

# FENG Research Bulletin

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Gearing for a Greener Future







Professor Ir Dr Amir Azam Khan



Professor Ir Dr Andrew Ragai Henry Rigit



Abdul Hafiz Abdul Karim



Assoc. Prof. Dr Siti Halipah Ibrahim



Hishammudin Afifi Huspi



Dr Shafrida Sahrani



Mohd Farid Atan



Ir Dr Leonard Lim Lik Pueh



Yee Ming Chong

## FENG RESEARCH BULLETIN

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### Editorial Policy

The FENG Research Bulletin is a publication of the Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS). It publishes current information on Research Activities, Research Publications, Research Findings, Research News, Recent Research Equipment and Trainings, Conferences, Seminars at the Faculty of Engineering, UNIMAS.

### Cover Page Designer

Saiful Edi

## EDITORIAL NOTE

The Faculty of Engineering has confronted the challenge of becoming avant garde in research over the last couple of years. The research grants, post graduate students and research publications have all increased considerably in order to bring Faculty of Engineering into the forefront of UNIMAS strategic plan. All this activity requires to be properly exposed for the viewers to recognize it within and outside University. The initiative of improving and fortifying the FENG Research Bulletin in order to achieve this goal, therefore, has never been more important.

The present bulletin is the 8<sup>th</sup> volume successfully published with great care and with specific task of fulfilling such responsibility. In this volume the viewers would notice that the editorial team, with the extensive support of Faculty administration, notably the Dean and the Deputy Dean, has worked hard to collect useful information related to research activities conducted during the current year.

The editorial team would like to present a special thanks to all the faculty members and Post Graduate students whose work rendered the publication of this bulletin possible. We sincerely wish that this hard work continues in future and brings laurels to the Faculty and to the University.

*Professor Ir Dr Amir Azam Khan*  
Editor FENG Research Bulletin

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## Message From The Deputy Dean (Postgraduate & Research)

Dear readers, I would like to start with a quote from one of the greatest scientists of the century,

*"If we did all the things we are capable of, we would literally astound ourselves".*

Thomas Alva Edison.

and astound I am... This annual publication is a clear evidence of all the hard work by the FEng family and this long list of achievements would not be reached if we do not realize our capability and talent. Almost instantly, when I stepped into the role to anchor the Postgraduate and Research Office, the enthusiasm and perseverance were reflected in the efforts of my FEng family. Well done to all and keep it up! FEng would not be at this level of success if not for your strong support. Congratulations to the Editorial Team for another job well done. This publication is one crucial report of our R&D. Thank you very much and let's continue to create success for many years to come.



Assoc Prof. Ir Dr Siti Noor Linda Taib

# MESSAGES



Assoc Prof. Dr Al-Khalid Othman

## Message From The Dean

Excellence in Research has always been one of the key thrust areas of Faculty of Engineering. It is really heartening to see that the Faculty has lived up to its reputation once more in 2015. One key area in which we have taken important stride is the setting up of Industrial labs in the Faculty. We have always been a strong voice in support of Industrial-Academic partnership. This has matured into a properly organized and physically representative initiative by the Faculty to setup labs in collaboration with industrial partners. During 2015 the Faculty established 4 Industrial Labs and 83% of the Academic Staff had their research visible on Google Scholar. The Faculty penned 6 Memoranda of Agreement (MoA) and 5 Memoranda of Understanding (MoU) during 2015 with other Research and Industrial organizations. With a total of 192 active Post graduate students and more than RM 5½ million of Research Grant and Contracts during this period, our Faculty stands tall with a sense of achievement never attained in the past.

With this I would like to congratulate the faculty members and editorial team of FENG Research Bulletin for their effort in coming up with this wonderful volume about research conducted in 2015.



# Simulation Investigation of a Heat-Driven Adsorber for Air Conditioning System Employing Activated Carbon-Methanol Working Pair

Harunal Rejan Ramji <sup>a</sup>, Sing Lim Leo <sup>b</sup>, Ivy Tan Ai Wei <sup>a</sup>, Mohammad Omar Abdullah <sup>a,\*</sup>

<sup>a</sup> Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), 94300, Kota Samarahan, Sarawak, Malaysia

<sup>b</sup> International College of Advanced Technology Sarawak (ICATS), Jalan Canna, Off Jalan Wan Alwi, Tabuan Jaya, 93350 Kuching, Sarawak, Malaysia

\* Corresponding author Tel: +60 82 583280 (direct line); Fax: + 082-583409;

Email address: [amomar@unimas.my](mailto:amomar@unimas.my); [amomar13@gmail.com](mailto:amomar13@gmail.com);

## 1.0 Introduction

The progress in the automobile air-conditioning systems which utilize the adsorption cooling technology had progressed ever since early 90's. The conventional electrical-driven compression systems are widely use in almost all of the automobiles today. However, air-conditioning technology is required to evolve due to the new environmental regulations, notably Montreal Protocol in 1987, Kyoto Protocol in 1997 and European Commission Regulation 2037/2000. These regulations are concerning about the depletion of the ozone layer and also global warming, which decided to phase- out CFCs and followed by HCFCs and HFC-134a. As a result, this trend has led to a strong demand for a new air-conditioning technology (Leo and Abdullah 2009) [1]. Unfortunately, no working prototype has been practically run in present automobiles due to various restrictions, due to sizing and cooling capacity limitations (Abdullah et al. 2011) [2].

A review on solar refrigeration by Kim (2008) [3] had covered the subjects of discussion on the energy efficiency and economic feasibility of solar base cooling technologies. It is stated that solar sorption systems appeared to be cheaper than electric and thermo-mechanical system. This is then evidently proven in literature involving adsorption refrigeration cycle powered by solar energy or other waste heat exhausted from engines. Solar adsorption refrigeration had been quite successfully used for ice making and cold production.

According to Leo and Abdullah (2009) [1] in their research findings on automobile adsorption application, the coefficient of performance (COP) obtained thru experimentation is approximately 0.19. Theoretically the value is quite small in compare to regular air conditioning that is on the market now. In spite of this, the value of specific cooling power recorded was a promising 396.6 Wkg<sup>-1</sup>. Other considered data acquired along were the cycle time which is set at 20 minutes and average chilled air produced is around 22.6°C. The prototype operates intermittently between two adsorbers in order to retain the chilled air along the 20°C temperature line. Being able to produce this degree of air conditioning, the cooling coil temperatures can fell up to 9.5°C to 14.7°C.

This paper is a continuation of study by Leo and Abdullah (2009) [1] and Abdullah et al. (2011) [2] on adsorption cooling system. In previous papers, the authors had discussed the basic prototype design and conducted several relevant experimental works and successfully patented a working prototype. In this paper, however, simulation works by CFD are presented and discussed ways to achieve more favorable design and minimize unnecessary energy losses. In attaining the specified condition, parametric study based on three temperature inlet is implemented. By varying these temperatures, the corresponding variables such adsorption rate, heat transfers and operating cycle time can be obtained. Subsequently, optimization study is conducted to verify the findings.

## 2.0 Physical and mathematical model

### 2.1 The adsorber

The Dubinin-Astakhov (D-A) equation relates the concentration, and temperature can be represented in the form of (Lu et al. 2004) [4];

$$x = x_0 \exp \left( -k \left( \frac{T}{T_s} - 1 \right)^n \right) \quad (1)$$

Where  $x$ , represents the concentration of methanol adsorbed in bed at the temperature of the adsorption,  $T$ .  $T_s$  represents the saturated temperature in the adsorber with given  $P$ , pressure. The saturated adsorption capacity of the working pair is given by  $x_0$ . The parameter  $k$  and  $n$  are constant that varies with different working pair.

### 2.2 Mass and energy balance equation

While employing the usual energy equation, the total heat power input to the system including the condenser and evaporator models can be presented as below

Total heat power input

$$P = \dot{m}_{eg} C_{p,eg} (T_{eg,in} - T_{eg,out}) \quad (2)$$

Condenser

$$\dot{m}_{ref} c_{p,ref} (T_{des} - T_{cond}) + h_{v,ref} = \dot{m}_{air} c_{p,air} (T_{out} - T_{in}) \quad (3)$$

Evaporator

$$h_{v,ref} - \dot{m}_{ref} c_{p,ref} (T_{cond} - T_{ev}) = \dot{m}_{air} c_{p,air} (T_{in} - T_{out}) \quad (4)$$

### 2.3 System performance parameters

The cooling output readings of the prototype via experiment are calculated from measuring the temperature difference of the inlet and outlet of the chilled air by its flow rate and specific heat (Lu et al. 2004) [4];.

$$P_{exp} = \dot{m}_{chill} c_{p,air} (T_{chill,in} - T_{chill,out}) \quad (5)$$



The total cooling capacity will be

$$Q_{c,exp} = \int P_{exp} dt \tag{6}$$

While in simulation, cooling power can be obtained theoretically by equations given;

$$Q_{c,theo} = m_{ref} (q_{v,ref} - c_{p,ref} (T_{cond} - T_{ev})) \tag{7}$$

Hence, the total cooling capacity can be presented as;

$$P_{theo} = \frac{m_{ref}}{t_{cycle/2}} (q_{v,ref} - c_{p,ref} (T_{cond} - T_{ev})) \tag{8}$$

Where  $q_{v,ref}$  is the heat of evaporation for methanol, and  $t_{cycle/2}$  is the half cycle time of the whole operation. The performance of the adsorption cooling system is commonly evaluated using two performance factors; the coefficient of performance (COP) and specific cooling power (SCP). In general, COP is the amount of cooling produced by an adsorption cooling system per unit heat supplied by Lu et al. (2004) [4] as shown:

$$COP = \frac{Q_{ev}}{Q_{in}} \tag{9}$$

### 3.0 Simulation results and analysis

During the heating process, methanol is desorbed and pressurized from the adsorber. Initially, the adsorber is injected with 455 mL of methanol which is equivalent to 360 g in standard atmospheric pressure condition. Theoretically, the more methanol are desorbed the more cooling effect can be produced. Equivalently, the ability of methanol to be squeezed out of the adsorbent bed will indicate the effectiveness of the system's heat transfer processes.

The ratio between adsorbate and adsorbent in this system was set around 0.45:1, which means the methanol content inside the adsorber was around 45% of the adsorbent content. It is to be noted that an excess amount of adsorbate can cause over saturation of activated carbon that could lead to reduce of system performance (Leo and Abdullah, 2009) [1].

#### 3.1 Effect of wall thickness on adsorber bed temperature, $T_{bed}$

Fig. 1 and 2 depict the adsorber bed temperature  $T_{bed}$  of the adsorber. This case study was presented via CFD simulation in comparison with the prototype experimental result conducted in laboratory. It would be difficult to obtain internal temperature profiles of the adsorber experimentally, so the experimental data (at 10 mm wall thickness) was taken only at external wall of the adsorber. Hence by using simulation the temperature contour is shown vividly to compliment that was obtained experimentally (Fig. 2).

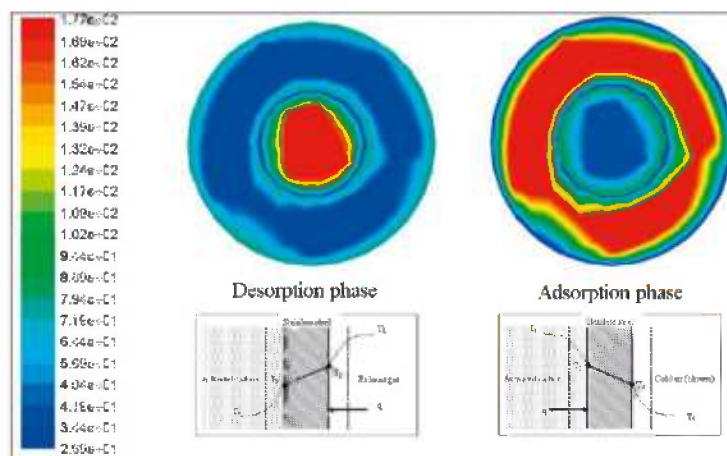


Fig. 1 Temperature profile of adsorber cross section during desorption and adsorption

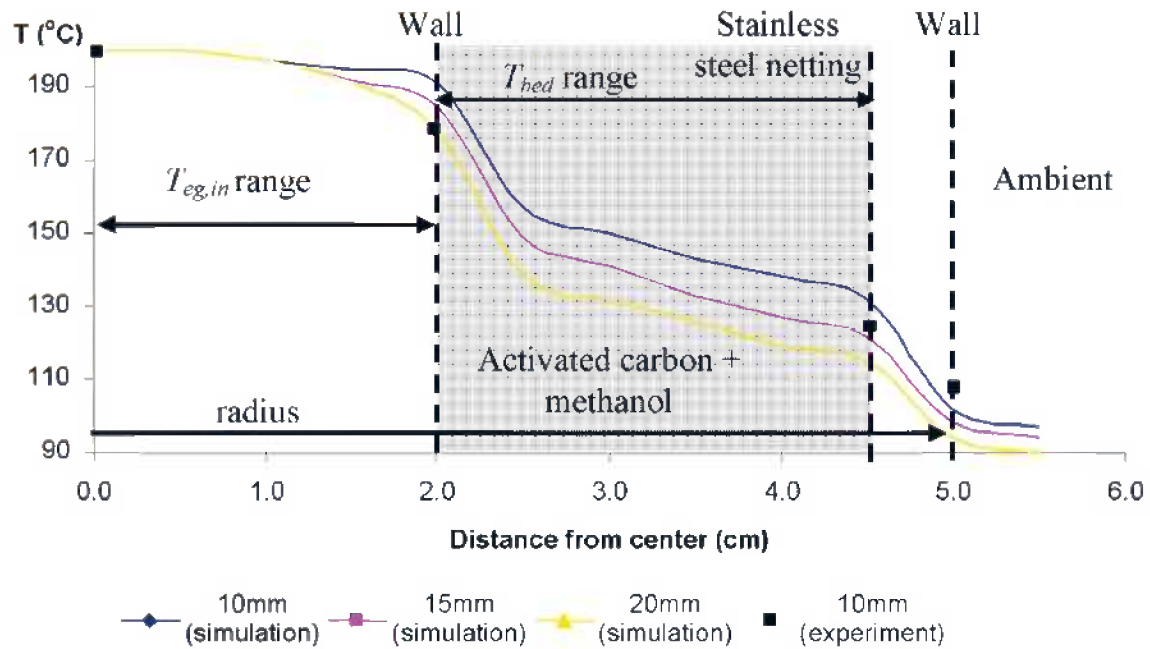


Fig. 2 Internal temperature of the adsorber during the desorption phase

The CFD result in Fig. 2 has shown that 10 mm of wall thickness would provide higher undesired heat channeling. Thus to maintain  $T_{bed}$  is in optimum operational range of  $T_{des}$  (below 150 °C) for the working pair, a wall of greater thickness should be chosen to keep  $T_{bed}$  as low as possible to avoid methanol decomposition.  $T_{eg,in}$  utilized in this simulation model were 150, 200 and 250 °C.

### 3.2 Chill temperature release, $T_{chill,out}$ and cooling power, and $P_{theo}$ influence of desorption temperature, $T_{des}$ and evaporating temperature, $T_{ev}$

In Fig. 3, simulation and experimental results were compared to observe its coherency. It was found that simulation results and the experimental results shows a slightly different values of  $T_{chill,out}$ . This may be due to the effect of ambient temperature that could affect the measuring of  $T_{chill,out}$ . This error could provide a slightly different reading from the simulation results. Though cooling power for both results exhibits satisfactory coherency.

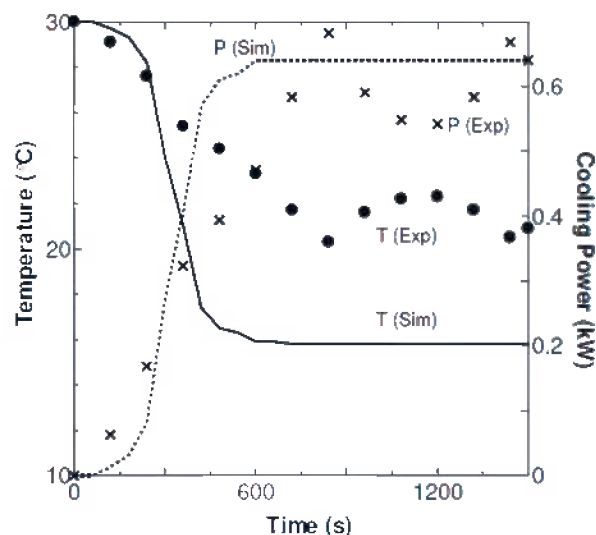


Fig. 3 Comparison between experimental and simulation results on  $T_{chill,out}$  and their respective cooling power,  $P$ .

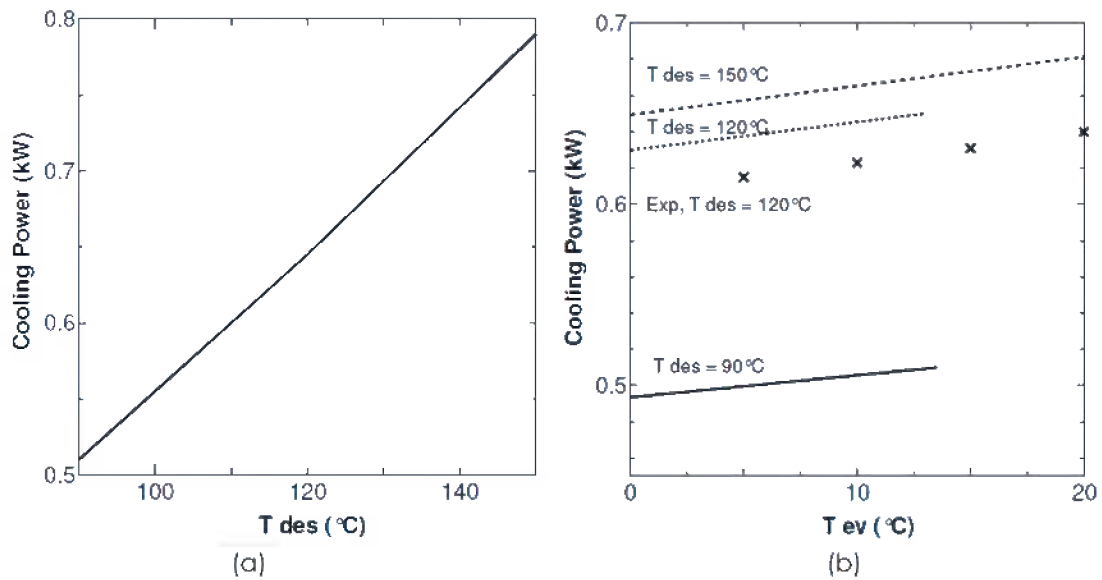


Fig. 4 (a) Influence of desorption temperature,  $T_{des}$  on cooling power (b) Influence of evaporating temperature,  $T_{ev}$  on cooling power.

Fig. 4 shows the effect of evaporator temperature on the system cooling power. The graph indicates the impact of pressure changes in the actual experiment where saturated temperature changes with pressure change thus the adsorption capacity of activated carbon-methanol working pair. Similar phenomenon had been described by Cho and Kin (1992) [5].

#### 4.0 Discussions

As we put together the findings on these two adsorbers, one of the most significance aspects to be considered is the cycle time of the operation. While previously during the development of the prototype, all of the operations were done manually and on a try and error basis. But through CFD investigation using ANSYS 13.0 software, these aspects can be thoroughly take notice and its effect to the whole system. The parameters were provided on Table 6. The values of the given parameters were obtained through simulations previously discussed above. In the above study, the optimization suggested by the simulation can be listed into;

1. Higher  $T_{eg,in}$  would yield higher cooling power, P but  $T_{bed}$  must be below operational  $T_{des}$  of the working pair to avoid the decomposition of the refrigerant.
2. The optimum  $T_{ev}$  falls under 15-25°C region to produce maximum cooling.
3. Higher  $T_{des}$  have faster desorption rate and this cut the cycle time shorter.

Based on the table 6, a comparison was made between three distinct researches that include the experimental prototype by Leo et al (2010) [1], diesel locomotive waste-heat powered adsorption (Lu et al. 2004) [4] and simulation study via CFD based on Leo et al. (2010) [1]. In Lu's findings, the author had presented a functional adsorption air conditioning system powered by waste heat. All of the results produced show a lot promise and its feasibility to be introduced as a regular cooling system. Though, the design as extravagantly huge and heavy which could than affect the performance of the car. Therefore, Leo et al. (2009) [1] decided to use a reduced sizing and weight system by introducing a dual adsorber system which can work intermittently with each other. The solution leads to a smaller system.

Depend on compactness and sizing, a practical automobile adsorption system would perhaps need to acquire a COP range from 0.25 to 0.8, with SCP from 0.4 - 1 kW/kg. Suggested cycle time for a dual adsorber system shall be < 10 - 15 minutes to avoid overheating of adsorber and loss of refrigerant.

Table 1 Comparison of experimental set up an simulation for the prototype adsorbers

	Experimental Set Up [1]	Simulation design (Present study)			Lu et al [15]
Mass of adsorbent (g)		800 (in each adsorber) of activated carbon			140000 of 13X zeolite grain
Mass of adsorbate (g)		360 of methanol			185000 of water
Length (cm)		40			100
Width (cm)		20			150
Height (cm)		10			45
Exhaust gas temperature (°C)	<200	150	<b>200</b>	250	400-600
Desorption temperature (°C)	120	<90	<b>&lt;120</b>	<150	270
Adsorption temperature (°C)	40	40	<b>40</b>	40	34,40
Desorption cycle time (s)	600	720	<b>600</b>	540	3600
Adsorption cycle time (s)	600	600	<b>600</b>	600	7200
Total cycle time (s)	1200	1320	<b>1200</b>	1140	10800
Cooling Power (kW)	0.635	0.52	<b>0.64</b>	0.79	3.0-4.2
COP	0.19	0.27	<b>0.25</b>	0.25	0.18-0.21
SCP (W/kg)	396.6	324.78	<b>400.00</b>	493.75	25.71

## 5.0 Conclusions

Based on the CFD result, it shows that the prototype application in real world would be feasible and a stepping edge in environmentally friendly technology. Through the CFD analysis conducted, an input exhaust gas of 200°C would have bed temperature around 120°C while employing 30mm thick of wall made by stainless steel. The adsorber took around 10 minutes to heat up and decrease to room temperature around the same period. This set of data produce a cooling power of 0.65kW and COP around 0.25 with cycle time of 1200s. It is summarized that higher input temperature would have relatively longer cycle time but it is able to produce higher cooling power in return. While in design, it proves that an optimal wall thickness should be 20-30mm of stainless steel that offer lower heat transfer rate to maintain the system under operational  $T_{des}$  at all time.

## Acknowledgement

The paper is reproduced from an Open Access article: *Harunal Rejan Ramji, Sing Lim Leo, Mohammad Omar Abdullah. Parametric study and simulation of a heat-driven adsorber for air conditioning system employing biomass-based activated carbon-methanol working pair, Applied Energy, Volume 113, January 2014, Pages 324-333. The paper can be assessed online at: <http://www.sciencedirect.com/science/article/pii/S0306261913005837>.*

## References

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## RESEARCH GRANTS

Dana Principal Investigator (DPI)					
Grant No	Project Leader	Co-Researcher	Title	Duration (Months)	Budget (RM)
02(DPI19)955 /2013(02)	Assoc Prof Ir Dr Siti Noor Linda bt. Hj. Taib	Prof Dr Shenbaga Rajaratnam Kaniraj Jeyachandran, Ahmad Kamal b. Abd. Aziz, Ir. Lee Lin Jye	Investigation on Lateral of Piles in Sarawak Soft Riverbank	24	50,000.00
02(DPI23)999 /2013(06)	Assoc Prof Dr Khairuddin Sanaulah	Dr. Lim Soh Fong Prof. Ir. Dr. Mohd Sobri Takriff Dr Hushairi Zen Afrasyab Khan	Modeling/CFD Validation of Direct Contact Condensation of Supersonic Steam with Subcooled water	24	50,000.00
F02(DPI25)11 25 /2014(01)	Prof Dr Ir M. Shahidul Islam	Assoc. Prof. Dr Abdullah Yassin, Assoc. Prof. Syed Tarmizi Syed Shazali, Lee Man Djun, Ting Ching Hung	Modelling Capacity Utilization of Water Treatment Plants for Achieving Sustainability in Manufacturing Industry: An Empirical Study in Sarawak, Malaysia	24	55,000.00
F02(DPI26)11 26/2014(02)	AP Dr Hushairi Zen	Assoc. Prof. Dr Al-Khalid Othman, Prof Datuk Khairuddin Abd Hamid, Bello Olalekan	Cross Layer Scheduling and Resource Allocation in WIMAX	36	51,600.00
F02(DPI27)/ 1215/2015 (01)	Assoc. Prof. Dr Al-Khalid Othman	Prof. Dr M Shahidul Islam, Dr Hushairi Zen, Mohd Azlan Ismail	Improving Pump as Turbine Efficiency for Microhydro Applications	24	50,000.00
F02(DPI28)/ 1244/2015 (02)	Dr. Nordiana Rajae	Dr Ir David Bong Boon Liang, Nurlaila Rosli	Music using Artificial Neural Network via Instrumental Timber Analysis	36	49,600.00

ERGS					
Grant No	Project Leader	Co-Researcher	Title	Duration (Months)	Budget (RM)
ERGS/02 (07)/859/ 2012(11)	Prof Dr Ng Chee Khoon	Dr Tay Kai Meng Mdm Chiew Fei Ha (UITM) Dr Delsye Teo Ching Lee	Development of a Novel Musical-inspired Meta-heuristic Optimiser for Mix Proportion Design of High-Strength Concrete	36	50,000
ERGS/02 (08)/860/ 2012(12)	Dr. Md Rezaur Rahman	Prof. Dr. Sinin Hamdan, Assoc. Prof. Dr Abu Saleh, Dr. Rubiyah Baini, Dr. Dyg Maryani Awg Hashim, Mohd. Farid Atan	Synthesis and Characterization of Mn <sub>3</sub> O <sub>4</sub> Nanoparticles and its Application on Oxidative and Antibacterial Activity.	36	50,000
ERGS/TK01 (01)/1007/ 2013 (04)	Assoc. Prof. Dr Abdullah Yassin	Assoc. Prof. Dr Syed Termizi Syed Shazali, Prof. Dr M Shahidul Islam, Mohd Azrin Mohd Said	A Novel Method in Measuring Cutting Edge Temperature of End Mill Tool in High Speed Machining Using Infrared Radiation	36	132,000
ERGS/TK03 (01)/1008/ 2013 (05)	Dr Onni Suhaiza Binti Selaman	Assoc. Prof. Dr Nasser Rostam Ashfar, Assoc. Prof. Dr Siti Noor Linda Taib, Dr Darrien Mah You Seng, Dygku Salma Awg Ismail, Dr Magdelene Andrew Munot, Dr Ena Kartina Abdul Rahman (Institut Teknologi Brunei)	Design and Efficiency Testing of a New Approach to Water Draining System in Slope	24	80,000
ERGS/TK03 (02)/1009/2013 (06)	Norazlina Bateni	Prof Dr Mohammad Abdul Mannan, Prof Dr FJ Futuhea, Prof Dr Ng Chee Khoon, Dr Rediansyah Mansyur, Dr Darrien Mah You Seng, Dr Delsye Teo Ching Lee	Performance of Micro-detention Pond using Honeycomb Structure for Green Pavement in Housing Area	36	135,000
ERGS/TK04 (02)/1011/ 2013 (08)	Dr Norsuzailina Mohamed Sutan	Dato Ir Dr Mohd Saleh Jafar- UPM Prof Dr Sinin Hamdan Dr Zainal Abidin Taib Delsye Teo Ching Lee Prof Dr Taufik Yup Yun Hin (UPM)	Developments of Durable Eco-Friendly Modified Multicomponent Binder (MMCB) Cement System Containing Ground Spent Fluidized Catalytic Cracking Unit (GSFCCU).	36	98,000
ERGS/ STG07(01)/1006 /2013(13)	Prof. Dr Mohd Omar Abdullah	AP Dr Cirilo Nolasco-Hipolito, Prof. Dr Kopli bin Bujang, Dr Ivy Tan Ai Wei, Mohamed Afizal Bin Mohamed Amin	Novel Hybrid Biotechnology System: Microbial Fuel cell (MFC) with activated-carbon adsorption for bioenergy production and wastewater treatment	24	132,000

FRGS					
Grant No	Project Leader	Co-Researcher	Title	Duration (Months)	Budget (RM)
FRGS/TK04 (01)/972/2013 (13)	Dr Delsye Teo Ching Lee	Prof Dr Ng Chee Khoon Prof Dr Md Abdul Mannan, Prof Dr Hilmi Mahmud (UM), Dr Norsuzailina Mohamad Sutan	Chloride Penetration and Time to Corrosion Initiation of Concrete Produced from Agricultural Waste	36	73,000
FRGS/TK01 (01)/973/2013 (14)	Assoc Prof Dr Syed Tarmizi Bin Syed Shazali	Prof Dr M Shahidul Islam, AP Dr Abdullah Yassin, Ahmad Adzlan Fadzli Bin Khairi, Hishammuddin Afifi Huspi, Mohd Azrin Mohd Said	Modelling of Energy Extraction From Low Velocity Water Stream with Micro Hydro Turbine	36	128,000
FRGS/ICT02 (01)/997/2013 (38)	Dr Tay Kai Meng	Prof Dr Lim Chee Peng (USM), Dr Mah Yau Seng, Asrani Lit, Dr Delsye Teo Ching Lee	A Novel Theoretical Synthesis of Fuzzy Causal Modeling and Information Theory: Mathematical Extensions, Evaluations, and a Real World Application in Sarawak	36	68,900
FRGS/TK07 (01)/1055/2013 (01)	AP Dr Siti Noor Linda Taib	Dr Nursuzailina Mohamed Sutan, Ibrahim B Yakub, Ron Aldrino Chan@Ron Buking, Dr Norazzlina M.Sa'don, Prof Fauziah Bt Ahmad	Strength, Morphological and Chemical Characterizations of Pavement Subbase Modified by Chemical and Industrial Waste for Durable Road Construction.	36	75,000
FRGS/TK04 (03)/1140/2014 (07)	Khairul Anwar Bin Mohamad Said	Khamirul Amin Bin Matori (UPM), Norsuzailina Binti Mohamed Sutan, Ibrahim bin Yakub, Taufiq Yap Yun Hin	Kinetic analysis of heavy metal and bacteria removal using PEI/nano-Ag membrane incorporated with biomass-based Activated Carbon	24	134,300
FRGS/TK01 (01)/1059/2013 (05)	Dr Mohd Danial Bin Ibrahim	Dr Miyanaga Norifumu, Nabilah Ibrahim, Muhd Fadzli Ashari	Investigation of Non-Newtonian and Multiphase Laminar-Turbulent Flow Regime Rheology of Modified Nano-Macro Boundary Surfaces	24	96,850
FRGS/TK03 (01)/1063/2013 (09)	Ir David Bong Boon Liang	Dr Tay Kai Meng, Prof Dr Ir Andrew Ragai Ak Henry Rigit, Dr Khoo Bee Ea	Tuning-Free Spatial Descriptor Model For Image Quality Perception	24	51,000
FRGS/TK04 (01)/1081/2013 (27)	Dr Nicholas Kuan Hoo Tien	Prof Dr Amir Azam Khan	An investigation of the analytical tensile model and mathematical impact response formula for the novel lightweight eco-friendly Pandanus atropacus based composite.	36	74,500
FRGS/TK04 (02)/1082/2013 (28)	Dr Siti Kudnie Sahari	Dr Nursuzailina Mohamed Sutan Prof Burhanudin Yeop Majlis Dr Rohana Sapawi Dr Ibrahim Ahmad Prof Madya Dr Azrul Azlan b. Hamzah	Theoretical Formulation of Interfacial Layer Growth between High-k and Germanium Surface	24	81,000
FRGS/SG02 (01)/1085/2013 (31)	Prof Dr Sinin Hamdan	Prof Madya Dr Hasnzam Ab Wahid Prof Dr Ismail Jusoh	Sound Quality Assessment of Wood	36	112,000
FRGS/TK01 (01)/1136/2014 (03)	Dr Shahrol Mohamaddan	Annisa Binti Jamali, Siti Zawiah Bt Md Dawal, Ahmad Hata Rasit, Mohd Syahmi Bin Jamaludin, Noor Aliah Binti Abdul Majid	Investigation of the Required Parameters for Club Foot Treatment Based On Non-Invasive Medical Approach	24	91,400
FRGS/TK04 (02)/1138/2014 (05)	Ibrahim bin Yakub	Dr Norsuzailina Binti Mohamed Sutan, Taufiq Yap Yun Hin, Khairul Anwar Bin Mohamad Said	An investigation on agro-waste based Selective Catalytic Reduction (SCR) catalyst in a denitrification of biomass-combustion flue gas	36	126,200
FRGS/TK02 (01)/1211/2014 (12)	Dr Gaddaffi Bin Ismail	Anissa Jamali, Iskanda Openg (UiTM), Dr Alik Duju (Sarawak Forestry Corporation)	Establishment of actual strength group and utilization of modified of Acacia mangium Timber of Sarawak	24	100,000
FRGS/TK03 (02)/1212/2014 (13)	Dr Rohana Sapawi	Dr. Siti Kudnie Sahari, Dyg Nur Salmi Dharmiza Awg Salleh, Dr Sohiful Anuar b. Zainol Murad	Mathematical Modeling of Minima Phase Nonlinearity CMOS Power Amplifier for Ultra Wideband Communication	24	121,000

FRGS/SG06 (02)/1287/2015(04)	Dr Muhammad Kashif	Prof Uda Hashim (UniMAP); Dr M. Eaqub Ali (UM); Prof Madya Dr Zainab Ngaini (UNIMAS); Prof Mohamad Rosup Bin Mahmood (UiTM, Shah Alam); Dr Siti Kudnie Sahari (UNIMAS)	Synthesis and characterization of Graphene Oxide via Hummers' Method As a Hole Transport Layer on Azo-Kojic Compound or Organic Photovoltaics (OPVs) Applications	24	138,200
FRGS/TK04 (06)/1304/2015/(23)	Dr Shafrida Sahrani	Dr Kismet Anak Hong Ping, Dr Dayang Azra Awg Mat, Dr Norsuzailina Mohamed Sutan, Prof Dr Idnin Pasya Ibrahim	Development of Time Domain Inverse Scattering Algorithm for the Detection and Imaging of Buried Objects.	24	68,200
FRGS/1/2015/TK01/UNIMAS/02/2	Dr Alsidqi Hasan	Dr Abdul Aziz (UniMAP) AP Dr Siti Noor Linda Taib, Dr Norsuzailina Binti Mohamed Sutan, Fauzan Bin Sahdi, Andries Fourie, University of Western Australia	Mathematical formulation of factors affecting total stress propagation anomaly in cemented slurry deposition within narrow walls	24	75,500
FRGS/1/2015/TK02/UNIMAS/03/1	Noraziah binti Abdul Wahab	Dr Shanti Faridah Salleh, Dr Ivy Tan Ai Wei, Nazeri Abdul Rahman, Mohd Farid Atan	Phytoremediation Mechanism Towards Ammoniacal Nitrogen Reduction in Industrial Effluent	36	128,000
FRGS/1/2015/TK02/UNIMAS/01/1	Prof. Ir Dr Andrew Ragai Henry Rigit	Assoc. Prof. Dr Khairuddin Sanauallah, Assoc. Prof. Dr. Hayder A. Abdulbari (UniMAP) Ir. Dr. Mohd Danial Bin Ibrahim Dr. Lim Soh Fong	Modeling transport processes of microscale non-thermal plasma discharge in liquids applicable to long chain crude oil molecules cracking	24	124,000
FRGS/1/2015/SG06/UNIMAS/03/1	Nur Syuhada bt Ahmad Zaui	Dr Rubiyah Bains, Dr Md Rezaur Rahman, Prof. Dr Sinin Hamdan and Dr Norsuzailina bt Mohamed Sutan	Influence of Chemical Treatment on the Physicochemical Properties of Aluminium Dross in Industrial Applications	24	94,200
FRGS/TK02 (04)/1302/2015(21)	AP Dr Rubiyah Bains	Prof Dr Mohd Omar Abdullah, Nur Syuhada Ahmad Zaui, Dr Md Rezaur Rahman, Noraziah Abdul Wahab, Norlisa Mill,	Study of drying characteristics for lemantak (Sarawak sago starch)	36	104,550
FRGS/1/2015/TK01/UNIMAS/02/03	Dr Fauzan bin Sahdi	Dr Alsidqi Hasan, AP Dr Siti Noor Linda Taib, Dr Norazzlina M. Sa'don, Dr Noel Boylan (Norwegian Geotechnical Institute (NGI), Prof. Dr. Bujang Bin Kim Huat (UPM)	Laboratory Modelling of The Rate Dependent Behaviour of Penetrometers For Improved Geotechnical Characterisation of Peat	36	98,500

RACE						
Grant No	Project Leader	Co-Researcher	Collaborative RU	Title	Duration (Months)	Budget (RM)
RACE/c(1)/890/2012 (08)	Prof Madya Dr Khairuddin Sanauallah	Dr Lim Soh Fong(Unimas) Prof Ir Dr Mohd Sobri Takrif (UKM) Dr Hayder A Abdulbari (UMP) Ir Zulkifli Hassan (UPM)	Prof Ir Dr Mohd Sobri Takrif (UKM)	Super-sonic Gasses injection into a pool of water. CDF validation & modelling of mixing and condensation	36	40,000.00
RACE/c(1)/1108/2014 (16)	Dr Norsuzailina Mohamed Sutan	Dato Ir Dr Mohd Saleh Jaafar (UPM) Dr Khamirul Amin Matori (UPM) Ibrahim Yakub (UNIMAS)	Dato Ir Dr Mohd Saleh Jaafar (UPM)	Characterizations and morphology of Tobermorite and Jennite like Calcium Silicate Hydrate (C-S-H) during hydration of Nano Pozzolan Modified Binder (NPMB)	24	45,000.00
RACE/c(2)/1109/2014 (17)	Ir Dr David Bong Boon Liang	Prof Dr Nor Ashidi Mat Isa (USM) Dr Khoo Bee Ee (USM)	Prof Dr Nor Ashidi Mat Isa (USM) Dr Khoo Bee Ee (USM)	Blind-PSNR Model For No-Reference Image Quality Assessment	24	50,000.00
RACE/c(3)/1110/2014 (18)	Dr Tay Kai Meng	Prof Dr Lim Chee Peng (USM) Nicholas Kuan Hoo Tien (UNIMAS) Dyg Nur Salmi Dharmiza Awg Salleh (UNIMAS) Hazmi Hijazi Abdul Halim (UNIMAS)	Prof Dr Lim Chee Peng (USM)	A novel Interval Type-2 Single-Input-Rule-Modules Connected Fuzzy Inference System: Theoretical Analysis, Extensions and Practical Applications	36	50,000.00
RACE/c(1)/1252/2015 (08)	Ir. Dr. Ting Sim Nee	Prof Madya Dr. Razali Abdul Hamid (UTM), Dr Tay Kai Meng (UNIMAS)	Prof Madya Dr. Razali Abdul Hamid (UTM),	A Theoretical and Mathematical Formulation for Qualitative and Quantitative Evaluation of Engineering Procurement Contractual Documents, Specifically for Malaysian Construction Industry	24	46,600.00

RAGS					
Grant No	Project Leader	Co-Researcher	Title	Duration (Months)	Budget (RM)
RAGS/TK01 (1)/1050/2013 (17)	Dr Shahrol Mohamaddan	Prof. Dr Mohamad Omar Abdullah Ervina Junaidi, Noor Aliah Bt Abdul Majid, Dr Helmy Bin Hazmi, Mohd Fareez Edzuan Bin Abdullah, Mohd Syahmi bin Jamaludin	Parametric Study on Rehabilitation Robot of Upper Limb Impairment for Domestic Setting	24	65,000.00
RAGS/TK02 (1)/1051/2013 (18)	Abdul Hafiz Abdul Karim	Dr Azham Zulkharnain Muhammad Fadzli Ashari Dr Shafrida Sahrani	Automated Sorting System with Image Processing for Colony Enumeration System	24	51,900.00
RAGS/TK04 (1)/1052/2013 (19)	Mohd Syahmi Jamaluddin	Prof Dr Amir Azam Khan Dr Azham Zulkharnain Noor Aliah Abdul Majid Mohd Fareez Edzuan Bin Abdullah Anissa Jamali	Mechanical Properties of Novel Hot Press Glycidyl Methacrylate/Sago Biomass Biocomposite	24	51,000.00
RAGS/TK06 (1)/1184/2014 (07)	Hishammudin Afifi bin Huspi	Mohd Azrin Mohd Said AP Dr Syed Termizi Syed Shazali Ahmad Adzlan Fadzil Khairi	Study and Improvement of Liquid Fueled Pulse Detonation Engine using Pre-heated Mixing Chamber	24	69,000.00
RAGS/1/2015/TK0/UNIMAS/03/2	Abang Mohd Aizzuddin bin Abang Mohtar	Adrus bin Mohd Tazudin, Azfar Satari Abdullah	Investigation of Machinery Faults through Vibration Analysis using Modular Vibration Test Rig	24	77,000.00
RAGS/1/2015/TK0/UNIMAS/02/1	Dr Mah You Seng	Dr Charles Bong Hin Joo Prof Dr Md Abdul Mannan En Mohd Syahmi bin Jamaludin	Fundamental Flow Characteristics of Individual Lot Stormwater Detention Underneath Residential Car Porch	24	70,000.00
RAGS/1/2015/TK0/UNIMAS/03/3	Mohd Syazwan Zafwan bin Mohamad Suffian	Dr Shahrol Mohammadan, Nur Alia Athirah Binti Hj Mohtadzar	Investigation on Vibration Characteristics of Keropok Keping Drying Machine	24	67,000.00
RAGS/1/2015/TK0/UNIMAS/03/1	Nazreen bt Junaidi	Mohd Syahmi Bin Jamaludin, Dr Ana Sakura Binti Zainal Abidin, Nurul 'Izzati Hashim	Investigation of Automated Cooling System for Kek Lapis Production Line	24	75,250.00

SGS					
Grant No	Project Leader	Co-Researcher	Title	Duration (Months)	Budget (RM)
F02(S164)/1197/2015 (01)	Dr Ana Sakura Zainal Abidin	Annisa Jamali, Dr Shahrol Mohammadan, Rasli Muslimen, Mohd Syahmi Jamaludin, Muhd Fadzli Ashari	Development of in-pipe robot for piping operations	24	25,000.00
F02(S165)/1198/2015 (08)	Dr Fauzan Sahdi	PM Dr Ir Siti Noor Linda Taib	Study on Strength and Compressibility of Selected Sarawak Peat Soil	24	25,000.00
F02(S166)/1218/2015 (03)	Sh Masniah Wan Masra	PM Dr Mohd Saufee Muhammad PM Dr Rahardjo Darmanto Djojodibroto, Dr Rohana Sapawi	Design and Development of Digital Index Quantitator (DIQ) for Identification of finger Clubbing	24	25,000.00
02(S140)/1117/2014 (05)	Dr Shafrida Sahrani	Dr Kismet Ak Hong Ping	Numerical Technique for Solving Electromagnetics Scattering Problems in Moving Boundaries and Its Application to Nanoelectrics	12	9,986.00
F02(S147)/1127/2014 (12)	Dr Mah You Seng	Nor Azalina Rosli, Prof Dr Frederick Josep Putuhena	Creating Multi-Purpose Road Pavement	24	25,000.00
F02(S149)/1129/2014 (14)	Dr Charles Bong Hin Joo	Prof Ir Dr Frederick Josep Putuhena	Effect of Sediment Deposition Thickness on Incipient Motion in Rigid Boundary Channel	24	25,000.00
F02(S153)/1154/2014 (18)	Dr Nordiana Rajae	Prof Madya Dr Awang Ahmad Sallehin Awang Husaini, Dr Azham Zulkharnain	Design and Synthesis of DNA Sequences for Solving Problems with DNA Computing	36	25,000.00
F02(S173)/1275/2015 (10)	Dr. Muhammad Kashif	Prof. Dr. Amir Azam Khan, Dr. Siti Kudnie Sahari	Study on the Effect of Deposition Temperature on Structural, Morphological and Electro-Optical Properties of Gallium (Ga) doped Zinc Oxide (ZnO) Nanostructures produced through Spray Pyrolysis Technique	23	23,500.00
F02(S174)/1276/2015 (11)	Ir Dr Prashobh Kumar Karunakaran	AP Dr Hushairi Zen, Dr Siti Kudnie, Nazreen Junaidi, Shirley Rufus, Dr Lakshmanan a/I Gurusamy	Determination of the Diameter of Carbon Steel Pipes which will Provide a Safe Clearance Point (Point of No Eddy Current) around Electricity Carrying Cables suspended Within Them with Spaced Insulators	24	25,000.00



OSAKA Gas Grants (2015)				
Project Leader	Co-Researcher	Title	Duration (Months)	Budget (RM)
Dr Alsidqi Hasan	Dr Fauzan b Sahdi	Environmentally Sustainable Residue Storage Facility (RSF) of Rare Earth Elements Processing Plant: Assessing Strength Suitability of Dihydrate Calcium Sulfate to be used for RSF	12	3000.00
Nazreen bt Junaidi	Dr Shahrol b Mohamaddan Nurul Izzati bt Hashim Nur Alia Athirah Mohtadzar Shirley ak Rufus	Design and Implementation of Remote Monitoring and Controlling System Using Smartphone	12	4500.00
Puan Norlisa bt Mili	AP Dr Rubiyah Hj Bains Nur Syuhada bt Ahmad Zauzi	Evaluation of factors affecting esterification process : conversion of waste cooking oil to biodiesel	12	4500.00
Cik Nur Alia Athirah Mohtadzar	AP Dr Hushairi Zen Dr Shahrol b Mohamaddan	Development of A Real-time Remote Monitoring System using Wireless Body Network System	12	4000.00
Dr Mahshuri Yusof	Jethro Ak Henry Adam Prof Madya Dr Siti Noor Linda Taib Dr Marini bt Sawawi	Mechanical Properties Of Clam Shell Powder-Filled Polymer Matrix Composites	12	3000.00
Mohamad Syazwan Zafwan b Mohamad Suffian	Prof Dr Amir Azam Khan Dr Shahrol b Mohamaddan	Effect of Thermal perturbation on a biodegradable polymer material tensile test response.	12	4500.00
Hazmi Hijazi b Abd Halim	Mohd Syahmi b Jamaludin Abdul Hafiz Abdul Karim Abg Mohd Aizuddin b Abg Mohd Mohtar	Utilization of a Low Cost Raspberry-Pi based Fast Charger for Lithium-Ion Mobile Phone Charging Station at Faculty of Engineering, UNIMAS	12	4500.00
Mohd Syahmi b Jamaludin	Dr Shahrol b Mohamaddan Hazmi Hijazi b Abd Halim Abdul Hafiz Abdul Karim Ahmad Adzlan Fadzli b Khairi	Utilization Arduino in Laundry Robot for the Impaired and Disabled	12	4500.00
Noraziah bt Abdul Wahab	Dr Shanti Faridah Salleh Dr Ivy Tan Ai Wei	Ammoniacal nitrogen reduction in industrial effluent discharge using phytoremediation technology	12	5000.00
Dr Marini bt Sawawi	Dr Mahshuri Yusof Dr Magdalene ak Andrew Munot Dr Siti Kudnie Sahari	Investigation of the rise husk particleboard properties	12	3000.00
Dr Rohana bt Sapawi	Dr Siti Kudnie Sahari Sharifah Masnich Wan Masra Nazreen bt Junaidi Kuryati bt Kipli	Low Power CMOS Power Amplifier for WiMax Application	12	5000.00
Abg Mohd Aizuddin b Abg Mohd Mohtar	Dr Shahrol b Mohamaddan Mohd Syahmi b Jamaludin Hazmi Hijazi b Abd Halim Adrus bin Mohamad Tazuddin	Development Of a Semi Autonomous Unmanned Aerial Vehicle (UAV) For Environmental Monitoring Applications	12	4500.00
Dr Ir Prashobh Karunakaran	-	Switch gear switching safety device	12	3000.00

DPP					
Grant No	Project Leader	Co-Researcher	Title	Duration (Months)	Budget (RM)
F02(DPP15) /1242/ 2014(15)	Prof Dr Amir Azam Khan	PM Dr Abdullah Yassin, PM Dr Faiz Ahmad, Wan Farhana Mohamad	Optimization of the Sintering Parameters of Ni/Cr - MoS <sub>2</sub> Self Lubricating Metal Ceramic Composites produced by Powder Metallurgy process	24	10,000
F02(DPP16) /1172/ 2014(16)	Prof Madya Dr Al-Khalid Othman	AP Dr Hushairi Zen, Mohd Azlan Bin Ismail	Steady-state Numerical Prediction of Radial Flow Centrifugal Pump Running in Turbine Mode	12	10,000
F02(DPP20) /1188/ 2014(20)	Prof Dr Mohammad Omar Abdullah	Prof Madya Dr Cirilo Nolascohopolito, Tan Yie Hua	Biodiesel production from waste oil, chemical characterization and effect of biodiesel-H <sub>2</sub> O emulsion on a small portable diesel generator system	36	10,000

DPP					
Grant No	Project Leader	Co-Researcher	Title	Duration (Months)	Budget (RM)
F02(DPP29) /1244(a)/2015(04)	Prof Dr Mohamad Omar Abdullah	Tee Pei Fang	A Combined Microbial Fuel Cell and Adsorption System for Bioenergy Production and Wastewater Treatment	36	10,000
F02(DPP30) /1245/2015 (05)	Prof Sinin Hamdan	Liew Fui Kiew	Physico-Mechanical Properties of Tin Oxide Nanoparticles modified Jute-bamboo fiber composites	36	10,000
F02(DPP31) /1246/2015 (06)	Prof Dr Md. Abdul Mannan	Lee Shyue Loeng	Enhanced Service Life of Flexible Pavement-Surface Coated with Fibres-Mixed Resin (FMR)	36	9,898
F02(DPP32) /1247/2015 (07)	Prof Dr Md. Abdul Mannan	Lau Pei Ching	Performance of Lightweight Aggregate using Sewage Sludge and Oil Palm Boiler Waste	36	10,000
F02(DPP33) /1248/2015 (08)	Prof Dr Md. Abdul Mannan	Lim Hung Ling	Structural Performance of Precast Honeycomb Pavement	36	10,000
F02(DPP34) /1249/2015 (09)	Dr Md. Rezaur Rahman	Josephine Lai Chang Hui	Polymer Nanotechnology for Biomedical Application	36	10,000
F02(DPP39) /1259/2015 (14)	Prof Madya Dr Azhaili Baharun	Muhammad Syukri Imran	Night Cooled Water for Radiant Cooling in Malaysian Building	36	10,000
F02(DPP40) /1260/2015 (15)	Prof Madya Dr Abu Saleh	Prof Dr Sinin Hamdan Dr Md Rezaur Rahman Amaranadha Reddy Manchuri	An Investigation of Novel Heterogeneous Nanocatalyst for Biodiesel Production from Jatropha Oil	36	10,000
F02(DPP45) /1265/2015 (20)	Dr Norsuzailina Mohamed Sutan	Prof Dr Amir Azam Khan Ibrahim Yakub Khairul Anwar Mohd Said	Micrstructural Investigations on Potential Pozzolanicity of Petrochemical Spent Catalyst Composite Binder	24	10,000
F02(DPP47) /1271/2015 (22)	Dr. Leonard Lim Lik Pueh	Dr Ivy Tan Ai Wei, Karlvin Jungan	Sustainable Water Purification and Soil Conditioner for Communities Living in Remote Area using Locally Synthesized Biochar	36	10,000
F02(DPP50) /1276/2015 (25)	Prof. Dr Amir Azam Khan	Prof. Ir Dr. Andrew Ragai Henry Rigit, Prof. Dr Pang Suh Cem, Chung Ping Ping	Synthesis and Characterization of New Hybrid Coatings Through Sol-Gel Process with variable Organic and Oxide Phase	36	10,000

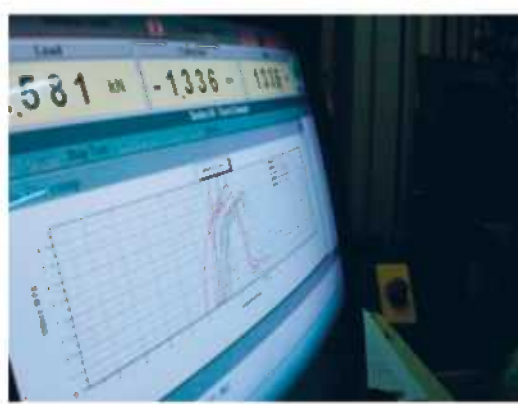
PRGS					
Grant No	Project Leader	Co-Researcher	Title	Duration (Months)	Budget (RM)
PRGS/TK01/ (01)1167/ 2014 (01)	Dr Shahrol Mohammadan	Annisa Binti Jamali Khairul Aidil Azlin Abd Rahman Helmy Hazami Mohd Syahmi Jamaludin Noor Aliah Abdul Majid	Development of Finger Rehabilitation Device for Post Stroke Patient	24	190,000

## EXTENDED ABSTRACTS

## Establishment of Actual Strength Group and Utilization of Modified of Acacia Mangium Timber of Sarawak

Gaddafi Bin Ismaili  
Email: igaddafi@unimas.my

Heavy and medium hardwood have no longer sustained to the market demand. Since its alarm, alternative light hardwood has drawn many attentions of researchers and had identified *Acacia mangium* as potential species. The seriousness had conveyed to an effort by planting *Acacia mangium* at largest scale of forest plantations. However, the result was tremendously unpredictable when *Acacia mangium* is found to be problematic in timber industry due to its root rot and phyllode rust diseases. Thus, these contributed the loss of structural mechanical and poor recovery of high-value products during processing. Initially, the forest study was carried out to modified *Acacia mangium*, which is to enhance and improve its growing rate and genetic properties. However, the engineering properties which refer to physical and mechanical properties were still not thoroughly explored by the researchers. This modified *Acacia mangium* species was known as *Acacia* hybrid. The proposes *Acacia mangium* and modified version of *Acacia mangium* will incorporate with a suitable engineering properties determination tests. This species will be analyzed and compared to a wide range of study which varies in terms of mechanical and physical properties of the species. Then the third proposal uses the mechanical and physical properties data to develop strength group classification. However, the result from this study will not be necessarily can be applied in real engineering application due to various factors after production. In real application the air-dry condition of wood capable of absorb water from the atmosphere thus affect its strength properties. Therefore, the study on the behaviour at real application will be carried out to determine the exact or actual strength of the wood. In this study, systematic information on engineering properties of new fast-grown *Acacia* variants will be presented in relation to tree age, effect of drying and compare them with general utility grade timber.



## Blind-PSNR Model for No-Reference Image Quality Assessment



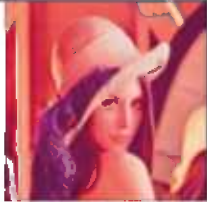


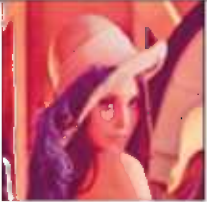
David B.L. Bong and B.E. Khoo  
Email: bbldavid@unimas.my

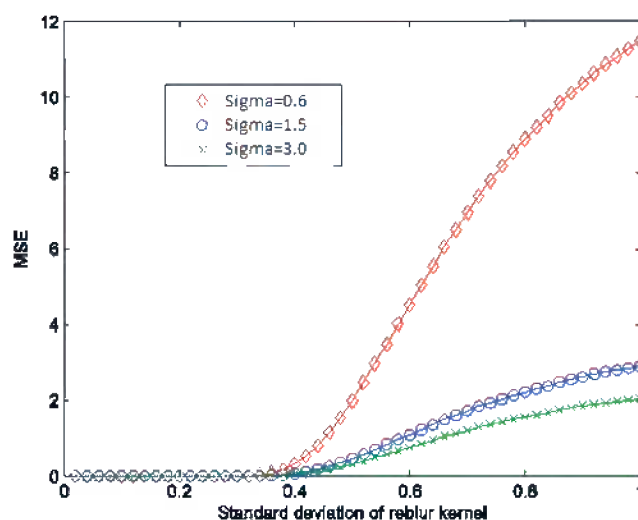
Peak signal-to-noise ratio (PSNR) is a popular method for measuring signal fidelity due to its simplicity and clear interpretation. It compares the reference and noisy signals, and uses a logarithmic scale to produce a difference score in decibels. For decades, this simple measure has been widely used in the quality assessment of signals and images due to its practicality, simplicity and clear physical meaning. However, for image quality assessment, its application is constrained by the use of reference and the correlation performance. PSNR method requires the availability of a reference image. This has undermined the usage of PSNR in no-reference (NR) or blind systems. Furthermore, image assessment by using PSNR does not produce good correlation results with respect to human perception of image quality. This has prompted the proposals of numerous methods which claim to be closely similar to human vision system (HVS) and able to yield high correlation with the perceived quality by human observers. In this research, distortion-specific agents would be used to create synthetic noise to replace the reference error for PSNR in NR assessment. The proposed technique has the same attributes of PSNR but is applicable in the NR domain. Experiment results showed that the new blind-PSNR approach achieved high correlation compared with existing methods.

### Acknowledgement

The authors would like to acknowledge Ministry of Education Malaysia for the provision of research grant RACE/c(2)/1109/2013 (17) to facilitate this research.

**Table 1:** PSNR for original and reblur images at different blur severity.

Gaussian blur severity	$\sigma=0.6$	$\sigma=1.5$	$\sigma=3.0$
Original Image	 PSNR=37.10dB	 PSNR=27.87dB	 PSNR=25.34dB
Reblur Image	 PSNR=36.03dB	 PSNR=27.78dB	 PSNR=25.29dB



**Figure 1.** Mean squared errors for reblur images at varying reblur severity

## Mathematical Modeling of Minima Phase Nonlinearity CMOS Power Amplifier for Ultra Wideband Communication

Rohana Sapawi  
Email: srohana@unimas.my

Ultra-wideband power amplifier is the last stage of the transmitter end that is capable of transmitting higher data rate over a wide frequency (3.1-10.6GHz) for short range. The challenge of this line of study is to achieve minimum phase nonlinearity in power amplifier over a wide frequency band. Minimum phase nonlinearity is required so that the output will retain its original identity and the time domain will not become distorted especially for UWB system using impulse signal. Previous works have shown that it is very hard to satisfy the gain, efficiency and wide frequency bandwidth in CMOS power amplifier because it has tendency to deteriorate the phase nonlinearity. The mathematical models that have been established are not suitable for ultra-wideband application in CMOS power amplifier due to the limitation of the bandwidth frequency. This study focuses on investigating the dominant factors influence in achieving minimum phase nonlinearity power amplifier in UWB technology. In order to achieve low phase nonlinearity, adequate and solid understanding is required on important design factors that must be carefully considered, which include operating bandwidth, linearity, gain flatness, and output power. In this research, the derivation of small signal analysis transfer function technique is used to formulate a mathematical model of minimum phase nonlinearity. The technique will be further studied and implemented in circuit topology by using Cadence tool for both circuit and layout simulation to analyze the performance. The experiment results will be compared with theoretical analysis to verify and validate the minimum phase nonlinearity of power amplifier. The novelty of this research lies on a new mathematical modelling of minimum phase nonlinearity for UWB technology. From the mathematical modelling, key performance factor of minimum phase nonlinearity can be applied to facilitate other researchers working in the area of power amplifier circuit design.

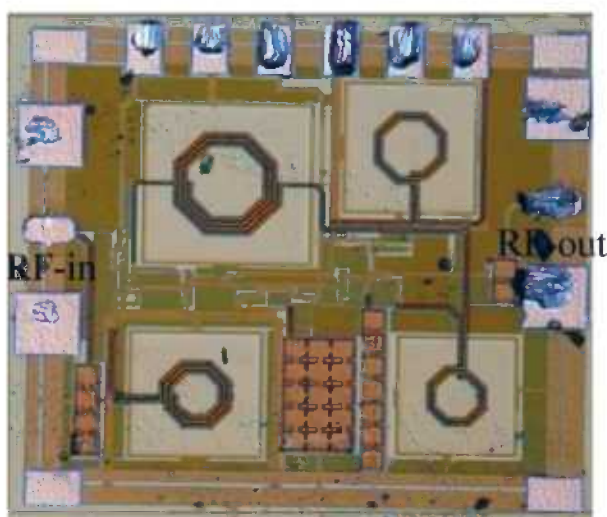


Figure 1. Chip micrograph of PA

## Development of Finger Rehabilitation Device for Post Stroke Patient

Shahrol Mohamaddan, Khairul Aidil Azlin Abd Rahman, Helmy Hazmi, Annisa Jamali, Mohd Syahmi  
Jamaludin and Noor Aliah Abdul Majid  
Email: mshahrol@unimas.my

Fingers are important part of human body. Major daily life activities such as cooking, writing etc. are performed by using fingers. Stroke, the third largest cause of death in Malaysia is example of problem that can cause the fingers malfunction. There are about 17,909 stroke patients reported in year 2005 where the figure is expected to exceed 25,000 by year 2020. In order to have chance for recovery, stroke patient need to perform the rehabilitation activities at the early stage of stroke. However, since the number of therapist is inadequate, it is not easy for the patients to have the rehabilitation period supported by the therapist. In this project, an ergonomics home-based finger rehabilitation device for stroke patient will be developed. The device control and spread the forces from the actuators by using mechanical mechanism to perform fingers movement for the

rehabilitation activities. Ergonomics software will be used to analyze the fingers (movement, rotation, strength etc.) based on the input from doctors or therapist. Emphasize of the new device is on the novel extension and flexion mechanism with intelligent control system. It is based on the two prototypes previously developed for this research as shown in Figure 1. In this project, the focus is on the active system device that is capable to actuate the fingers with various types of movement. It is considered as the pre-treatment device that will be used regularly in specified period of time to support the fingers massage. It is different from the well marketable passive system such as 'the cone staking cones' or 'the arm skate' that is only be used after the nerve or motor system is partially recovered through the fingers massage.

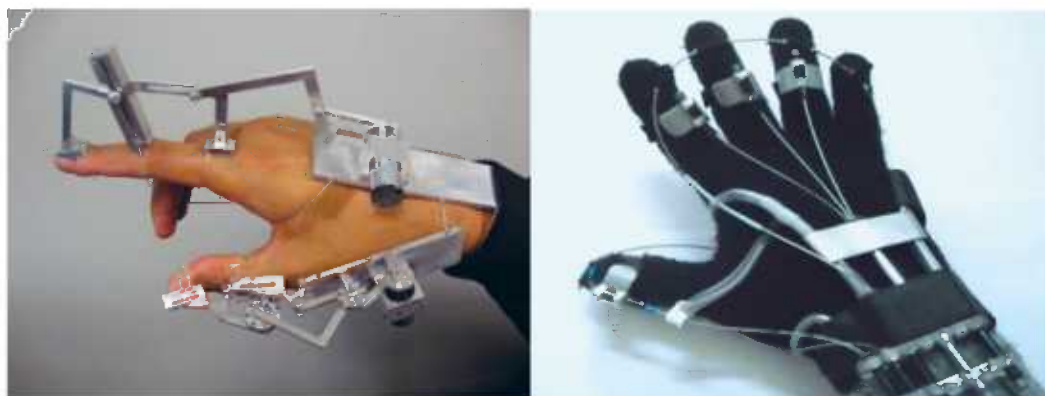


Figure 1: First (left) and second (right) prototype of finger rehabilitation device

## Study and Improvement of Liquid Fueled Pulse Detonation Engine using Pre-Heated Mixing Chamber

<sup>1</sup>Hishammudin Afifi, Syed Tarmizi, Mohd Azrin, Ahmad Adzlan Fadzi  
Email: [1hhafifi@unimas.my](mailto:1hhafifi@unimas.my)

Pulse Detonation Engines (PDEs) have shown great potential in converting the chemical energy content of combustible mixtures by using detonation process. Detonation is a reactive combustion wave that propagated supersonically. PDE has a simpler and lighter design in comparison to the current conventional propulsion system. For a PDE to operate, initially it requires the combustible mixture to be filled completely in the combustion tube. Then the combustible mixtures need to be ignited by using a sufficient energy-initiating device. Detonation wave created will generate a sudden high-pressure rise. These will be accompanied by strong shock wave that propagates through the tube open end. In this project, a pre-heated mixing chamber will be utilized to improve the liquid Fueled PDE. The expected outcome is an extensive understanding of the effect of pre-heated liquid fuel-air mixing process on the operation of PDE. Simulation study and experimental investigation will be performed to investigate the system. Figure 1 shows simulation study for pre-heated mixing chamber and it shows that liquid fuel-air mixture flow in designated mixing chamber moves smoothly. However, the design can be improve by introducing diamond shape mixing chamber.

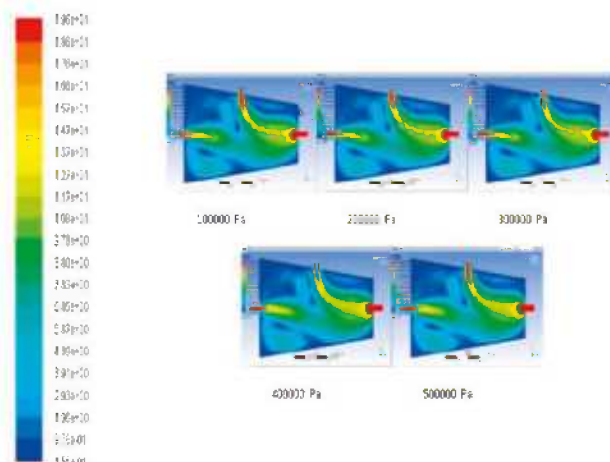


Figure 1. Velocity Contour in CFD Simulation for Various Inlet Pressure

## Determining Potential of Subcooling to Attenuate Hydrodynamic Instabilities for Steam-Water Two Phase Flows

<sup>1</sup>Khairuddin Sanaullah, Afrasyab Khan  
Email: [1skhairuddin@unimas.my](mailto:1skhairuddin@unimas.my)

Hydrodynamic instabilities, occurring at the interface of steam and water, play an important role in the design of systems stated above, when they are operated at high temperature and pressure. The creation and propagation of Kelvin Helmholtz (KH) instabilities has been experimentally investigated here for the first time in condensable fluids i.e. steam & water. Here the instabilities occurred in the close vicinity of the steam-water interface, were attributed mainly to the temperature fluctuations of micro scale or less. Supersonic steam was injected inside the subcooled water at inlet pressure varying from 1.5 bars to 3.0 bars by using a specially designed supersonic nozzle, whereas temperature of water inside the vessel was raised from 300 C to 600C at an increment of 50 each. Kelvin Helmholtz instabilities in the form of minor as well as amplified transient temperature fluctuations were recorded using a specially designed apparatus that uses LM35 sensors & data acquisition system. Hydrodynamic Instabilities are regarded as important but undesirable occurrences for the systems used in process industries, which involve steam. Subcooling has more vital effect on the attenuation of Kelvin-Helmholtz hydrodynamic instabilities than the steam inlet pressure. Along axial direction subcooling is more effective than decrease in inlet steam pressure by 37%, whereas along radial direction subcooling is more effective than decrease in inlet steam pressure by 5%. However, the gravity and viscosity act as supportive factors for dumping of Kelvin-Helmholtz hydrodynamic instabilities. In the current study an extent of deformation in the accompanying structure due to the pressure stresses induced by the hydrodynamic instabilities was determined using one way Fluid Structure Interaction (FSI) analysis in Ansys and showed further pronounced deformation due to the hydrodynamic instabilities observed at the low pressure gradient. It was also found that on real scale, micro level deformation occurs inside the structure.

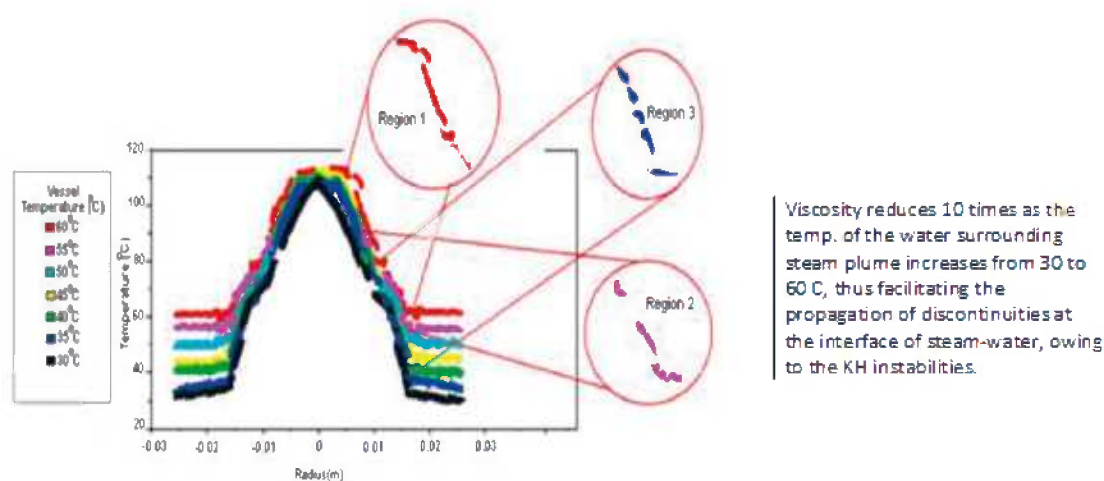


Figure 1. Temperature Fluctuation at different water temperatures.

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## RESEARCH NEWS

### ESTABLISHMENT OF INDUSTRIAL LABORATORY AT DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING IN COLLABORATION WITH SACOFA SDN BHD



The Telecommunication lab, which was completed in April, provides highly skilled human capital for the telecommunication industry and also acts to support the growing demand of telecommunication industry globally. The CEO of Sacofa SDN BHD, Mr Sudamoto Osman hopes that the number of towers with fibre-optic connections will grow throughout the state expanding to Lawas and Limbang by this year. More than 500 towers have already been installed to improve the quality of telecommunication in the state. He said the upgrading of these towers would enable high capacity bandwidth which will allow fast network services such as 4G and Long-Term Evolution (LTE) to all service providers. International Gateways are being explored through neighboring countries like Brunei, Indonesia and Singapore.

He also said the company would expect better services when there is a collaboration of structural studies between Sacofa and Unimas. Sudamoto said Unimas-Sacofa Telecommunication Laboratory is the first collaborative arrangement in the field of telecommunication and technology. To date, Sacofa has set up more than 700 towers throughout the state.

UNIMAS has taken initiative to setup industrial labs in partnership with the leading industries which would help train manpower and develop an interface between industry and academia. Faculty of Engineering being avant garde in this field has already signed several MoU's with industry to establish industrial labs at its premises.

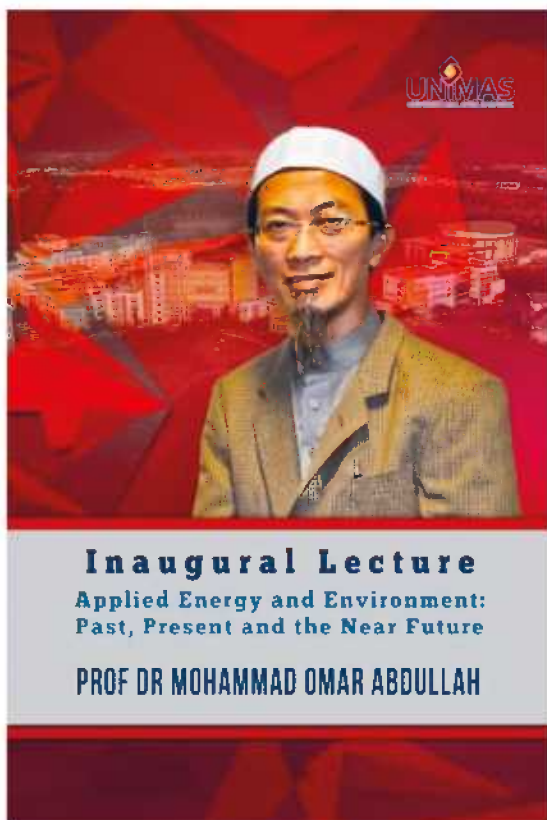
### TALK GIVEN BY DR PIERRE BARROY, UNIVERSITY OF PICARDIE JULES VERNE, FRANCE, 27<sup>TH</sup> JULY 2015



Dr Pierre Barroy from University of Picardie Jules Verne, France, visited Faculty of Engineering on the 27<sup>th</sup> July, 2015. His visit was a followup to a meeting and one-to-one dialogue which took place in Paris on the occasion of Malaysia day held on 21 May 2015. On this occasion several French and Malaysian Universities were invited at "La Maison des Métallos, Paris" organized by Campus France under the Ministry of Higher Education, Paris. A meeting between Dr Pierre Barroy and UNIMAS delegation headed by Prof. Dato' Dr Muhamad Kadim Suidi, Vice Chancellor UNIMAS, was held during this event. Dr Pierre Barroy was invited to visit UNIMAS to explore collaboration possibilities between the two universities. On the 27<sup>th</sup> July, Dr Pierre Barroy gave a talk to the Faculty and Post Graduate students of Engineering on the topic, "Materials for Renewable Energy: Opportunities for collaboration between UNIMAS and University of Picardie Jules Verne". The talk was attended by a number of interested Faculty members and PG students. The talk was followed by an extensive Q & A session where Dr Pierre Barroy explained several of the themes elaborated during his talk. Interested faculty members can contact him directly for further queries at the following email: [pierre.barroy@u-picardie.fr](mailto:pierre.barroy@u-picardie.fr)



## INAUGURAL LECTURE BY PROFESSOR MOHAMMAD OMAR ABDULLAH 'APPLIED ENERGY AND ENVIRONMENT: PAST, PRESENT AND THE NEAR FUTURE'



The Faculty of Engineering at Universiti Malaysia Sarawak proudly hosted the Inaugural Lecture by Professor Mohammad Omar Abdullah, an established scholar and a prestigious researcher in the field. Mohammad Omar is a leading academic at the university whose renowned expertise in Engineering has been recognized locally and internationally. His Inaugural lecture titled, '**Applied Energy and Environment: Past, Present and the Near Future**', offered an overview of Applied Energy. The lecture exposed on his extensive experience in conducting and evaluating research. The lecture highlighted the history and current developments in Applied Energy, and how it will influence energy sustainability in the future.

The lecture was organized on 17<sup>th</sup> June, 2015 at the PITAS main auditorium and was attended by a large number of Faculty and staff. The Chief Guest on the Occasion was YBhg Prof. Dato' Dr Mohamad Kadim bin Suaidi, VC UNIMAS. The inaugural lecture in UNIMAS is a platform to promote and celebrate the academic reputation of professorial staff. It is a significant contribution to the University's role within the wider community by providing a public forum to present current research and intellectual discoveries at University.

## UNIKL AND UNIMAS SIGNED MOU TO EXPAND COLLABORATION



Universiti Kuala Lumpur (UniKL) and Universiti Malaysia Sarawak (UNIMAS) signed a Memorandum of Understanding (MoU) on June 11, 2015, that will see both institutions collaborate on research, education and training.

The agreement was signed by YBhg Professor Dato' Dr. Mohamad Kadim Bin Suaidi, Vice Chancellor of UNIMAS and YBhg Professor Dato' Dr. Mazliham Bin Mohd Su'ud, President and Chief Executive Officer of UniKL, at Rumah University, UNIMAS. The event was also witnessed by the Chairman of UniKL, Datuk Dr. Adham Baba.

The agreement will see cooperation across several fields including joint research activities, structured discussion around education and research challenges as well as joint supervision of undergraduate and postgraduate students. The universities will exchange teaching materials, published research and scientific data, in addition to jointly funded research proposals with a view to promote a stronger scientific research culture as well as efficient technological business venture.

The agreement was also a continuation of research collaboration efforts already established between UNIMAS and UniKL in the field of renewable energy. UniKL through the Sustainable Energy Analysis Research Laboratory headed by Associate Professor Dr. Engku Ahmad Azrulhisham has been working together as collaborative partners with UNIMAS's Centre for Renewable Energy in the rural electrification research funded by the Ministry of Energy, Green Technology and Water (KetTHA) at various locations in Sarawak.

The MoU inked will serve as a stepping stone towards a stronger cooperation in the future between the universities providing platforms for staff and students in exploring opportunities to produce high impact publications, joint research project, organization of joint workshops and training, as well as conferences and visit.

### FINAL YEAR PROJECT SYMPOSIUM 2015



Faculty of Engineering held its Final Year Project Symposium 2015 on the 6 - 8th July 2015.

Final Year Project Symposium is a showcase of the finding of FYP conducted at the Faculty of Engineering. It is an annual event which is open to the industries and public in an effort to promote industrial engagement in the academic program offered by Faculty of Engineering. This symposium was well attended by several local, national and international industries in order to explore research project from four different engineering programs which are Civil, Mechanical and Manufacturing, Electrical and Electronics, Chemical engineering and Energy Sustainability.

### BRIDGING MECHANICAL AND MANUFACTURING ENGINEERING DEPARTMENT, UNIMAS WITH MAZDA JAPAN AND RYOBI LTD THROUGH DRB-HICOM'S NETWORK



The close relationship between universities and industries has never depleted in developed countries. In pursuing it so that UNIMAS is also in line with this goal, Ir Dr Mohd Danial Ibrahim (standing second from left) successfully secured an opportunity to serve as a practical engineer at DRB-HICOM for his industrial attachment. The industrial attachment is a requirement for Professional Interview preparation upon getting his Ir status for academicians. With that given opportunity, Dr Danial managed to gain trust of HICOM Diecasting's CEO, Mr Ainol Azmil Abu Bakar and Casting Engineering Department's Deputy Manager, Mr Rosli Mohamad, to assist HICOM Diecastings in securing the ties between Mazda Japan and the company. The project is to supply Mazda Japan their bracket assembly that is supporting the drive shaft to the engine, a part that is vital in holding the part in place during power transmission from differential gear to tyres of a vehicle. HICOM Diecastings Sdn. Bhd. is a subsidiary of DRB-HICOM Berhad, one of Malaysia's giant corporation in automotive industry. In a recent trip to Mazda Japan's plant in Hiroshima and Houfu, Japan, which was fully financially supported by DRB-HICOM, Dr Danial was exposed to the process of "Bracket Assembly Shaft Mass Readiness (MPR) and Pre-production (PP) Evaluation Meeting and Trial". The visit was largely divided into two teams, one team to Ryobi Limited (one of the leading die casting companies worldwide), and the other team to Mazda Headquarters Plant located in Hiroshima Prefecture, and Mazda Houfu Plant located in Yamaguchi Prefecture. Houfu Plant is about 2 hours ride from Hiroshima Prefecture on a rapid train.

Apart from Mazda, HICOM has a trustworthy history of providing automotive parts for companies such as Ford, Nissan NSK, Triumph, Kawasaki, and Honda. For non-automotive parts, HICOM also provides products to companies such as HekaDental, White Rodgers, Allweiler and Panasonic.

Through the available network between HICOM and UNIMAS, Dr Danial succeeded in providing some platform to bridge these two organizations into a further stage, where the HICOM Diecastings is interested to join the research and development team at UNIMAS through an MoU. The team is scheduled to find solutions, numerically and/or experimentally, in troubleshooting problems available throughout die casting processes. It is also hoped that towards mutual benefits, more collaborative research will continue to be enhanced between these two bodies in the near future.

### VISIT OF INFRA TECH GROUP MALAYSIA TO THE FACULTY OF ENGINEERING





Infra Tech Group Malaysia, an MoU partner of UNIMAS visited the Department of Civil Engineering. on 31 July 2015. Ir Dr Shakor Badaruddin who led the team, gave a short presentation on the company profile, latest technology and civil engineering practices in the field of geotechnical and pavement engineering. He also briefed the department members on the MOU.

## UNIMAS SIGNED MEMORANDUM OF UNDERSTANDING (MOU) WITH UNIVERSITY OF LIMOGES, FRANCE

A Memorandum of Understanding (MoU) was inked between UNIMAS and University of Limoges, France, on the 20th May, 2015. The signing ceremony was held at the French Ministry of Foreign Affairs and International Development in Paris. Prof. Dato' Mohamad Kadim Suaidi, Vice Chancellor UNIMAS and Mr Alain Célérier, Vice President Administration University of Limoges, France, signed on behalf of each University. The occasion was also graced by, notably among others, Dato' Prof. Dr. Asma Binti Ismail, Director General of Higher Education, Ministry of Education, Malaysia and Madame Anne GRILLO, Director of Cultural, Research and University Cooperation, Ministry of Foreign Affairs and International Development, France.



UNIMAS is collaborating with University of Limoges since 2013 under an MoA signed for joint supervision of PhD. A Malaysian student, Dayang Salyani bt Abang Mahmud, is currently enrolled to work on the topic of "Ceramic Electrodes for Low Temperature Solid Oxide Fuel Cells", jointly supervised by Prof. Dr Jean Claude Labbe and Dr Nicolas Glandut from Limoges and Prof. Dr Amir Azam Khan and Dr Magdalene Munof from UNIMAS.

The present MoU, signed for an initial period of 5 years, is expected to enlarge and increase cooperation in mutual fields of interest. After the signing of MoU, Mr Alain Célérier, Vice President University of Limoges disclosed that a high level team from Limoges, including researchers in the fields where Limoges holds an international reputation, would visit UNIMAS by the end of 2015. This team would meet the scientists and post graduate students working in UNIMAS to explore and decide upon joint PhD, faculty mobility and students' exchange mutually agreed between the two Institutions. It is the desire of both UNIMAS and University of Limoges to expand and strengthen this collaboration for the benefit of all stake holders.

## UNIMAS STEM ENGINEERING CONFERENCE (ENCON2015)

Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS) in strategic partnership with Tabung Ekonomi Gagasan Anak Bumiputera Sarawak (TEGAS), organized UNIMAS STEM EnCon2015 from 7th to 9th October 2015, at Four Points Hotel, Kuching. The conference was jointly hosted with Sarawak Education Department and was officiated by YB Datu Haji Len Talif Salleh, Assistant Minister at Chief Ministers Office (Promotion of Technical Education), Chairman of TEGAS. The theme of the conference "Engaging Industries and Society through Innovative Engineering and Technology", was aligned with the mission of the local government and non-government bodies in Malaysia to encourage engineers and practitioners to work hand in hand with academicians and scientists around the world, towards the betterment of Engineering of the country. Among the key focus of the conference was partnership and promotion of science, technology, engineering and mathematics (STEM). Main features of the conference were prominent keynote addresses by Professor Dr Nasruddin Bin Abdul Rahim from University of Malaya and Associate Professor Dr Tan Kay Chen from National University of Singapore.

The conference also featured a STEM forum on Technical and Vocational Education and Training (TVET) to support the development and sustainable workforce for Sarawak. Parallel to the conference event, the exchange of Memorandum of Agreement and Memorandum of Understanding also took place between the Faculty of Engineering and six industries namely Shorefield, One Medicare, X-FAB, SACOFA, Infratech and Elcorp.





### VISIT FROM TELKOM UNIVERSITY BANDUNG INDONESIA

Department of Electronics Engineering UNIMAS received an educational visit from representatives of Telkom University Bandung Indonesia. The half day visit included a tour of electronic engineering laboratories and discussion on collaborations between the Telkom University Bandung and Dept of Electronic Engineering UNIMAS in terms of joint researches, student exchange and joint supervision of postgraduate students.



### VISIT OF ASSOC. PROF. DR CHAN CHEE MING FROM UNIVERSITI TUN HUSSEIN ONN



Prof Madya Dr Chan Chee Meng, of Universiti Tun Hussein Onn visited the department of Civil Engineering on 10 June, 2015 to share, meet and discuss about possible research collaboration. She gave a lecture on "Dredging and Dredged Marine Soils in Malaysia: Green Construction & Reuse Potential".

### MOA SIGNED BETWEEN UNIMAS AND DARMAGA SDN BHD ON WATER DESALINATION



This MoA signed between UNIMAS and Darmaga SDN BHD for selling of Biomass membrane desalination system in Malaysian market would open new avenues for commercialization of locally developed technology. Darmaga SDN BHD is a company located at Kuantan, west Malaysia with its activities in the field of Technology Business. The memorandum was signed by Dato' Prof. Mohamad Kadim Suaidi, Vice Chancellor of UNIMAS and Dato' Ir Che Mat Wanik, Executive Chairman of Darmaga SDN BHD, at UNIMAS Campus on the 13<sup>th</sup> April, 2015. Prof. Dr M Shahidul Islam, a researcher from Faculty of Engineering, has developed Biomas Based Membrane desalination water treatment system which can produce clean water from Sea and River water sources. This cost effective solution has an advantage over other traditional water treatment systems in respect of lower energy consumption, higher productivity and chemical free treatment. Previously two pilot projects based on the same technology developed by Prof. Shahidul Islam have also been successfully commissioned in Malaysia. The first one at Sadong Jaya, Sarawak on 1st February, 2015 and the second one at Kg Lalhoh, Kelantan on 10th March, 2015. The product water of these plants is dedicated for public use. Dato' Prof. Dr. Mohamad Kadim Suaidi, Vice Chancellor, UNIMAS officially opened this facility to Public.

### SCIENTIFIC LECTURES/SEMINARS/KEYNOTES

Prof. Dr Sinin Hamdan from Department of Mechanical and Manufacturing Engineering gave a keynote talk to the 4<sup>th</sup> International Conference on Engineering and Innovative Materials (ICEIM2015) held at Penang Malaysia on the 3<sup>rd</sup> and 4<sup>th</sup> of September, 2015. The Conference was organized under the auspices of the International Academy of Computer Technology. He

gave a talk about the "Wood and Wood Polymer Composites". Prof. Sinin has a large experience of conducting research on wood polymer composites on which he has regularly published and has supervised several Masters and PhD students in this area of Natural Fiber Composites.



Associate Professor Ir Dr Siti Noor Linda Taib was invited as a speaker and delivered a Lecture entitled 'Slope Protection and Management' at a seminar on "Landslide Hazards and Disaster Management" held on the 15th June 2015 at the Executive College, Kuching. The seminar contained 5 CPD Hours and about 30 participants were present during the seminar. This Seminar was organized by KLIUC, IKRAM and Executive College.



She was also invited to speak at a workshop on GUIDELINES FOR CONSTRUCTION ON PEAT AND ORGANIC SOILS IN MALAYSIA organized by CREAM CIDB at Hotel Istana, Kuala Lumpur, on 9th September, 2015. She delivered a talk on 'Soil Investigation and Peat Testing' to the selected audience present at the workshop.



Prof. Dr Amir Azam Khan from Department of Mechanical and Manufacturing Engineering gave a keynote lecture to the 14<sup>th</sup> International Symposium on Advanced Materials held from 12 to 16 October 2015. The title of his talk was "Characterization of Multi-Layer Structure produced through Laser Treatment on the Surface of Porous ZrB<sub>2</sub>-SiC mixed Ceramic Substrates". The conference was attended by more than 250 scientists from 20 different countries. He chaired one of the technical sessions and was given the privilege to preside over the discussion panel on Ceramics Materials and Surface Processing.



Prof Khan delivered a keynote talk on the occasion of National Research and Innovation Conference (NRICon2015). The talk was on the topic of "Sintering of High Performance Ceramics: Present and Future Challenges". The NRICon 2015 was organized by Kuching Polytechnic Sarawak, at Regency Hotel Kuching on 1<sup>st</sup> December, 2015, aimed at transferring advanced knowledge between scientists and Technical and Vocational Education Training (TVET) Centres in Malaysia.

Prof. Dr Abdul Mannan from Department of Civil Engineering presented a Keynote address to the Seminar on Empowering Structural Integrity towards Sustainable Construction. The title of his talk was "Structural Failures due to non-compliance with standards: Case studies in Malaysia". The seminar was organized by CIDB Negeri Sarawak on the 17th August 2015 at Pullman Hotel Kuching.

Dr Idawati Ismail from Department of Civil Engineering, was one of the invited speakers in Geopolymer Seminar (GeoSEM 2015) held at the Hotel Putra Palace, Kangar, Perlis, organized by Centre of Excellence in Geopolymer and Green Technology, Universiti Malaysia Perlis (UniMAP). The Seminar was organized on the 2<sup>nd</sup> of October 2015.



Associate Professor Dr Nasser Rostam Afshar from Department of Civil Engineering conducted a workshop on "Application of Value Engineering in Civil Engineering Projects" at UITM on 31st Jan. 2015. The workshop was organized by the Faculty of Civil Engineering, UITM Sarawak. The workshop was attended in large number by the Staff and students of the Faculty of Civil Engineering

He also conducted a Workshop on "Value Engineering" (Application of Value Engineering in Civil Engineering Projects) at UNIMAS on 9th June 2015. It was organized under the Knowledge Transfer series of workshops, in which staff from Jabatan Kerja Raya (JKR), Water Board Kuching (WBK) and Sarawak Energy Berhad (SEB), participated and obtained firsthand knowledge about Value Engineering.



A workshop on Industrial Methodology was conducted by Prof. Dr Engr M Shahidul Islam, a researcher at the Department of Mechanical and Manufacturing Engineering. This workshop was conducted at Merdeka Palace Hotel, Kuching on 20 and 21 October 2015. Dato' Prof. Dr. Mohamad Kadim Suaidi, Vice Chancellor, UNIMAS opened the workshop. The workshop was attended by participants from Sarawak Hidro SDN BHD power management and engineering staff. The speaker gave an overview of Industrial Applications and usefulness of Research related to Industry. During the course of this workshop, Prof. Shahidul Islam provided an indepth information related to industrial operations research, including problem identification, conceptual and mathematical model building on problem, model testing with piloting for achieving solutions and Model validation. The context of this workshop was very useful in building University Industry relationship on a strong foundation.



Ir Dr. M. Danial Ibrahim from Department of Mechanical and Manufacturing Engineering gave a keynote talk at the International Conference on Mechanical and Automotive Engineering (ICMA 2015), held at the Grand Margherita Hotel, Kuching on 27<sup>th</sup>-28<sup>th</sup> Feb 2015. The Conference was jointly organized by the International Post Graduate Network and ISLAMIC WORLD Network for Environmental Science and

Technology. The Conference was attended by Research Scientists and Post Graduates from within and outside Malaysia. Dr Danial discussed on the topic of "Innovations and Optimizations in Engineering" during his keynote address.

## FACULTY SEMINARS

The Faculty of Engineering organizes seminars given by invited faculty members to share important aspects of their research findings. During 2015 the following seminars were organized:

**Development of slow wave structures for millimeter-wave CMOS application**, given by Dr Dayang Azra Binti Awang Mat on 13, May 2015, Department of Electrical and Electronic Engineering

**Design of the Roller Clamp Robotic Assembly System** given by Dr Ngu Sze Song on 15 October 2015, Department of Electrical and Electronic Engineering

**Introduction to Ansys Fluent**, given by Ir Dr Mohd Danial Ibrahim, on 21 October, 2015, Department of Mechanical and Manufacturing Engineering

**Emulsion Liquid Membrane for Reactive Dye Removal from Aqueous Solution**, given by Norlisa Hj. Milli on 25, November 2015, Department of Chemical Engineering and Energy Sustainability



## TRAININGS ON SCIENTIFIC EQUIPMENT



The training on Hot Press machine was conducted from 8<sup>th</sup> until 9<sup>th</sup> July 2015 at the Workshop, Department of Chemical Engineering and Energy Sustainability. The objective of this training was to teach and train the technical staff on how to handle the machine correctly.

At the Department of Mechanical and Manufacturing Engineering, three trainings were conducted during 2015. These trainings were attended by the relevant Technicians, Post Graduate Students and their supervisors. First training was on Diesel Engine test bed. Siti Fazilah was incharge of the training conducted at the Applied Thermodynamics lab. Another training was conducted on High Energy Planetary Ball Mill. This was under the charge of Mr Sabariman Bakar and conducted at the Mechanical Metallurgy Lab. Last one was on High Temperature Furnace (1700 °C). This furnace is also placed in the Mechanical Metallurgy Lab under the charge of Mr Sabariman Bakar.



## STUDENTS' BEST PAPERS

## Production of Green Biodiesel from Crude Jatropha Oil using Heterogeneous Catalyst: An Optimized Process using Response Surface Methodology (RSM)

AmaraNadha Reddy, Abu Saleh Ahmed, Md. Saiful Islam,  
and Sinin Hamdan

Department of Mechanical Engineering, Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS)  
Email: [hsinin@feng.unimas.my](mailto:hsinin@feng.unimas.my)

Heterogeneous catalysts are promising catalysts for maximum biodiesel yield from transesterification of vegetable oils in two steps. In this work seashells were used as a material source for synthesis of calcium oxide (CaO) heterogeneous catalyst. Calcination- Hydration- calcination method was adopted. Characterization technique FTIR confirmed the presence CaO. A response surface methodology (RSM) based on five-level-two-factor central composite design (CCD) was employed to optimize the transesterification parameters (Catalyst to oil ratio and reaction time) of pretreated CJO to produce optimum Jatropha biodiesel (JB). The suitability of the predicted model was verified through the experiments.

**Keywords:** Biodiesel, Jatropha, Transesterification, Seashells, response surface methodology.

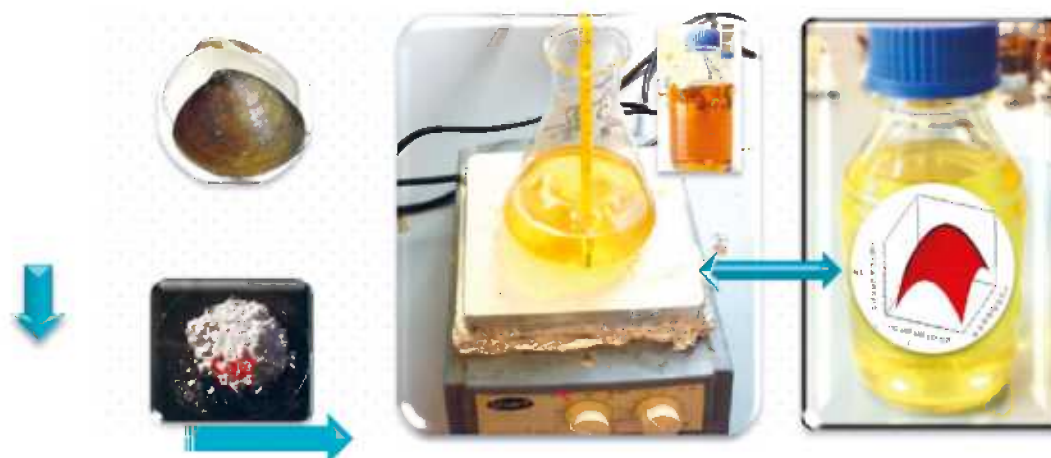


Figure 1. Calcination- Hydration- calcination method

## A New Monotone Interval Fuzzy Inference System with an Application in FMEA for Risk Evaluation and Prioritization

Kerk Yi Wen, Tay Kai Meng

Department of Electrical and Electronics Engineering, Faculty of Engineering, UNIMAS  
Email: [kerkyiwen@hotmail.com](mailto:kerkyiwen@hotmail.com)

The focus of the research is on handling non-monotone information in the modelling process of a multi-input target monotone system. On one hand, monotonicity property is a piece of useful prior (or additional) target information which can be exploited for modelling of a monotone target system. On the other hand, it is difficult to model a monotone system if the available information is not monotonically-ordered. In this research, an interval-based method for analysing non-monotonically ordered information is proposed. The applicability of the proposed interval-based method in handling fuzzy rule base is evaluated with real Failure Mode and Effect Analysis (FMEA) information from a semiconductor manufacturing plant. The Fuzzy Inference System (FIS) is used for developing an improved Risk Priority Number (RPN) model for risk analysis in FMEA. The FIS-RPN model considers three risk factors, i.e., Severity, Occurrence, and Detection as the inputs, and produces an FIS-RPN score as the output. The proposed interval-based method constitutes a new fuzzy reasoning approach to transform non-monotonic information to interval-valued monotone system. To visualise the outcome, an interval-valued monotone surface plot at the level of Detection=3, is shown in Figure 1.

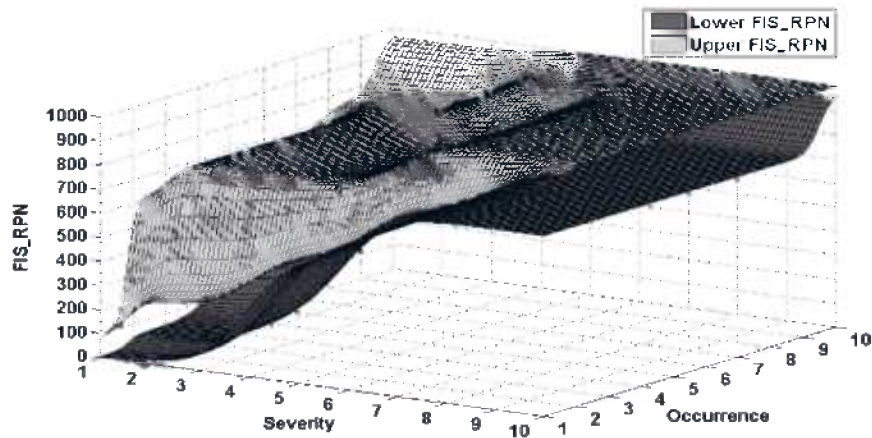


Figure 1. A surface plot for the interval FIS\_RPN model with 50% fuzzy rules and 30% noise (Detection=3).

## Diesel Engine Performance Study on Castor Biodiesel

Mohamad Ismail Mohamad Salim, Abu Saleh Ahmad

Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, UNIMAS

Email: aasaleh@unimas.my

The depletion of fossil fuels and increasing demand of conventional energy globally had been the main concern of the humankind nowadays. A continuous supply of energy is vital to support the human civilization. Biodiesel was one of the promising alternative of conventional fuel which is renewable, environmental friendly and sustainable. Biodiesel derived from castor oil was proved suitable to be used as diesel substitute. In this study, diesel engine performance test were been carried out by using various castor biodiesel blends to study the effect of load on the engine performance. Engine performance such as specific fuel consumption, brake horse power and mechanical efficiency at different load were been analyzed to study the potential of castor biodiesel to be used in diesel engine. Engine performance study shows that mechanical efficiency and brake horsepower of diesel engine increased when the engine load increase and the specific fuel consumption decreased when the engine load increase for all castor biodiesel blends.

Biodiesel Blend	
B0	100% petroleum
B10	10% v/v biodiesel in conventional diesel
B20	20% v/v biodiesel in conventional diesel
B30	30% v/v biodiesel conventional diesel
B40	40% v/v biodiesel in conventional diesel



Figure 1. Castor Biodiesel Blend used for Diesel Engine Performance Study (left), Techno-Mate Diesel Engine (right)

## Enhance Service Life Of Flexible Pavement-Surface Coated With Fibres-Mixed Resin (FMR)

Lee Shyue Leong, Md. Abdul Mannan, Wan Hashim Wan Ibrahim  
 Department of Civil Engineering, Faculty of Engineering, UNIMAS  
 Email: mannan@unimas.my

Road plays an important role in supporting a country's economic and development. However, along with the rapid development of the country, the load which can be supported by the asphalt concrete is increasing and eventually leads to the pavement deterioration. Beside this, flooding is a common phenomenon in low land area and the road would be submerged in water for a period of time. With the present of water, the adhesion bond between aggregate and binder is weakened which affects the pavement's durability. This problem leads to stripping and raveling of road which requires road maintenance. In Malaysia, the annual road maintenance budget is RM 580 million but it is unable to meet the ever increasing demand. As such, pavement durability and its service life has become a major concern for the road designer. Therefore, this study aims to investigate the possibility of utilizing fibres-mixed resin (FMR) to increase the durability and service life of asphalt concrete. FMR is a mixture of polyester resin with fibres. FMR and a coating of a FMR layer on the surface of a laboratory-prepared unmodified asphalt concrete mixture is studied in term of its durability performance.

**Keywords:** Asphalt concrete, durability, maintenance, service life, polyester, resin.



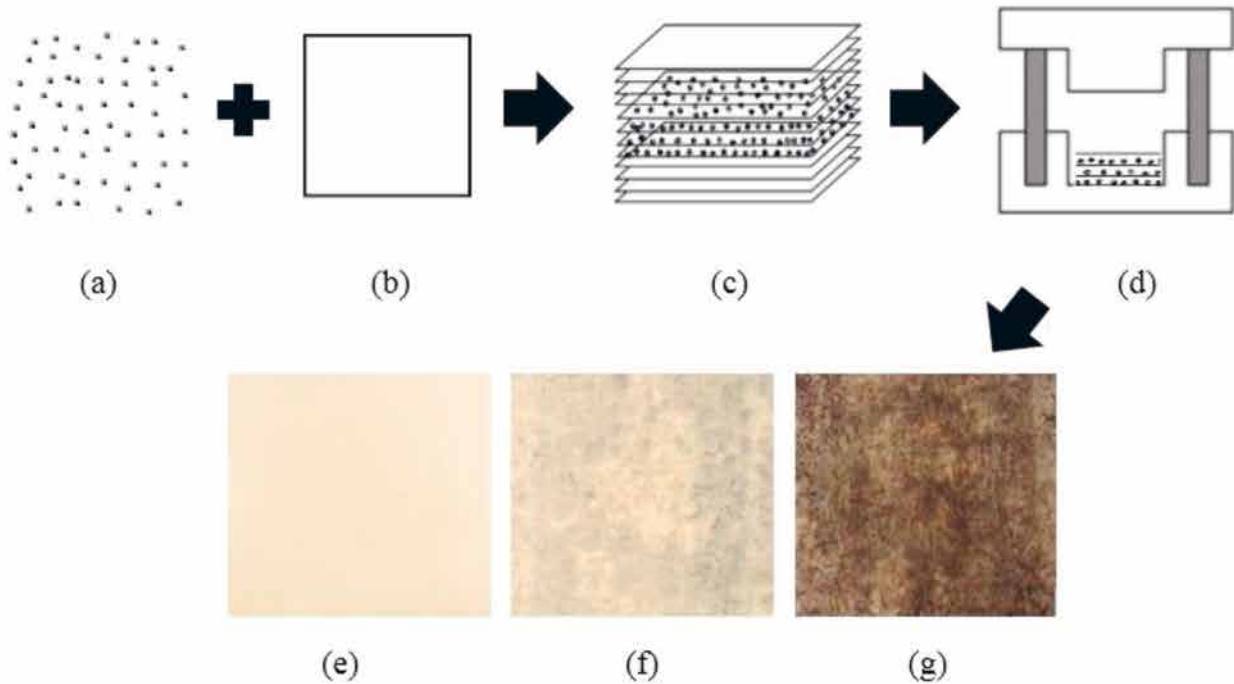
Figure 1. Polypropylene macro-synthetic fibres.

## Characterization of Ground Coffee Waste-Based Composite

<sup>1</sup>Tan Ming Yee, Nicholas Kuan Hoo Tien and Amir Azam Khan  
 Department of Mechanical and Manufacturing Engineering, UNIMAS  
 Email: <sup>1</sup>min\_e@live.com

The depletion of natural resources and escalating environmental issues, such as pollution, green house effect and global warming has raised the concern on the importance of green technology in restoring our mother nature. Coffee beans are from the seed of a genus of flowering plants, known as *Coffea*. Upon preparation of coffee beverage, one-half of the coffee beans remain as waste after processing. There are 6 million tonnes of ground coffee waste generated each year. The ground coffee waste contains large amount of organic compound which are cellulose, hemicellulose and lignin. The existent of high content of organic material and compound from the ground coffee waste has led to negative effects on the environment and result in release of greenhouse gases into the atmosphere, the disposal of these ground coffee waste should be properly managed. Thus, this reseach utilises the agro waste ground coffee reinforced high density polyethylene (HDPE) composite to replace the use of petroleum-based synthetic fibre and matrix. Compression moulding is used to fabricate the composites. Effect of particle size, volume fraction and chemical treatment on mechanical properties of composite are studied. Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM) are performed. Figure 1 shows the schematic representation of the preparation of the composite.





(a) Ground coffee waste, (b) HDPE, (c) Mixing with different ratio, (d) Compression moulding, (e) Composite (Neat PE), (f) Composite (10% ground coffee waste), (g) Composite (20% ground coffee waste)

**Figure 1.** Schematic representation of the preparation of ground coffee waste/ HDPE composite



Welcome event for Fresh Post Graduate Students, 15<sup>th</sup> October, 2015



Panel Discussion during the Post Graduate Proposal Defense, 22<sup>nd</sup> December, 2015

STUDENT NEWS

Faculty of Engineering Postgraduate Colloquium 2015



On 14<sup>th</sup> April 2015, the **3<sup>rd</sup> Faculty of Engineering Postgraduate Colloquium 2015** was successfully organized Universiti Malaysia Sarawak (UNIMAS) and co-organized by Curtin University, Malaysia Sarawak (Curtin Sarawak) at UNIMAS campus. This was the second collaboration event between UNIMAS and Curtin Sarawak after both institutions signed a collaborative Memorandum of Understanding (MoU) in December 2013 in order to develop and promote academic links and research collaboration between both institutions of higher learning.

The objective for organizing this event is to provide a platform for postgraduate students to present the progress of their work while evaluating their research progress. Also, it is meant for students to obtain constructive feedbacks and comments by engaging themselves in stimulating dialogues.

This year colloquium, with the theme of "Research for Sustainability Future", was aimed to encourage postgraduate student to share and disseminate their research work and inculcate the issue of green technology and sustainable development. The topics of interest are included but not limited to engineering, science technology and ICT, and business and economics.

The colloquium was a one day event started at 8.00 a.m. and ended at 5.00 p.m. There were a total of 48 participants, which composed of 26 UNIMAS students and 22 Curtin Sarawak students, joined the colloquium. 40 of them participated in oral presentation and 8 in poster presentation.

Each individual university was given 1 Best Paper Awards and 1 Best Poster Award. For UNIMAS, the Best Paper Award and Best Paper Award were given to Mr. Amarnadha Reddy and Ms. Nurlaila binti Rosli respectively. On the other hands, for Curtin Sarawak, the Best Paper Award and Best Paper Award were given to Mr. Caleb Acquah and Mr. Arshad Raza respectively.

**CLASSIFICATION OF EMOTIONS IN MALAY POPULAR MUSIC USING MULTILAYER NEURAL NETWORK (MLNN)**

**1. INTRODUCTION**  
Basic emotions such as anger, disgust, fear, happiness, sadness and surprise have long existed in human evolution and influence essential in controlling their algorithms and behavior. The original formulation of emotion classification model is further described by Plutchik's Wheel of Emotions diagram [1] as shown in Figure 1 in a category in Figure 2.

**2. CLASSIFICATION OF EMOTIONS VIA MLNN**  
Lapses the nature range of audio features in information and regression available in features set over [1] feature applications, detection and model class of emotion is categorized in study as follows: engaging as interpretations of music are understood and abstractly perceived by human listeners. These emotion classification (EC) is not only a generally tag, regional and cultural music, but also in the nature of subjective classification of relative genre.

**3. METHODOLOGY**  
The MLNN system in this study is developed and tested using MATLAB 2012. Music data were obtained from the various sources in CD, MP3 and MP4, which are converted to a standard 16-bit 44.1 kHz 2-channel sampling frequency, 16-bit precision 12 samples. Figure 3 shows the MLNN architecture in Figure 4, which is presented in Figure 5.

**4. TEST SETUP**  
For better performance of MLNN, the accuracy evaluation, RMSE, classified is tested with different data in terms. The testing process can be done using three different algorithms:  
 1) MLPNN - MLP Neural Network  
 2) MLNN - MLP Neural Network  
 3) MLNN - MLP Neural Network

**5. RESULTS AND CONCLUSION**  
50 songs for each emotion were used to test the algorithm using the performance measurement evaluation (PME) [2]. Based on the results, the average accuracy using different algorithms in MLNN from Figure 5, the best were demonstrated using the same set of test music. Results show that the MLPNN algorithm that uses audio features data from both vocal and instrumental part of song are more competitive than MLNN algorithm that uses only vocal or only instrumental audio feature in training data.

**6. CONCLUSION**  
This finding will collectively shed light on the fundamental question of how vocal and instrumental music feature interact with one another with regard to music emotion. Besides, the research will contribute to the increase of music information retrieval, audio analysis, affective computing and music analysis packages.

**REFERENCES**  
[1] Plutchik, R. Wheel of Emotions. Harvard Medical School, Boston, MA, 1980.  
 [2] Plutchik, R. Wheel of Emotions. Harvard Medical School, Boston, MA, 1980.  
 [3] Plutchik, R. Wheel of Emotions. Harvard Medical School, Boston, MA, 1980.  
 [4] Plutchik, R. Wheel of Emotions. Harvard Medical School, Boston, MA, 1980.

## Postgraduate Proposal Defense 2015

The 2nd Postgraduate Proposal Defense was successfully held on the 10th and 11th of June 2015 at the Faculty of Engineering. This event was carried out by the faculty to review the progress of the postgraduate students on their research and at the same time the content of their research was reviewed and revised to clarify the research objectives and methodology.



This two-day event consisted of six sessions and 20 slots that were designated for 20 postgraduate students who were registered between 1 January 2014 and 30 June 2015. These students were selected based on their registration date, i.e. the priority was given to the student with the earlier registration date. All twenty (20) students submitted the information form which included recommendation from their respective supervisors.

The postgraduate students comprising of Master (by research) and PhD presented their proposal defense in front of an open audience which also included selected panel members. The panel consisted of one chairman and three members who evaluated postgraduate students' performance. The interaction between presenting students and Faculty members turned out to be very useful as it helped to understand, improve and appreciate the proposal as well as some initial work conducted by the students. Some useful suggestions given by the expert evaluators during the Q&A session were also very much appreciated by the presenting students. The activity reinforces the Faculty's policy of Continuous Quality Improvement (CQI) for its Post Graduate program.

The 3rd postgraduate proposal defense was held for students registered in 2015, on the 9th and 10th of September 2015. A total of twenty (20) postgraduate students comprising of Master (by research) and PhD presented during this proposal defense. This two-day event consisted of six sessions, where each session included three to four presentations in front of panel and audience. All twenty (20) students who presented submitted recommendation from their respective supervisors and three hardcopies of the proposal report.

The 4th postgraduate proposal defense was carried out on 22nd and 23rd of December 2015. A total of twenty (21) postgraduate students comprising of Master (by research) and PhD presented their proposals during this time. This two-day event consisted of six sessions. The panel members evaluated the proposals in depth and gave useful comments to the candidates for improvement.

## Research Students

## Civil Engineering

Name	Level	Type	Supervisor	Co-supervisor(s)	Title
Hisyammudin Bin Maseri	PhD	Full time	Dr. Onni Suhaiza Selaman	Assoc. Prof. Ir. Dr. Siti Noor Linda Taib/Prof. Dr. Engr Md. Abdul Mannan	Efficiency of Cylindrical Detention Pond (CDP) As Innovative Pavement System
Marina Patrick	PhD	Full time	Prof. Ir. Dr. Frederik Josep Putuhena	-	Development of Spatial Variation of Storm Rainfalls (Rainstorms) for Sarawak Region
Karlvin Anak Jungan	PhD	Full time	Ir. Dr. Leonard Lim Lik Pueh	Dr. Ivy Tan Ai Wei	Sustainable Water Purification and Soil Conditioning for Communities Living in Remote Area using Locally Synthesized Biochar
Nur Syahina Binti Yahya	PhD	Full time	Dr. Gaddafi bin Ismaili	Dr. Hj. Iskandar Openg	Experimental Study of Fingerjointing and Lamination Properties of Acacia Species of Sarawak
Nur Emilia Azira Bt Kamisly	Masters	Full time	Dr. Gaddafi bin Ismaili	Dr. Hj. Iskandar Openg	Machining and Treatability of Acacia Mangium Superbulk and Acacia Hybrid Timber of Sarawak
Johnny Ngu Ong King	Masters	Full time	Dr. Darrien Mah Yau Seng	Dr. Charles Bong Hin Joo	Fundamental Flow Characteristics of Individual Lot Stormwater Detention Underneath Residential Car Porch
Evon Tang Ee Wen	Masters	Full time	Dr. Darrien Mah Yau Seng	Dr. Onni Suhaiza Selaman	Effect of Hydraulic Structure on Drainage with Drowned Outlet and Its Application
Lau Jing Teck	Masters	Full time	Dr. Darrien Mah Yau Seng	Dr. Alsidqi Hasan	Effects of Land Use Change to Water Supply: Case Study of Tapah/Beratok Water Treatment Plant
Jason Lee Kee Hean	Masters	Full time	Dr. Mohamad Raduan Bin Kabit	-	Effect of Countdown Timer on Vehicle Queue Discharge at Signalized Intersections in Kuching
Melissa Lee May Syn	Masters	Full time	Dr. Mohamad Raduan Bin Kabit	-	Modeling The Effects of Distracted Driving on Driving Performance Among Drivers in Kuching
Ho Lee Lee	PhD	Full time	Prof Ir Dr Law Puong Ling	Dr Lim Soh Fong	Development and Evaluation of a Deterministic Methodology for Measuring the Effectiveness of Environmental Management System (EMS)
Lee Shyue Leong	PhD	Full time	Prof Dr Md Abdul Mannan	Prof Dr Wan Hashim Wan Ibrahim	Investigation on Potential Use of Rice Bran as Alternative Material in Bituminous Mixture
Nurulhuda binti Nadziri	Masters	Full time	Dr Idawati Ismail	Prof Dr Sinin Hamdan	Microstructural Characterization of Cementless Binders Using Industrial By-Products for Construction Materials
Tengku Noor Ain binti Tengku Hasbullah	Masters	Full time	Dr Onni Suhaiza Selaman	Prof Madya Dr Siti Noor Linda Taib	Removal of Emerging Contaminant from Dye Wastewater into Soil by Using Shell and Coal as Adsorption Material
Mohammad Fadzli Bin Jawawi	Masters	Full time	Profesor Madya Dr. Siti Noor Linda bt Taib	-	Chemical Stabilization of Mukah Peat with Locally Available Agriculture and Industrial By-Products
Lim Hung Ling	PhD	Full time	Prof Dr Md Abdul Mannan	Dr Delsye Teo Ching Lee	Structural Performance of Precast Honeycomb Pavement
Ir Jamil bin Matarul	PhD	Part time	Prof Dr Md Abdul Mannan	Prof Madya Dr Mohammad Ibrahim Safawi	Enhancing Service Life of RC Structures for Chloride Belt Area Through Durability-Based Concrete Properties
Nur Izaitul Akma binti Ideris	PhD	Full time	Dr Norsuzailina Mohamed Sutan	Prof. Dr Amir Azam Khan, Dr Idawati Ismail	Effect of Supplementary Cementitious Materials on Concrete Properties
Shilya Zulaikha binti Zamani	Masters	Full time	Prof Dr FJ Putuhena	Dr Charles Bong Hin Joo	Strategic Planning of Integrated Rajang River Basin Development
Nurul Amal binti Yusuh	Masters	Full time	Prof Dr Md Abdul Mannan	Dr Raudhah Ahmadi	Enhanced Mechanical Properties of Medium Strength Self-Compacting Concrete Through Hybridisation and Synergistic Effects of Fibres
Zulhelmi bin Adul Manap	Masters	Part time	Dr Onni Suhaiza Selaman	Dr Darrien Mah Yau Seng	Evaluation of Peak Design Discharge for Small Scale Development in Sarawak
Zamhuri Bin Drahan	Masters	Full time	Profesor Dr. Wan Hashim bin Wan Ibrahim	-	An Application of Airports Pavement Management System (APMS) at Kuching International Airport
Moh Hioung Teck	Masters	Full time	Prof Madya Dr Siti Noor Linda Taib	Dr Onni Suhaiza Selaman	A Study on New Slope Drainage Design Under the Effect of Rainfall Infiltration and Ground in Tropical Region

Alifa Hamzah bin Johari	PhD	Full time	Prof Ir Dr Law Puong Ling	Prof Madya Dr Siti Noor Linda Taib	Study of Peat Soil Erosion Rate, Sediment Yield and Slope Stability for Application in Equatorial Region
Qairuniza binti Roslan	Masters	Full time	Dr Siti Halipah Ibrahim	Rohaida Affandi	Optimum Roofing Design Concept for Hot Humid Climate
Bayu Mahista Tamtomo	Masters	Full time	Dr Mohamad Raduan Kabit	-	Hybrid Expert System for Diagnosis of Flexible Pavement Deterioration and Rehabilitation Strategies
Nadia Zaini	Masters	Full time	Dr Siti Halipah Ibrahim	Prof Madya Dr Azhaili Baharun	Industrialised Building System (IBS) Towards Green Construction and Sustainability
Nam Nguk Chiu	Masters	Full time	Dr Darrien Mah Yau Seng	Prof Dr FJ Putuhena	Road Subsurface as Component of On-Site Detention (OSD) Urban Drainage System
Dayang Rozina binti Abang Madni	Masters	Part time	Dr Gaddafi Ismaili	-	Physical and Mechanical Properties of Three-Fast Growing Plantation Species in Sarawak
Lau Pei Ching	PhD	Full time	Prof. Dr M Abdul Mannan	Dr Delsye Teo Ching Lee	Performance Of Lightweight Aggregate Using Sewage Sludge And Oil-Palm-Boiler Waste
Jerren Tan Yun Ping	Masters	Full time	Dr Ir Ting Sim Nee	Prof Madya Dr Azhaili Baharun	Procurement Route Selection Guideline for Construction Projects in Malaysia
Striprabu a/l Strimari	PhD	Full time	PM Dr Siti Noor Linda Haji Taib	Dr Norazzalina M. Sa'don	Chemical Stabilization of Sarawak Soils as Pavement Subbase
Eric Yong Pik Kwong	Masters	Full time	Dr Delsye Teo Ching Lee	Dr Norsuzailina Mohamed Sutan	The Engineering Properties of Concrete Containing Waste From the Oil Palm Industry
Yong Leong Kong	PhD	Full time	Prof Ir Dr Law Puong Ling	PM Dr Siti Noor Linda Haji Taib, Dr Darrien Mah Yau Seng	Model Development of Riverbank Erosion at Batang Rejang
Oon Yin Wee	PhD	Full Time	Prof Ir Dr Law Puong Ling	Dr Lim Soh Fong / Prof Dr Kopli Bujang	A Novel Oil and Grease (O&G) Removal Apparatus with Curved Coalescence Frustums and Triangular Surface Restraints
Muhammad Syukri Imran Bin Abdullah	PhD	Full time	Profesor Madya Dr. Azhaili Bin Baharun	AP Dr Siti Halipah Ibrahim	Nocturnal Cooling Of Water For Radiant Cooling In Malaysian Building
Chai Chern Tcian	Masters	Full time	Profesor Dr. Frederik Josep Putuhena	Dr Onni Suhaiza Selaman	Study On Storm Water Retention Performance Of Green Roof Under Tropical Climate In Sarawak
Bong Chien Chai	Master	Full Time	Prof Madya Dr Azhaili bin Baharun	Abdul Azim bin Abdullah / Rosmina binti Ahmad Bustami	Turbine Float System and Achorage Design
Nur Afnie Faryisha Binti Mohamad Hamsah	Masters	Full time	Puan Rosmina binti Ahmad Bustami	-	Design of Long Storage for Excess Water and Development of Hydrological Framework in Sg. Swk Kanan Sub-
Chiew Fei Ha	PhD	Full Time	Prof Dr Ng Chee Khoon	Dr Tay Kai Meng	Optimization of Mix Proportion for High Strength Concrete Based on Harmony Search
Sim Yeong Liang	PhD	Full Time	Prof Dr FJ Putuhena	Prof Madya Dr Azhaili Baharun / Prof Ir Dr Law Puong Ling	Development of Construction Quality Assessment Model that Applicable to Malaysian Construction Industry
Lee Lin Jye	PhD	Full Time	Prof Dr Shenbaga Kaniraj Rajaratnam	Dr Siti Noor Linda Haji Taib	Analyse the Lateral Movement on Soft Riverbank
Lai Phui Hua	PhD	Part Time	Prof Madya Dr Haji Mohd Ibrahim Safawi Mohd Zain	Dr Siti Noor Linda Haji Taib	A Proposed Design Procedure for Replacement of Saturated Peat Soil with Foamed Concrete
Azrin bin Ahmad	PhD	Full Time	Dr Raudhah binti Ahmad	-	A Framework of Seismic Risk Assessment and Seismic Microzonation Of Batang Ai Hydroelectric
Thong Chia Chia	Masters	Full time	Dr Delsye Teo Ching Lee	Prof Dr Ng Chee Khoon	Mechanical and durability properties of polyvinyl alcohol (PVA) treated oil palm shell (OPS) concrete
Riji Burmanu Benjamin	PhD	Full Time	Prof Ir Dr Law Puong Ling	-	Modeling of Environmental Pollution from Decayed Vegetables in the Face of Climate Change in Northeast, Nigeria

## Electrical and Electronics Engineering

Name	Level	Type	Supervisor	Co-supervisor(s)	Title
Angelina Viviana Anak Harry	Masters	Full time	Dr. Siti Kudnie Sahari	-	Effect of Annealing Temperature of TiO <sub>2</sub> Thin Film by Sol-Gel and Spray Pyrolysis Method
Dayang Halimah Binti Abang Mohamad	Masters	Full time	Dr. Rohana Bt Sapawi	-	Mathematical Modeling of Minimal Phase Nonlinearity CMOS Power Amplifier for Ultra Wideband Communication
Siti Dhamirah 'Izzati Binti Damni	Masters	Full time	Assoc. Prof. Dr. Sakena Abdul Jabar	-	Quality of Service (QoS) Provisioning Mechanism In Time-Slotted Optical Burst Switched (OBS) Network
Suzana Binti Idris	Masters	Full time	AP Dr. Hushairi Zen	-	Design of Remote Monitoring and Control System for Disaster Application
Kueh Yi Lin	Masters	Full time	Assoc. Prof. Dr. Wan Azlan bin Wan Zainal Abidin	Dr Thelaha Masri/ Dr Kismet Anak Hong Ping	Real-Time Image Processing for Vehicle Collision Prevention and Mitigation System
Azyyati Binti Basrol	Masters	Full time	Assoc. Prof. Dr. Wan Azlan bin Wan Zainal Abidin	-	GPS Signal Effects on Vegetation
Nabil Shaukat	PhD	Full time	Dr. Lakshmanan A/L Gurusamy	-	Ultra Low Power System for IOT
Alvin Lau Kouk Shenn	Masters	Full time	Ir. Dr. Prashobh Kumar Karunakaran	Dr. Lakshmanan A/L Gurusamy	Underwater Electricity Transmission using Electric Cables Suspended Within Carbon Steel Pipes
Nurul Syuhada Binti Hasim	Masters	Full time	Dr. Kismet Anak Hong Ping	Dr. Thelaha Masri	The Design of Compact Planar Antenna for Microwave Tomography System
Dayang Siti Amira Binti Awg Yusuf	Masters	Full time	Dr. Rohana Bt Sapawi	-	Design of CMOS Power Amplifier with Notch Filter for UWB System
Anisia Jati Sang	Masters	Full time	Dr. Tay Kai Meng	-	Improvement of Agricultural System and Farming Management in Rural Sarawak using Advanced Fuzzy Failure Mode and Effect Analysis Methodology and Hazard Analysis and Critical Control Point Methodologies
Eustacius Jude Anak Joseph	Masters	Full time	Dr. Kismet Anak Hong Ping	Dr. Dayang Azra Awang Mat/ Dr. Kuryati Binti Kipli	Nearfield Electromagnetic Imaging Technique for Brain Tumour Detection
Juliana Binti Nawawi	Masters	Full time	Dr. Shafrida Binti Sahrani	Dr. Kismet Anak Hong Ping	Tomographic Image Reconstruction and Edge Preserving Smoothing Filter for Object Detection in Homogeneous Media
Nurlaila binti Rosli	PhD	Full time	Dr Nordiana Rajae	Ir Dr David Bong Boon Liang	Applying Neural Network in Emotion Classification of Malay Popular Music Based on Vocal and Instrumental Sound Timbres
Michelle Lu	PhD	Full time	Prof Madya Dr Wan Azlan Wan Zainal Abidin	Dr Thelaha Masri / Dr Dennis Lau Hau Aik (SESCO) / Dr Chen Shiun (SESCO)	Swarm and Evolutionary Techniques for Optimization of Under-Frequency Load Shedding Scheme
Kenny Voo Hon Bing	Masters	Full time	Ir Dr David Bong Boon Liang	Dr Kismet Hong Ping	Structural Similarity Based Image Quality for 3 Dimensional Image
Chai Kok Chin	PhD	Full Time	Dr Tay Kai Meng	-	Fuzzy Multiple Criteria Decision Making: New Methods Toward Ranking Fuzzy Quantities and Their Applications
Dyg Khayrunsalihaty Bariyyah binti Abang Othman	Masters	Part time	AP Dr Hushairi Zen	Prof Madya Dr Al-Khalid Othman	Distributed Beacon Scheduling Specification Using Link Quality Indicator (Lqi) Approach in WSN
Nor Shafrillah binti Isa	Masters	Full time	Dr Shafrida Sahrani	Dr Kismet Hong Ping	Overset Grid Generation Method for the Analysis of Electromagnetic Field Around a Complex Moving Body
Anis Suzziani binti Rosslan	Masters	Full time	Dr Dayang Azra Awang Mat	Dr Kismet Hong Ping	Integrated Filter-Antenna Design for Microwave Breast Imaging System
Amy Sahida binti Soetarman	Masters	Full time	Dr Kismet Hong Ping	Dr Shafrida Sahrani	Microwave Imaging for Breast Tumour Detection using PSO-Based Segmentation Strategy

Loh Woei Tan	Masters	Full time	Ir Dr David Bong Boon Liang	Dr Nordiana Rajae	Video Quality Assessment Based on Hybrid PSNR and Optical Flow Estimation
Jam'aah binti Suud	PhD	Full time	AP Dr Hushairi Zen	Prof Dr Wan Hashim Wan Ibrahim	Road Traffic Management and Monitoring Network
Nik Amni Fathi bt Nik Zaini Fathi	Masters	Full time	Dr Siti Kudnie Sahari	Dr Rohana Sapawi & Prof Dato' Dr Burhanuddin Yeop Majlis & Prof Madya Dr Azrul Azlan Hamzah (UKM)	Theoretical Formulation of Interfacial Layer Growth Between High-K and Germanium Surface
Au Yeung Wai Lun	Masters	Full time	Dr Ngu Sze Song	Dr Siti Kudnie Sahari	Termination Structure Design to Improve Robustness/Reliability of High Voltage Semiconductor Devices using Si and Sic
Sylvia Ong Ai Ling	PhD	Full time	Dr Hushairi Zen	Prof Dr Wan Hashim Wan Ibrahim	Network for Smart Traffic Management: Topology, Architecture and Protocol
Justin ak Masiar @ Peton	Masters	Full time	Prof Madya Dr Al-Khalid Othman	Dr Hushairi Zen	Optimized Energy Management System for Rural ICT Telecentre: Standalone Solar PV Power System
Faralyna Aisyah binti Abdul Rasid	PhD	Full time	Prof Madya Dr Wan Azlan Wan Zainal Abidin	Dr Thelaha Haji Masri & Dr Martin Anyi	Rural Application Optimization Design for Hybrid Solar PV System
Arisita Duwi ak Supit	Masters	Full time	Dr Kismet Hong Ping	Dr Tay Kai Meng	Reconstruction of Reinforcement Bars in Concrete Structures using Electromagnetics Direct Scattering and PSO Techniques for NDT Applications
Nor Haizan binti Jamali	Masters	Full time	Dr Kismet Hong Ping	Dr Dyg Azra Awg Mat & Dr Shafrida Sahrani	Image Reconstruction Based on Combination of Inverse Scattering Technique and Total Variation Regularization Method
Azarina binti Azman	Masters	Full time	Dr Shafrida Sahrani	Dr Kismet Hong Ping	Reconstruction of Shape by Applying Overset Grid Generation Method to an Iterative Inversion Technique
Kerk Yi Wen	Masters	Full time	Dr Tay Kai Meng	Dr Darrien Mah Yau Seng	A New Interval-Based Method for Monotone Fuzzy Modelling with Engineering Application
Jee Tze Ling	PhD	Full time	Dr Tay Kai Meng	-	A New Two-Stage Framework with Generic Algorithm Search and Similarity Reasoning for Constructing Fuzzy Inference Models with Real World Applications
Chai Nee Ping	PhD	Full time	AP Dr. Wan Azlan bin Wan Zainal Abidin	AP Dr Al-Khalid bin Hj Othman	Real-Time Heavy Vehicle Monitoring Using GPS and GIS Technology
Yong Guang	PhD	Full Time	Dr Kismet Hong Ping	Prof Madya Dr Al-Khalid Haji Othman / Dr Thelaha Haji Masri	Filtered Forward-Backward Time-Stepping Inverse Scattering Technique for Buried Object Detection and Shape Reconstruction
Ng Shi Wei	PhD	Full Time	Dr Kismet Hong Ping	Dr Hushairi Haji Zen / Dr Wan Azlan Wan Zainal Abidin	Microwave Imaging Reconstruction of Breast Composition Utilizing Filtered Forward-Backward Time-Stepping Technique for Breast Cancer Detection
John Tin Yuan En	PhD	Full time	AP Dr. Wan Azlan bin Wan Zainal Abidin	Prof Madya Dr Azhaili bin Baharun, AP Dr Al-Khalid bin Hj Othman	Adaptive Model for Thermal Comfort of Residential Buildings
Nuramalina bt Bohari	Master	Full Time	AP Dr Wan Azlan bin Wan Zainal Abidin	Dr Martin Anyi / Dayang Nur Salmi Dharmiza bt Awang Salleh	Solar-hydro Hybrid Controller System Design
Bello Olalekan	PhD	Full Time	AP Dr Hushairi Haji Zen	Prof Madya Dr Al-Khalid Haji Othman	Scheduling in Satellite Networks Employing Mimo Technology
Toh Sheng Wei	PhD	Full Time	Dr Tay Kai Meng	Prof Madya Dr Haji Mohamad Omar Abdullah	Intelligent Performance Optimization Framework for Collaborative Hybrid Energy System
Pang Lie Meng	PhD	Full Time	Dr Tay Kai Meng	Dr Darrien Mah Yau Seng	A New Type-2 Single Input Rule Modules (SIRMs) Connected Fuzzy Inference System-Based Group Decision Support and Assessment System with Engineering Applications
Ibrahim Abba	PhD	Full Time	Prof Madya Dr Wan Azlan Wan Zainal Abidin	Dr Kismet Hong Ping / Dr Thelaha Masri	Empirical Model Development for Effect of Ionosphere on Mobile Satellite Signal Performance: Kano and Kota Samarahan
Ng Liang Yew	PhD	Part time	AP Dr Hushairi bin Zen	Prof Madya Dr Al-Khalid Haji Othman	Tracking with Non-line-of-sight (NLOS) Mitigation in Indoor Environment

Mohd Azlan bin Ismail	PhD	Full Time	Prof Madya Dr Al-Khalid Othman	Prof Madya Dr M. Shahidul Islam, Dr Hushairi Zen	Low Head Modular Microhydro for a Flexible Implementation System
Bong Voon Pai	PhD	Full Time	Prof Madya Dr Wan Azlan Wan Zainal Abidin	Dr Thelaha Masri / Dr Kismet Hong Ping	Propagation Models for Low Latitude Region of L-Band Mobile Satellite Signal Performance
Teh Chin Ying	PhD	Full time	Dr Tay Kai Meng	-	Development of a Local Monotonicity Preserving Data-Driven Fuzzy System for Video Signal Processing
Andrew Sia Chew Chie	Masters	Full time	Dr Kismet anak Hong Ping	Dr Nordiniana Rajae	Detection of Buried Objects in Dispersive Medium Utilizing Filtered Forward-Backward Time-Stepping Inverse Scattering Technique
Chang Wui Lee	Masters	Full time	Dr Tay Kai Meng	-	Applications of Evolving Tree to Real World Problems
Chong Yee Ming	Masters	Full time	Dr Martin Anyi	Dr Lakshmanan A/L Gurusamy	Design of an Electronic Load Controller (ELC) System for Remote Communities' Micro-Hydro Power Plants
Florence Francis Lothai	Masters	Full time	Ir Dr David Bong Boon Liang	-	An Analysis of the Effects of Using Various Sensors in Biometric Identification
Hacm Ak Henry @ Andrew	Masters	Full time	AP Dr Hushairi bin Zen	-	Smart Meter Data Analysis For The Detection Of Non-Technical Loses
Marta A/P Elizabeth	Masters	Full time	Dr Kismet anak Hong Ping	Prof Madya Dr Wan Azlan Wan Zainal Abidin, Dr Nordiniana bt Rajae	Time-Domain Inverse Scattering Technique for Early Breast Cancer Detection
Mohamad Faizal Bin Mahsen	Masters	Full time	Dr Kismet anak Hong Ping	Prof Madya Dr Wan Azlan Wan Zainal Abidin, Dr Shafrida Sahrani	Detection of Object Hidden Behind the Wall using Inverse Scattering Technique
Nurliyana Binti Hussaini	Masters	Full time	AP Dr Thelaha bin Hj Masri	AP Dr Wan Azlan Wan Zainal Abidin, Dr Kismet Hong Ping	Performance Enhancement of Microstrip Antennas Using Electromagnetic Band Gap Structures
Puteh Munawwarah Binti Ibrahim	Masters	Full time	Dr Kismet anak Hong Ping	Dr Nordiniana bt Rajae, Dr Martin Anyi	Reconstruction of Breast Composition Utilizing Filtered Forward-Backward Time-Stepping (FBTS) Inverse
Seniorita Bandy Ak Kerungan @ Engkasan	Masters	Full time	Profesor Madya Dr. Wan Azlan bin Wan Zainal Abidin	-	Mapping Of Solar Energy Potential And Solar System Capacity In Sarawak
Tham Chung Meng	Masters	Full time	Ir Dr David Bong Boon Liang	-	To Investigate using Negative Sequence Components Of Voltage And Current To Protect Distribution Lines
Therry Lee Zee	Masters	Full time	Ir Dr David Bong Boon Liang	-	Multimodal Biometric Recognition Based on Bit-Plane Extraction

## Mechanical and Manufacturing Engineering

Name	Level	Type	Supervisor	Co-supervisor(s)	Title
Amaranadha Reddy Manchuri	PhD	Full time	Assoc. Prof. Dr. Abu Saleh Ahmed	Prof. Dr. Sinin Hamdan/ Dr. Md. Rezaur Rahman/ Dr. Md. Saiful Islam (UPM)	A Sustainable Jatropha Biodiesel Production for Diesel Engines
Chung Ping Ping	PhD	Full time	Prof. Ir. Dr. Amir Azam Khan	Prof. Ir. Dr. Andrew Ragai Henry Rigit/Prof. Dr. Pang Suh Cem	Synthesis and Characterization of New Hybrid Coatings through Sol-Gel Process with Variable Organic and Oxide Phase
Mohammad Shoab Khan	Masters	Full time	Prof. Dr. Sinin Hamdan	Dr. Md Rezaur Rahman	Development of Kenaf Fibre Hybrid Composite Plate for Strengthening of Reinforced Concrete Beam
Herman Bin Khamis	Masters	Full time	Dr. Shahrol Mohamaddan	-	Vr-Harro: Virtual Reality-Based Hand Rehabilitation with Intent Activation using EMG Sensing
Nazriman Bin Wagiman	Masters	Full time	Mohd. Syahmi Bin Jamaludin	Prof. Ir. Dr. Amir Azam Khan/ Dr. Azham Zulkharnain	Glycidyl Methacrylate with Sago Hampas Biocomposite: Effects of Different Composition of Biofilters on Tensile Properties and Water Absorption
Fabian Halley Pata Anak Alban Datti	Masters	Part time	Assoc. Prof. Dr. Syed Tarmizi Syed Shazali	Abang Mohamad Aizuddin Abang Mohd Mohtar	Construction of the Finite-Element Model of Futsal Balls and Simulations of Their Impact
Mohammad Ashaari Bin Kiprawi	Masters	Full time	Assoc. Prof. Dr. Abdullah Yassin	-	Developing Cutting Edge Temperature Measurement of End Mill Tool in High Speed Machining using Infrared Radiation



Name	Level	Type	Supervisor	Co-supervisor(s)	Title
Mohd Rahmat Bin A Rahman	Masters	Full time	Ir. Dr. Mohd Danial Ibrahim	Prof. Ir Dr. Amir Azam Khan	Molten Flow Behaviour in Mold Design of High Pressure Die Casting
Yana Shaheera Binti Yunus	Masters	Full time	Ir. Dr. Mohd Danial Ibrahim	Prof. Ir. Dr. Andrew Ragai Henry Rigit	Micro-Needle with Micro-Pump for Drug and Blood Delivery in Polygonal Structure of Micro-Channel
Muhammad Shukry Bin Fasihuddin	Masters	Full time	Ir. Dr. Mohd Danial Ibrahim	-	Improvement of Machine Reliability through Vibration Analysis
Mohammad Aliff Bin Abd Rahman	Masters	Full time	Dr. Shahrol Mohamaddan	Dr. Magdalene Anak Andrew Munot	Investigation of Palm Oil Harvesting Tools Effect Towards Human Musculoskeletal System
Ting Sing Hong	Masters	Full time	Dr. Shahrol Mohamaddan	Dr. Helmy bin Hazmi	Development of Virtual Reality Tools for Autism in Children
Muhammad Zaidi Mohtar	Masters	Full time	Ir. Dr. Mohd Danial Ibrahim	PM Dr. Azham Bin Zulkharnain	Optimization of Air Flow Inside Biosafety Cabinet Class II Using CFD
Rashidah Binti Salim	Masters	Full time	Assoc. Prof. Dr. Syed Tarmizi bin Syed Shazali	-	Visualizing Sound Waves with a Ruben's Tube
Md. Faruk Hossen	PhD	Full time	Profesor Dr. Sinin bin Hamdan	Dr Md Rezaur Rahman	Study on Chemically Modified Jute Fiber Reinforced Polyethylene/Clay Nanocomposite
Christopher Jantai Anak Boniface	Masters	Full time	Ir Dr Mohd Danial Bin Ibrahim	-	A Radiant Times Series Method for Cooling Load Calculation for Dewan Tunku Abdul Rahman Putra (DETAR)
Hazel Maybelline Anak Johan	Masters	Full time	Profesor Madya Dr. Syed Tarmizi bin Syed Shazali	AP Dr Abdullah Haji Yassin	Effects of Automated Manufacturing System Toward Workforce's Behaviours
Ahmad Syafiq Haqim bin Sarip	Masters	Full time	PM Dr Syed Tarmizi Syed Shazali	Prof Dr M. Shahidul Islam	Design of Tracking Parabolic Solar Trough for Diffused Sun Radiation
Laurence Satia Ak Usit	Masters	Full time	Profesor Ir Dr. M. Shahidul Islam	-	Improvement Of Cooling Water System At Bakun Hydroelectric Power Plant
Mohamad Ismail bin Mohamad Salim	Masters	Full time	Prof Madya Dr Abu Saleh Ahmed	Prof Dr Sinin Hamdan / Dr Md Rezaur Rahman	Efficient Conversion of Castor Oil to Biodiesel by Using Heteogeneous Catalyst
Tan Ming Yee	Masters	Full time	Dr Nicholas Kuan Hoo Tien	Prof Ir Dr Amir Azam Khan	Characterisation of Ground Coffee Waste-Based Bio-Composite
Kiew Kwong Siong	PhD	Full time	Prof Dr Sinin Hamdan	Prof Madya Dr Hasrizam Abdul Wahid & Prof Madya Dr Ismail Jusoh (FSGK)	Sound Quality Assessment and Acoustic Properties of Selected Wood Species in Malaysia
Md. Mizanur Rahman	Masters	Full time	Prof Dr Sinin Hamdan	Dr Md Rezaur Rahman	Studies of Jute Fiber and Jute Cellulose Reinforced Polyethylene with Maliec Anhydride, Nanoclay and Silica
Taharah Binti Edin	Masters	Full time	Profesor Madya Dr. Abu Saleh Ahmed	Dr Md Rezaur Rahman	Biodiesel Production from Jatropha Oil as an Alternative Fuel for Diesel Engine
Lee Meng Chuen	Masters	Full time	Dr Nicholas Kuan Hoo Tien	Dr Marini Sawawi	Characterisation of Chemical Treatments of Pandanus Fibre in Composites
Nurhanna Zulaikha binti Ishak	Masters	Full time	Dr. Shahrol Mohamaddan	-	Analysis of Ergonomics Approach to Accessibility and Needs of Children with Disability in Public Facilities and Consumer Products
Teo Chong Yaw	Masters	Full time	Profesor Madya Dr. Abdullah bin Hj Yassin	-	Green Cutting - Development of Water Mist Jet Cooling System
Lee Man Djun	PhD	Full time	Prof Dr M. Shahidul Islam	PM Dr Syed Tarmizi Syed Shazali / PM Dr Abdullah Yassin	Modeling on Capacity Utilization of Manufacturing Industry in Malaysia
Dayang Salyani Abang Mahmud	PhD	Full time	Prof. Ir Dr Amir Azam Khan	Dr Magdalene Andrew Munot/ Dr Nicolas Glandut (Limoges)/ Prof. Dr Jean Claude Labbe	Low Temperature Solid Oxide Fuel Cells: Synthesis, Assembly and Testing at Temperatures Below 600K
Ting Ching Hung	Masters	Full time	Prof Dr M. Shahidul Islam	PM Dr Syed Tarmizi Syed Shazali, PM Dr Abdullah Haji Yassin	An Approach with Operation Research for Developing Predictive Model for Industrial Preventive Maintenance

Name	Level	Type	Supervisor	Co-supervisor(s)	Title
Syed Salman Shafqat	PhD	Full Time	Prof. Dr Amir Azam Khan	Dr Shanti Faridah Salleh/ Dr Nicholas Kuan Hoo Tien	Synthesis and characterization of Cu & Ni embedded ORMOCERS by sol-gel method
Houssein M.A Elawad	PhD	Full Time	Prof Dr M. Shahidul Islam	PM Dr Syed Tarmizi Syed Shazali / PM Dr Abdullah Yassin	Measuring Contextual Effect of Inputs on Physical and Economic Efficiency of Production
Tracy anak Dickie	PhD	Part Time	PM Dr Syed Tarmizi Syed Shazali	AP Ir Dr Shahril bin Osman (UCTS)	Fabrication and Mechanical Measurement of Nipah Palm Fiber Material
Wong Lee Kwang	Masters	Full time	Ir Dr Mohd Danial Bin Ibrahim	-	Simulation And Experimental Study Of Portable And Non Portable Lantern Wind Turbine
Kamran Ahmed Samo	PhD	Full Time	Prof Ir Dr Andrew Ragai Henry Rigit	Prof Madya Dr Azhaili Baharun / Prof Madya Dr Jane Labadin (FIT) / Dr Thelaha Masri	Determination and Mapping of Tidal Electrical Power Potential for Sarawak and Sabah
Patrick Low Tiong Kie	PhD	Part Time	Prof Ir Dr Andrew Ragai Henry Rigit	-	A Thermal Conversion System for Converting Oil Palm Fronds into Biochar for Oil Palm Plantation
Wan Farhana binti Mohamad	PhD	Full Time	Prof Dr Amir Azam Khan	AP Dr Abdullah Yassin & AP Dr Faiz Ahmad (UTP)	Study of Wear and Oxidation of Metal Matrix Composites Containing Solid Lubricants Produced by Powder Metallurgy Method
Muhammad Ridhwan bin Abdul Rahman	Master	Full Time	PM Dr Syed Tarmizi Syed Shazali	Prof Madya Ir Dr Mohamad Shahril Osman / Prof Dr M. Shahidul Islam	Design of an Internal Thermal Heat Exchanger Concept System for a Concentrated Solar Power Tube
Tay Chen Chiang	PhD	Full Time	Prof Dr Sinin Hamdan	-	The Mechanical Properties of Natural Fiber (Sago Residues) Reinforced Urea Formaldehyde Resin Composite
Liew Fui Kiew	PhD	Full Time	Prof Dr Sinin Hamdan	Dr Md Rezaur Rahman / Prof Ir Dr Mohamad Rusop Mahmood (UiTM Shah Alam)	Physico-Mechanical Properties of Tin Oxide Nanoparticles Modified Jute-Bamboo Fiber Composites
Yiong Ngee Fei	Masters	Full time	Professor Dr Amir Azam Khan	Dr Nicholas Kuan Hoo Tien	The Effect of Particle / Fibre Addition to Polymer Matrix Composites : Study of Vibration and Acoustic Properties

## Chemical Engineering and Energy Sustainability

Name	Level	Type	Supervisor	Co-supervisor(s)	Title
Georgie Wong Abdullah	PhD	Full time	Prof. Dr. Mohammad Omar Abdullah	-	Framework for Safety and Environment in Energy Sector: An Industrial Perspective
Sia Yong Yin	Masters	Full time	Dr. Ivy Tan Ai Wei	Prof. Dr. Mohammad Omar Abdullah	Palm Oil Mill Effluent (POME) Treatment using Activated Carbon Derived from Agricultural Biomass
Ariny Anak Demong	Masters	Full time	A. P. Dr. Khairuddin Sanallah	Prof. Ir. Dr Andrew Ragai Henry Rigit	Study of Swirl Effect on Mass Transfer and Hydrodynamics in a Gas-Liquid Bubbly Flow Reactors
Nurul Ain Bt Mohamed Alipah	Masters	Full time	Khairul Anwar B. Mohamad Said	Dr. Noruzailina Mohamed Sutan	Characterization and Kinetic Study of Polyetherimide (PEI), Activated Carbon (AC), and Nano-Silver (AG) Flat Sheet Membrane for Heavy Metal Removal
Sherlyna Parveen Anak Deshon Kaman	Masters	Full time	Dr. Ivy Tan Ai Wei	Ir. Dr. Leonard Lim Lik Pueh	Preparation of Activated Carbon From Agricultural Biomass for The Treatment of Palm Oil Refinery Effluent
Mohammed Haji Alhaji	PhD	Full time	A. P. Dr. Khairuddin Sanallah	Dr Lim Soh Fong	Development of An Efficient Photocatalytic Reactor for Degradation of Palm Oil Mill Effluent
Sherra Bellina Anak Barrabas Kuta	Masters	Full time	Dr. Rubiyah Baini	Dr. Noruzailina Mohamed Sutan	An Investigation on Agrowaste-Based Selective Catalytic Reduction (SCR) Catalyst in A Denitrification of Biomass-Combustion Flue Gas

Name	Level	Type	Supervisor	Co-supervisor(s)	Title
Md. Tipu Sultan	PhD	Full time	Dr. Md Rezaur Rahman	Prof. Dr. Sinin Hamdan	Development of Tropical Wood Polymer Composites for Sustainable Application
Ahmad Salam Farooqi	Masters	Full time	A. P. Dr. Khairuddin Sanaulah	Dr. Shanti Faridah Saleh	Effect of Swirl Bubble Injection on Hydrodynamics in Gas/Liquid Bubbly Flows
Ramizah Liyana Binti Jama-In	Masters	Full time	Khairul Anwar B. Mohamad Said	-	Preparation and Characterization of Hybrid Antibacterial Membrane by Incorporating Silver Particle with Polyethyleneimine and Polysulfone for Water Treatment
Tan Yie Hua	PhD	Full time	Prof Dr Mohammad Omar Abdullah	Prof Madya Dr Cirilo Nolasco Hipolito	Biodiesel Production from Waste Oil, Chemical Characterization and Effect of Biodiesel-H <sub>2</sub> O Emulsion on a Small Portable Diesel Generator System
Agnes Lee Yung Weng	Masters	Full time	Dr Lim Soh Fong	-	Selective Heavy Metals Removal by Zirconium Based Magnetic Sorbent
Joel Ting Sing Hong	Masters	Full time	Dr Md Rezaur Rahman	Prof Dr Sinin Hamdan & Dr Shanti Faridah Salleh	Preparation and Characterization of Chemically Modified Cellulose Gel-Reinforced Unsaturated Polyester Composites
Jong Yik Jia	Masters	Full time	Prof Dr Mohammad Omar Abdullah	-	Energy Performance Study of a Chip Fryer
Jicqueline Mitchell Varonica ak Ratai	Masters	Part time	Dr Shanti Faridah Salleh	Mohd Farid Atan	Study on Catalytic Pyrolysis of Macroalgae for Production of Bio-Oil
Tian Chuan Min	Masters	Full time	Professor Dr. Mohammad Omar Abdullah	AP Dr. Abu Salleh Ahmed	Custom Design, Development & Techno-Economical Study of a Small Cooling Water Power Generator for Sejingkat Power Corporate Sdn Bhd
Nazeri Abd Rahman	PhD	Part Time	Dr Rubiyah binti Haji Baini	Prof Dr Mohd. Omar Abdullah	Sustainable Utilisation of Pelletised Plantation Biomass Wastes in Sarawak for Power Generation
Tee Pei Fang	PhD	Full Time	Prof Dr Mohammad Omar Abdullah	Dr Ivy Tan Ai Wei	A Combined Microbial Fuel Cell and Adsorption System for Bioenergy Production and Wastewater Treatment
Josephine Lai Chang Hui	PhD	Full Time	Dr Md Rezaur Rahman	Prof Dr Sinin Hamdan	Polymer Nanotechnology for Biomedical Application
Deviana Endia Pani	Master	Full Time	Dr Shanti Faridah Salleh	Prof Madya Dr Khairuddin Sanaulah / Dr Lim Soh Fong	Study on Hydrogen Sulphide (H <sub>2</sub> S) in Bakun Embankment Dam
Sherena binti Saree	Master	Full Time	Dr Shanti Faridah Salleh	Prof Dr Mohammad Omar Abdullah	Fundamental Studies on the Thresher Performance in the Palm Oil Mill
Ephrem Ryan anak Alphonsus	Master	Full Time	Prof Dr Mohammad Omar Abdullah	Dr Leo Sing Lim (ICATS)	Fluid Diversion System for Automobile Adsorption Air Conditioning System
Wong Teck Soon	Masters	Full Time	Dr Shanti Faridah Salleh	Dr Lim Soh Fong	Assessment of the Availability of Agricultural Waste for Energy Production
Siti Kartina Abdul Karim	PhD	Part Time	Dr Lim Soh Fong	Prof Ir Dr Law Puong Ling / Dr Shanti Faridah Salleh	Sorption of Organic and Inorganic Contaminants via Banana Fibers
Wong Teck Soon	Masters	Full time	Dr Shanti Faridah binti Salleh	Dr Lim Soh Fong	Acid Hydrolysis of Sago Hampas Using Different Types of Reactors for Glucose Production

**Deputy Dean  
(Post Graduate & Research)**

Assoc. Prof. Ir Dr Siti Noor Linda Taib  
tlinda@unimas.my  
Tel: +6082-583326 Fax: +6082-583410

**Deputy Dean  
(Industry & Community  
Engagement)**

Assoc. Prof. Dr. Hushairi Zen  
zhushairi@unimas.my  
Tel: +6082-583209  
Fax: +6082-583410

**Head Quality Unit,  
Post Graduate & Research**

Prof. Dr. Amir Azam Khan  
akamir@unimas.my  
Tel: +6082-583322

**Department of Mechanical &  
Manufacturing Engineering****Head of Department**

Dr. Shahrol Mohamaddan  
mshahrol@unimas.my  
Tel: +6082-583296  
Fax: +6082-583410

**Contacts for research groups:****Advanced Manufacturing**

Leader: Assoc. Prof. Dr. Syed Tarmizi  
Syed Shazali  
starmizi@unimas.my  
Tel: +6082-583340

**Materials and Processing**

Leader: Prof. Dr. Sinin Hamdan  
hsinin@unimas.my  
Tel: +6082-583247

**Thermofluids & Energy**

Leader: Prof. Ir. Dr. Andrew Ragai  
Henry Rigit  
arigit@unimas.my  
Tel: +6082-583292

**Department of Chemical  
Engineering & Energy  
Sustainability****Head of Department**

Dr. Shanti Faridah Salleh  
sshanti@unimas.my  
Tel: +6082-583338  
Fax: +6082-583410

**Contacts for research groups:****Sustainable Renewable Energy  
(SURE)**

Leader: Prof. Dr. Mohamad Omar  
Abdullah  
amomar@unimas.my  
Tel: +6082-583280

**Fluid Transport & Separation Process  
(FITS)**

Leader: Assoc. Prof. Dr. Khairuddin  
Sanaullah  
skhairuddin@unimas.my  
Tel: +6082-583266

**Materials & Polymer Engineering  
(MAPE)**

Leader: Dr. Md Rezaur Rahman  
rmrezaur@unimas.my  
Tel: +6082-583302

**Sustainability & Environmental  
Engineering (SEEN)**

Leader: Mr. Nazeri Abdul Rahman  
arnazeri@unimas.my  
Tel: +6082-583479

**Department of Civil  
Engineering****Head of Department**

Dr Mohamad Raduan Kabit  
kraduan@unimas.my  
Tel: +6082-583337  
Fax: +6082-583410

**Contacts for research groups:****Transportation Infrastructure  
Planning and Sustainability (TRIPS)**

Leader: Prof. Dr Wan Hashim Wan  
Ibrahim  
wiwhashim@unimas.my  
Tel : +6082-581222

**Geotechnical Engineering  
Research Group (GERG)**

Leader: Assoc. Prof. Ir Dr Siti Noor  
Linda Taib  
tlinda@unimas.my  
Tel: +6082-583326

**Hydro-Environmental Engineering  
Research and Development (HERD)**

Leader: Prof. Ir. Dr. FJ Putuhena  
fjputuhena@unimas.my  
Tel: +6082-583349

**Innovative Materials and Structural  
Engineering (IMASE)**

Leader: Prof. Dr. MD Abd Mannan  
mannan@unimas.my  
Tel: +6082-583223

**Energy and Construction  
Management (ECoM)**

Leader: Ir. Dr. Ting Sim Nee  
snting@unimas.my  
Tel: +6 082-583279

**Department of Electrical &  
Electronics Engineering****Head of Department**

Dr. Norhuzaimin Julai  
jnorhuzai@unimas.my  
Tel: +6082-583339  
Fax: +6082-583410

**Contacts for research groups:****Advanced Telecommunications  
Research (ATRe)**

Leader: Dr. Thelaha Masri  
mthelaha@unimas.my  
Tel: +6 082-583339

**Computer Engineering**

Leader: Assoc. Prof. Dr. Mohd  
Saufee  
msaufee @unimas.my  
Tel: +6 082-583356

**Microelectronics**

Leader: Mr. Ng Liang Yew  
ngliangy@unimas.my  
Tel: +6 082-583269

**Centre for Renewable Energy  
(CREN)****Director of CREN**

Assoc. Prof. Dr. Azhaili Baharun  
bazzhaili@unimas.my  
Tel: +6082-583230  
Fax: +6082-583410

**Contacts for research groups:****Hydro**

Leader: Assoc. Prof. Dr. Hushairi Zen  
zhushairi@unimas.my  
Tel: +6082-583209

**Biomass**

Leader: Prof. Dr. Sinin Hamdan  
hsinin@unimas.my  
Tel: +6082-583247

**Solar**

Leader: Assoc. Prof. Dr. Al-Khalid  
Othman  
okhalid@unimas.my  
Tel: +6082-583325

**Tidal**

Leader: Prof. Ir. Dr. Andrew Ragai  
Henry Rigit  
arigit@unimas.my  
Tel: +6082-583292

**Wind**

Leader: Assoc. Prof. Dr. Thelaha  
Masri  
mthelaha@unimas.my  
Tel: +6082-583339

**Hybrid**

Leader: Prof. Dr. Mohammad Omar  
Abdullah  
amomar@unimas.my  
Tel: +6082-583280



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**JASPE**  
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**Call for papers for**

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## Background

ENGINEERING CONFERENCE (ENCON) IS THE - FLAGSHIP CONFERENCE FOR THE FACULTY OF ENGINEERING, UNIVERSITI MALAYSIA SARAWAK (UNIMAS)

With the theme '*Innovative Solutions for Engineering and Technology Challenges*', the objectives of the current conference are to:

- Provide a platform for researchers, academicians, engineers, industrial professionals as well as graduate students to share their experience and findings especially on the solutions for engineering and technological challenges.
- Promote and enhance networking opportunities among the participants from various backgrounds who work in the field of engineering and technology.
- Push the limit knowledge to engineering and technology by sharing ideas and latest technological advances and innovative solutions.

## Who should attend

The target participants consist of academicians, researchers, engineers, industrial professionals and graduate students.

## Call For Papers

Call for papers has commenced and participants are cordially invited to submit their papers.

The following topics of interest are included, but not limited to:

- Civil and Structural Engineering
- Geotechnical Engineering
- Water Resources Engineering
- Highway and Transportation
- Construction Management
- Environmental Engineering
- Risk Management
- Procurement Management and Contract
- Energy Efficiency and Policies
- Renewable Energy
- Chemical Engineering
- Manufacturing and Industrial Engineering
- Material Engineering
- Earthquake Engineering
- Climate Change
- Pollution and Control
- Engineering and STEM Education
- Related Case Studies
- Any other related topics

FOR FURTHER INFORMATION , PLEASE CONTACT :

Dr. Norsuzailina bt Mohamed Sutan,  
Tel; 082-583232  
email :msnorsuzailina@unimas.my,

Dr. Charles Bong Hin Joo  
Tel : 082-583294  
Email:bhjcharles@unimas.my





**Faculty of Engineering  
Universiti Malaysia Sarawak  
94300 Kota Samarahan  
Sarawak Malaysia**

**Tel: (+6) 082 583346 Fax: (+6) 082 583410**