

### 1. **Institut Teknologi Brunei; Twenty Years of Excellence in Technical Education**

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#### **Abstract**

Institut Teknologi Brunei was established in 1986. Its inception took place one year after the inauguration of Universiti Brunei Darussalam. Whilst Universiti Brunei Darussalam offered courses at degree level in wide general areas of study, Institute Teknologi Brunei (ITB) specialized in the business, engineering and technological fields at Higher National Diploma or advanced technician level. The intention was to train highly motivated technicians in certain fields so as to fulfill the ever increasing national technological needs. ITB began by offering three different Higher National Diploma level (HND) programmes chosen to fulfill the immediate needs of both government and private sectors. These programmes were in Computer Studies, Electrical Engineering, and Business and Finance. ITB was successful in obtaining accreditation by BTEC (British Technical Education Council) for all of these courses thereby ensuring their international recognition.

### 2. **Porous Media Utilizations in Energy Systems**

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#### **Abstract**

Porous media is used extensively in chemical engineering to enhance the rate of mass transfer and mixing process because the porous matrix has extensive surface area per unit volume, order of  $10^4$ - $10^5$  m<sup>-1</sup>. For instance, glass beads are used in many reactors and mass transfer columns. Good examples of mass transfer through porous media are our lungs, food mass exchange between blood and different body organs, evaporation from body skin, etc. Porous media can be used to enhance the thermal efficiency of energy systems, such as compact heat exchangers, heat pipes, electronic coolers and solar collectors. The values of the Nusselt number are approximately 50% higher than the values predicted for laminar flows in channels without porous materials (Lauriat and Ghafir, 2000). For gas flows, the convective heat transfer coefficient is higher for systems filled with porous material than that of systems without porous material. It should be mentioned that many authors and researchers have extensively studied heat transfer enhancement with and without porous media and reviews are available (Vafai and Hadim, 2000 and Webb 1997).

The focus of the present chapter is on the utilization of porous media for heat transfer enhancement in energy systems performed by our research group, namely; advanced solar air heater, earth tube and heat Exchanger.

#### **Keywords**

Energy systems, Porous Media, Heat Exchangers, Solar Energy, Earth Tube, Heat Transfer Enhancement

### 3. **Hydraulic Modelling of the Effects of Tidal Flows and Sediment Transport on Channel Geometry and Flow in Klang River Estuary**

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#### **Abstract**

This study involved the determination of the effects of tide on channel geometry, flow, and sediment transport within the Klang River estuary between 1975 and 1999. Survey data as well as hydraulic modelling using MIKE 11 software were used to determine the interaction between tidal wave, flow and sediment transport in the Klang River estuary. The area of flow in all the section within the study area has the carrying capacity for the design flood ARI100 of 1293m<sup>3</sup>/s. However results of the study has revealed that Klang River estuary has decreased in carrying capacity by 40% between 1988 and 1993 resulting in the possibility that the carrying capacity for the ARI 100 of 1293 m<sup>3</sup>/s may not be achievable in some areas along the upstream section. The estuary was found to be well mixed with a low flow regime or sub-critical flow. Bed load was mainly fine silt with median diameter (d50) of between 0.006 mm and 0.007 mm. Water depth was found to be more than 3 m making the estuary suitable for navigation.

#### **Keywords**

tidal effects, waves, well mixed estuary, low flow regime, Froude number, sediment, deposition, navigation, carrying capacity, fine silt.

### 4. **Prediction for the Thermal Performance of Flat Plate Collector using Expert System**

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#### **Abstract**

An expert system prototype was developed to support the design of a flat plate collector for collecting energy which is used for drying purposes in Malaysia. The climate of Malaysia, can be classified as warm - humid equatorial and characterized by high temperatures and humidity with strong radiation, which is filtered through the heavy cloud cover and high water vapor content in the air. The developed program is capable of handling Malaysian ambient conditions, collector characteristics, and material thermal properties. The criteria for solar systems in Malaysia were used as the input in the program to simulate the performance of the solar system. The mathematical model was validated by comparing its output with experimental results. The technique seems to be promising for use in Malaysia since there was a strong correlation between the predicted and experimental results.

#### **Keywords**

Expert system, Flat plate collector, Thermal performance, Malaysia

## 5. High-Speed Data Access for Medical Applications

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### Abstract

High-speed data access has become very important for doctors to take advantage of the wide variety of diagnostic and surgical tools currently available. It is also a great enabler and efficiency enhancer for health service providers. It provides doctors access to vast sources of knowledge and information, which empower them to help patients live happier and healthier. Internet has become a very useful and powerful source of information for the health care sector and there has been a phenomenal increase in doctors and related personnel using it for several purposes like telemedicine etc. The ever-increasing multimedia content such as pictures, video clips and audio has greatly increased the volume of data of medical interest. However, in many parts of the world doctors find accessing data and information from sources including the Internet very slow and often frustrating. Studies have shown that doctors and patients would benefit greatly from speedy, real-time access to medical information. This paper presents possible and feasible schemes for implementing high-speed data access for medical applications. While passive optical networks (PON) capable of delivering very high data rates (gigabits per second) may be contemplated in the long run and with higher investments, it is shown that highly feasible and cost-effective solutions are possible in a shorter time frame by deploying a family of digital subscriber line (DSL) technologies capable of delivering megabits of data over existing copper telephone lines to doctors, hospitals and clinics.

## 6. New Technique in Fingerprint Matching based on An-AVL Tree Search Algorithm

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### Abstract

The current commercial automated fingerprint systems available in the market are based on either minutiae or whole image. Both systems suffer from searching time. That is because of using a sequential algorithm in the search, and then they suffer from false acceptance (FAR) and false rejection (FRR) rates. This paper will present a system prototype that uses Adelson Velskii and Landis (AVL) tree searching technique to perform a faster user information retrieval and will avoid errors caused by FAR and FRR. The paper contains our experiment results.

### Keywords

Fingerprint statistical features, Fingerprint unique key, and AVL tree.

## 7. Implementation of Resonant Frequency and H Bridge Inverters in Induction Heating

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### Abstract

This paper presents a hardware development of a Resonant Inverter designed for low power induction heating. The Resonant Inverter technique is introduced to minimize the number of power switching devices implemented in the system. The use of DC to AC power MOSFET inverter is to generate 50 kHz magnetic flux could be used to heat up the stainless steel vessels. Power MOSFET (IRF840) with rating 500V/ 8A is used as resonant inverter with operating frequencies up to 50 kHz. The heating coil with a few layers is designed as concentric flat coils which is connected together in away to produce maximum flux to be penetrated in the magnetic material vessel.

### Keywords

Electromagnetics, Power Electronics, Induction Heating

## 8. Changes in Carbon, Nitrogen and the Carbon/Nitrogen Ratio during Composting of Sewage Sludge

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### Abstract

Scholars have been working to scientifically manage the increasing amount of sludge produced by wastewater treatment plants. However, the strict criteria for waste disposal, imposed by the national legislation make the management of sludge more difficult. This is particularly true because of the larger volumes produced and the lack of sites suitable for landfilling or agricultural use within an economical distance. The C/N ratio is often used as an index of compost maturity despite many pitfalls associated with this approach; it seems to be a reliable parameter for following the development of the composting process. In this work the experimental data showed that the C/N ratios in the final composts were 17.6, 18.4, 17.8, 15.9 and 18.1 in the case of experiments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively. These ratios are considered to be acceptable, where compost T<sub>1</sub> of C/N ratio 17.6, and T<sub>4</sub>, with a C/N ratio of 15.9 can be considered to be mature.

### Keywords

Sludge, Compost, carbon, nitrogen, C/N ratio

9. **Towards Implementing Multimedia Technologies for Classroom Learning in Brunei Darussalam**

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**Abstract**

Conventional teaching methods, especially in the technical education stream, have several shortcomings. Advances in technology have given rise to multimedia communications which can provide several useful applications in areas of education. From pre-school to continuing adult education and training, at home, school, or college, multimedia communications can play a vital role in developing the concept and practice of lifelong learning. Multimedia-based learning strategies and approaches can help to create a rich learning culture and help students address the performance needs of a rapidly changing work environment. This paper examines some of the advantages of emerging technologies such as multimedia in classroom teaching and learning. It presents the various aspects of implementing multimedia technologies for education in Brunei Darussalam with a view to creating new capabilities and opportunities in a fast changing technological environment.

10. **Protocol Conversion FROM HDLC TO IEC 870 Communication Protocol Standards**

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**Abstract**

A protocol converter is designed to make controlling station that implement HDLC protocol standard be able to communicate with controlled station implement IEC870 protocol standard. The two protocols are studied to determine the similarities and differences between them. Each application function of the two protocols is modeled using communication finite state machine module and then these modules are verified against error. Since the two protocols are multifunction protocols, a converter is constructed for each application function. The constructed converters are verified against errors. Finally, the two protocol converters are designed and implemented using Microsoft visual C++ programming language that operates under Windows environment. The designed software have been tested and worked successfully.

**Keywords**

IEC 870, HDLC, Protocol Conversion. Communication Finite State Machine (CFSM), Conversion Algorithm, Closed Cover Technique, Reachability Analysis. Protocol Data Unit Level Conversion

11. **Student's Perception of English Language Programs: A Comparative Study at Two Technical Colleges**

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**Abstract**

This paper investigates the attitudes and perceptions of one hundred students of two technical colleges in Brunei Darussalam towards English Language Program (ELP). Almost identical program is offered by these two colleges that have entirely different entry-level requirement and award different set of qualifications. The study results indicated that no significant difference was noticed in the students' skills and learning. However, statistically significant difference existed in attitudes of the students of two colleges. There also exists a relationship between students' satisfaction with ELP and in their overall attitude and skill as well. Gender and age are found insignificant. Based upon the analysis, conclusion has been made together with some recommendations for further studies.

12. **Performance comparison of Gray-Coded M-Quadrature Amplitude Modulation in Coded and Uncoded Orthogonal Frequency division Multiplexing Techniques over Additive White Gaussian Noise**

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**Abstract**

In this paper, we investigate and compare the performance of various Gray coding M-quadrature amplitude modulation (M-QAM) schemes in uncoded and coded Orthogonal Frequency Division Multiplexing (COFDM). Coded OFDM utilizing forward error correction as channel coding is investigated to determine the optimum rate and length of convolutional encoder employing Viterbi decoding algorithm.  $\frac{1}{4}$  rate convolutional coding with length 10 utilizing octal code generator of [1117 1365 1637 1653] outperforms other rates and lengths by at least 3 dB in 64-QAM. In

comparison to uncoded OFDM, COFDM performs at least 10 dB better for eg. in 64-QAM to achieve a BER of  $10^{-3}$  transmitting 500 subcarriers. Further works is currently ongoing to include adaptive bit loading to ensure efficient bandwidth utilization as well as to formulate a forward error correction code that would reduce the peak to average power ratio commonly found in OFDM transmission.

**Keywords**

Gray coding, OFDM, QAM, forward error correction, channel coding, and multicarrier transmission.

13. **El-Nino and La-Nina - in the context of Brunei Darussalam**

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**Abstract**

Climate changes have important implications for the economy of a country. The recent phenomenon of Asian Tsunami and hurricane season has shown that these events can result in devastating damage to both people and property.

The weather changes take place due to ocean and atmosphere interaction, and the two processes of El Nino and La Nina result in substantial changes in climate in various parts of the world. The changes in both temperature and rainfall would affect the people and thus their forecast helps to control and mitigate the effects. This paper examines the weather outlook for Brunei Darussalam in coming months and general consequences for engineering activities.

14. **Aircraft Family Concepts for High Subsonic Regional Aircraft**

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**Abstract**

The aim of this work is to make a feasibility study of the aircraft family concepts using a combined Hybrid Laminar Flow Control Variable Camber Wing (HLFC-VCW) for a high subsonic Advanced Technology Regional Aircraft (ATRA). The prediction of ATRA's performance used computational fluid dynamic and empirical methods. The aircraft family concept using a combined HLFC-VCW is feasible for ATRA aircraft family from aerodynamic point of view.

15. **Clustering Location of Forest Fires using Self-Organizing Map**

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## Abstract

This paper focuses on clustering the locations of Indonesian forest fires and visualizing them into a two-dimensional map using a self-organizing map (SOM) algorithm. The input data is based on the quantity of the hot spots of forest fires that spread in several locations within ten months period. We analyze the distributions of the hot spots locations of the regions that may have the high frequencies to risk of the forest fires disaster using the SOM algorithm. We have used a principal component analysis (PCA) to reduce the size of the original datasets in order to improve the accuracy of the clustering results. The SOM algorithm has been used to cluster and visualize the map of the hot spots locations into four groups based on the relative similarity of the risks of forest fires on each of the regions such as danger level, low level, high risks, and low risks. From the analysis we have found that a time period where the highest level of quantity and intensity of the forest fires occurs in some regions can be clearly classified.

## Keywords

Forest fires, hot spots, principal component analysis, self-organizing map

## 16. Trademark Matching Based on Robust Features using Counter-Propagations Neural Network

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## Abstract

The classification and recognition of 2-dimensional trademark patterns independently of their position, orientation, size and scale by proposing a new feature vector has been discussed. The feature extraction is based on local as well as global statistics of the image. These features have appealing mathematical simplicity and are versatile. In this approach each gray image is computed by automatic thresholding and segmentation algorithms. Pixel information of segmented regions is treated by different geometric and numeric operations to form the feature vector. Second part of this work takes into account the use of counterpropagation neural networks (CPN) for training and matching tasks. Proposed feature vector is applied at input of CPN. The effectiveness of the proposed feature vector is tested with various trademarks which were not used in learning phase.

## Keywords

pattern recognition, trademark matching, feature extraction, segmentation, counterpropagation neural network

## 17. Impact and Bending Properties of Pineapple Leaf Fibre (PALF) Reinforced Polypropylene (PP) Laminated Composites

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### Abstract

Pineapple leaf fibre which is rich in cellulose, relatively inexpensive and abundantly available has the potential to be used as reinforcement for polymer composite. The present study investigated the impact and bending properties of pineapple leaf fibre-polypropylene (PALF-PP) composites as a function of volume fraction. The work of fracture or impact strength of the composites were found to be increased with the increase in fibre content. A comparatively higher impact strength is observed for composite with 2.7 % volume fraction. However, at higher percentages of volume fraction (5.4%, 10.8% and 16.2%) the work of fracture decrease by about 19.2% and then 2.7% of volume fraction. It may be due to the fact that the addition of fibre requires less energy to initiate a crack, void and low interfacial adhesion between fibre and resin. The flexural modulus gives higher value at 2.7% volume fraction. The flexural strength of the composites containing 5.4% volume fraction was found to be higher than that of pure polypropylene resin by 5.1%. Scanning electron microscopic studies were carried out to understand the fibre–matrix adhesion and to study the behaviour of fibre during breakage.

## 18. Strengthening ATM Authentication Protocols

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### Abstract

Authentication methods for bank cards have little changed since their introduction in the 1950's. Typically, the authentication design involves a trusted hardware device called smart card or token. These cards can be categorized into microprocessor cards or memory cards. The card holder's Personal Identification Number (PIN) is usually the only means to verify the identity of the user. Further, many existing designs based on such devices use a delegation technique whereby the device acts on behalf of the user by deploying its strong cryptographic capability. However, due to the limitations of such design, an intruder in possession of a user's device can discover the user's PIN with brute force attack. For instance, in a typical four digits PIN, one in every 10,000 users will have the same number. In this paper, we proposed a range of authentication protocols suitable for smart card applications such as in bank ATM financial transactions. We consider a situation whereby the user has a trusted personal device or token. In this case the user has to identify himself/herself to the bank computer through the terminal since the device is trusted. Secondly, we consider a situation whereby the terminal is not trusted. In this case, the authentication protocol allows the card to authenticate the terminal and vice versa.

19. **A Quasi-Analytic Method for Calculating Photon and Carrier Densities in Super Luminescent Light-Emitting Diodes**

**S. Yunus and T.J. Fairclough**

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**Abstract**

In this article a theoretical one-dimensional model of a super-luminescent light-emitting diode (SLED) is developed. By notionally considering the SLED to be made up of a large number of small sub-sections the photon and carrier densities are calculated using a novel quasi-analytic approach.

20. **Caution Required to Interpret Results of Experimental Studies - A Bottom Friction Case Study**

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**Abstract**

The wind wave hindcasting and forecasting plays an important role in the planning of a number of coastal engineering projects as well as for taking safety measures against the extreme events such as hurricanes. A number of numerical models have been developed in recent years, however, the predictions have been more reliable for deep water as compared to finite water depth. Two most important factors that affect wind wave forecasting are non-linear wave interactions and for finite water depth, the bottom friction. Non-linear wave interactions have both positive and negative signature whereas bottom friction is an important sink. Together these bring about significant changes in wave spectrum and hence affect wave forecasting. This paper examines the effect of bottom friction on wave evolution.