defined engineering as “The creative application of scientific principles”. These principles are applied to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behavior under specific operating conditions. It is not an exaggeration to say that today's sophisticated world is ruled by engineers and engineering. The in-house talk on 14<sup>th</sup> August 2014 by Ir. Dr. Dhakshyani Ratnadurai gave an overview of engineering and the role s and responsibilities of engineers in today's scenario. The talk was attended by 15 students and 4 staff.





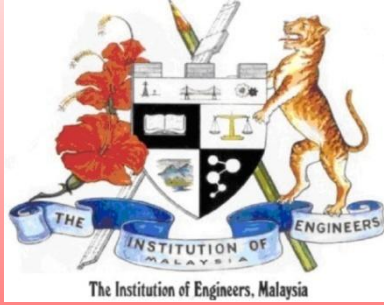
# Seminars & Workshops

## Business Aviation in Malaysia



Business aviation encompasses the usage of any “general aviation” aircraft for a business purpose. The Federal Aviation Administration defines general aviation as all flights that are not conducted by the military or any of the scheduled airlines. As such, business aviation is a part of general aviation that focuses on the business use of airplanes and helicopters which are getting more common nowadays. An invited talk on ‘Business Aviation’ by Maj. Ir. Kandiah Padmanathan (Rtd) was conducted on August 22, 2014. The talk gave a deep insight into categories of business aviation, the use and need of business aviation, the role of business aviation in economic development, business aviation as a productive tool in strengthening business and communities, providing safety and security for top market holders of the business communities. The talk also highlighted the other airport services provided by a business aviation company. The talk was attended by 55 students and 6 staff. The audience was definitely enlightened by the examples of reasons for which a private jet could be used based on the luxury characteristics of rich and famous.



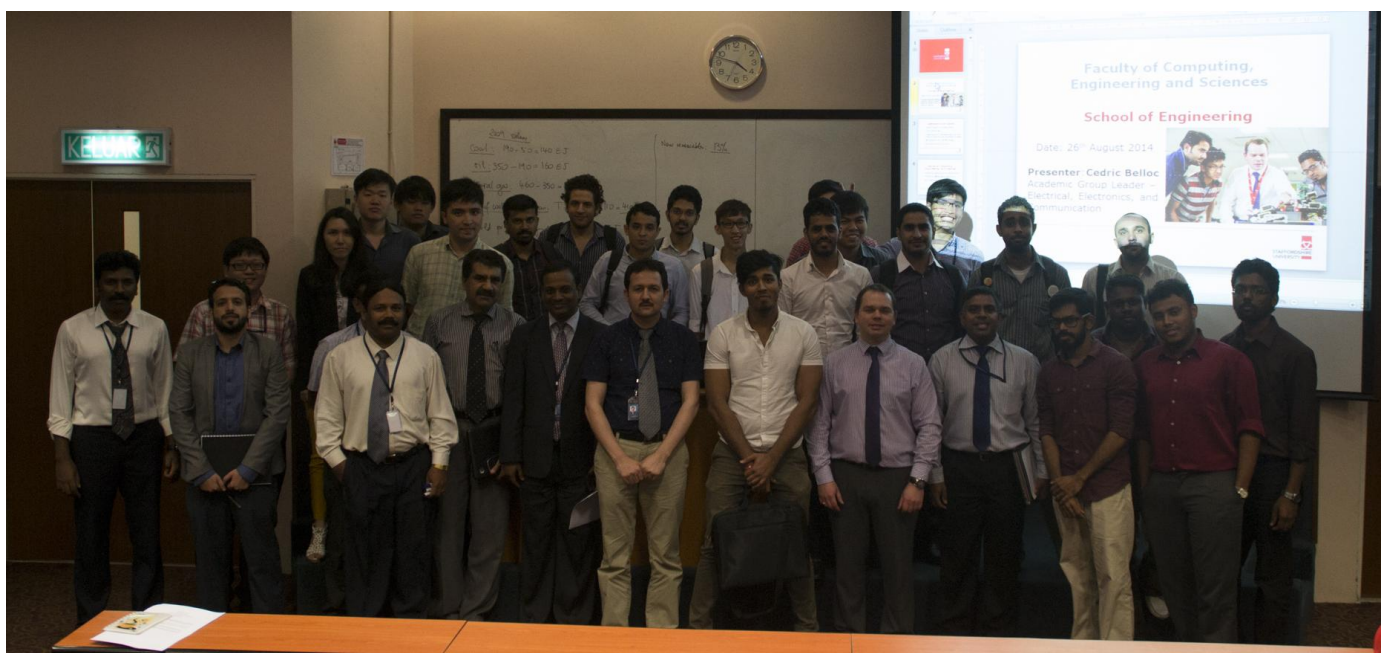


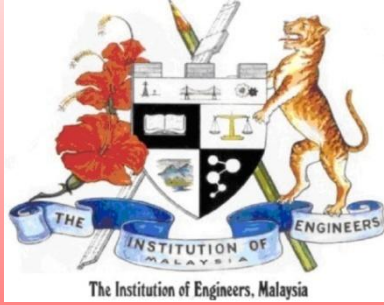
# Seminars & Workshops

## Introduction to Renewable Energy



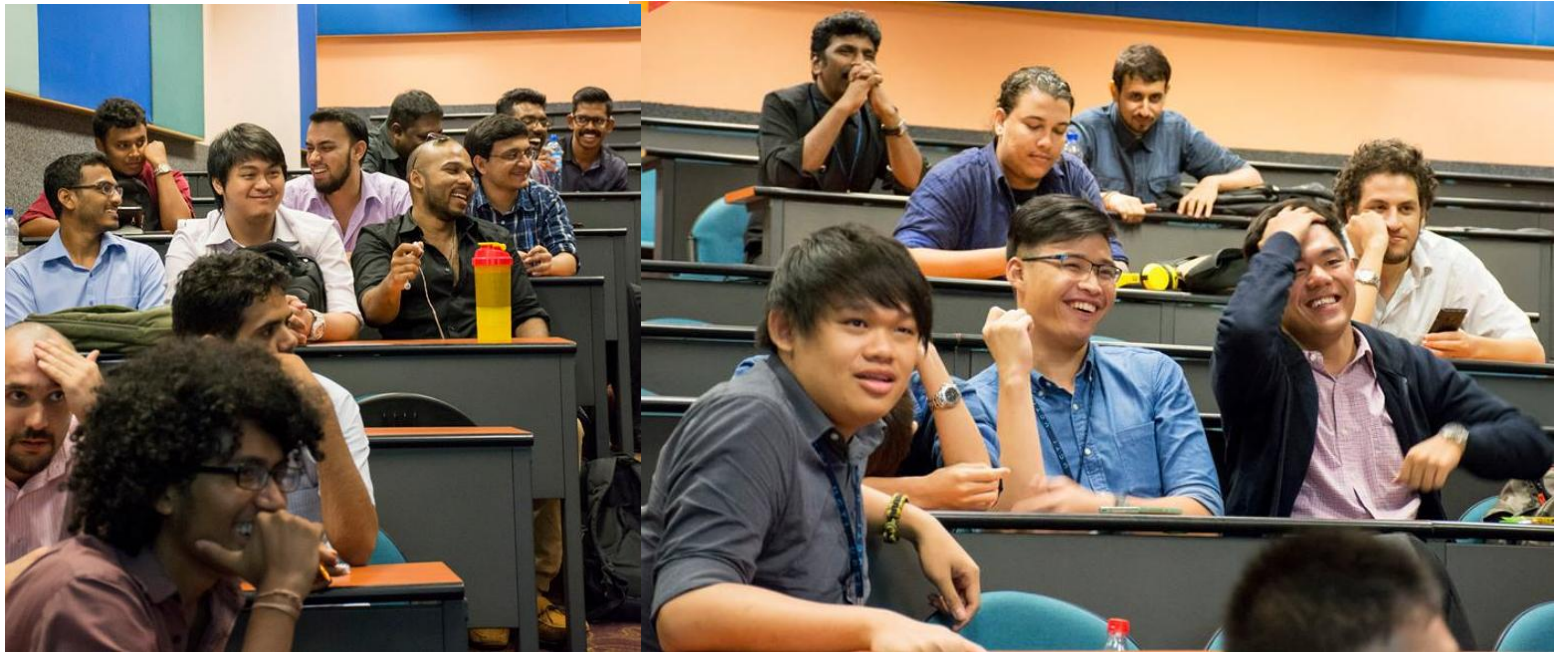
With the whole world of engineering steering towards sustainable development, renewable energy technologies are one of the essential contributors to the harvesting of energy as they contribute to the energy security and reduce on the dependence on fossil fuels thereby mitigating green house gasses. It was a pleasure to have Mr. Cedric Belloc talk on 'Introduction to Renewable Energy' on August 26, 2014. It was his first trip to Malaysia as an external examiner for engineering. He initiated his talk with various type of renewable energy possibilities and also highlighted the advantages and technical limitations of renewable energy sources. The talk concluded with comparative analysis of the technologies with a hands-on session for the students. The talk was attended by 34 students and 12 staff.





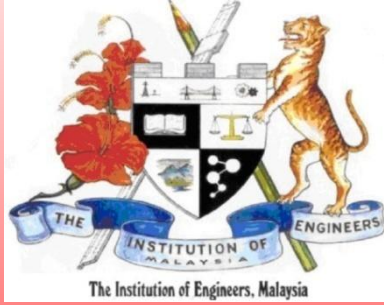
# Seminars & Workshops

## Communication Skills for Engineers



In a day to day job activity of an engineer, soft skills such as are as important as technical skills. Studies show that soft skills tops the list of must haves for employers with 98% of them expressing that communication skills is essential. While speaking, writing, and listening are everyday actions, many professionals underestimate the importance of communication skills. Engineers tend to prioritize technical skills over communication skills, not realizing that they cannot be fully effective in their jobs if they are not effective speakers, writers and listeners. Yet it is a known fact in the engineering field that strong communication skills are crucial to success. On September 9, 2014 the in-house talk on 'Communication Skills for Engineers' by Assoc. Prof. Ir. Dr. Vinesh Thiruchelvam was an interactive session which highlighted the significance of communication skills for engineers. The session also included a 'passing the correct technical information game' that gave the students a good laugh when the final outcome was shown. Communication from all angles was presented from an engineering sense. 33 students and 5 staff attended the talk.





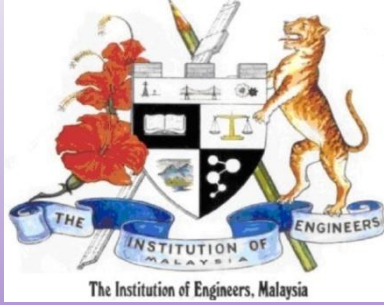
# Seminars & Workshops

## Role of BEM and its Importance



The Board of Engineers Malaysia (BEM) is a statutory body constituted under the Registration of Engineers Act 1967 (REA) . It was formed with a vision to be a highly respected and authoritative body that ensures public interest and safety in engineering. Its primary role is to facilitate the registration of engineers and regulate the professional conduct and practice of registered engineers in order to safeguard the safety and interest of the public. The objectives of BEM are to enforce the implementation of Continuing Professional Development (CPD), to add more functions and advise the Government & Public, to strengthen the penalties as stated in the REA 1967, to strengthen the suspension period, to introduce new parts that deal with the establishment, to empower & conduct of proceedings of a Disciplinary Committee, to act as a submitting engineer related to CCC or others and to impose additional conditions to ensure engineers follow latest developments. On September 10, 2014, the invited talk on the 'Role of BEM/IEM and the Importance of Engineers to a Country ' by Ir. Gary Chien from IEM highlighted a detailed explanation on the services of BEM & IEM and the path way towards attainment of the professional engineering status through graduate and student memberships. 40 students and 16 students attended the invited talk.



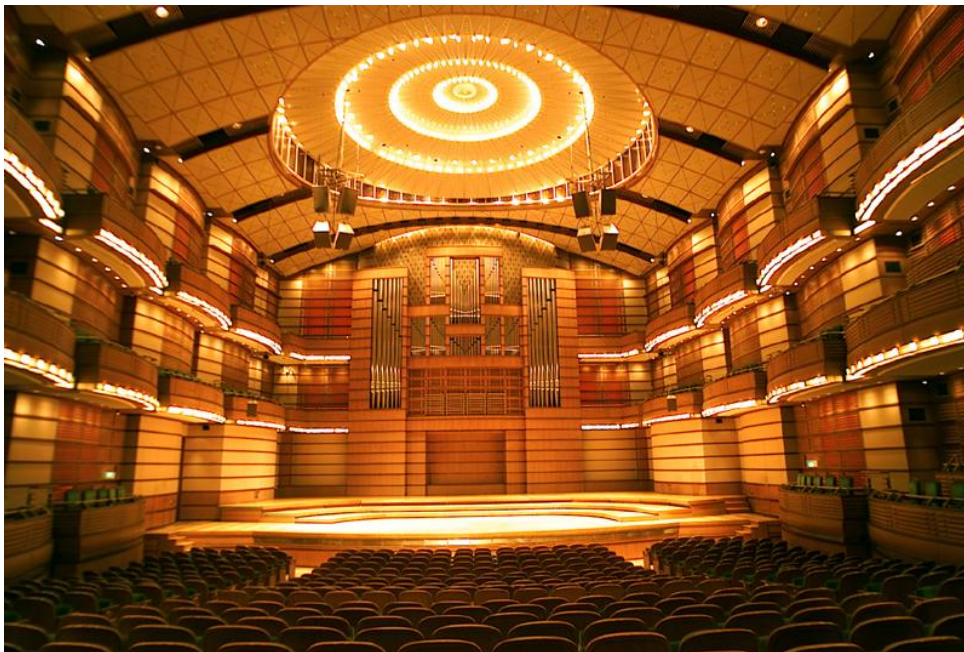


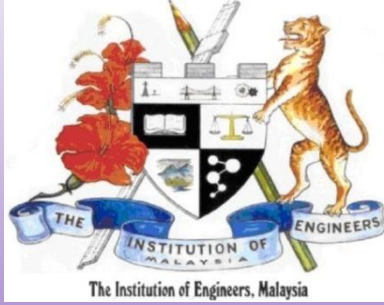
# Industrial Visits

## Petronas Philharmonic Theatre



The Dewan Philharmonik Petronas (DFP) is Malaysia's first dedicated music hall launched on 17th August 1998. Home to the Malaysian Philharmonic Orchestra (MPO), Dewan Philharmonik hosts some of the world's finest artistes and orchestras which includes names like Mstislav Rostropovich, soprano diva Dame Kiri Te Kanawa, Sir Neville Marriner and the Academy of St. Martin in the Fields, and other renowned orchestras such as the Vienna Symphony and New York Philharmonic. DFP has also attracted orchestral groups around the Asian region. The many genres of music such as jazz and world music sets lucidity for over the last two seasons with performances by Count Basie Orchestra, Yellowjackets, Ladysmith Black Mambazo, Lincoln Center Jazz Orchestra and sitar virtuoso Anoushka Shankar. On Tuesday, August 6th, 2014 a group of 5 students, 1 staff and 11 IEM members visited DFP located at KLCC. It was definitely an eye opener as the precision engineering put in place to suit acoustics, furniture sound absorption, vertical organ pipes and the HVAC system with minimum decibel levels was a sight to view. The engineering design and construction implemented has made the maintenance of this facility a challenge.





# Industrial Visits

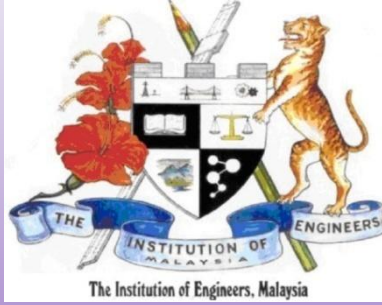
## Top Glove Sdn Bhd



On the September 18, 2014 it was APU's second time organising a trip to Top Glove, the world's largest rubber glove manufacturer. We were once again privileged to visit their glove production lines but this time around at a more advanced factory which was the new facility. 4 staffs and 24 students went through a guided tour given by 5 Top Glove engineers, showing off their high-end equipment for research and development purposes as well as the longest production line recorded at about 1.18km. The participants certainly learnt a lot about mechatronics applied in glove manufacturing during the visit.







# Industrial Visits

## Jimah Power Plant

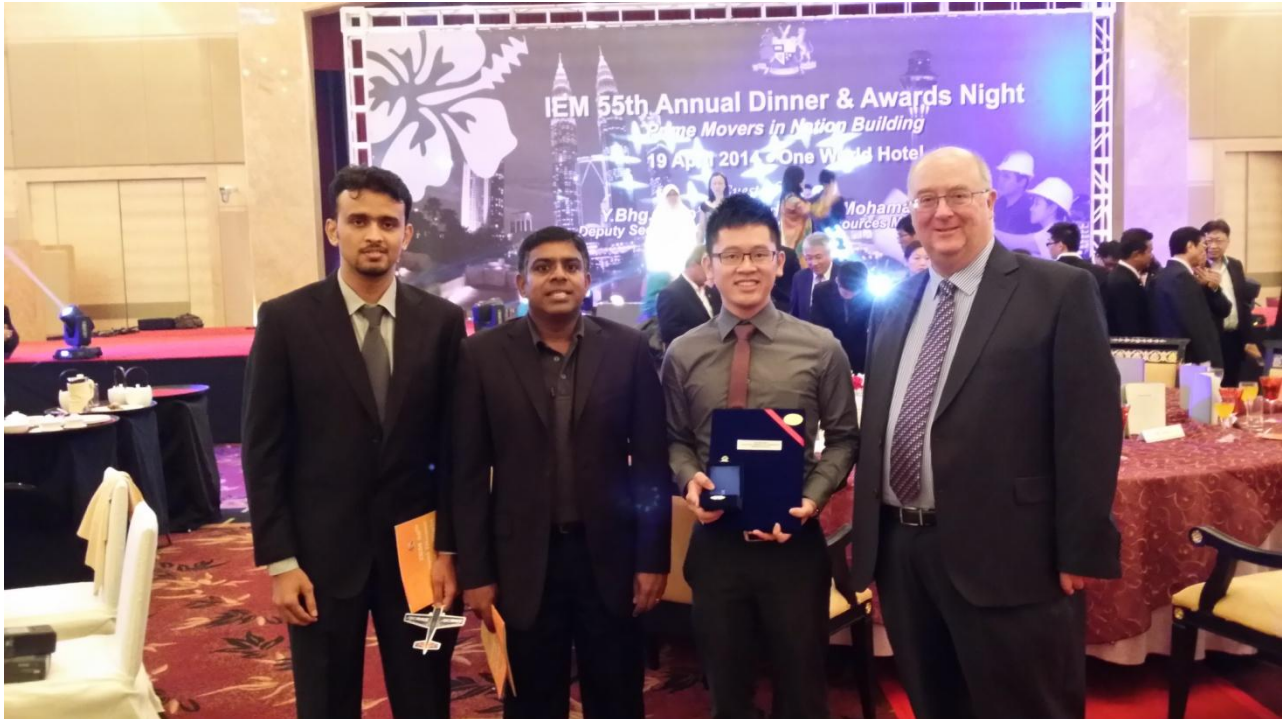


On the September 18, 2014, 30 students and 3 academic staff, visited the JIMAH Power plant in Negeri Sembilan. The entire visit was facilitated by Ir. Gopinath, Assistant Manager and Engineer Ms. Siti Aishah. JIMAH is a coal fired plant that has been in operation from 2009 and produces 2x700MW of power and functions as an IPP in which the power produced is sold to Tenaga Nasional Berhad. There are around 200 staff working in the plant.

A deep knowledge about the operation of the power plant was delivered jointly by Ir. Gopinath and Ms Siti Aishah. Thereafter the participants toured the entire entire power plant. The students gained an in depth knowledge on the operation and maintenance of a coal fired power plant.

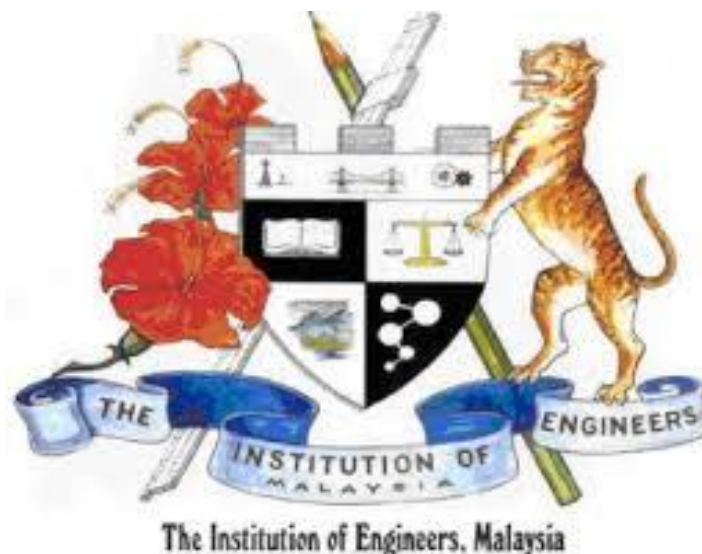


## 2014 IEM Academic Excellence Awards



From Left – Mohd Sultan (IASS Rep), Dr Vinesh, Chu Yee Chaw, Prof Les Trustrum

APU Engineering graduate, Chu Yee Chaw, was awarded the prestigious IEM (Institute of Engineers Malaysia) Award at the One World Hotel held on 19<sup>th</sup> April 2014. The IEM Gold Medal is awarded to the best overall final year Engineering student in a local institution of higher learning. The Institute of Engineers, Malaysia (IEM) was established in 1959 and its primary function is to promote and advance the science and profession of engineering in any or all of its disciplines and to facilitate the exchange of information and ideas related to engineering. IEM membership total is currently at about 23,000, making it one of the largest professional organizations in the country. Chu Yee Chaw is currently employed as an Application Engineer in the Sales Department of the company at Nordic Flow Control Pte Ltd, located in Singapore. The company offers system integration for marine and offshore industry such as valve remote control system, tank gauging system, anti-heeling system. His main role is to assist the sales team to prepare technical proposals as well as quotations for bidding purposes.



## UReka Ur Business Challenge 2014



**Tan Chin Sern Presenting his Very Interesting Innovative Idea**

UReka, driven by Agensi Inovasi Malaysia, is an online open innovation platform where people share ideas, seek expertise, form collaborative teams, attract funders and customers. It is a Crowd-sourced movement to turn innovative ideas into realities. Four students Kenneth Gan, Tan Chin Sern, Thierry Thommasse, and Vinesh Kumar of School of Engineering qualified for the finals of Ureka Ur Business Challenge 2014 which was held on June 27, 2014 at Taylors University. Kenneth Gan was placed in the top 10 for his idea on Detection and Alarm System to Prevent Forest Fire.



**Kenneth Gan Presenting his Innovative Idea that got him to 10<sup>th</sup> Place**

## Bistanika Sdn Bhd

On 3<sup>rd</sup> July 2014, APU-SoE signed an Memorandum of Agreement with Bistanika Sdn Bhd to allow for collaboration on Final Year Projects and Internships. Bistanika was represented by Mr KM Chua, Director in the signing session. To date two projects have been offered to APU.

- i) 'Functional Development of Siemens S71200 PLC' to be supervised by Mr Suresh Gobee.
- ii) 'Development of Motion/Process Control with Siemens S71200 PLC' to be supervised by Mr Nasrodin Mustapha. This project is now undertaken by student Belvinder Singh.

## BISTANIKA SDN BHD

## OYL Research & Development Centre Sdn Bhd

On 4<sup>th</sup> of July 2014, APU-SoE signed an Memorandum of Agreement with OYL Research & Development on Final Year Projects and Industrial Collaborations. OYL was represented by Mr Yeow Tee Siong, Operating Manager in the signing session. This was SoE's first collaboration with a full fledged research centre. One student, Foong Lik Wei has already started on a FYP with OYL titled, 'Application of active noise control in HVAC system' under the supervision of Dr Thang Ka Fei and with external supervision from OYL under Dr Chin Wai Meng (Research Manager).



## Omron Electronics (Malaysia)

On 18<sup>th</sup> of July 2014, APU-SoE signed an Memorandum of Agreement with PC Automation Sdn Bhd to allow for collaboration on Final Year Projects. PCA was represented by Mr Lee Boon Teck, Managing Director in the signing session. To date three projects have been offered to APU;

- i) 'Seismic Shaking Table Control' – In progress by student Andrew Teh under the supervision of Mr Chitturi Venkatratnam.
- ii) 'Smart Flow Diversion Control' – In progress by student Rudy Irawan under the supervision of Mr Arun Seeralan.
- iii) 'Smart Stock Management Control' – still available for students under the supervision of Dr Raed Abdulla.



## The Everly Group Sdn Bhd

On 15<sup>th</sup> of August 2014, APU-SoE signed a Memorandum of Agreement with The Everly Group Sdn Bhd to allow for collaboration on Final Year Industrial Projects. Everly was represented by Mr Dennis Tan, Managing Director, in the signing session. To date five major projects have been offered to APU.

- i) 'Design and Development of Energy Saving and Monitoring System' - currently preliminary works are being undertaken by students Haw Wai Kit and Huang Jiann Jer under the supervision of Mr Pang Jia Yew.
- ii) 'Smart Monitoring CCTV' to be supervised by Dr Thang Ka Fei.
- iii) 'Central Solar Hybrid Water Heating System' to be supervised by Ms Shamini Patpanavan.
- iv) 'Internet Through Power Cable Socket' to be supervised by Mr Veeraiyah Thangasamy
- v) 'Quality Control of Food Presentation Through Image Processing' to be supervised by Assoc Prof Ir Dr Vinesh Thiruchelvam.

Most projects are still available for students to undertake.



## Vel Tech University

On 20<sup>th</sup> of August 2014, VEL TECH UNIVERSITY from India visited APU and in depth discussions were held in areas of R&D collaboration. Dr Sarasu (R&D Director) and Mr Prabhakar (Vice-President) gave a presentation on opportunities. They were also taken on an APU facilities tour with an added tour of the Technology Park as well. MoU discussions are in progress. VEL TECH UNIVERSITY Chennai has established more than 25 courses in engineering under six Faculties of Electrical & Electronics, Mechanical, Civil, Technology, Information and Computing, and Management.



# SoE FYP Presentations Jul - Sep 2014



**Final Year Poster Presentation  
UC4F1310 EEE-EEIT-TE-ME**

## Engineering

Ir. Dr. Dhakshyani Ratnadurai



Engineers make things work. They apply theories, methods and tools that are appropriate but use them selectively and always try to discover solutions to problems even when there are no applicable theories and methods to support them. Engineers have to work within organizational and financial constraints. Engineering is the application of mathematics and science - gained by study, experience, and practice and is applied with judgment to develop ways to use economically the materials and forces of nature for the benefit of society. Engineers turn ideas into reality. Engineers have to be good communicators, team players and equipped with broad skill sets besides knowledge in science and mathematics.

A practitioner of engineering is an engineer who creates the world that never was. You don't have to be a genius to be an Engineer. Some of the characteristics of an engineer includes the solving of problems, figuring out how things work, enjoying being creative, enjoying working with people, doing well in math and science, wanting to make a difference, possessing a curiosity about how things work and asking 'why' about the world around us.

There are various engineering disciplines such as aerospace, biomedical, chemical, civil, computer, electrical, environmental, industrial, materials science, manufacturing, mechanical, mechatronics, petroleum, structural and telecommunication. All disciplines require the engineers to consider the aspects of sustainability, cost, performance, quality of life, environment and safety.

Engineers are employed internationally in the automobile industry, manufacturing, construction, pharmaceuticals, food industry, petroleum and chemical industry, computer and electronics industry and telecommunications. The benefits of being an engineer includes job satisfaction, variety of career opportunities, challenging work, intellectual development, potential to benefit society, financial security, prestige, professional environment, technological and scientific discovery and creative thinking.

Engineers are everywhere. Engineers are problem solvers who make things work better, efficiently, quickly and cost effective. As a conclusion, it can be said that engineers create new things and make old things better.



## Introduction

LTE has been categorised as fourth generation (4G) wireless communication system by the world marketers, but in fact it is part of 3G standard IMT-2000, which works on Orthogonal Frequency Division Multiple Access (OFDMA) in downlink transmission and Single Carrier Frequency Division Multiple Access (SC-FDMA) in uplink transmission. OFDMA and SC-FDMA are the multiple access techniques defined by 3GPP for LTE standard. These techniques play significant role towards the achievement of high speed transmission in wireless communication standards with low latency and provide an efficient access over LTE network by dividing the available bandwidth into narrow sub-bands that distributed effectively among users. This leads the increased spectrum efficiency with the existing of multiuser ambiance. In this paper, a comparative BER performance analysis of both the techniques using different digital modulations schemes is present.

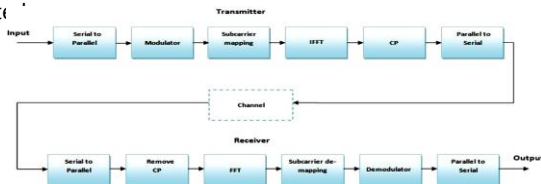


FIGURE 1: BLOCK DIAGRAM OF AN OFDM SYSTEM

In OFDMA system, input serial data stream converts into parallel data stream and passed through a base band modulator. Subcarrier mapping is the next where, the multilevel sequences of modulated symbols are mapped to a subset of subcarriers. Then an IFFT operation is applied to transform the modulated subcarriers in frequency domain into time domain and generates OFDMA symbols. A guard band often called as cyclic prefix (CP) is inserted between symbols to avoid ICI and ISI. A parallel to serial converter is then applied to convert into serial for the transmission through the channel. At the receiver side inverse operations of the transmitter take place.

TABLE 1: DESIGN PARAMETER

Parameters	Values
Data Block Size	16
Number of Subcarriers	512
FFT Length	512
Channel	AWGN
CP Length	64
Number of Iterations	1000

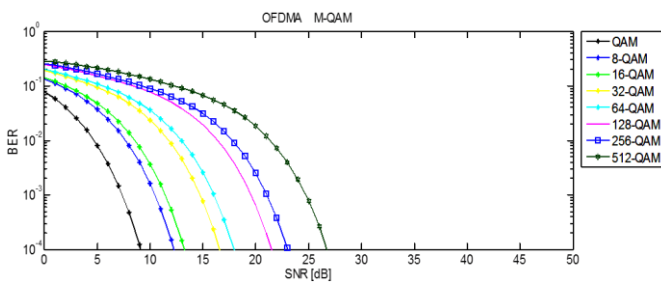


FIGURE 2: BER OF OFDMA FOR M-PSK

Figure 2 shows the BER performance results for the OFDMA system with M-PSK modulations over an AWGN channel. It can be observed that BPSK and QPSK have same performance and provide 9 dB over a BER of  $10^{-4}$ , whereas 8-PSK, 16-PSK, 32-PSK, 64-PSK, 128-PSK, 256-PSK and 512-PSK provide 12.5 dB, 17.5 dB and 23 dB, 28 dB, 34 dB, 40 dB and 46 dB respectively for the BER of  $10^{-4}$ .

Figure 3 shows the BER performance results for the OFDMA system with M-QAM modulations over AWGN channel. It can be observed that 4-QAM and 8-QAM have same performance and provide an SNR of 9 dB and 12.5 dB respectively over a BER of  $10^{-4}$ , whereas 16-QAM, 32-QAM, 64-QAM, 128-QAM, 256-QAM, and 512-QAM provide 13.5 dB, 17 dB, 18 dB, 22 dB, 23 dB and 27 dB respectively for a BER of  $10^{-4}$ .

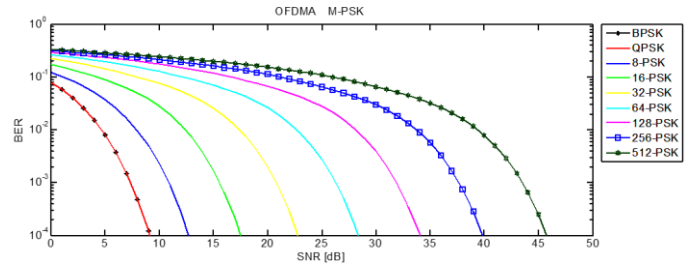


FIGURE 3: BER OF OFDMA FOR M-QAM

The results show that 16-QAM outperforms 16-PSK by 4 dB, 32-QAM outperforms 32-PSK by 6 dB, 64-QAM outperforms 64-PSK by 10 dB, 128-QAM outperforms 128-PSK by 12 dB, 256-QAM outperforms 256-PSK by 17 dB, and 512-QAM outperforms 512-PSK by 19 dB at the BER of  $10^{-4}$ .

Table 2 shows the BER performance results of SC-FDMA with M-PSK and M-QAM modulation schemes over AWGN channel. It can be observed that BPSK, QPSK and QAM have similar performance, whereas 8-PSK, 16-PSK, 32-PSK, 64-PSK, 128-PSK, 256-PSK and 512-PSK provide 10.5 dB, 17 dB, 22 dB, 27 dB, 32 dB, 37.5 dB and 43 dB respectively at the BER of  $10^{-4}$ , whereas 8-QAM, 16-QAM, 32-QAM, 64-QAM, 128-QAM, 256-QAM, and 512-QAM provide 12.5 dB, 13.5 dB, 17 dB, 18 dB, 22 dB, 23 dB and 27 dB respectively for the BER of  $10^{-4}$ . The results show that M-QAM outperforms M-PSK at the BER of  $10^{-4}$ .

Table 3 shows the performance analysis of OFDMA and SC-FDMA SC-FDMA. It can be observed that SC-FDMA outperforms OFDMA for the higher modulation schemes.

TABLE 2: PERFORMANCE ANALYSIS OF M-PSK & M-QAM at BER of  $10^{-4}$

SC-FDMA system		BER Vs SNR at BER of $10^{-4}$			
M-PSK		M-QAM			
Modulation	Bits/Symbol	SNR (dB)	Modulation	Bits/Symbol	SNR (dB)
BPSK	1	9			
QPSK	2	9	QAM	2	9
8-PSK	3	10.5	8-QAM	3	13
16-PSK	4	17	16-QAM	4	14
32-PSK	5	22	32-QAM	5	16
64-PSK	6	27	64-QAM	6	17
128-PSK	7	32	128-QAM	7	20.5
256-PSK	8	37.5	256-QAM	8	22
512-PSK	9	43	512-QAM	9	25.5

TABLE 3: PERFORMANCE ANALYSIS OF OFDMA and SC-FDMA

BER Vs SNR Performance Comparison at BER of $10^{-4}$					
Modulation	OFDMA SNR(dB)	SC-FDMA SNR(dB)	Modulation	OFDMA SNR(dB)	SC-FDMA SNR(dB)
BPSK	9	9			
QPSK	9	9	4-QAM	9	9
8-PSK	12.5	10.5	8-QAM	12.5	13
16-PSK	17.5	17	16-QAM	13.5	14
32-PSK	23	22	32-QAM	17	16
64-PSK	28	27	64-QAM	18	17
128-PSK	34	32	128-QAM	22	20.5
256-PSK	40	37.5	256-QAM	23	22
512-PSK	46	43	512-QAM	27	25.5

## CONCLUSION

This paper evaluates the performance of OFDMA and SC-FDMA multiple access techniques of LTE physical layer over AWGN channel. BER VS SNR results for M-PSK and M-QAM are presented. The results shows that lower order of M-PSK and M-QAM have similar perform. However, M-QAM outperforms M-PSK for the higher orders in OFDMA as well as in SC-FDMA over AWGN channel. In another comparison, it is concluded that SC-FDMA and OFDMA perform similarly for BPSK, QPSK and 4-QAM. SC-FDMA outperforms OFDMA for the higher order M-PSK and M-QAM modulation schemes.

## REFERENCES

[1] Holman.H. Toskala A., "LTE for UMTS - OFDMA and SC-FDMA Based Radio Access", John Wiley, 2009



## INTRODUCTION

Video is a very common type of media which allow people to transfer information. Videos might be having noise or background music sometimes. So, the main concern of watching video is to gain information from it by having automated subtitling system. Existing feature extraction methods in speech processing have been used to develop this Video Automated Subtitling. This STT system already tested with 60 samples out of 150 samples with overall recognition rate of 79%.

## OVERALL SYSTEM DEVELOPMENT

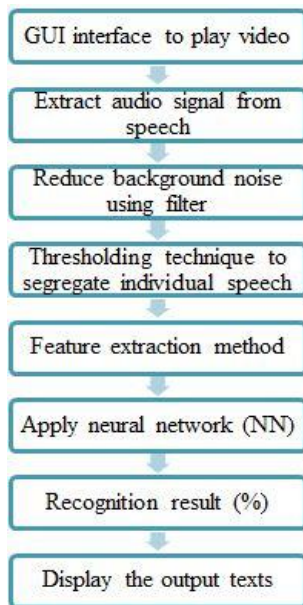


Fig. 1. STT System for Video Automated Subtitling

Fig. 1 shown the overall system development for the STT system from Video Automated Subtitling. Brief introduction will be provided in terms of the procedures that have been carried out to make the work done.

First of all, it is to create a Graphical User Interface (GUI) using MATLAB to play the sample video. The next step will be to extract the audio signal from the video itself due to the primary concern is to further analyze the audio. Then, noise removal process and filtering methods will be carried out to remove unwanted information.

Once the audio signal has been filtered appropriately, the next step is to segregate the individual speech using thresholding technique. There is a total number of 150 samples to be tested and the concern is to separate the 150 speech signals and save them into respective files.

Feature extraction method then can be applied into the separated speech signal files to extract the features coefficient values (MFCCs & LPCs). Neural Network will be applied thereafter for training and verification purposes. Finally, the recognition rate of the Neural Network will be obtained and lastly the translated words will be displayed.

## RESULTS

Neural Network Recognition Rate (NNRR)

NN for Test Video	Recognition rate (%) – method 1	Recognition rate (%) – method 2
1 (50 samples)	82	80
2 (100 samples)	84	79
3 (150 samples)	72	69
Average	79.33	76

Neural Network Training Time (NNTT)

NN for Test Video	Time required (s) – method 1	Time required (s) – method 2
1 (50 samples)	2	12
2 (100 samples)	37	49
3 (150 samples)	64	141
Average	34.33	67.33

Fig. 2. Recognition Rate and Training Time for Neural Network

Fig. 2 shown the recognition rate and training time for this particular system. The recognition rate is the primary concern of this system and it achieved the average rate of 79% for MFCC and 76% for LPC. These are the results that based on 60 samples have been tested out of 150 samples that have been trained using Neural Network. For the training time, it is very obvious that the first method (MFCC) consumed only slightly more than half a minute which is much better than second method (LPC) of 67 seconds. The more samples to be tested, the longer the training time. In short, all the required works have been done successfully.

## CONCLUSION

Messages in video can be successfully transferred via automated subtitling, research objectives have been achieved. Limitation is the selected video must be slow and with pauses between words.

## REFERENCES

- Othman, Z. A., Rasak, Z., Abdullah, N. A. & Mohd. Yusoff, M. Y. (2009) Jawi Character Speech-to-Text Engine Using Linear Predictive and Neural Network for Effective Reading. In *Modelling & Simulation - Third Asia International Conference*. Bali, 25-29 May 2009. Bali: IEEE. P.348-352.
- Dutta, K. & Sarma, K.K. (2012) Multiple feature extraction for RNN-based Assamese speech recognition for speech to text conversion application. In *Communications, Devices and Intelligent Systems (CODIS), 2012 International Conference*. Kolkata, 28-29 December 2012. Kolkata: IEEE. P.600-603.
- Dede, G. & Sazli, M. H. (2010) Digital Signal Processing. *Speech recognition with artificial neural networks*. 20(3). P.763-768.

## Benchmarking Exercise @ University Technology Petronas



**From left; Dr Khaled Abdalla (Deputy Head of Petroleum Engineering - UTP), Dr Vinesh and En Mohd Ayyub (Programme Executive - UTP)**

On 10<sup>th</sup> July 2014, a benchmarking exercise was carried out with University Technology Petronas (UTP) for the development of the BEng (Hons) in Petroleum Engineering programme. UTP were very kind with their hospitality and facility tours. A discussion followed on curriculum development with specific discussion on lab sessions, module descriptors, resources required, challenges from EAC and the interaction with the industrial companies such as Haliburton and Emerson. UTP were represented by Dr Khaled Abdalla (Deputy Head of Petroleum Engineering) and En Mohd Ayyub (Programme Executive). APU was represented by Dr Vinesh. The benchmarking exercise also covered general areas such as Learning Outcomes, Module descriptor/content development, planning of resources and the challenges that await in handling EAC management.



## Lunch Get Together for Staff – EAC Visit Success (25<sup>th</sup> June 2014) & Hari Raya (9<sup>th</sup> Sept 2014)



## Appreciation to Peter Hoornaert – Dean of FCET



Peter Hoornaert the Dean of FCET at APU, is leaving the university for another adventure. Having known Peter, it is easy to say that his basic 'Mr Nice Guy' character will be missed. His academic encouragement to staff and his friendly chats which are always motivating has been characteristics which defined Peter. Over his tenure as Dean, Peter has launched and given appreciations during events such as Inotech 2013 and APRoC 2014 of which students were enlightened by his speeches. SoE wishes him the best of luck in his future endeavours and thank him for the support given in all academic matters over the last two years.

If you would like to be a part of the 'Engineers Insight' editorial team or have an article/paper published please contact:  
shankar@apu.edu.my