**Keynote 1**  Professor Dato’ Dr. Noraini Idris  

*STEM Education For 4th Industrial Revolution: A Way Forward*

To remain competitive in the global economy and 4th industrial revolution, Malaysia needs to build a strong workforce in STEM. But educators and policymakers face immense challenges. All young people should be prepared to think deeply and to think well so that they have the chance to become the innovators, educators, researchers, and leaders who can solve the most pressing challenges facing our nation and our world, both today and tomorrow. But, right now, not enough of our youth have access to quality STEM learning opportunities and too few students see these disciplines as springboards for their careers. STEM education has the potential to produce and sustain a new workforce of problem solvers, innovators, and inventor who have the knowledge, skills and values to innovate and compete in the new global marketplace – 4th Industrial Revolution. The strength of the STEM workforce is often viewed as strong indicator of a nation's ability to generate ideas towards the creation of innovative product and services as well as to sustain. The question is, "What kind of education system does Malaysia need to transform STEM education and deliver it equitably to all students? To what extent does the present system ensure that students acquire the relevant knowledge and skills to meet 4th Industrial demands? In this presentation, presenter will share and discuss how STEM Education lead to more growth especially in terms of cognitive skills and economic outcomes.

**Keynote 2**  Professor Kwing-So Choi  

*New strategies in leading-edge flow separation control using plasma actuators*

Flow separation control has been carried out using DBD (Dielectric-Barrier-Discharge) plasma actuators, which were placed near the leading edge of an NACA 0012 aero foil. Here, pulsed wall-normal jets were issued against the flow by injecting the jet vorticity into the separated region, reattaching the separated flow with a very small jet momentum coefficient of less than 0.0005%. In the lecture, the mechanism of flow separation control using plasma actuators will be discussed by showing how the vortices created by plasma jets interact with the separated flow based on time-resolved PIV (Particle Image Velocimetry) measurements.

**Keynote 3**  Professor Dr. Nasir M. Ahmad  

*Design and Applications of Antifouling Functional Polymeric Materials for Industry and Environment*

Designing functional materials especially polymers with antifouling polymers with antifouling and antimicrobial properties has an important routine to solve industrial challenges, such as infections and fouling, in healthcare, environment, energy, and water. Recently, there
has been considerable interest in developing tailor-made polymers because of their distinct properties including their sizes, length scale, ease of process ability, relatively lower cost, tunable properties as well as others diverse functionalities. Considering above, this presentation will focus to elaborate the polymer systems developed as antifouling and antimicrobial materials termed respectively as bio passive and bioactive polymers. Recent state of the art involving various types of bioactive and bio passive polymeric systems and their applications will be presented from the perspective of industrial challenges and applications.

Plenary 1
Assoc. Prof. Dr. Azrul Azlan bin Hamzah

Development of anti-diuretic hormone (ADH) Sensor for Smart Monitoring of Fluid Level in Artificial Kidney

Nephrogenic diabetes insipidus (NDI), which can be congenital or acquired, results from failure of the kidney to respond to Antidiuretic Hormone (ADH). This disorder leads to excessive urine production. Reliable biosensor is required to overcome this phenomenon in order to regulate amount of urine production, particularly in artificial kidney. One of the most prominent biosensors is graphene-based field effect transistor (FET) sensors. Graphene is a nanomaterial consisting of a monolayer of carbon atoms arranged in two-dimensional hexagonal crystalline form. The monoatomic structure of graphene offers unique properties such as high mechanical strength, distinctive electronic properties, high carrier mobility, high saturation velocity, and low charge scattering. Owing to these properties graphene has been used in sensitive detection of analytes. In particular, conductance-based Field Effect Transistor (FET) graphene biosensor have received much attention because of their simple design and ability to allow sensitive measurements. This research is to be conducted to finding ways to fabricate graphene-based field effect transistor (G-FET) using cost effective materials and methods for effective detection of Antidiuretic Hormone (ADH). As a first step, G-FET will be modelled and simulated using Lumerical DEVICE software in order to study and optimize parameters involved. Then, these optimized parameters will be used in effective fabrication of graphene-based field emission transistor (G-FET). Then, fabricated structures will be functionalized with aptamers to detect concentration of ADH hormones produced by pituitary glands. Finally, functionalized biosensor will be integrated with microfluidic device to regulate the amount of urine produced by artificial kidney. In short, this field is new emerging field and it is capable of producing low cost and highly effective chemical sensors. The sensor would then provide data for smart and remote monitoring of patient’s real-time fluid level, directly from doctor’s office.

Plenary 2
Prof. Dato’ Dr. Burhanuddin bin Haji Yeop

MEMS based Chemical Sensors for Biomedical Applications

In a chemical sensing system for biomedical applications, the system usually consists of a chemical sensing unit [1], microfluidic [2] and pumping system [3], microgenerator unit to power up the sensors [4],
and an energy storage device [5]. CuO and ZnO nanowires could be fabricated into a highly sensitive gas and chemical sensors for biomedical applications [1]. Metal oxides nanostructures are important materials involving in the development of gas detection systems, but most of them only working at elevated temperature. A diode-based structure of p-type copper oxide (CuO) and n-type zinc oxide (ZnO) nanowires (NWs) on silicon, which possess rectifying I-V characteristic, was fabricated to overcome this drawback. Chemical sensing characteristics of CuO NWs and ZnO NWs with and without diode structure have been examined by measuring the resistance change towards 0.5% methanol vapour at room temperature. The diode-based structures showed significant improvement in sensing behaviours. The implementation of CuO NWs and ZnO NWs with diode-based structures showed great enhancement in terms of sensitivity, reliability and recovery rate. Elements to be detected are guided into microfluidic channels using MEMS micropumps [2,3]. The micro chamber and the fluidic channel were fabricated using standard photolithography and soft lithography process. Conventional method by pouring PDMS on a silicon wafer and peeling after curing in soft lithography produces unspecific layer thickness [2]. In the micropump, planar valveless design is used [3]. The technique utilizes MEMS fabrication methods by using a double sided etch. A planar diffuser and a nozzle element of the pump, as well as a 150 μm thick silicon membrane, are designed and fabricated using only three pattern process steps. An actuator-chamber and a pump-chamber with depths of 250 μm are formed after 250 min KOH etching, while the diffuser/nozzle element with a depth of 50 μm is sequentially formed after chamber forming. Aside from sensing, microfluidic and pumping elements, the chemical sensor system needs a microgenerator and energy storage unit to function. A piezoelectric micro-power generator (PMPG) device developed has 10 μm SU8 proof mass, 200nm Au /20 nm Cr interdigitated electrode, 1.5 μm functioning PZT layer and 200 nm Si3N4 on 10 μm Si substrate. The Fabricated PMPG vibrates at 61 Hz with power density of 0.29 W/cm3 and can supply 3.33AC voltage, 2.19V DC voltage to the final load [4]. On the other hand, the power storage unit, interdigital structured supercapacitor consists of silicon as the substrate, nickel as current collectors and polyvinyl alcohol-based gel as a solid-state electrolyte. The maximum charge density value is $4.1 \times 10^{-6}$ pC/μm² and the maximum capacitance achieved is 0.116pF [5]. The combined system realised a stand-alone chemical sensing device for biomedical applications.

Plenary 3

Professor Ir. Dr. Abdul Aziz Bin Abdul Raman

Challenges And Opportunities For Malaysian Engineers In Coming Years

In this talk, the speaker will explore the challenges and opportunities available for Malaysian engineers from various perspectives in coming years. The perspective may include educational, job opportunities, emerging areas and others. Engineers have been contributing to nation building directly and indirectly and in coming years the scenario is unlikely to change. However, due to complexity and demand of the society, scarcity of natural resources and the globalization in real sense,
will definitely pose new challenges for the engineers in coming years. Many jobs and conventional services may disappear. However, they will be also opportunities created where many types of products, services and jobs will be created in the future, which may not exist yet. Examples will be shared. The speaker will provide some strategies to prepare themselves for challenges and opportunities in coming years. IR 4.0 aspect will be also discussed in the context of this talk.

Plenary 4  Sr Mohamad Shazali bin Sulaiman

Metamorphosis Of Qs Profession: Revolutionary Journey In Malaysia Towards Industry 4.0

The current scenario in the construction industry in Malaysia has changed dynamically and this has caused the quantity surveying profession developed. We are finally on the track of the much-augured fourth industrial age. The transformational technology that will bring about a new industrial revolution is already available, and across the global economy, businesses are beginning to leverage it to deliver huge productivity benefits. The roles of quantity surveying profession have evolved as the Clients not only employ for the basic and supplementary services but also for the revolutionary services such as adjudication, risk management, value engineering and development appraisal. As a result, quantity surveying profession has developed from the normal production of Bills of Quantities and administration of contract to the diversified ever-widening scope of services. This paper is a presentation of the changes in quantity surveying profession roles in Malaysia based on review of the basic and supplementary services and the new frontier services. It also gives an insight of the new competencies that are needed to stay relevant in the Malaysian construction industry.

Plenary 5  Ar Wee Hii Min

Engineering the Built Environment

The paper aims to address the perceived divide between engineering and the built environment; primarily from the standpoint of an architectural practice. Using examples from competed projects, the speaker will attempt to demonstrate how engineers, architects and builders can collaborate to improve the built product, reduce expenditure and enhance the construction experience. This lecture is especially suited to young engineers and engineering students as it provides an alternative viewpoint from which to celebrate engineering.

Plenary 6  Mr. Leon Liew Chee Eng

Innovation and its Impact on the Energy Sector

Fossil fuels—coal, petroleum (oil), and natural gas (concentrated organic compounds found in the Earth's crust) make modern life possible. These huge sources of energy work to generate power and they make the manufacturing of tens of thousands of commercial goods possible. Fossil fuels have become synonymous with modern industrial society, their potential to solve some of the challenges of everyday
existence has been understood throughout history. Going forward, Technology with Innovation, in its many forms, is the key to a decarbonised energy future. In particular, advances in electric storage and renewable energy are key areas that have the potential to dictate the pace and the scale of the energy transition. Their impact is growing as renewable energy displaces hydrocarbons, particularly oil and coal, in power generation. In turn, the anticipated improvement in electric storage, notably batteries, has the potential to revolutionise the transport sector as the electric vehicles (EVs) become a viable alternative to petrol and diesel fuelled cars. A record 157 gigawatts of renewable power were commissioned in 2017, up from 143GW in 2016 and far out-stripping the 70GW of net fossil fuel generating capacity added last year. Global economic growth that both drives energy demand and is directly impacted by energy price volatility remains high on the global agenda. Recent history has shown that falling oil prices have largely failed to boost economic growth in consuming countries, but they have had a dramatic impact on the fiscal balances of hydrocarbon-producing countries. Falling energy prices might not boost economic growth but the inverse is true: economic growth does boost energy demand.

Plenary 7
Mr. Abbas Ali

Big Data Analytics In The Facilities Management Industry

Aim to explore the current condition of the Big Data concept with its related barriers, drives, opportunities and perceptions in the architecture, engineering and construction on the platform offerings with an emphasis on facilities management (FM) solution tool offerings.

PARALELL SESSIONS

Paper ID:

1 Digitizing Flood Processes for Sarawak River Operations
Darrien Yau Seng Mah,*, and Frederik Josep Putuhena

Abstract.
Kuching city of the Sarawak State, Malaysia is located on a flat alluvial plain 30 km away from the sea. The low-lying city is vulnerable to high tides, where the city had experienced recorded spring tides as high as 3.5 m MSL. In 1998, a barrage is established near estuary to protect the city. The structure is the property of the State Government under the care of Sarawak Rivers Board, but the operation is managed by a private contractor. The operation team extensively regulates the hydrological data of the river system with its telemetry system. However, the operator is lacking a flood forecasting system to predict high flow from upstream. This paper reports a computer modelling efforts to guide the barrage operations in flood warning. We present a way of warning based on computerized flood mappings The behaviours of the river in terms of levels, rates of flow, and other parameters are simulated. The riverside communities are to be alerted at lower river water levels between 0.8 and 1.0 m MSL as compared to the currently used 1.37 m MSL for flood warning with reference to Batu Kawa.

2 Human Technical Competency Assessment Model for Escape, Evacuation and Rescue Operation in Offshore Installation
Lim Wen Khai, **Risza Rusli, and Azizul Buang

Abstract
The importance in identifying safety critical task in high-risk industries for competence assessment is greatly emphasized to ensure the personnel is well equipped with high level of competence and
assurance in certain safety critical tasks. Although competency assessment is widely implemented in offshore industry, failure in escape, evacuation, and rescue (EER) operation still occur and has led to tragic consequences associated with high number of fatalities, indicates that lacking in competency assessment is still exist. In this research, a human technical competency assessment model is developed to assess the technical skills of candidate in EER activities. Case study is selected to evaluate the model. Failure in high severity rating and high sequence task has much higher impact to the overall assessment than failure in task with high severity rating but low sequence and task with low severity rating but high sequence. The value of severity rating is identified to have highest impact towards the overall score, followed by sequence and recovery. This model has implemented stricter assessing criteria to evaluate candidate’s performance. Thus, this human technical competency assessment model has indeed sufficient to assess the technical skills of personnel in ensuring the success of EER operations in offshore installations.

**Keywords:** safety critical task, EER, technical competency, assessment

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3 Band-Notched Antipodal Vivaldi Antenna Using Edge-Located Vias Mushroom EBG Structure for Ultra Wideband Applications

Saidu A. Adamu, Thelaha Masri, Wan Azlan W. Z. Abidin, Kismet H. Ping, and Hieng T. Su

**Abstract**

An Ultra wideband (UWB) Antipodal Vivaldi Antenna operating at 2.78 GHz to more than 12 GHz having dual band notch characteristics is designed for UWB applications. The proposed double-layered AVA is designed using a low cost FR-4 dielectric substrate with combined thickness of 2.1mm. Two edge-located vias mushroom type Electromagnetic Band Gap (EBG) structures were incorporated in a conventional antipodal Vivaldi antenna (AVA) in between the two substrate layers and below the feeding line, to realize the proposed antenna. Using the band gap property of the EBG structure, two notch bands were created within the ultra wideband frequency range for IEEE 802.16 WiMAX application at 3.18 – 3.80 GHz and IEEE 802.11a WLAN application at 5.13 – 5.80 GHz. Simulation results showed a nearly stable end-fire radiation pattern in the entire frequency range except in the two notch bands, with a peak realize gain of 7.69 dBi at 6.5 GHz. Surface current distribution and far-field radiation patterns are also studied to further characterize the performance of the proposed antenna.

**Keywords:** Antipodal Vivaldi Antenna, Edge located vias, Ultra wideband, Slot edge corrugation, Reflection Coefficient

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4 Digital Electronic Load Controller Design for Micro-Hydroelectric System

**Y. M. Chong, M. Anyi, and L. Gurusamy**

**Abstract**

A micro-hydroelectric system is an important alternative for rural electrification, but its output voltage fluctuates over a small change of consumer loads. In order to protect the users and their appliances, the output voltage must be regulated to the nominal voltage of the appliances. For that purpose, this paper describes the concept of a simple and cost effective digital Electronic Load Controller (ELC). The formulation of proportional-integral-derivative (PID) control based ELC algorithm is presented, and the flow chart of the algorithm is derived. The hardware implementation of the ELC was established to verify the concept. By using a laboratory setup, the tuning effect of PID time interval on the voltage regulation was investigated and presented as there is no well documented information about the setting of that variable in literature. The experimental results showed that the ELC performed better with minimum value of time interval. The ELC was also tested with load variations, and the results showed that the output voltage was kept regulated at the nominal voltage despite the load variations. This has confirmed that the concept and methods used in the ELC design proposed in this paper can be considered for the voltage regulation of the micro-hydroelectric system.

**Keywords:** electronic load controller, micro-hydroelectric, voltage regulation, proportional-integral-derivative control, time interval

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5 Monitor Points Selection in CFD FLACS for Gas Detector Placement

Siti Hajar Binti Ahmad Mokhtar, ** Risza Binti Rusli and Azizul Bin Buang

**Abstract**

It is important to deeply analyze in making the decision for the placement of the gas detector. CFD FLACS helps in simulate the gas dispersion and come out with the concentration for each area. The area with flammability range (LEL and UEL) for methane can be detected through this software. In order to simulate gas dispersions, four parameters were set: wind speeds, leak directions, leak rates and leak directions. Monitor points (MP) act as concentration sensors were chosen, filtered and analyzed based on three ways: 1) through the nearest MP location to leak location, 2) the worst-case identification and 3) the highest number of scenarios detected. The selection of monitor points is important as there were many monitor points are put into the geometry. Since the main objective of this research is to optimize the gas detector placement, reduce the time taken for the gas detector to
detect the flammable gas release with full coverage are what industries need nowadays. Hence, it is expected that the approached ways capable to optimize the gas detector placement. Competent engineers and safety engineers are responsible to determine the effective placement of the gas detectors as well.

**Keywords**: effectiveness, performance, placement, monitor points, CFD FLACS, methane

6 Study of Pollutant Degradation Coefficient in Natural Wetland of Mangrove Forests

**Alifatul Haziqah Abu Hanipah, Guo Zhenren and El-Said Mamdouh Mahmoud Zahran**

**Abstract**

Natural mangrove wetlands located at the transition zone between upland and rivers usually act as an effective pollution buffer due to their function in degrading organic pollutants (BOD) in polluted water. The efficiency of mangrove wetlands is often reported based on the percentage of pollutant removals but the associated degradation kinetics received little attention. This study looks at the pollutant degradation coefficient, \( k \) of mangrove wetlands by on-site experiments at the wetland of the Brunei River which is dominated by Rhizophora Apiculata and Sonneratia Alba. The experimented mangroves were enclosed with timbers and the timer pool retained partially treated wastewaters. Water samples were collected at the inlet and in the pool and then tested in several runs of experiments. The pollutant degradation coefficient, \( k \), was estimated using the typical reaction kinetic model. It was found that \( k \) has a mean and median of 0.43 and 0.47 (day-1) respectively. The value of \( k \) was further modified for saline water conditions and it was estimated to be 0.28 (day-1) with salinity up to 20 ppt. These findings provide an overall insights of reactions of pollutants in mangrove wetlands and can be used in water quality modelling of tropical river with mangrove forests.

**Keywords**: Natural wetlands, Mangrove, Degradation, Water pollutions

7 Nano-biocontrol of Coffee (Coffee) and Water Spinach (Ipomoea aquatica) on Apple Snail (Pomacea spp)

**Khalisanni Khalid, Mohd Nor Mohd Rosmi, Azlina Masdor, Rashid Mat Rani and Kayathiri Karunanithi**

**Abstract**

Pomacea is a genus of freshwater snails with gills and an operculum, aquatic gastropod mollusks in the family Ampullariidae, the apple snails. Some species have been introduced outside its native range and considered invasive because of voracious appetite for plants. In this study, the effect of Coffee (Azadirachta indica) and water spinach (Ipomoea aquatica) raw extracts on Apple Snail were investigated. Based on the experiment, it was found that there was cidal effect on Apple snail after tested with coffee and water spinach extracts. It also found that coffee and water spinach extracts affect the Apple snail by lowering its metabolic rate and eventually contribute to mortal effect on the Apple snails.

**Keywords**: apple snail, spinach, coffee, nano-biocontrol

8 Evaluation of the energy efficiency of the model object from renewable and traditional materials based on an assessment of heating costs

**V. Roudna, L. Labudek, M. Prak and A. Ticha**

**Abstract**

The aim of the study is to assess the energy efficiency of buildings from renewable and natural materials, compared with objects based on traditional materials in terms of heating costs in the Czech Republic. Assessing the energy efficiency of an object is accomplished by comparing heat losses and the cost of heating in buildings formed from materials based on wood and hemp and materials based on ceramics and polystyrene, which are forming the supporting structure and the thermal insulation. Comparison is made on two identical projects, with only slight differences due to the technological capabilities of the used materials. Support structures are made from pressed wooden joists and wooden beams in the first example, and from ceramic tiles and bricks in the second example. Thermal insulation is use from hemp in the first example and from polystyrene in the second example. The work deals with the evaluation of the energy efficiency of the buildings based on an assessment of the heating costs of the model objects obtained using computational methods for evaluating heat loss, and the heating costs of objects using a condensing gas boiler. The final evaluation of the energy efficiency of the buildings is made on the basis of the collected data on heat loss and heating costs of the objects, taking into account their current price levels in the Czech Republic.

**Keywords**: renewable material, traditional material, heating costs
9 **Model Predictive Current Control Fed by Four-leg Voltage Source Inverter Under Balanced and Unbalanced Load Conditions**

Hazrul Mohamed Basri, Kasumawati Lias, Wan Azlan Wan Zainal Abidin, Al-Khalid Othman

**Abstract**

This study investigates the finite control set–model predictive current control (PCC) of a four-leg voltage-source inverter. This topology can supply energy to unbalanced three-phase loads by providing the path for a zero-sequence load. The proposed control strategy takes advantage of the discrete nature of the power converter system to predict the future behavior of the output current. PCC is based on an optimal approach that selects the most accurate switching signals among 16 valid switching states by computing the minimum cost function and applying the optimal switching state to the next sampling time. The performance of the proposed control was experimentally validated using LabVIEW FPGA™. Results show that the proposed control can provide independent balanced and unbalanced load current tracking with low harmonic distortion content.

**Keywords:** Model predictive control, Current control, Four-leg inverter, Unbalanced load.

10 **Experimental Study on Permeable Pavement Sub surface Hydrology Characteristics**

Norazlina B., Lai S.H., FJ Putuhena, Mah Y.S. and Mannan M.A.

**Abstract**

Permeable pavement is a green approach towards sustainability development. It’s consists of strata of fine particles with surface layer of porous concrete, asphalt or precast permeable pavement. This research introduces a novel permeable pavement with unique hydrological features as permeable pavement with an underground stormwater detention; a micro detention pond permeable pavement, MDPP. The MDPP consists of three-piece suit of a single modular unit with top and bottom covers, hexagonal plate and hollow cylinders in between as water storage and holder. The hydrological characteristics are investigated through laboratory scale rainfall simulator experiments. From the study, the storage capacity gives about 10% differences from calculated design detention pond storage volume. Permeability rate is similar after 1 to 1.5 hrs rainfall regardless of various rainfall intensity for 10 yrs flood control scenario. Subsurface runoff is 100% released to the ground level within 5hrs for rainfall intensity of 80mm/hr falling continuously within 3hours duration. The infiltration capacity is 20mm/hr with compacted local subgrade (lateritic soil); fall in medium category of Soil Conservation Service Group, SCS soil infiltration rate. Based on the preliminary results, MDPP can be applied for permeable pavement roadworks.

**Keywords:** Permeable pavement; micro-detention-pond-permeable-pavement; rainfall simulator, hydrological characteristics.

12 **Student Perceptions on Watching Learners-produced Screencast Videos in Learning Mathematics**

Irene Yang and Lau Bee Theng

**Abstract**

The purpose of this study was to examine the relationships of learners’ perceived intention, strategies, design, learning platform and effectiveness in watching the learners-produced screencast videos. In addition, the predictors of screencast video as an effective learning tool were explored in the present study. A survey was administered to undergraduate engineering students who used learners-produced screencast videos to supplement their learning in mathematics. The findings indicated that learners mainly use screencast videos for understanding some difficult concepts, prefer to watch screencast individually, favor the feature of highlighting important concepts and able to clearly understand the explanation provided by peer through voice narration in screencast videos. Correlational analysis indicated high statistically significant relationships between learners’ perceived intention and perceived effectiveness of screencast videos as well as between perceived learning platform and perceived effectiveness of screencast videos. In addition, learners’ intention to use screencast videos was identified as the most critical factor which significantly predicted learners’ perceived effectiveness of the approach. Potential implications of the findings and recommendations for future research were discussed in this study.

**Keywords:** learners’ perceptions, screencast videos, worked examples, peer learning.

13 **Device-Free Object Positioning Estimation for Indoor Environment using IR-UWB Radar**

Terence Jerome Daim, Razak Mohd Ali Lee

**Abstract**

Impulse Radio Ultra-Wideband (IR-UWB) radar is a type of radar functioning based on UWB transmission technology that uses an exceedingly wide bandwidth low power impulse signal to continuously transmitting and receiving the impulse signal for object detection within a range. To date, most of the proposed Ultra-Wideband (UWB) transmission technology based object positioning estimation systems for indoor environment depends on objects to be attached with an active UWB...
devices. In certain circumstances, it is ideal to track objects in passive manner without the requirement of any attached tracking devices or device-free object positioning estimation. IR-UWB radar has shown promising utilization in realizing device-free object positioning estimation for indoor environment. With this motivation, in this paper a study on device-free object positioning estimation for indoor environment using IR-UWB radar is presented.

**Keywords:** Device-Free, IR-UWB radar, Indoor Environment, Object Positioning Estimation

14 **Plasma Induced Corona Discharge Treatment of the Hydrocarbons & Crude Oil Historical Prospectives and Future Trend**

**Mohamed Shaaban, Hossein Zeynal, Khalid M. Nor**

**Abstract**

The fact that heavy oils made up approximately 50% of the all available world resources of the hydrocarbons, which still exist beneath the crest of earth and impose a major stress on to the methods of Enhanced Oil Recovery (EOR) and their stock holders. However, despite of all the efforts only 10% of these have been utilized till present. So far, only 5 methods prove their effectivity for breaking of the long chain hydrocarbons into the smaller chains. These methods include thermal cracking, coking, visbreaking, hydrocracking and catalytic cracking. A new method, which has emerged to have the ability to withstand the position of an effective measure in this regard, is the non-thermal corona discharge that promises for the better yield. The main objective here is to bring the issue into forefront with historic prospective and the associated work conducted on the subject. In addition to it the effectiveness of this process has been investigated in terms of the amount of energy needed for the purpose as well as in terms of total amount of oil that can be treated using this method.

**Keywords:** Non-Thermal Plasma, Corona Discharge, Crude Oil, Thermal Cracking.

15 **Turritella terebra Shell Synthesized Calcium Oxide Catalyst for Biodiesel Production from Chicken Fat**

**M. N. Mohiddin, **A. A. Saleh, A. N. R. Reddy and S. Hamdan

**Abstract**

Heterogeneous catalyst has been viewed as a promising catalyst for biodiesel production. This study employed Turritella terebra (TT) shell as a source for synthesizing heterogeneous CaO catalyst for biodiesel production via transesterification by utilizing chicken fat as a feedstock. The TT shell CaO catalyst was characterized and its catalytic performance was studied. The spectrographic methods that include FTIR, SEM, PSA, and BET -BJH were employed for characterization of the synthesized CaO. The TT shell CaO catalyst optimally produced chicken fat biodiesel (CFB) with reaction parameters at catalyst concentration of 4 wt%, chicken fat to methanol molar ratio of 1:12, reaction temperature of 60°C, and reaction time of 90 min. The optimal yield was 94.03% and the TT shell CaO catalyst still yield 79.19% of CFB on the fifth cycle of reaction. This study has implied that TT shell is a feasible and attractive renewable source of heterogeneous CaO catalyst for biodiesel production.

**Keywords:** biodiesel, transesterification, heterogeneous catalyst, CaO, chicken fat

16 **Optimal Weekly Hydrothermal Generation Planning Using Mixed Integer Linear Programming**

**Mohamed Shaaban, Hossein Zeynal, and Khalid M. Nor**

**Abstract**

The efficient allocation of thermal generation resources and hydropower generation resources in electric power systems is imperative to achieve a systemwide optimal operation cost. This paper presents a comprehensive model for the weekly hydrothermal generation planning considering detailed hydraulic coupling of hydropower plants on the same river network. Due to the large-scale nature of the problem, a mixed integer-linear programming (MILP) approach, based on the branch and bound & cut (BB&C) algorithm, is used. The proposed approach is validated on a standard testbed system, and is then applied to the IEEE 300 bus system with 69 generating units. Test results have vindicated the effectiveness of the proposed approach.

**Keywords:** hydrothermal scheduling, mixed-integer linear programming, power generation, electricity grids.

17 **Recent Development of Nipah Palm Fiber Extraction Process**

**Tracy Dickie, Syed Tarmizi b. Syed Shazali, and Noor Hisyam b. Noor Mohamed**

**Abstract**

*Nypa fruticans* or locally known as nipah palm is extracted from its fronds to determine its potential as reinforcing agent in polymer composites. The objective of this paper is to investigate the method to extract nipah palm fiber from its fronds and to determine its diameter and density. Two extraction methods were tested; they are the dry and wet method. The dry method is where the fronds are dried under hot sun and the wet method is where the fronds were soaked in water prior to extraction. The
extraction process found that nipah palm has two types of potential fiber suitable for reinforcement, coarse (fiber A) and fine fiber (fiber B). Both extraction methods are able to produce these two fibers. Both methods are discussed extensively in this paper. The diameter of fiber A and B were 0.53±0.06 μm and 0.039±0.08 μm respectively. Distribution of the fibers was measured using optical microscope. The densities of the fibers were measured using pycnometer method and the densities were 1.00 g/cm³ and 0.89 g/cm³ for fiber A and B respectively.

Keywords: Nypa fruticans, Nipah fiber, Natural fiber, Fiber extraction

18 Use of Compressed Earth Bricks/Blocks in Load-Bearing Masonry Structural Systems: A Review
Lim Chung Han, Adriana Erica Amaludin, Ahmad Nurfaidhi Rizalman and Salinah binti Dullah

Abstract
Clay fired bricks are commonly encountered in the construction sector as infill between structural frames. This system has been favoured by builders due to familiarity, ease of manufacture, and they also do not required skilled labourers to erect. Produced from molded clay and hardened by firing in a kiln, brick production is both energy intensive and high in CO2 emission. Fired bricks are typically held together by cement mortar at the bed and perpend joints which provide very minimal resistance against shearing or flexure. This meant brick walls often require additional wind posts or stiffeners to provide stability. Compressed earth masonry offers an alternative to the conventional brick walling system in that, besides having the advantages of conventional bricks, they also confer higher compressive strengths due to the high pressure compaction manufacturing process. The high strength allows the system to be adapted into load-bearing masonry system for use in low-rise buildings as an alternative to the more expensive reinforced concrete or steel framing system. The high pressure compaction process along with high quality molds also give fair-faced finished to the bricks, allowing them to be used as facing bricks and eliminating the need for surface finishing such as plastering to walls. Additionally, compressed bricks featuring interlocking key holes along the bed joints allows for simplified and faster wall erection process. This review paper aims to document the research progress thus far in adopting the compressed interlocking bricks as a sustainable alternative to current building materials.

Keywords: Compressed earth, blocks, bricks, interlocking.

19 Adsorption of Copper (II) from Aqueous Solution Using Tea (Camellia Sinensis) Leaf Waste
Hafizah Binti Naihi, Azmi Bin Ahmad, Nur Faziera Binti Manchul, Sugi Anak Baki, Siti Nur Asilah Aimi Binti Mohamad Norza’in

Abstract
The extensive use of heavy metals such as copper in various industries has discharged a large amount of the metals into the environment which are toxic at higher concentrations. The use of low cost agricultural waste of biological origin such as tea waste may be an economic solution to this problem. Tea waste is among the potential material to be developed as adsorbent for heavy ions. Tea waste contains cellulose and lignin which have been reported having excellent metal binding capacity. The aim of this study is to use the tea waste for the removal of Cu2+ ions. The effect of variation in different parameters like initial concentration of Cu2+ ions in solution, adsorbent dosage and contact time were investigated using batch adsorption method. The adsorbent, tea waste was characterized using compound microscope and FTIR spectroscopy. Experimental results showed that the maximum removal of copper ion by tea waste at optimum condition (pH 7, 60 min. contact time, 0.8 g adsorbent dose and 0.7 M copper initial concentration) is 74%. The adsorbent prepared from tea waste is efficient and it can be conveniently employed as a low cost alternative in the treatment of wastewater for heavy metal removal.

Keywords: Tea waste, copper (II), adsorption, heavy metals.

21 Optimization of Sweet Potato Pectin Extraction using Hydrochloric Acid and Its Rheological Properties
**Dyg Norkhairunnisa A. Zaidel, Nurul Hidayah Ismail, Nor Azizah Mohammad, Liza M. Salleh, Zanariah Hashim and Dyg Norkhairunnisa A. Zaidel

Abstract
Pectin has been used widely as thickener, stabilizer and gelling agent. However, the sources of pectin industrially are still limited. This study aims to optimize the extraction of pectin from sweet potato residue using hydrochloric acid and analyze the rheological properties of the pectin. In this study, the extraction of pectin from sweet potato residue by hydrochloric acid was optimized to maximize its yield using response surface methodology (RSM). The extracted pectin was further analyzed for its degree of esterification (DE) using Fourier Transform Infrared Spectroscopy (FTIR) and rheological properties using viscometer. The optimum condition to extract pectin from sweet potato residues using hydrochloric acid was at extraction temperature 60°C, pH 1 and extraction time 60 min with 24.4% pectin yield. The pectin extracted has 57.48% of DE which indicated that it is high methoxyl pectin
and able to form gel with the addition of sugar. The rheological properties analysis showed that 0.5% w/v pectin sugar solution possessed Newtonian fluid behavior while 1.0% w/v sugar pectin solution and 2.5% w/v pectin sugar solution showed pseudo plastic fluid behavior.

**Keywords:** acid extraction, degree of esterification, pectin, sweet potato, rheology

**Influence of drop height on the impact characteristics of futsal ball size 4**

*S.T. Syed Shazali, F.H.P. Alban Dattu, A.M. Aizuddin, M. Andrew Munot and N. H Noor Mohamed*

**Abstract**

Futsal research on the ball characteristic has received little scientific attention. Recently, modern football has been developed that afford excellent ball control and delivering. Different construction and size of ball delivers different characteristics of the ball. The purpose of this study is to examine Futsal ball size four deformations and coefficient of restitution (COR) during the impact. In this study, the Futsal ball were dropped vertically under three conditions. A subject performed five repetitive drop of the ball to impact a steel plate. The ball velocity were measured by SparkVue motion sensor attached on the top of the apparatus while the deformation were recorded using a high-speed video camera, at up to 1,000 frame per second. From the experiment, the ball deformation and COR were measured. Based on the motion sensor data, the deformation and the Coefficient of Restitution (COR) was calculated. The results obtained show the deformation and coefficient of restitution (COR) value varies with different height at the same type of futsal ball size 4. It shows that, the different height of ball drop give different ball impact characteristics. It was found that the COR depended on the amount of the deformation of the ball.

**Keywords:** Deformation, Coefficient of Restitutions, Futsal ball, Impact Test

**A Wavelet Transform Technique Based MIMO-OFDM System to Evaluate the PAPR Values**

*Sofia Pinardi, Ahmad Fadzil Ismail, Mohammad Kamrul Hasan, Khaizuran Abdullah*

**Abstract**

The peak to average power ratio (PAPR) of a transmitted signal is one of fundamental difficulties in wideband multi-bearer frameworks that utilization orthogonal frequency division multiplexing (OFDM) or multiple input multiple output (MIMO) OFDM. This paper focuses on peak average power ratio (PAPR) values on multiple input multiple output (MIMO) and wavelet transform (MIMO-WOFDM) technologies where the maximum likelihood (ML) technique is implemented. Using Wavelet OFDM based on the discrete wavelet transform because of Fast Fourier Transform (FFT), that generally implemented by OFDM has many drawbacks. The scrutinizing data and sounding out the local signal regularity on a fine scale, a function oscillating, denoising, and compression of images, wavelets constitute are very competitive method. The multiple antennas 4x4 (four antennas at the transmitter and four antennas at the receiver) has been selected to improve the system performance. The research use Bior 1.1 for wavelet family and the number of subcarriers are 64 as well as 128 respectively. To assess the performance, a simulation study has made. To check the performance, the results were compared PAPR values use MIMO and without MIMO. Results suggest that the deviation value at 0.002 probability is 0.304 dB at transmitter and 0.344 dB at receiver (with MIMO and without MIMO). The increase of subcarrier also improves the PAPR value where the deviation is 0.266 dB at transmitter and 0.306 dB at receiver.

**Physical, and Thermal Properties of Wood Impregnated with a Mixture of Furfuryl Alcohol, Styrene, and Nanoclay**

*Md. Tipu Sultana,*, Md. Rezaur Rahmana, SininHamdan b, and Md. Faruk*

**Abstract**

In this study, raw wood (RW) samples were treated with mixture of furfural alcohol (FA), styrene (ST), and nanoclay of varying concentration of FA and ST. These treated and untreated samples were then subjected to FTIR, SEM, water uptake (WU), mechanical and thermal studies. The FT-IR results at 1600-1800 cm⁻¹ showed that the ST/FA/Clay-WPNCs had different peak numbers with different positions compared with the RW. So, there was an interaction between RW, FA, ST and clay. The WU of ST/FA/Clay-impregnated wood is lower than RW. In thermo gravimetric result, below 100°C the impregnated wood samples had less weight lost compared to RW.

**Keywords:** Wood, FA, ST, and nanoclay

**Effect of Fiber Chemical Treatment on the Chemical Resistance Behavior of Jute Polyethylene Composites Used for Storage Tank**

*Md. Faruk Hossen, Sinin Hamdan, Md. Rezaur Rahman, and Md. Tipu Sultan*

**Abstract**

The jute polyethylene nanocomposites were developed using the hot-press technique with different fiber weight ratios. Due to the hydrophilic nature of fiber and nanoclay, they exhibited poor
interfacial interaction to hydrophobic polymer matrix. In order to enhance the interfacial interaction between fiber and polymer, the chemically treated jute were used for the manufacturing of composites in this study. The chemical resistance tests of prepared composites were performed in order to probe whether these are resistant to various chemicals such as: acids, alkalis, and solvents. The effect of chemical treatments of the composites have been investigated. It was observed that the fabricated composites were resistant to all chemicals except carbon tetrachloride. The treated jute composites showed higher chemical resistance than raw jute composite and silane treated jute composite yield the highest resistance which can be suggested for making the water and chemical storage tanks.

**Keywords**: Jute fiber, Chemical treatment, Composites, Chemical resistance, Storage tank

27 Prediction of Dissolved Oxygen and Nitrate Concentration in Activated Sludge Wastewater Treatment using Artificial Neural Network

**M. H. Husin, M. F. Rahmat, N. A. Wahab**

**Abstract**

Plays a significant role in returning safe and clean water back to its source, wastewater treatment plant (WWTP) need to operate efficiently despite challenges in energy consumption and stringent effluent standards set by the authority. Modeling the activated sludge process (ASP) of WWTP is essential for better understanding of the system, safety, dynamic prediction, control, and optimization of the plant. The mechanistic model is too complex causing it difficult to be applied directly to controller design making data-driven model that is known for its simplicity, and high prediction accuracy is a desirable choice. Despite the good prediction feature, determination of a reliable data-driven model for a nonlinear system is complicated. This paper addresses the issue of identifying the relevant input variables for the prediction of dissolved oxygen concentration and nitrate concentration in the neural network model. A discussion is made encompassing the prediction accuracy compared to other input variables combination found in the literature. Better mean-square error and regression percentage were obtained using the proposed input parameters.

**Keywords**: activated sludge, neural network model, wastewater treatment plant, nonlinear system, prediction

28 A review of anaerobic digestion of fruit and vegetable waste (FVW)

**Roslinda Seswoya, Ang Siew Fen, and Liew Kit Yang**

**Abstract**

This is a review paper anaerobic digestion of a fraction of organic fraction of municipal solid waste particularly on fruit and vegetable waste. At first, the need on the anaerobic digestion as sustainable approach for organic waste stabilization is discussed. The general food waste characteristics and the common fruit waste (as available in Malaysia) in also included. Lastly the comprehensive review on the digestibility of fruit and vegetable waste (FVW) either in mono digestion of co-digestion is presented. As a conclusion, the addition of sewage sludge as a co-substrate for the co-digestion of FVW improved the methane yield.

**Keywords**: organic, fruit waste, anaerobic, methane yield

29 1D Compressibility of High Moisture Content Clays Solidified with Small Cement Dosages

**Mohammed Mansoor Mofreh Gubran, **Chee-Ming Chan**

**Abstract**

Soft soil is normally associated with high moisture content and fine content which result in high compressibility and low strength. However, a proper treatment such as solidification by means of hydraulic binders are required in order to be usable for beneficial purposes (e.i backfilling). The aim of this paper is to evaluate the compressibility behavior of solidified Malaysian refined kaolin and dredged marine soil at high moisture content at low percentage of ordinary Portland cement. For this purpose, series of one dimensional consolidation tests were conducted on natural and solidified specimens at cement content of 0, 5, 10, 15 % by dry mass. Results show that the void ratio and coefficient of volume compressibility decreased as the cement content increased. The corresponding yield stress increased linearly with cement content increment in both kaolin and DMS. Overall, the cement effects were more pronounced in kaolin compared to dredged marine soil.

**Keywords**: 1D Compressibility, soft soil clay, solidification

30 Optimization of Swietenia mahagoni Seed Oil Extraction in Supercritical Carbon Dioxide

**Nor Asyiqin Bakeri, Noor Fadzilah Abu Bakar, **Liza Md. Salleh, Hartati, Hasmida Mohd Nasir, Dayang Norulfairuz Abang Zaidel**

**Abstract**

Supercritical carbon dioxide extraction has been used for extraction of oil from Swietenia mahagoni seed. The effect of different particle sizes on diffusivity coefficients, D (/s) were studied by applying
second Fick's law of diffusion proposed by Crank. Particle size of 710 μm showed the highest D of 3.1 x 10^-12 m²/s. Gas compression at pressure of 30 MPa and temperature of 60°C on seeds caused swelling effect thus allowed faster diffusion of carbon dioxide through porous structure of Swietenia mahagoni seed. For optimization of Swietenia mahagoni seed oil extraction, a three-level factorial design in response surface methodology was used to analyze the effect of pressure (20 – 30 MPa) and temperature (40 - 60°C) on extracted oil yield. The highest extraction oil yield of 29.70% was obtained at pressure of 30 MPa and temperature of 40°C. Qualitative phytochemical analysis showed the presence of alkaloid, saponin, triterpenoid, phenolic hydroquinone and tannin but absence of flavonoid. 

**Keywords:** Swietenia mahagoni, supercritical carbon dioxide extraction, optimization, diffusivity coefficients

31 Design and Implementation of Space Vector Pulse Width Modulation (SVPWM) for Harmonic Reduction for Three Phase Inverter System

**Yonis. M. Buswig*, Norhuzaimin bin Julai, Al-Khalid bin Hj Othman, Azuka Affam Christie Mijen, Sim Sy Yi, W. M. Utomo**

**Abstract**

This paper presents a simulation and design for reducing harmonics in three-phase inverters using space vector pulse width modulation (SVPWM). Converting Direct Current (DC) to Alternating Current (AC) gives distortion or noise which can be at the source or at the output. Problems arise in inverters and other power electronics devices when total harmonic distortion (THD) is high during operation. This noise or distortion can lead to problems for the equipment that being supplied especially in shortening the lifespan of the equipment. The model was simulated using MATLAB/Simulink with the block set and also M-file. Metal-Oxide-Semiconductor-Field-Effect-Transistor (MOSFET) was used as switches. The SVPWM is used as the control algorithm/system to control the switching scheme of the MOSFETs. The SVPWM as a type of Pulse Width Modulation (PWM) succeeded in reducing the harmonics up to 0.26%. Experiments on 2-level inverter in the laboratory using DSP microcontrollers, contribute to validation of the proposed strategy.

**Keywords:** inverter, SVPWM, three-phase inverter, harmonics, reduction

32 Detection of pathogenic bacteria in landfill leachate

Nurhasia Mira Anuar and **Chee-Ming Chan**

**Abstract**

The leachate from landfill site could be point sources of the risk of the pathogen contamination. This is due to the fact that certain component in solid waste such untreated human and pet excrement, food waste and biosolids may contain pathogenic bacteria. Much of it is contaminated with bacteria capable of causing diseases to human. The leaked contaminated leachate with the pathogenic bacteria can even threaten to human and surrounding environment. Due to the fact that leaked leachate from landfill site can reach the surface and groundwater sources, this study aimed to isolated pathogenic bacteria in leachate with no regards to the landfill ages and treatment facilities. The study were able to isolated four different species of pathogenic and coliform bacteria from three different landfill sites. Among the detected species are Escherichia coli, Salmonella sp, Shigella sp and Pseudomonas aeruginosa. The leaked leachate from landfill site may favor the entry of these isolated pathogenic bacteria into the soil environment. It is believes that the entry of these bacteria will led to the contamination of groundwater sources. Finding from this study could assist other researcher in developing more sustainable solid waste management practices in the future.

**Keywords:** landfill; leachate; pathogenic bacteria

33 Condition Assessment of Heritage Building: A Case Study in Kota Bharu Kelantan, Malaysia

**Siti Nor Fatimah Zuraidi, Mohammad Ashraf Abdul Rahman, Zainal Abidin Akasah and Sa’Afilah Abd Rahman**

**Abstract**

Building assessment is one of the key components of building maintenance. Usually, heritage buildings are expected to serve their functional requirements throughout their operation and maintenance. The primary purpose of performing a building assessments is to evaluate the building’s condition. Without assessment, it is difficult to determine a built asset’s current condition, so failure to inspect can contribute to the asset’s future failure. This study propose a new assessment method, derived from the current rating systems, for assessing the building’s condition and rating the seriousness of each defect identified. To achieve this, the study used a two-phase, sequential exploratory mixed methods research that was initiated with a qualitative phase (Delphi technique), and followed by a quantitative phase (Analytic Hierarchy Process technique). This condition instrument assesses three main criteria: the building structure (e.g. foundation, column, beam, truss and stair); building fabric (e.g. ceiling, floor, internal wall, external wall, roof, door, window and arch); and building service (e.g. electrical, air-condition, fire protection, sanitary and plumbing).
These three assessment criteria are then multiplied to find the building’s score. Instead of a longhand description of a building’s defects, this assess requires concise explanations about the defects identified, thus saving on-site time during a building inspection. The full score is used to give the building an overall rating: Very Good, Good, Fair, Poor or Very Poor. The application of the proposed model is illustrated by a case study. Our overall findings reflect the reliability of the model.

**Keywords:** evaluate, building condition assessment, heritage building

34 Integrating Architecture and Engineering Education

**NAG. Abdullah, Second MM. Tahir, and B. Karsono**

**Abstract**

Architecture Engineering program, could it be the new paradigm of architecture education in meeting the progress of Industrial Revolution in our local context? “Integrating Architecture and Engineering – Architecture Engineering”. This idea was met with intrigued just on the notion itself and poses questions as to what the program would actually churn out and where the graduates will be positioned in the public or even private sector. This paper intended to discuss the challenge of integrating both architecture and engineering education; outlined the differences between architecture and engineering; the integration of both and the potential of graduate produced by Architecture Engineering Program and finally the proposal of how this program can be implemented. Integrating both is not an easy task, but it has the potential to contribute to a much better and diversify human resources in the built environment.

**Key words:** Architecture Engineering; integrating architecture and engineering education; the potential.

35 Numerical Study of Flow Pattern and Local Holdup using Two-Fluid Eulerian Simulation of Bubble Column Reactors with Varies Design of Spargers

**Nur Khairunnisa Abd Halim, **Siti Aslina Hussain, Mus’ab Abd. Razak and Mohd Amirul Syafiq Mohd Yunus**

**Abstract**

The project is motivated from the difficulties in understanding the complexity of fluid dynamics of gas-liquid flow in bubble column reactor mainly operated in oil and gas company. Hydrodynamical-numerical simulation on multiphase models is the best method for fluid dynamics investigations. The steady state and transient, three-dimensional simulations are carried out using Eulerian two-fluid model in ANSYS CFX. A complete description of the actual system evolved is defined including details of parameters used and input acquisition data to ensure the success of the simulation test. In this paper, gas hold-up and its distribution along axial and radial direction are presented for different design of sparger plates. Comparison of results from simulation and published experimental data contributed the validity in analyzing the dynamics of multiphase system.

**Keywords:** CFD simulation, Bubble column, Hydrodynamics, Gas holdup, Gas distribution

36 Experimental Study on Engineering Characteristics of DMS with Granular Materials as Drainage Layer

**S.F.S.M. Johan and C-M. Chan**

**Abstract**

Dredging activities produced almost a million cubic meters of dredged marine soils (DMS) are excavate annually in Kuala Perlis waters alone. Conventionally the DMS were dumped back into the sea at the designated site because the dredged soils are not suitable for utilized in civil engineering application. However, this process is unsustainable and contain hazardous contamination especially near the industrial area. This study describes an experimental evaluation of engineering characteristics of DMS using sand and palm oil clinker (POC). The obtained result of DMS have high value moisture content is 218 %, where the soil is slurry and liquefied with Gs is 2.68. Based on the results presented in this study, it gives an overview of the current research on the effect of recycled granular materials as drainage layer towards the consolidation rate of DMS. All the granular materials have best agreement to have higher value of cv, where the DMS becomes stiffer and structured after the end of consolidation time. This indicate a promising application of the drainage materials as one of the beneficial use of DMS for the future.

**Keywords:** DMS, compressibility, drainage layer, sand, pcc

37 Investigation of the Communication Frameworks and Protocols for PMU based Wide Area Measurement System

**Mohammad Kamru Hasan, Musse Mohamud Ahmed, Aisha-Hassan Abdalla and Shayla Islam**

**Abstract**

Control, measurement and monitoring systems in electrical substations are highly required to have high availability, accurate, and real-time monitoring systems. The traditional substations are
equipped with Power Line Carriers (PLCs) with the association of SCADA systems. These PLCs use high-voltage lines between the substations as a channel byoverlaying a modulated carrier frequency on the frequency of the transmission voltage in the overhead lines. However, the existing PLCs with SCADA system suffers synchronization issues and thereby effects the system to have the real-time observations, control, and measurement accuracy. Because, the modern smart grid contains the digital substations used to generate ever-increasing volumes of data that used to ensure reliable operation specially, the all-digital substation protection system. All the digital components (instrument transformers, processing units, merging units, intelligent electronic devices, communication network, and synchronization source) may affect the overall availability levels of accuracy issues. Therefore, the aim of this research strategy is to study of automation system and its communication protocol of PMUs based Wide Area Measurement System (WAMS).

**Keywords:** IEEE C37.118, SCADA, PMU, Hybrid Time Synchronization Scheme

### 38 Strategic Provision of Staff and Facilities for Successful Delivery of a Civil Engineering Technology Programme Preparation of Papers

A.S. Mohd. Kassim, **C.M. Chan, N. H. Hashim, M. L. Ahmad Jeni, N. Kahar, A. Ahmad and I. Baba

**Abstract**

The strength and competencies of teaching and supporting staff in an institution of higher learning should not focus on the academic programmes per se, but encompass the campus-wide efforts towards full implementation of outcome-based education, or more commonly known as OBE. This paper examines the strategic pairing of staff and facilities in the successful implementation of an undergraduate Civil Engineering Technology programme. The teaching staff comprises of professors, associate professors, senior lecturers, lecturers, instructors and the tenured tutors awaiting pursuit of postgraduate degrees. The instructors are especially equipped with industrial experience and exposure, often of former employment in related industrial fields and are therefore well-versed with workplace expectations. Teaching load is analysed with relevance to staff-student interaction for effective learning, coupled with the student advisory and counselling system for continual monitoring of the academic performance. The teaching staff are also encouraged to engage in professional development, such as via industrial attachment, consultancy and research collaboration to strengthen the practical-cum-industrial component of the engineering technology programme. In addition, staff assessment is conducted by both the university and the students to ensure unbiased quality monitoring. Facilities-wise, common academic services like library, lecture halls and rooms, laboratories and workshops are complemented by an integrated information technology system and other daily amenities such as residential colleges, banking services, healthcare centre, transportation, sports and recreation. In short academic excellence cannot be achieved by good teaching and learning techniques alone. It needs to be underpinned by an organized, well-grounded supporting system which includes comprehensively every façade of a student’s life on campus, from within and outside the lecture rooms, to ensure effective and successful delivery of the programme in grooming balanced graduates.

**Keywords:** staff, facilities, engineering technology, industrial exposure, teaching workload

### 39 Bachelor of Civil Engineering Technology: Alignment of Programme Educational Objectives With The Learning Outcomes In Accordance With Sydney Accord

**C.M. Chan, N. Hashim, M. L. Ahmad Jeni, N. Kahar, A. Ahmad and I. Baba

**Abstract**

In widening the horizon of academic programmes offered at local universities, the compliance with international academic standards and guidelines are of utmost importance to ensure unified global recognition and accreditation for future prospects of the graduates. The Sydney Accord recognizes 4-year engineering technology programmes, and assists in determining if a bachelor-level programme attains the required level for purposes of licensure and registration, employment or admission to graduate school in another jurisdiction or signatories (International Engineering Alliance, 2017). As such, this paper examines the alignment of Programme Educational Objectives (PEOs) and Programme Outcomes (POs) of an undergraduate Civil Engineering Technology programme with stipulations of the Sydney Accord. At institution and faculty levels, the objectives and learning outcomes are oriented with the vision and mission respectively, assuring consistency of the programme outputs with the organizational aspirations in general. The mechanisms and processes involved to establish and then review the objectives from time to time are elaborated, showing a collaborative effort with stakeholders to keep the curriculum of the Programme abreast with current industrial needs and market trends. A discourse on how the POs are put in place with the PEOs ensues, detailing the mapping of the Programme’s POs with the 12 standard outcomes of the Accord, as set forth in the Engineering Technology Accreditation Council (ETAC) Manual 2015, administered by the Board of Engineers Malaysia (BEM) as a provisional signatory of the Sydney Accord. Also, a graduate engineering technologist is to be equipped with the essential attributes embodied in the POs, which capture both academic and non-academic skills and competencies expected of a graduate of the
Institutional Demands vs. Historical Baggage: What do Postgraduate Students Perceive of Plagiarism?

**Chee-Ming Chan, Alina Shamsuddin, Azeanita Suratkon, Ismail Abdul Rahman and Rahmat Sanudin**

**Abstract**

While plagiarism is virily said to be common among undergraduates due mainly to ignorance, the occurrence of the academic dishonest among postgraduate students is perhaps not that unheard of either, though for reasons other than lack of awareness. Considering that plagiarism is a serious academic offence, it would logically be shunned by a mature, responsible postgraduate student in preparing written work for submission. As such, it is noteworthy that plagiarism cases among postgraduate students may be attributed to a combination of reasons at both personal and institutional levels. This paper describes an in-house study of postgraduate students’ perception on plagiarism at the University, with emphasis on 2 clusters of factors, i.e. institutional demand and historical baggage. Responses from 315 postgraduate students at both master’s and PhD level were analysed and discussed. From the institutional demand perspective of workload and grading exercise, it was found that excessive workload and time-consuming field trips with little impact on the assessment were considered silent factors pushing students towards the dishonest act, while seemingly unfair assessment by the lecturers was also thought to be a trigger to plagiarism. On the other hand, students do come with historical baggage of prior experiences, and largely regarded reporting the published work of others (without citation) as a form of respect and recognition, and that creating a patchwork of others’ efforts to be claimed as one’s own is considered acceptable. All in all, the survey results shed light on the potentially negative pull towards plagiarism caused by intrinsic values of the students as well as the University’s academic system in general, highlighting the need to realign the factors examined.

**Keywords:** Plagiarism, integrity, citation, awareness, postgraduate writing

Effective Postgraduate Student Recruitment Strategy: Identifying the Prerequisites

**C-M. Chan, A. Shamsuddin, A. Suratkon, I. Abdul Rahman, and N. Md Noor**

**Abstract**

The increased accessibility to higher education, coupled with the heightened aspirations for lifelong learning among working professionals have significantly raised the demand for postgraduate degrees in the country. stiff competition among institutions of higher learning has driven education providers to run universities as structured business entities, where the postgraduate programmes offered in the respective institutions are adaptively designed, skillfully packaged and tenaciously marketed. This paper examines the basic prerequisites of expectations and perceptions of potential students for enrolment in the University’s postgraduate programmes, with the aim of acquiring a better understanding of the students’ perception and expectations as a first step in fostering effective branding of the University. A simple online survey was conducted for data collection over a short period of a week, to gauge the response for a number of basic questions. Considering that the University is relatively young in terms of provision of postgraduate programmes (20 years), the survey was necessary to identify the salient aspects in outlining an effective recruitment strategy for sustained enrolment of postgraduate students. Besides, the means by which respondents prefer to explore the University and the programmes available was identified, along with their preferred choices of tokens upon registration as new students at the University. In a nutshell, the survey shed light on the general recognition and identification of the University, as well as the potentially effective outreach channel and manner to improve the chances of successful new postgraduate student recruitment. A close-loop marketing and recruitment model was also proposed in support of a greater sustainable student enrolment system.

**Keywords:** Higher education, accessibility, recruitment, marketing strategy

Low-Cost Tap Water Purification System (Loco Device)

Ibrahim, S.H Suri, M.N.S, Yaman, K, Abdul Wahab, R, and Adam, J.H.

**Abstract**

This study is focusing on the safe and clean water which is essential element in our life. Safe and readily available water is important for public health, whether it is used for drinking, domestic use and many more. Improved water supply and sanitation, and better management of water resources.
can boost countries’ economic growth and can contribute greatly to poverty reduction. In the market nowadays, there are various types and brands of water purification devices that could eliminate all the germs and bacteria in the water. Unfortunately, all the well-known brands are too expensive. It can cost up to thousands of ringgit excluded the maintenance and replacement works. Thus, it becomes a burden for low and middle-income families to have an assurance to consume a safe and clean water. Therefore, LOCO device is a low-cost tap water purification system is built to help these families to have the same quality of water with other famous brands of water purification devices. LOCO device is a modification of an existing water filter that can be found in the market. With this production of LOCO device, it could help these families to have a safe and clean water for a cheaper price especially for those who live in the rural area.

**Keywords:** drinking water, water purification system, LOCO device

43 **Strengthening Dredged Marine Sediments using Electrokinetic Stabilization Method**

Nurul Syakeera Nordin, and **Chee-Ming Chan**

**Abstract**
Nearshore’s facilities are often require frequent and regular maintenance dredging in maintaining appropriate water depths and enlarging the access channel and turning basin. A large amount of sediments were spawned from the dredging works. The dredged marine sediments (DMS) are not appropriate to be used in construction activities because of its poor geophysical properties. The purpose of this research is to study the improvement in moisture content and strength of DMS by using electrokinetic (EK) method. DMS are classified as a high plasticity silt (MH) with 240.74 % of its natural water content. Stainless steel plate was used as the electrode, while distilled water (DW), citric acid (CA) and calcium chloride (CaCl2) were applied as the stabilizing agents. The aforementioned stabilizers are electrically injected into the DMS which causing flow of the solutions through the pores in DMS under 50 V/m of applied direct current (DC). The EK treated DMS shows it increases in strength in the dry zone area after the 14 days treatment. The dry zone area was created near the anode and wet zone was created near the cathode. The EK treated DMS hence could be reuse as a geomaterial in construction activities. Largely, EK has significantly improve the quality of DMS even though the strength increase observed was not homogeneous throughout the specimen.

**Keywords:** electrokinetic, dredged marine sediments, stainless steel, citric acid, calcium chloride.

44 **Optimization of Carbon dioxide removal from CO2-CH4 system by response surface methodology**

Muhammad Babar, **Mohamad Azmi Bustam, Abulhassan Ali, Abdulhalim Shah Maulud**

**Abstract**
The presence of high CO2 content in natural gas reservoirs is one of the major threat to the environment. Cryogenic CO2 capture technology is one of the emerging technology used for natural gas purification before customer use. In this research work, binary CO2-CH4 mixture having 75% CO2 content is studied. Aspen Hysys simulator with Peng Robinson property package is used for the prediction of phase equilibrium data for the binary mixture. The data obtained through Aspen Hysys simulator is the optimized for the S-V two phase region for maximum CO2 capture. Response surface methodology is used for the optimization of the predicted data. Optimization of the pressure and temperature conditions is done to obtain maximum CH4 in the top stream and minimum CO2 with minimum energy requirement. In this research work the pressure and temperature ranges selected from the predicted phase equilibrium data for the optimization are 1 to 20 bar and -65 to -150 °C respectively, at atmospheric pressure and -123.50 °C the desirability value is maximum which is 0.843. under these conditions the CO2 and CH4 in the top product stream is 1070.72 Kg/hr and 152.04 Kg/hr respectively with an energy requirement of 2.087 GJ/hr.

**Keywords:** Natural gas, Cryogenic CO2 capture, Aspen Hysys, Optimization, RSM

45 **Simplified XFEM Modelling of Multi-Bolted Joints Incorporating Multi-Point Constraint Connectors**

**Khairi Supar, and Hilton Ahmad**

**Abstract**
Joining are the weakest link in most structures, therefore joint efficiency is important and dependent upon joining material properties, applied clamp-up and joining configurations. In recent years, due to emerging computing technologies has led to implementation of numerical approach in predicting material behaviours in joining structures. However, modelling of full joining parts requires large time and cost computational efforts, moreover, these models is highly non-linear that may face difficulties in obtaining good convergence. This paper aimed to reduce high time computational effort by reducing joining parts modelled, and therefore significantly reduced associated surface interactions without sacrificing physical behaviour of friction load transfer. The fastening system to consist of bolt head, bolt shaft, nut and washers are represented by a fastener connector to join two adjacent plates by introducing multi-point constraint. The properties of fastening connectors were following actual
geometry and materials properties of fasteners by using simplistic stiffness expressions. It was found that MPC technique able to reduce approximately one-third of computation times compared to conventional full solid model. Although latter techniques showed wobbling effect due to constraint of point at the bolt centreline, however, these effects were less significant in quasi-isotropic and thicker plates. Overall, good agreements with experimental results (average discrepancies of 30%) were obtained.

**Keywords**: Multi-bolts joints, stress concentrations, multi-point constraint, XFEM, secondary bending

### Application of Anaerobic Reactor in Waste to Energy (WtE) Concept for Methane Production Optimization from POME

M. I. Shahidul, M. L. Malcolm and J. J. Eugene

**Abstract**

This paper is a report on a study conducted in palm oil mill effluent (POME). The aim of the study was to optimize methane production from POME under the effect of Hydraulic Retention Time (HRT) and Sludge Retention Time (SRT). An up-flow anaerobic reactor was used in this study. At the first stage, anaerobic reactor operated at HRT of 6, 8, 10, 12 and 15 days. In the second stage, it was operated with the matured sludge of POME at SRT of 10, 15 and 20 days. The COD and volatile suspended solids of POME were used as methane potential (CODMP). The experiment conducted at 35°C for a length of 60 days and input-output data of CODmp were used as independent variables to estimate methane production. The estimated results show that the optimum methane production was 0.0832 m³/(gCODMP)⁻¹ at HRT 8 days, at a constant loading rate of CODmp. It was also found that at SRT 15 days, the optimum methane production was 0.0820 m³/(gCODMP)⁻¹. The study concluded that methane production from POME by using anaerobic reactor is an effective way. This study recommends for future research in this field at aiming to increase methane production to a sustainable level.

**Keywords**: Hydraulic retention time, Sludge retention time, Methane production, Palm oil mill effluent, Anaerobic reactor

### Palm Oil Mill Effluent Treatment Using Electrocoagulation-Adsorption Hybrid Process

Y. Y. Sia, **I. A. W. Tan and M. O. Abdullah

**Abstract**

Palm oil processing is a multi-stage operation which generates large amount of palm oil mill effluent (POME). Due to its potential to cause environmental pollution, POME must be treated prior to discharge. Electrocoagulation (EC), adsorption (AD), combined EC and AD, and EC integrated with AD have shown great potentials to remove various organic and inorganic pollutants from wastewater. Up to date, no study has been found on POME treatment using EC-AD hybrid process. Therefore, this study aims to investigate the feasibility of EC-AD hybrid process as an alternative treatment for POME. In this study, EC was run simultaneously with AD to treat POME. EC-AD hybrid process achieved higher removal of total suspended solid (TSS), chemical oxygen demand (COD) and color as compared to EC and AD stand-alone processes. The EC-AD hybrid process reduced 79% of TSS, 44% of COD and 89% of color from POME. The adsorption kinetics of TSS, COD and color were best interpreted using pseudo-second-order model, which indicated that chemical sorption was the main control over the adsorption rate. Overall, the EC-AD hybrid process could be recommended as an alternative treatment for POME.

**Keywords**: Palm oil mill effluent, Electrocoagulation, Adsorption, Kinetics

### Assessing Performance of Aerobic Routines using Background Subtraction and Intersected Image Region

Faustine John, **Irwandi Hipiny, and Hamimah Ujir

**Abstract**

It is recommended for a novice to engage a trained and experienced person (i.e., a coach) before starting an unfamiliar aerobic or weight routine. The coach’s task is to provide real-time feedbacks to ensure that the routine is performed in a correct manner. This greatly reduces the risk of injury and maximise physical gains. We present a simple image similarity measure based on intersected image region to assess a subject’s performance of an aerobic routine. The method is implemented inside an Augmented Reality (AR) desktop app that employs a single RGB camera to capture still images of the subject as he or she progresses through the routine. The background-subtracted body pose image is compared against the exemplar body pose image (i.e., AR template) at specific intervals. Based on a limited dataset, our pose matching function is reported to have an accuracy of 93.67%.

**Keywords**: Augmented Reality (AR), Background subtraction, Image similarity measures.
49 Application of Water Pinch Technology in Minimization of Water Consumption in Palm Oil Mill

**Mili, N., Ngau, O. T., Baini, R., Salleh, S. F and Abang Hardin, D. S. H**

**Abstract**
This research proposes to establish property integration technique, in graphical targeting and mathematical modelling by using reuse, regeneration reuse, and regeneration recycle in order come up with the accurate targets for maximum direct recycle of process resources, with the minimum effluent produced and minimum fresh water consumption at a palm oil mill in Sarawak. The problems are treated as single contaminant problems where the contaminants are the biochemical oxygen demand (BOD) and the hardness properties of the process streams. Graphical method for both contaminants are solved using Microsoft Excel software, meanwhile mathematical programming is executed using MATLAB software. The results show a fresh water demand reduction by 42.6% for both contaminants for graphical targeting; mathematical modelling by using reuse approach shows a reduction 63.1% and 60.3% for BOD and hardness properties respectively; regeneration reuse approach shows a reduction of 78.1% and 64.7% for BOD and hardness respectively; lastly, regeneration recycle approach shows a reduction of 90.7% and 69.5% for BOD and hardness respectively. Thus, regeneration recycle process is the best choice to be implemented in the palm oil mill to reduce the consumption of fresh water.

**Keywords:** Water Pinch Technology, Graphical Method, Mathematical Modelling, Single Contaminant, Regeneration Recycle

50 Performance Analysis of Fabricated Bio-Filtration System for Small-scaled Greywater Treatment: TSS and Turbidity Removals


**Abstract**
River pollution, which is mainly due to excessive drainage of untreated domestic greywater, has becoming a serious concern in both poor and developing areas like Sarawak in the current years. Realizing the vital role of Sarawak rivers, need to improve the level of pollution, demand of clean freshwater resources, as well as to save cost on household water supply, the greywater generated daily from every household needs to be pretreated for reuse, otherwise, discharged. This further demands for cheap pretreatment technology for domestic and residential use. This research, therefore, analyzes the efficiency of a low-cost bio-filtration system which uses agricultural wastes, namely rice husk and coconut coir, as bio-filter media in improving the quality of the greywater effluent, in terms of total suspended solids (TSS) and turbidity removals. Positive outcomes are attained such that the rice husk bio-filtration system is able to reduce the TSS and turbidity levels by 49.06% at an average rate of 4.33 mg/L.hr and 57.70% at a rate of 4.02 FNU/hr respectively. Besides, the coconut coir bio-filtration system achieved insignificantly different TSS and turbidity removal efficiencies of 49.70% with mean rate of 5.43 mg/L.hr and 63.10% at rate of 5.09 FNU/hr respectively.

**Keywords:** bio-filtration, coconut coir, domestic greywater, rice husk

51 Analysis of Influence Factors Affecting the Energy Consumption in Technology Campus, UTeM

**Nor Hafizah Hussin, Rahaini Mohd Said, and Nadiah Ishak**

**Abstract**
Energy resources utilisation is a necessity for human civilisation to survive and progress. However, inefficient use of energy will not just effect the economy as it will aslo contributes substantially to climate change. To improve the energy saving, the influence factors that contribute to high energy consumption must be studied and analyzed. The objectives of this research is to analyze the influence factors that affect the energy consumption for energy savings in Technology Campus, UTeM. The correlation analysis was performed using Pearson’s Correlation Coefficient to measure the streng of relationship between the influenced factors ; number of lighting and equipment used, occupancy and temperature in a laboratory building. The results shows that all the factors have strong linear correlation with the energy consumption and proven by the hypothesis testing for testing the population correlation coefficient. This study has an advantage to be used in modelling the most influenced factors in forecasting the future energy consumption.

**Keywords:** Influence factors, Energy consumption, Correlation Analysis, Pearson’s Correlation Coefficient
Effects of Chemical Treatment on Mechanical Properties of Oil Palm Empty Fruit Bunch (EFB) with Urea Formaldehyde (UF) Resin Particleboard
**Marini Sawawi, Stephanie Johnnes Gobli, Noor Hisyam Mohammad, Mashuri Yusof, Siti Kudnie Sahari, Kuryati Kipli, Ervina Junaidi, Nur Tahirah Razali, Magdalene Andrew Munot**

Abstract
The purpose of this research is to mainly investigate the effects of the chemical treatment on the mechanical properties of the oil palm empty fruit bunch (EFB) with urea formaldehyde (UF) resin particleboard through Scanning Electron Microscopy (SEM), flexural test – three point bending test and the water absorption test. A single layered oil palm EFB/UF particleboard with the fibres treated with NaOH of 0.5%, 1.0% and 1.5% concentrations were made. Testing procedure was done in accordance with the American Standard Testing Materials - ASTM 1037 standard for testing wood based fibre and particle panel materials. The SEM images of 1.0% NaOH treated fibre shows a rougher surface indicating that more silica bodies are detached from the EFB surface which improves the mechanical interlocking ability of the fiber. In terms of the flexural properties the treated EFB/UF particleboard shows an improved quality compared to the untreated board. There is significant increase of 82% and 81% in the flexural strength and flexural modulus respectively of the 1.0% NaOH treated board from 0.5% NaOH treatment. As for the water absorption rate, the treated particle board shows a decrease in water absorption rate after the treatment.

Keywords: oil palm empty fruit bunch, particleboard, urea formaldehyde, NaOH treatment

A Classification of Lossless and Lossy Data Compression Schemes
**Lee Chin Kho, S. S. Ngu, A. Joseph, D. A. A. Mat, A. S. W. Marzuki and K. Kuryati**

Abstract
Data compression is a promising scheme to increase memory system capacity, performance and energy advantages. The compression performance could affect the overall network performance when compression scheme is implemented in a communication field. Many data compression schemes have been introduced. This paper classifies the major data compression schemes according to nine different perspectives, such as homogeneity, purpose, accuracy, structuring of the data, repetition distance, structure sharing, number of passes, sampling frequency, and sample size ratio. The classification will provide researchers with the in-depth insight on the potential role of compression schemes in memory components and network performance of future extreme-scale systems.

Keywords: Data Compression, Lossless, Homogeneity, Accuracy, Sampling Frequency

The Consciousness in Term of Level of Knowledge and Implementation among Developer on the Current Sustainable Construction Practice in Malaysia
**Sitti Diana Tamjehi, Afzan Ahmad Zaini, Nadia Zaini, and Abdul Wafi Razali, Nurfadilah Darmansah**

Abstract
In Malaysia, sustainable construction concept has been practice by government since year 2000 to minimize the environmental issues in construction industry. The level of sustainability in construction industry is still low and need to be improved in which it requires responsibility by construction stakeholders particularly developers, who plays the important roles in the development process. This research adopted quantitative and qualitative research methodology to achieve the aim of the research. This research employed questionnaire survey to 142 developers and semi-structured interview to six (6) registered architects from Klang, Selangor to determine the level of consciousness in terms of knowledge and implementation level on the current sustainable construction practice in Malaysia. All selected developers were registered under Jabatan Perumahan Negara. The item studied include background of respondents, developer knowledge and the company implementation on sustainable construction practice. The findings from the questionnaire survey were analyzed based descriptive and content analysis. The results indicate that the conceptual knowledge of developer on sustainable construction is at moderate level whereas the social concept is the highest compared to the economy and environment concept. The implementation of the developer on sustainable construction result is also at moderate level. From the research, it can be concluded that the consciousness in term of level of knowledge and implementation among developer on the current sustainable construction practice in Malaysia is still low. However, there is still room for improvement in terms of long-term benefits. Future research may focus on innovation strategy that can give more idea to improve the developer knowledge and better implementation on sustainable construction.

Keywords: Sustainable, Construction, Consciousness, Developer, Survey, Selangor
Development of Digital Simulation of Intelligent Electronic Devices Operating Platform for Digital Substation: An Overview

**Lakshmanan Gurusamy and Yanuar Z. Arief**

Abstract

Intelligent Electronic Devices (IEDs) is a generic name that covers various protection control, metering and monitoring devices that uses microcontroller technology and is collectively known as substation automation systems (SASs). The thrust towards the digital substation came from the replacement of the old electromechanical and analogue electronic protection systems to digital power systems protection systems using digital signals, digital signal processing and digital communication systems. Hence a future research and innovation challenge to the digital substation will be how to improve power system operation and control (e.g. of the system frequency, reactive power balance, etc) using the IED data and the control room digital signal processing to intelligently handle operation and control. It is whole new area of avenues for which the digital substation may provide solutions. This paper gives an overview of a digital substation development using digital simulation of IEDs operating platform.

**Keywords:** Intelligent electronic devices, digital substation, substation automation system, digital signal, digital communication system

Experimental Investigation on Effect of Lightning Surge in AC Power and Telecommunication Lines for Electrical Devices

Abu Arif Jalaluddin, Mohd Hafiez Izzwan Saad, **Yanuar Z. Arief, and Lakshmanan Gurusamy**

Abstract

Lightning surge phenomenon was recognized as one of a threat to electrical and electronics devices. This event can cause degradation to the devices performance and at high energy can cause the total failure in devices operation. This research work objective is to observe and monitor the effect of lightning surge to electrical devices especially through their power lines and telecommunication lines port. The surge immunity test was conducted using lightning surge simulator to evaluate the immunity of electrical equipment such as multi-function printer, laser fax and integrated telephone systems to ensure them continues reliability operation. Variable voltage values were injected to electrical devices in an increasing value up to 15kV or until the devices cannot withstand the voltage and start to degrade, temporary lost function and totally lost function. The devices performance and behavior were monitored at the normal performance until abnormality performance were observed and amount of voltage value at that time were recorded for analysis purpose. From this experiment, the high functional devices such as multi-function printer had the lowest immunity to the surge value followed by laser fax and lastly is integrated telephone systems. It was shown that the degradation and damage would occur if there were some narrow coincidence between the phase angle of waveform and superposition of surge. In this case, the frequently occur at phase angle of 90 and 270. The results revealed that the worst and high probability for damage to occur towards coupling/decoupling network is at common mode compare to differential mode (L-PE & N-PE). This investigation study on the possibility equipment to be degraded by the exposure of surge is very important due to unpredictable nature of lightning strike. The data and information obtained from this project would contribute towards standards implementation for surge protective devices.

**Keywords:** Lightning surge, AC power line, telecommunication line, electrical devices, surge immunity simulator

Investigation of Transient Overvoltage on 500 kV Transmission Line Plan in Sarawak Using PSCAD

**Yanuar Z. Arief, Nur Izziani Roslan, Mohd Hafiez Izzwan Saad, Lakshmanan Gurusamy, and Nor Asiah Muhamad**

Abstract

Transmission system is a crucial system in electrical power since the system transmit the electricity from power generation to consumer load. According to World Bank, the power losses from transmission lines are rapidly increasing from year to year at the rate of 3.85% in the year of 2013 to 5.792% in 2014. Losses in transmission system are most likely from power quality problems such as transients. Transients are the outcome of high unexpected increment in voltage or current surge magnitudes. The peak values of both voltages and current are usually more than twice of that normal voltage and current amplitudes. The surges due to transients can vitally cause power system failure and breakdown of electrical equipment especially at the substations. There were few known transient overcurrent and overvoltage problems which are due to faults, lightning and line energizing. This research work mainly focuses on simulating transients for 500 kV transmission system which employ Sarawak as the case study location. Sarawak currently has main 275 kV transmission line covering the whole Sarawak from Miri to Kuching known as Sarawak backbone, but due to lots of industries and rapid development and urbanization boom in Sarawak, there is a planned of 500 kV transmission line.
as a backup if the 275 kV transmission line proves inadequate. In Sarawak, the 500 kV is planned to be energized at 275 kV. But, in fact this work is for that transmission line to be operated at 500 kV, hence, monitoring the highest transient may occur. The results revealed that lightning and three-phase faults of 1.0s fault time duration cause the highest change in amplitude of current on the line up to 9.06pu and 9.27pu, respectively. The highest lightning amplitude is observed when lightning was simulated at the receiving end of the line which is near to the Tada substation.

**Keywords:** 500 kV transmission system, substation, switching surge, lightning surge, PSCAD

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### Abstract

Pet feeding can be done manually by pet owners, or automatically with the help of the pet feeders. However, there are few limitations by relying on some of pet feeding machine available in the market. The main concerns here are to solve the issue of unavailability of pet owners and the hygiene aspect in pet feeding. The developed automated system enables pet owners to feed their pets while they are away. Besides, using weight mechanism as its operating option, the hygiene aspect of pet feeding is improved. Furthermore, this device improves time management of pet owners and resource management of pet foods. The main objective of operating this research is to develop an automated pet feeding device focusing on in house pets by utilizing Arduino Uno as its Central Processing Unit (CPU) or microcontroller which function to control a weight sensor (load cells) and a servo motor.

Smart Pet Feeding Machine is an automated pet feeding device designed to run based on weight mechanism. It will automatically dispense pet foods when minimum amount of weight is triggered and will automatically stop dispensing when it reaches maximum amount of weight. Basically, the machine will be dispensing once it reads total weight of less than 10 grams and will stop action of dispensing once it reads weight of 50 grams. The amount of pet foods to be dispensed is 40 grams. Its architectural design includes a vertical storage compartment to store pet foods, a square opening at the bottom of storage compartment as opening for dispensing, a motorized dispenser and an aluminium bowl to place dispensed pet foods. The motion of dispenser is operated by a servo motor attached to the dispenser. The materials used to fabricate the housing of this device are easy to find materials such as aluminium tin, plywood and perspex. Hence, productivity of both parties which are pet owners and their pets can be enhanced.

**Keywords:** Pet Feeding Machine, Arduino, Automatic, Weight Mechanism, Load Cells

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### Quality Enhancement of Oil Palm Empty Fruit Bunch (EFB) Pellet with Torrefaction Process for Energy Generation

**Siti Nor Ain Musa and Muhammad Fahmi Wello**

**Abstract**

Torrefaction is a promising heat treatment method for biomass especially for those that rich in lignocellulose. The treatment which is conducted between 200 to 300 °C in anoxic condition is able to enhance the properties of pelletized biomass used for energy generation. Oil palm empty fruit bunch (EFB) was torrefied at 200°C, 250°C and 300°C (10°C/min) to investigate the enhancement of the quality of the pellet produced. Significant improvement of the energy content and removal of moisture content was recorded at higher temperature. Inversely, the torrefaction causes the ash content to increase especially when the torrefaction condition become more severe. Torrefaction of oil palm at optimal temperature is recommended in order to maximize the energy content of the pellet while maintaining the ash content within the biomass standard requirements for herbaceous biomass. The optimal temperature which can tolerate the influence of torrefaction on the energy content, moisture content, and ash content of EFB pellet is between 240°C to 250°C.

**Keywords:** torrefaction, calorific value, ash content, herbaceous biomass

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### IoT Based Water Level Monitoring for Early Flash Flood Warning System in Urban Areas

**Abstract**

Flash flood normally caused by extremely heavy rainfall and lasted in a short period of time, i.e. less than 6 hours. Due to high population density in urban areas and the short time scale, flash flood in urban areas could result in tremendous monetary lost. In order to accurately generate warnings of flash flood, information on the exact location and severity of the impending flood are crucial. However, currently, there is no urban flash flood sensing system that could generate this information in real time. In this paper, a warning system based on Internet of Things (IoT) is presented. The prototype was developed using water level sensor module, Arduino Uno, WiFi module ESP8266 and GPS location shield. An information system which shows the real time and history water levels of the specific locations is also developed. In addition, warning messages are delivered to users' mobile phones when the water level is more than 1 meter. The prototype is assumed to be installed at street
lamp posts in the cities at 1 meter above ground. This design will increase the spatial resolution for flash flood warning system which is still a challenge of satellite remote sensing technique.

**Keywords:** flash flood, early warning system, IoT, Arduino, location-based

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**61 Functionalized chitosan as gel polymer electrolyte for dye sensitized solar cells**

**Wan Zaireen Nisa Yahya, Pang Zhen Hong, Wan Zul Zahran Wan Mohd Zain, and Norani Muti Mohamed**

**Abstract**

Dye sensitized solar cells (DSSCs) are potential future source of renewable energy with low cost production, converting from sunlight energy to generate electricity. Among the challenges faced by the DSSCs is in terms of stability of the cells whereby the liquid electrolyte may suffer of leakage and solvent volatilization. Electrolyte as one of the major components in DSSCs plays the role as the inner charge carrier transport between electrodes and regenerate the dye back to its neutral state. The objective of this research is to develop quasi-solid polymer electrolyte based on functionalized chitosan biopolymer to overcome the leakage problem in DSSCs. Chitosan polymer are functionalized by quaternization of the amine groups of the chitosan with iodopropane forming tripropyl chitosan iodide. The synthesized chitosan was then used as electrolyte composition in presence of iodine, iodide salt and imidazolium based ionic liquid. The synthesized chitosans are characterized by Nuclear Magnetic Resonance Spectroscopy (NMR), Fourier Transform Infrared spectroscopy (FTIR) Thermal Gravimetric Analysis (TGA). The polymer electrolytes were then tested in DSSCs configurations. The results shown that the gel polymer electrolyte containing the tripropyl chitosan iodide in presence of ionic liquid produced a higher power conversion efficiency as compared to the gel polymer electrolyte film without ionic liquid.

**Keywords:** chitosan, gel polymer electrolyte, dye sensitized solar cells, ionic liquids

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**62 Compressive Strength and Water Absorption of Concrete by Utilizing Palm Oil Fuel Ash (POFA) as a Cement Replacement**

**A.W. Razali, N.F. Darmansah, A.A. Zaini, N. Zaini and S. D. Tamjehi**

**Abstract**

The usage of agricultural waste in form of ashes as one of the constituent materials in concrete has been done through the years. Palm Oil Fuel Ash (POFA) is one of the largest agricultural waste produced in Malaysia that contain high amount of silica and high pozzolanic reaction. The mass production of POFA disposed to open area and can generate environmental issues and health hazards. Due to the waste disposal problem, a lot of initiatives and efforts have been done by utilizing POFA into various construction materials including substitute to Ordinary Portland Cement (OPC) in concrete production. This paper discusses on the water absorption properties and compressive strength of concrete by utilizing POFA for several percentage of cement replacement. Four different percentages of POFA replacement in concrete mixture were used which are 2.5%, 5%, 7.5%, 10% and control sample mixture without POFA. The compressive strength test and water absorption test of 100mm x 100mm x 100mm cubes were tested on 7, 14 and 28 days. Three concrete cubes sample were casted for each concrete mixture. The concrete mixture was designed according to British standard with water cement ratio of 0.45. The results stipulated that 10% of POFA replacement in concrete production decreased the compressive strength but the strength slightly increased at 28 days of curing period. The water absorption test results showed that higher content of POFA in concrete increased the ability of the concrete to absorb more water. It can be concluded that lower percentage of POFA replacement increase the compressive strength and reduce the water absorption amount of the concrete mixture.

**Keywords:** POFA, compressive strength, water absorption, concrete

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**63 Energy Consumption Assessment on Industrialised Building System (IBS)**


**Abstract**

Malaysia Government mission towards development of low carbon cities in reducing carbon emission by 40% by year 2020. Therefore, our construction industry plays an important role and gives negative impacts on the environment. Factors of embodied energy and carbon emission are important in selecting construction method by considering the low carbon type of construction material to be used during the construction process. This paper presents an analysis of Embodied Energy and carbon emission in a building that used IBS and conventional method to achieve sustainable construction in Malaysia. All data was recorded and analyze using a commercial Life Cycle Assessment (LCA) tool called Carbon Calculator. The study includes IBS component; precast concrete wall panel, column, beam and half slab and cast in situ components; burn clay bricks, reinforced concrete slab, column, and beam. The results are presented in terms of carbon dioxide equivalent (CO2E) of construction.
materials and comparison analysis is made between IBS and Conventional method. The results obtained from Carbon Calculator due to manufacture and installation of components show a that IBS method consumed 26.93 CO2E/m2 and conventional method offers 39.57 CO2E/m2. By comparing IBS and conventional method, it is found that the average of total energy consumption due to construction materials was 33.25 CO2E/m2 and involved 31.94% reduction in comparison with conventional method. Therefore, for further building construction’s practice in relation to type of construction method it is recommended to be below the average amount of energy consumption 33.25 CO2E/m2 (50%) and any values obtained above the average amount is considered not being able to adopt sustainable building practice. Generally, it can be concluded that implementation of IBS method can be regard as a potential in reducing the amount of embodied energy and carbon emission compared to conventional method.

Keywords: Embodied Energy, Carbon Emission Industrialised Building System and Conventional Method

64 Performance Analysis on a Surface Aerator propeller configurations on Stratified Water via Simulation
A.N.A. Abang Bakeri, A.L. Yusoff a, J. Lai, H. Abdul Halim Yun, H. R. Ramji

Abstract
Thermal stratification of lakes or reservoirs is a phenomenon where the temperature of water body changes at different depths. Destratification system must be introduced to preserve the water quality of lakes or reservoirs. Artificial aeration is an effective way to maintain the water quality of lakes or reservoirs in terms of the concentration of dissolved oxygen (DO). This research emphasized on the performance of a mechanically driven aerator in terms of power consumption and rotational speed as well as its performance in terms of Standard Aeration Efficiency (SAE) by developing a mathematical model. However, the power consumption is different with different immersion radius of propeller’s blade. Less power consumption will give a lower rotational speed of aerator. Thus, the SAE is the highest when the immersion radius of propeller’s blade is at 0.49m to achieve a lower oxygen mass transfer coefficient, KLa as less power is consumed.

Keywords: Aeration, Power consumption, Rotational speed, Dissolved oxygen (DO), Standard Aeration Efficiency (SAE).

65 Bamboo Application in Building Design Case Study: Green School, Bali - Indonesia
**Bambang Karsono, Julaiah Wahid, Dona Rose Amer Koesmeri, and Nurakmal Abdullah Goh

Abstract
Bamboo has been used as building material for a long period of time. Nevertheless, bamboo is often regarded as a lower class material which is used by lower-income people. Today, after global warming and sustainability issues are emerged, bamboo as building material is widely discussed and reviewed. Some architects and builders recently tend to choose bamboo as building material as an alternative to wood. Good-quality woods for construction these days are rarely found due to deforestation. This paper attempts to discuss how bamboo is used inventively in building design. Descriptive-qualitative methods were used in this study to reveal an understanding of the application of bamboo in building design. Case study was taken to classify how bamboo is formed creatively in curved which results in an innovative organic form. The paper’s result will show that bamboo can be a potential building material for organic shaped buildings and become an alternative building material to the use of steel and concrete.

Keywords: bamboo, local value, creative design.

67 Performance of Low Cost 3D Printed Minimum Quantity Lubrication Applicator using Palm Oilin MillingSteel

Abstract
One of the most significant factors in machining process or metal cutting is the cutting tool performance. The rapid wear rate of cutting tools and cutting forces expend due to high cutting temperature is a critical problem to be solved in high-speed machining process, milling. Near-dry machining such as minimum quantity lubrication (MQL) is regarded as one of the solutions to this difficulty. However, the function of MQL in milling process is still uncertain so far which prevents MQL from widely being utilized in this specific machining process. In this paper, the mechanism of cutting tool performance such as tool wear and cutting forces in MQL assisted milling is investigated more comprehensively and the results are compared in three different cutting conditions which is dry cutting, wet cutting (flooding) and MQL. The MQL applicator is constructed from a household grade low cost 3D printing technique. The chips surface of chips formation in each cutting condition is also observed using Scanning Electron Microscopy (SEM) machine. It is found out that wet cutting (flooding) is the best cutting performance compare to MQL and dry cutting. However, it can also be
said that wet cutting and MQL produced almost the same value of tool wear and cutting forces as there is only 2-3 microns difference in average tool wear and 20-30 N difference in cutting forces between them.

**Keywords:** 3D printing; MQL; milling; tool wear; cutting forces

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**68 Titanium Dioxide (TiO2) doped Reduced Graphene Oxide (rGO) with Different Dye for Solar Cell Application**

Siti Kudnie Sahari, Afiqah Baharin, Rafidah Kemat, Muhammad Kashif, Nur Tahira Razali, Zainab Ngaini, Uda Hashim, Mohamad Rusof Mahmood, Marini Sawawi, Kuryati Kipli, Zaidi Embong, Norsuzailina Mohamed Sutan

**Abstract**

In present work, Titanium Dioxide (TiO2) solution was synthesized by using precipitation-peptization method while reduced graphene oxide (rGO) was synthesized via chemical reagent by using hydrazine hydrate. Different doping ratio of rGO which is 0.1wt% and 0.3wt% were investigated in this work. The TiO2-rGO thin films were deposited on the glass substrates by using doctor-blade technique. The surface morphology and electrical characterization of as deposited thin films were characterized by using Scanning Electron Microscopy (SEM) and a circuit with different value of resistance that connected in parallel. The results have proven that different doping ratio and dyes gives effects towards the open circuit voltage and short circuit current. The input light should be constant in order to obtain accurate reading for performance of DSSC.

**Keywords:** Titanium Dioxide, reduced graphene oxide, doping ratio, thin films

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**69 Modeling Risk Factors and Challenges with the Implementation of Risk Management in High-Rise Building Construction**

Afzan Ahmad Zaini, Nurzawani Md Sofwan

**Abstract**

Construction risks are inherent in every construction project especially high-rise building construction which is complex in nature. It is important to understand the significant risk factors and challenges in high-rise building construction in order to facilitate the construction stakeholders to minimize the negative effect of construction risks. One of the strategies that can be obtained is by the implementation of risk management before any construction project starts. Therefore, this research intends to identify the causal effect of high-rise building construction risk factors and challenges towards the implementation of risk management. This research employed a questionnaire survey of 105 experienced and less experienced construction stakeholders dealing with high rise building construction. The results were analyzed using factor analysis and converted into AMOS graphic to analyze the inter-relationship of risk factors and challenges towards risk management. These inter-relationships were modeled based on hypothesis and theoretical framework of the research. The result shows only five (5) hypotheses were supported out of twelve (12) hypotheses that have been tested. A positive relationship between risk factors and challenges towards risk management from this model can be used by construction stakeholders in identifying the major risk factors and challenges and a systematic way to manage the high-rise building construction risks. Based on the findings of this research, it is suggested that future research may focus on inter-relationship of risk management towards the performance of a construction project.

**Keywords:** AMOS graphic, construction risks, high rise building, model, survey

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**70 Numerical Study for Incompressible Boundary-Layer Flow Past a Selected Sarawak Terrain**

S. P. Yiiong, and **J. Labadin**

**Abstract**

This paper presents the study of a three-dimensional incompressible boundary-layer fluid flow passing a complex terrain. The main aim is to understand the airflow structures involved as the complexity of the terrain is increased. The motivation for the study originates from the frequent occurrence of helicopter accidents at mountainous areas. The problem is modeled by incorporating a selected topographical data into the incompressible boundary layer using reduced Navier Stokes equations where the derivation was earlier published. The governing equations are solved numerically by adopting the Newton-Raphson method. The distributions of the total skin-friction and the pressure over the terrain are presented and it was observed that there exist regions of flow separation, recirculation and reattachment at certain critical height of the terrain. Due to the irregular shape of the terrain, the inconsistencies of the appearance and disappearance of flow separation are observed as the height of the terrain becomes relatively large.

**Keywords:** Navier-Stokes equations, boundary-layer, high Reynolds number, skin-friction, nonlinear system
71 Optimization of Immobilization Media of Thalassospira Profundimaris: Diffusion and Strength Studies
Josephine Lai Chang Hui, Muhd Nurul Azam Muhd Drus, Rubiyah Baini, Nor Hasmaliana Abdul Manas and Azham Zulkharnain

Abstract
Many petroleum samples have abundant heterocyclic compounds. One example of petroleum samples is diesel where nitrogen, sulphur and aromatic compounds are the major impurities present in it. Heterocyclic compounds are inextricably into life processes in which a vast number of active heterocyclic compounds are being used. One example of heterocyclic compounds is carbazole which is known to be highly carcinogenic. Bacteria called Thalassospira Profundimaris could potentially degrade the carbazole compounds. The bacteria are immobilized inside media to offer high mechanical strength, high metabolic activity, and resistance to toxic chemicals causing damage to the cell. The media used widely are gellan gum, Ca-alginate and yeast. The finding of the maximum carbazole degradation, optimum strength and diffusivity of the media are profound to increase the performance of the bacteria entrapped inside as well as withstanding the harsh environment around it. This project has proven that the concentration affects the porosity and strength of the media. Increasing the concentration of media would form stronger media with lower diffusivity where lower concentration forms soft media with higher diffusivity.

Keywords: Carbazole, Thalassospira Profundimaris, Cell Immobilization, Gellan Gum, Ca-Alginate, Degradation

72 Assessing predicting factors: Good Management Practices towards the Successful Implementation of Green Supply Chain Management (GSCM) in IBS Construction Project
Sharifah NurFarhana Syed Sahimi, Rohana Mahbub, Afzan Ahmad Zaini, Nadia Zaini and Yon Syafni Samat

Abstract:
The increasing push to use Industrialised Building System (IBS) in the current Malaysian construction industry has opened up opportunities for the implementation of Green Supply Chain Management (GSCM) in IBS to optimise the advantage of environmental sustainability and the green concept. This research aims to investigate the relationship of good management practices towards the successful implementation of GSCM in IBS construction project by adopting a quantitative method through a questionnaire survey and qualitative method to verify the responses. A total of 30 valid responses were analysed by using Regression method. The response obtained is within the IBS key players and evaluated using regression analysis. The results are validated by three (3) IBS industry experts to identify the relationship between good management practices towards successful GSCM implementation in IBS construction. Preliminary findings from the analysis found that all the management practices are significant to the successful implementation of GSCM in IBS construction. Successful implementation will lead to the investigation on how the performance of GSCM can help to digitalize the supply chain management towards the Fourth Industrial Revolution (IR 4.0) in IBS construction.

Keywords: Industrialised Building System (IBS); Green Supply Chain Management (GSCM); Management Practice; Successful Implementation

73 Sarawak Traditional Malay Architecture Typology: The Resettlement of Kampong Seberang Hilir, Kuching, Malaysia
Samat, Y.S., Abdullah, N.A.G, Awang Sulong, A.H.

Abstract
What is a country without a past, and a city without old buildings? In recent days, the development of a city on the basis of advancement and modernization would not only cause the identity of the city to alter, but it would also affects the people’s perceptions and memories of it. Reckless demolition of old and heritage buildings comes at a cost as unchecked development will drastically alter a city’s identity. While tearing down older buildings is sometimes necessary in the name of development, proper research must be undertaken before deciding to do so. This study intended to establish a new model of recording and documentation method of old traditional village architecture typology. To achieve this, the research will be done in two phases namely Research and Inventory, and Recording and Detail Documentation of 12 traditional villages’ resettlement project. Our expected overall findings will reflect the possible model of documentation methodology and guideline that could be the reference for the future development of other traditional villages and old buildings.

Keywords: old buildings, city’s identity, architecture typology, resettlement, traditional villages
74 Physical Modeling Approach for Assessing the Effect of Climate Change on Groundwater at Coastal Area

**R. May and S. A. S. Hamid**

**Abstract**

Seawater intrusion has brought a great deal of attention globally with the worsening effect of rising sea level and changing of climates. Global climate change which has caused the unevenness increased in extreme events such as droughts and floods has anticipated water resources to become impaired. In this study, under the influence of climate change, a shallow unconfined groundwater was laid out orderly to investigate the saltwater intrusion phenomena in coastal aquifers. Experiments were conducted using laboratory rectangular model tank filled with fresh water, well-sorted sand and salt water into three separate chambers. In spite of the fact that numerous experimental procedures have been acquired to investigate the transient development of the saltwater interface in unconfined aquifers, none of them has tackled the possibilities of applying the climate change effect. The main focus of this particular investigation is to compare the relation of recharge and rising of sea level on the behavior of the saltwater interface in the unconfined aquifer from laboratory experiment with the normal cases of flood and the sea level rise as well as the drought and sea level rise. Simulation on the projected rising of sea level due to the climate change leads to significant intrusion outcomes of 52.4% with a toe of the saltwater wedge (TOE) distance of 0.54 m; however, an increase in the magnitude of precipitation rates and freshwater head can ultimately recharge the groundwater. This mitigates the changes of 49% in the saltwater-freshwater interface (SFI) with a receding distance of 0.22 m.

**Keywords:** climate change, saltwater-freshwater interface, sea level rise, seawater intrusion, unconfined aquifer

75 Design of Completion Detectors in Asynchronous Communication System

Norhuzaimin Julai, Shamsiah Suhaili, Yonis M Yonis Buswig, Rohana Sapawi, Kuryati Kipli

**Abstract**

In digital design, there are two types of design, synchronous design and asynchronous design. In synchronous design, global clock is one of the main system that consume a lot of power. The power in synchronous design is consumed by clock even if there is no data processing take place. The asynchronous design that depends on data is clockless and as far as the power is concerned, asynchronous design does not consume much power compared with synchronous design and this really make asynchronous design the preferred choice for low power consumption. Besides having low power consumption, there are many advantages of asynchronous design compared with synchronous design. This paper proposed new dual rail completion detector (CD), 3-6 CD, 2-7 CD and 1-4 CD for on-chip communication that are used widely in an asynchronous communication system. The design of CD is based on the principle of sum adder. The circuit is designed by using Altera Quartus II CAD tools, synthesis and implementation process is executed to check the syntax error of the design. When the design is successful, the simulation process will take place.

**Keywords:** Asynchronous system, Low power design, Completion detector, Dual rail

76 Insect Enzymes for Biotechnology Industry: From Nature to Industrial Applications

Nadiah Ishak, Ashuvila Mohd Aripin, Sharfina Mutia Syarifah and Fadilat Ayeronfe, Angzzas Kassim*

**Abstract**

The demand for enzymes application is increasing in biotechnological based industry. This is due to their ability to catalyse specific biochemical reactions and generate certain products that have significant commercial value. Meanwhile, insects have evolved and established various enzymatic pathways that are not only important for their survival but also valuable for industrial processing especially biotechnological-based industries. Unfortunately, some of these enzymatic reactions cannot be replicated using conventional organic synthesis process. Therefore, scientists and engineers are looking to higher-level ideas about how biological systems work, evolve and interconnect in nature in order to put the application into the industry. A new field of innovation to increase performance and reliability, discoveries are in turn solving some of technology’s greatest challenges as the demand for cleaner and greener technology is rising. This paper will reviewed on the application of insect’s enzyme as a biocatalyst in the field of biopharmaceutical, agricultural, food and pulp and paper industry.

**Keywords:** biocatalyst, biopharmaceutical, food, pulp and paper industry
**Shear Strength Parameters of Cement Stabilized Amorphous Peat of Various Water Additive Ratios at Different Natural Moisture Content under Consolidated Undrained Triaxial Test**

**Atikah Rahmi, Siti Noor Linda Taib, and Fauzan Sahdi**

**Abstract**

This paper presents the findings of the shear characteristic of cement stabilized amorphous peat under consolidated undrained (CU) triaxial test. Three different natural moisture contents of peat which are 1210%, 803%, and 380%, were stabilized using cement with water to additive (W/A) ratio of 2.0 and 3.0. CU triaxial test was conducted to the specimens after cured for 90 days. The stabilized peat specimens exhibited ductile behavior and were sensitive to the over-consolidation. The total and effective cohesion ($c_{tu}$, $c''$) were found to be greater at W/A ratio of 2.0 compared to W/A ratio of 3.0, and greater at lower initial moisture content specimens. The total and effective friction angles ($\phi_{tu}$, $\phi''$) are ranged from 15 o to 32 o and 36 o to 47 o consecutively and found to be increased upon the increase of W/A ratio except for the specimens with moisture content 1210% and 803% in term of total friction angle.

**Keywords:** cement-stabilized peat, consolidated-undrained triaxial, peat, shear parameters, water to additive ratio.

**Batch Electrocoagulation Treatment of Peat Water In Sarawak with Galvanized Iron Electrodes**

**N. Abdul Rahman, N.A. Tomiran and A. H. Hashim**

**Abstract**

Peat water is an abundant water resource in Sarawak where some of the coastal areas in Sarawak still utilize peat water for domestic usage. Peat water contains natural organic matters especially humic substances. Humic acids contribute to the brown color in peat water and can cause diseases like stomach cancer, blackfoot disease and etc if consumed by a human. Electrocoagulation is an alternative to conventional water treatment which have the advantages of being environmental friendly, minimal sludge production and no addition of chemical substances. The aims of this study are to fabricate an electrocoagulation system with galvanised iron electrodes and investigate the effects of the operating parameters such as inter-electrode distance, applied current density, number of electrodes, and treatment time on peat water in the system. The performance of batch electrocoagulation system in term of their removal efficiency of several parameters such as total organic carbon (TOC), chemical oxygen demand (COD), color, and turbidity are evaluated. This system successfully removes 98.44% of COD, 92.02% of TOC, 97.92% of turbidity and 99.91% of color by using galvanized iron as an electrode at current density of 25 A/m2 in 30 minutes with 10 galvanized iron electrodes. Despite the fact that there is a small amount of iron ions and zinc ions remained in the treated peat water which are 0.001mg/l and 0.0442mg/l respectively, but these concentrations are below the standard limits imposed by Malaysia Ministry of Health (MOH). Generally, all the parameters studied meet the standard limit imposed by MOH except for total organic carbon. This is due to the improper filtration system adopted in this study. The total operating costs for 25 A/m2 in 30 minutes treatment time of 10 electrode plates is RM 8.75 per m3. Overall, the study have successfully design a batch electrocoagulation system to treat peat water by using galvanized iron.

**Keywords:** Peat water, Electrocoagulation, Galvanized iron.

**Analysis of Rainfall Effect on Slope Failure in Sabah**


**Abstract**

The paper is aimed to characterize the relationship between the landslide events and the critical rainfall intensity-duration from the rainfall analysis. In this study, 10 landslide events that occurred in Ranau, Sabah area between years 2007 to 2015 were investigated and analyzed using rainfall threshold based on soil water index (SWI) method. The analysis results showed that both short-intense rainfall (i.e., 1-day) and prolonged antecedent rainfall (i.e., 14, 30-day) played a significant role of the landslide initiations in Ranau, Sabah area. Overall results indicated that this method can simulate the rain infiltration response by the level of soil moisture in the area of landslide.

**Keywords:** Landslide, Soil water index, Slope stability.

**The Effect of Sorbent Dosage and pH on Pb2+ and Cu2+ Ions Removal from Aqueous Solution**

**Siti Kartina Abdul Karim, Soh-Fong Lim and S. N. David Chua**

**Abstract**

The discharge of heavy metals in water is amongst the highest ranked source of water pollution. Lead is carcinogenic and can pose health risks to human. Copper is essential to human, but the release of copper to water affects the marine ecosystem. Therefore, this study investigates the potential use of banana sorbents to remove Pb2+ and Cu2+ ions from aqueous solution. The banana sorbents are...
Sago Starch Adhesive: Chemical Treatment Analysis

**Rubiyah Baini, Martha Stephanie Davis, Maswida Mustafa Kamal, Nur Amalina Shairah Abdul Samat, Norlisa Mili, Josephine Lai Chang Hui, Md Rezaur Rahman, Siti Noor Linda Taib

Abstract

Sago starch has multiple applications in industries such as textile, cosmetics and pharmaceutical, paper and wood. This study focuses on the utilization of sago starch to promote free-formaldehyde adhesives. Formaldehyde-based adhesive commonly used in wood industry emits formaldehyde, which is classified as carcinogen, into the air that has raised concerns over the potential hazards to human health. Sago starch-based adhesive was produced by blending the sago starch with sodium hydroxide (NaOH) and glycerine. Fourier-Transform Infrared Spectroscopy (FT-IR) was used to characterize the chemical changes in the sago starch-based adhesive. The quality of sago starch adhesive was tested according to their viscosity. Parameters affecting the viscosity of the sago starch-adhesive such as time, temperature, concentration of sodium hydroxide, and the amount of glycerine were studied. The viscosity of the sago starch-based adhesive decreased as the mixing time, temperature, concentration of NaOH and the amount of glycerine increased.

Keywords: sago starch, adhesive, viscosity

Indigenous Architecture and Fire Prevention: Between Conservation and Transformation

**Zayn Al-Abideen Gregory, Nurakmal Goh Abdullah, Bambang Karsono, Yon Syafni Samat and Dona Rose Koesmeri

Abstract

Longhouses are a unique and globally threatened housing typology. Previously extant elsewhere in Southeast Asia, Sarawak represents the only place on earth where longhouses are still being newly built and maintained. Traditionally built from wood, a major threat to the viability of this housing form is its susceptibility to fire. Every year in Sarawak, between one to fifteen longhouses are razed to the ground. Fire risk represents an existential threat to longhouses and by extension to the culture and way of life of the Iban people, for whom the longhouse represents an internationally recognized symbol. Using qualitative research design with observational data collection, this pilot study discusses the architectural design, planning and layout of wooden longhouses built in the 1980s and 1990s, evaluates the presence and efficacy of existing fire prevention measures; and considers possible design solutions to prevent spread of fire via passive barriers related to structure, compartmentation, opening protection and materials selection. In addition to technical solutions aimed at conserving existing longhouses, the possible future evolution of the typology is situated in respect to the changing needs and desires of the Iban people themselves.

Keywords: longhouse, traditional architecture, fire barrier, fire safety, Iban

Identifying Pocket Under-used Spaces at UNIMAS West Campus for Potential Infill Development Towards a Livelier, Conducive and Sustainable Campus Environment

Dona Rose Amer Koesmeri, NurAkmal Abdullah Goh, Siti Halipah Ibrahim, Bambang Karsono, Azhaliah Baharun, Zayn Al-Abideen Gregory and Yon Syafni Samat

ABSTRACT

Universiti Malaysia Sarawak (UNIMAS), a Malaysian public university located at Kota Samarahan, Sarawak, acting as a small city by itself, has shown its commitment to implement Low Carbon Cities Framework and Assessment System (LCCF) at its campus. LCCF is a performance based system comprising of four (4) key elements namely Urban Environment, Urban Infrastructure, Urban Transportation and Building. This research looked into one of the Sub-Criteria under the assessment system named I-2 Infill Development as the Performance Criteria, which will contribute to the assessment for UNIMAS Low Carbon Campus (ULCC) program. This paper presents the identification of pocket unused spaces for potential infill development. A campus shall be a comprehensive development that values the university community where teaching, learning activities, research, administrative operations and leisure are conducted in an approach that enhances and protects the environment. A conducive environment resulted from a well-planned campus, will eventually support the campus community structure altogether, whilst ensuring the best
practice implementation and statutory compliance. Infill development in UNIMAS shall be the process of developing vacant or pocket under-used spaces within existing developed campus areas. Ideally, infill development encourages development within the defined footprint. A successful infill development planning should focus on the job of crafting well-functioning campus environment. Infill sites are normally located within existing development which reduce the need for major earthwork which indirectly reducing emission for earthwork activities thus has a significant economic benefit in avoiding new infrastructure development. Attention to the planning of infill development is essential to ensure that the future new development fits the existing context, structured and integrated beautifully with the existing campus environment.

Keywords: infill development, pocket spaces, urban environment, sustainable development, land use, campus master plan, planning.

84 Design Concept: Integrating and Creating ‘Third Place’ in Schools’ Environment

** R. N. Syaheeza, and A. I. Zaini

Abstract

Interactions between younger and older generations that leads to social connectivity is important. Introductions of boarding schools segregated students with the surrounding society. The segregation causes total institution that negatively impacted the students’ social behavior, thus causes the students to be socially detached with the community. Adapting Third Place urban theory in smaller scopes such as educational institution can create school layout design that emphasizes social interactions. It can be defined as public spaces that serves as a rejuvenation or escapism tool from First Place (home) and Second Place (workspace). In boarding schools, First Place is the dormitories and Second Place is the classrooms. This paper focuses on the conceptual idea of integrating Third Place with boarding school design. Observation in an educational hub in Pengkalan Chepa, Kota Bharu shows the street hawkers’ stalls allow a common area for teachers, students, government servants and the local community to interact between each other. Surrounding the site are other institution such as schools, residentials, a prison and a mosque. By merging the Third Place of the community with the boarding school, opportunity for the students to socially interact increases in theory. This paper introduces a new conceptual idea for school layout design.

Keywords: ‘Third Place’, boarding schools, social interactions, conceptual design

85 Noise level estimation based on local statistic using Halccon

**Siti Haryanti Hairrol Anuar, Zuraida Abal Abas, Mohamad Haniff Harun, and Nor Hafizah Hussin

Abstract

Digital images have been used since long time ago in computer science field. The earlier application of digital images was primarily concentrate on scientific and military missions. Noise level is one of the critical issue for users of digital images. Although the concept of noise level during capturing, processing and transmission has been found in the early 1960, the interest to develop noise level increased, since Foerstner and Immerkaer successfully prepared apparently a method to estimate the noise of images. Nowadays, plenty of researchers have used different methods to study on noise level estimation. In general, noise level can be classified into three categories: transform-based methods, filter-based methods and patch-based methods. The properties of noise level have been improved greatly in these 20 years. The noise is assumed as additive Gaussian distributed. This paper shows the development of noise level in the last 30 years using Halccon and give a clear future direction in research for noise level with some comparison.

Keywords: Digital images, Gaussian noise, Noise level, Principal component analysis

86 Fabrication and Analysis of Composite Mixed Matrix Membrane for CO₂ Separation

Nur Aqilah Binti Fauzan, **Hilmi Bin Mukhtar, and Rizwan Nasir

Abstract

Growth of multilayer composite mixed matrix membrane (CMMM) for gas separation gained high attention due to the desired of energy efficient technologies. Polyethersulfone (PES)/carbon molecular sieve (CMS) mixed matrix composite membrane with non-woven fabric as support layer were formed by dry-wet phase inversion technique using solvent, N-Methyl-2-Pyrrolidone (NMP). FESEM analysis of developed membrane determined the porous structure of asymmetric composite membrane. Thin film composite membranes achieve high permeability and selectivity because of thermal, mechanical and chemical permanence, as compared to material of pure polymeric. Separation for carbon dioxide (CO₂) and methane (CH₄) gases disclosed an enhanced separation performance upon CMS-grafting as composite mixed matrix membrane as compared to pure composite membrane.

Keywords: Composite Membrane, CO₂, CH₄, dry-wet, permeability.

87 MUA: Malaysian Ethnic Groups Face Database

Abstract
From a human face, one can tell that person’s emotion, gender and ethnicity. The ethnicity recognition score contributes to increase the matching score in the face recognition. This paper presents Malaysian ethnicity recognition using a new face database, MUA, developed by a biometric research group, Sarawak Biometric (SARAB). This database contains data from three main ethnic groups in Malaysia mainly Malay, Chinese and Indian. In addition, MUA also contains data for the biggest ethnics in Sarawak, the Ibans or called Sea Dayaks. We used 200 face data from MUA. Several geometric features were extracted from the images. The classifier used is Support Vector Machine whereas the accuracy obtained for facial ethnicity classification is 92.01%.

88 Microstructure Of Amorphous Tropical Peat

Abstract
The estimation of peat strength and compressibility properties is complex due to continuous changes in microstructure caused by decomposition. Decomposition significantly alters the fibre content and structural fabric arrangement in peat and is a significant factor towards establishing the strength and compressibility characteristics. The present study assessed the microstructure of amorphous peat through scanning electron microscope (SEM) and relate it to the index properties such as moisture content, specific gravity, pH, liquid limit, organic and fibre content test. The micrographs of amorphous peat show colloidal amorphous-granular particles with no visible evidence of hollow cellular connections. The measured index properties reflect the effect of decomposition and are somewhat different from that of fibrous peat. The influence of fabric composition on the geotechnical properties of peat is discussed. This paper contributes to improving the characterisation of amorphous peat through microstructural study.

Keywords: Amorphous peat; Microstructure; Index properties; Decomposition

89 Simulation and forecasting of precipitation in Kuching City by using Salp Swarm Optimization Neural Network
**L. Y. H. Teng and K. K. Kuok

Abstract
There is significant changes in precipitation recently which leads to continuously occurrence of floods. For this reason, it is necessary to forecast precipitation accurately that can be used to directly apply for hydraulic engineering design as well as water-resources management. Not only that, long-term forecast of precipitation is important for the local authorities to confront and mitigate the adverse consequences. Thus, this paper is aimed to explore and develop new novel neural network that can be used to forecast long term precipitation (rainfall) accurately at Kuching. In this paper, annual mean monthly precipitations for year 2020, 2050 and 2080 are generated using Salp Swarm Optimization Neural Network (SSONN). For the evaluation of the results, appropriate statistical indexes such as root mean square error (RMSE), coefficient of determination (R2) and index of agreement (IA) are applied. The results from the simulation of SSONN are acceptable with 3.95mm, 0.48 and 0.831 for RMSE, R2 and IA respectively. The forecasting results can still be further improved by trying out different combinations of appropriate Global Climate Model (GCM) predictors. Moreover, more investigation works for input determination are needed in order to obtain more accurate results for predicting precipitation.

Keywords: precipitation forecasting, salp swarm optimization neural network, artificial neural network, Kuching

90 Forecasting Long Term Precipitation using Snap-Drift Cuckoo Search Neural Network Model
**Ka Yong Kho, King Kuok Kuok

Abstract
Long term precipitation trend prediction is crucial for many different sectors such as the agricultural, industrial and also hydrological fields. It is especially essential for water resources planning and urban storm water management infrastructures. This paper studies the implementation of Snap Drift Cuckoo Search optimization algorithm into a feedforward neural network (SDCSNN) to downscale Global Circulation Model (GCM) data into local scale resolution by coupling it with historical rainfall data from site. The performance of SDCSNN is benchmarked against two commonly used training functions –Levenberg Marquardt (LM) and Scaled Conjugate Gradient (SCG) through several performance indicators such as mean absolute error (MAE), mean squared error (MSE), root mean squared error (RMSE) and correlation coefficient (R). Results showed that SDCSNN was able to achieve a lower MAE, MSE and RMSE while scoring a ‘0.9~1.0’ R and thus outperforming the LMNN and SCGNN. SDCSNN forecasted an increasing precipitation trend over the late 21st century, with approximately 5% increment when compared to year 1961-1990.

Keywords: Climate Change, Neural Network, Rainfall, Precipitation Forecasting, Statistical Downscaling