## TABLE OF CONTENTS

| i. | Dean’s Message | 4 |
| ii. | Message from FRAC Team | 5 |
| iii. | Featured Article [Microsoft Azure for Research] | 6 |
| iv. | News from Faculty of Engineering | 8 |
| v. | Short Course/Training Programme at Faculty of Engineering | 12 |
| vi. | PhD Research Completed | 15 |
| vii. | Research at the Faculty of Engineering: | |
| | Research Seminars | 22 |
| | Research Week | 27 |
| | Completed Research Projects | 29 |
| | On-going Research Projects | 30 |
| viii. | Departmental Research Projects/Articles: | |
| | Department of Applied Sustainability and Enterprise Development | 31 |
| | Department of Chemical and Environmental Engineering | 34 |
| | Department of Civil Engineering | 36 |
| | Department of Computer Science and Engineering | 38 |
| | Department of Electrical and Electronics Engineering | 41 |
| | Department of Mechanical and Production Engineering | 44 |
| ix. | Publications – Journal Papers | 47 |
| x. | Publications – Conference Papers | 48 |
| xi. | On-going PhD Projects | 50 |
I am pleased to present to readers the latest Research Bulletin of the Faculty of Engineering (FoE).

The bulletin aims to facilitate the exchange of research ideas and outcomes within the broader community and to foster a culture that stimulates quality research and learning across all disciplines. A wide range of applied and fundamental research work is highlighted in this bulletin.

The Faculty of Engineering has always played a significant role within the University of Mauritius’s research agenda. The Faculty is composed of a diverse community of industrial designers, technologists and engineers that are committed to producing competent, caring and innovative graduates with aptitude for critical thinking; citizens who can make a positive difference to Mauritian society. The FoE’s endeavours have consistently shown that good mentors can play a significant part in influencing the career pathway of young graduates.

In order to enhance partnerships with industry-based stakeholders, the University has set up a knowledge Transfer Office that would act as a catalyst to transform knowledge created in our labs to real world solutions. In addition, the FoE has always collaborated, on research projects, with partners in other universities, research institutes, engineering companies, community based organisations and government to help address real world problems.

The University through its strategic plan 2015-2020 wishes to create an environment conducive to research. Thus, this is a very exciting time for the Faculty of Engineering. It is also important that we do not forget our heritage and the origins of the Faculty – formerly the School of Industrial Technology. Our past is an indication of our future and I invite all staff, both academic and professional staff, to take their commitment to the Faculty even further.
We have great pleasure in presenting to you this issue of the research bulletin of the Faculty of Engineering covering the period November 2014 to October 2015.

The aim of the University of Mauritius is to enhance research and innovation capacity, drive research based on industry and societal needs, and promote regional and international collaborations for research. In order to achieve excellence in research, the university has to stimulate performance in research, develop centres of excellence in niche areas, and disseminate research results.

To implement the above plan, the Faculty of Engineering has engaged in a number of research projects during the year and this bulletin offers an opportunity to our researchers to showcase their current projects. It is interesting to note that multidisciplinary research is being carried out at the faculty. As you will discover in this issue, the research carried out at the Faculty of Engineering spans on a variety of themes with emphasis on sustainability given the growing concerns regarding global warming. There is a strong focus on sustainable development with emphasis on green energy.

Our featured article highlights a promising tool to help the community with research involving computationally intensive requirements. Cloud computing is an answer to the increasingly demanding applications given the limited computing resources that are available currently. This project facilitates and accelerates scholarly and scientific research by enabling researchers to use the power of Microsoft Azure to perform big data computations in the cloud.

The Faculty Research Advisory Committee has been active in organising a series of research seminars to disseminate research work that has been undertaken in various fields to our colleagues and students. Some projects have been accomplished with close collaboration with industry and more projects of this type is to be expected with stronger university-industry links. Besides, our research should be industry driven.

The bulletin would not have been possible without the contributions of our academic staff and their associates. The Faculty Research Advisor, Assoc Prof R T F Ah King, wishes to thank these contributors and particularly the members of the Faculty Research Advisory Committee for their collaboration during the year.
Microsoft Azure is an open and flexible global cloud platform that supports any language, tool, or framework, and is ideally suited to researchers’ needs across disciplines. The integrated tools, pre-built templates and managed services make it easier to build and manage enterprise, mobile, Web and Internet of Things (IoT) apps faster.

Azure supports a wide range of operating systems including Linux, programming languages like JavaScript, Python, PHP, Java and Node.js, frameworks namely .NET, tools for building smart applications for iOS, Android and Windows devices, databases like MSSQL.

It also provides for virtual machines and cloud computing as well as platforms for Analytics and IoT application development.

Microsoft Azure for Research

The Microsoft Azure for Research project facilitates and accelerates scholarly and scientific research by enabling researchers to use the power of Microsoft Azure to perform big data computations in the cloud.

The Azure Machine Learning Service can be used for predictive modeling. Azure Machine Learning users can build predictive models, construct recommendation engines, and develop fraud prevention systems, which can then be woven into applications. The service enables users to call on tools they’re already familiar with, like the R programming language.

Microsoft Azure for Research Workshop at UoM

Microsoft offers free technical one-day and two-day training workshops around the world. The first workshop in Mauritius was organized on the 12th of June by Dr. Baby Gobin-Rahimbux, chairperson of the Industry Liaison Subcommittee of the CSE Department and member of FRAC of the Faculty of Engineering, in collaboration with Microsoft Indian Ocean Islands.

The sessions were animated by the Microsoft Team, which also comprised of Mr. Sudeep Rohatgi Azure expert from Microsoft HQ. Academics for various tertiary institutions attended this workshop.
An overview of the various services provided by Azure was given. This was the start of a series of training session to come.

Microsoft Azure Research Grants

Microsoft Research is soliciting proposals for projects that use Microsoft Azure in research. Research proposals are from any branch of scholarly activity and are reviewed on the fifteenth of even-numbered months (February, April, June, August, October, and December).

For more information on Microsoft Azure for research, visit the following link:

Congratulations

Congratulations to Professor Krishnaraj Madhavjee Sunjiv Soyjaudah for his appointment as Director of Tertiary Education Commission as from 17 August 2015.

Academic Promotion Exercise: From Lecturer to Senior Lecturer

- Mr Raj Kishen Moloo
- Dr Bhimsen Rajkumarsingh
Youth Sustainability Forum

Students of the Department of Applied Sustainability and Enterprise Development (DASED) in collaboration with UoM Students’ Sustainable Development Society organised the “Youth Sustainability Forum” on Tuesday 23rd June to Wednesday 24th June 2015 in the Paul Octave Wiehe Auditorium. The Honourable Yogida Sawmynaden, Minister of Youth and Sports was the Chief Guest for the Opening Ceremony in the presence of the Ambassador, Embassy of the United States of America, Ms Shari Villarosa.

As the world moves increasingly towards a green economy, more environmentally sustainable jobs are being created. The economic crisis, in the view of many, represents an important opportunity to rethink the entire economy and make the necessary transition to green jobs. There are many new and exciting sectors of the job market, in conservation, renewable energy, sustainable agriculture, and engineering and design. This two days event intended to help students connect with those jobs and to explore what a "green job" actually means and how students can effectively convince employers to "green" their businesses through cost-cutting measures and tapping into new markets through innovative design changes.

The event also featured presentations from selected private and public organisations and NGO’s involved in the field of sustainability. During the forum students of DASED had an exhibition to promote their creativity through research and enable potential employers to judge the employability skills of the students.
Ongoing Short Course/Training Programme

**Short Course on Green Buildings**
Ms R Rughooputh, Department of Civil Engineering
Prof T Ramjeawon, Department of Civil Engineering
Mr H Shamachurn, Department of Electrical & Electronic Engineering
Dr M Gooroochurn, Department of Mechanical & Production Engineering
Mr A A H Khoodaruth, Department of Mechanical & Production Engineering

**Enterprise Systems Education for Africa (ESEFA)**
Mr D S Callychurn, Department of Mechanical & Production Engineering
Assoc Prof S Baichoo, Department of Computer Science & Engineering
Mrs B Z Cadersaib, Department of Computer Science & Engineering
Mrs B Gobin, Department of Computer Science and Engineering
Dr M Gooroochurn, Department of Mechanical & Production Engineering
Assoc Prof D K Hurreeram, Department of Mechanical & Production Engineering
Mr R Ramful, Department of Mechanical & Production Engineering
Mr Y Seechurn, Department of Mechanical & Production Engineering
Mr B S Toolsy, Department of Mechanical & Production Engineering

**Defensive Driving Techniques and Care of Vehicles**
Mr A A H Khoodaruth, Department of Mechanical & Production Engineering
Mr V Oree, Department of Electrical & Electronic Engineering
Mr V Ramsurrun, (External Resource Person)
Mr I A Aubeeluck, (External Resource Person)

**Forthcoming Short Course/Training Programme**

**Short Course on ‘Introduction to SQL Programming’**
Dr (Mrs) B A Gobin, Department of Computer Science & Engineering
Dr (Mrs) N Gooda Sahib, Department of Computer Science & Engineering
Mrs S Cheerkot-Jalim, Department of Computer Science & Engineering

**Introduction to Web Technologies**
Mr S Pudaruth, Department of Computer Science & Engineering
Mr S Kishnah, Department of Computer Science & Engineering

**Short Course on “Excel@Spreadsheets”**
Mr S Kishnah, Department of Computer Science & Engineering
Mr S Pudaruth, Department of Computer Science & Engineering
Completed Short Course/Training Programme

TQM: An Integrated Approach to Quality and Continuous Improvement [11 & 18 October 2014]
Mr D S Callychurn, Department of Mechanical & Production Engineering
Dr D K Hurreeram, Department of Mechanical & Production Engineering

Training Programme on 'Design of fire hydrant and hose reel systems for Buildings [15 November to 20 December 2014]
Mr A A H Khooadaruth, Department of Mechanical & Production Engineering (Coordinator & Resource Person)
Mr V Oree, Department of Electrical & Electronic Engineering
Mr V Ramsurrun, (Ministry of Public Infrastructure)
Mr K Ramkissoon, (Prodesign)

Short Course on Supervisory Management [15, 22, 29 November & 06 December 2014]
Mr D S Callychurn, Department of Mechanical & Production Engineering
Assoc Prof D K Hurreeram, Department of Mechanical & Production Engineering

Executive Short Course - Seminar on Total Quality Management for Process Improvement [31 January 2015]
Assoc Prof H Ramasawmy, Department of Mechanical & Production Engineering

Training Programme on 'ICT Productivity Skills' [09 to 30 May 2015]
Mr S Kishnah, Department of Computer Science & Engineering
Mr S Pudaruth, Department of Computer Science & Engineering

Short Course on Certificate of Competence on Occupational Noise Risk Assessment [20 February to 14 March 2015]
Mr G Juwaheer, (External Resource Person)
Dr B Y R Surnam, Department of Mechanical & Production Engineering
Assoc Prof D K Hurreeram, Department of Mechanical & Production Engineering (Coordinator)

Supervisory Management Training Programme [08 & 22 August 2015]
Assoc Prof D K Hurreeram, Department of Mechanical & Production Engineering
Mr D S Callychurn, Department of Mechanical & Production Engineering

Short Course (non-award) on 5S implementation [08, 11 & 15 April 2015]
Assoc Prof D K Hurreeram, Department of Mechanical & Production Engineering
Mr D S Callychurn, Department of Mechanical & Production Engineering

Basic Course in Textiles and Garment Manufacture [04 July to 13 August 2015]
Dr (Mrs) A V Soocheta, Department of Applied Sustainability and Enterprise Development
Assoc Prof S Rosunee, Department of Applied Sustainability and Enterprise Development
Mr J Chummun, Department of Mechanical & Production Engineering
Assoc Prof N Kistamah, Department of Applied Sustainability and Enterprise Development

Short Course on 'Fundamental Automechanic for Drivers' [25 April to 28 May 2015]
Assoc Prof D K Hurreeram, Department of Mechanical & Production Engineering
Dr M Gooroochurn, Department of Mechanical & Production Engineering
Mr S Doman, Department of Mechanical & Production Engineering
Short Course on Occupational Noise Risk Assessment [12 June to 04 July 2015]
Mr G Juwaheer, (External Resource Person)
Dr B Y R Surnam, Department of Mechanical & Production Engineering
Assoc Prof D K Hurreeram, Department of Mechanical & Production Engineering
(Coordinator)
Mr V Ramsurrun (External resource person)
Mr I A Aubeeluck (External Resource Person)
Mr V Oree, Department of Electrical & Electronic Engineering

Short Course on ICT Productivity Skills [13 June to 27 June 2015]
Mr S Pudaruth, Department of Computer Science & Engineering
Mr S Kishnah, Department of Computer Science & Engineering

Dr B Y R Surnam, Department of Mechanical & Production Engineering
Mr V Oree, Department of Electrical & Electronic Engineering
Mr V Ramsurrun (External Resource Person)
Mr K Ramkissoon (External Resource Person)

Short Course (Non Award) in “Project Management” [08 August 2015]
Mr A S Cadersa, Department of Civil Engineering
P Seechurn, (External Resource Person)
H Kalisaran, (External Resource Person)
Mr S Jagessur, (External Resource Person)
P Bungee, (External Resource Person)
I Pondor, (External Resource Person)

Short Course (Non-Award) in “Photovoltaics for Beginners” [15 August 2015]
Mr Y K Ramgolam, Department of Electrical & Electronic Engineering
Dr G Ramsawock, Department of Electrical & Electronic Engineering
Prof K M S Soyjaudah, Department of Electrical & Electronic Engineering

Training Programme on 'Defensive Driving Techniques and Care of Vehicles' [15 August 2015]
Mr A A H Khodaruth, Department of Mechanical & Production Engineering
Mr V Ramsurun, (External Resource Person)
Mr I A Aubeeluck, (External Resource Person)

Design of Fire Hydrant and Hose Reel Systems for Building [August 2015]
Mr A A H Khodaruth, Department of Mechanical & Production Engineering
Mr V Oree, Department of Electrical & Electronic Engineering
Mr V Ramsurrun (External Resource Person)
Mr K Ramkissoon (External Resource Person)

Short Course on "Common Rail Diesel Engine Management" [22 August 2015]
Mr A A H Khodaruth, Department of Mechanical & Production Engineering

Training Programme on Defensive Driving Techniques and Care of Vehicles [22 August to 12 September 2015]
Mr A A H Khodaruth, Department of Mechanical & Production Engineering
Mr V Oree, Department of Electrical & Electronic Engineering
Mr V Ramsurrun, (External Resource Person)
Mr I A Aubeeluck, (External Resource Person)

Corrosion- Monitoring, Testing and Prevention [25 to 26 September 2015]
Dr B Y R Surnam, Department of Mechanical & Production Engineering
Traditionally, textiles have been manufactured by knitting and weaving yarns. In the spinning process a mass of fibres is converted into an ordered assembly of fibres followed by insertion of twist. However, one key parameter in spinning is that the fibre length should be 30 mm or longer. If the fibre length is shorter, the spinning process using conventional machinery is commercially not viable due to quality problems and low productivity.

Bagasse is the biomass remaining after sugarcane stalks have been processed to extract sugar. Bagasse represents about 30% by mass of the total sugar-cane crushed and is mainly used as a primary fuel source for sugar mills in Mauritius. Bagasse fibres cannot be spun using conventional spinning machinery because of their short fibre length, which is in the range of 1-2 mm. Conversion of the bagasse into paper is an attractive way to add value to the biomass.

The aim of this project was to manufacture textiles from bagasse paper by using a relatively little known processing route, based on converting paper ribbons into yarns.

In this study, softwood and bagasse pulp papers of density ranging from 0.55 to 0.67 g/cm³ were used to make paper yarns from paper ribbon of different widths (2 – 20 mm). Paper-yarns were manufactured on a modified textile spinning machine. This work also necessitated the development of a manual yarn twister. Manual twisting enabled a detailed study of the intricacies of paper twisting under a varying set of physical parameters. It was found that paper ribbons must be moistened before they are twisted and that a minimum of 17% of moisture by mass is required for that purpose. Since moistening weakens paper, one set of paper was treated with 1% of ‘NADAVIN DHN’ resin during manufacture in order to impart wet strength to it in the moistened state, enough to resist the tension due to twisting. It was found that the resin treatment had little effect on the performance of the resulting dry paper when compared to that of the untreated one. This work has also shown that paper may also be steamed and then twisted into yarn. The strength of paper yarns is dependent on the strength of the paper from which they are made. Also, a sheet of paper tends to be stronger (up to twice as strong) in the machine direction i.e. in the direction parallel to its selvedge. Ribbons were therefore slit in that direction.
When a 4 mm paper ribbon was twisted, it assumed a twisted-ribbon (convoluted) shape following the first few turns (0.22 turns per cm); further twists introduced wrapped-ribbon shape partially as well along the length.

At about 5 tpcm, the ribbon was completely twisted into the degenerated wrapped ribbon i.e. into a paper yarn. A wider paper-ribbon, say of width 20 mm, has to be narrowed down by passing the ribbon through a ‘ribbon-folding’ device and then twisted. Paper of higher grammage is thicker and more resistant to twisting and the resulting yarn is coarser. Thus a 2.2 tpcm paper-yarn made from paper of 44.8 g/m² had a linear density of 896 tex (g/km) while 74.5 g/m² paper had a linear density of 1490 tex, and required an extra length of paper of about 5% to yield yarns of identical length. In the dry state, paper yarn does not exhibit any twist-liveliness.

Test results obtained from yarns made on spinning machine were comparable to those obtained from manual twister. Paper-yarns tend to have maximum strength at a particular twist value – optimum twist value, on this account behaving just like fibrous yarns. Further increase in twist imparted to the yarn made it weaker. This variation is less prominent for yarns made from ribbons of widths 2 and 3 mm. Most of the yarns were found to be weaker than the paper they have been made from: the breaking loads of the yarns range between +50% to +114% of that of the paper (of the same width) they were made from. Only yarns made from the lighter papers of 25.4 and 44.8 g/m² were found to break at a higher load than that of their respective paper ribbons. It was also found that the diameter of the paper-yarns increased as the basis weight (i.e. the thickness) of the ribbon increased.

The tendency for the diameter to decrease with increase in tpcm was not significant over the range of twist investigated. SEM images revealed that the broken ends of the fibrous textile yarns, just like that of paper, contained more of fibre breakage and slippage rather than sharp broken ends.

During fabric manufacture, it preferable to pull the yarns from a large package to prevent kinking. Paper-yarns can easily be made into a woven structure without any treatment. On the other hand, knitting such yarns has proved to be relatively difficult. Lubrication improved its knittability; paper-yarns were softened using polyethylene glycol (PEG-100) stearate. Thus, it has been possible to knit bagasse paper-yarns of linear density 204.2 tex on a E5 (5 needles per inch) hand-knitting machine to produce plain and rib structures having tightness factors 11.6 and 12.1, respectively. The fully relaxed state of the knitted structure (loop shape factor) depends on the conditions it has been left to dry after knitting.

This project has shown that it is possible to manufacture a range of textile structures from bagasse paper, which can be integrated into composites and other value-added products. This work also paves the way for the local craft industry to turn locally available bagasse into products that would potentially have a distinct Mauritian cache or identity.
The demand for ethanol has been increasing tremendously in recent years not only for its use as feedstock of chemical manufacturing but also because it is considered as a potential alternative source of liquid fuel for automobiles. As per the EIA 2007 report, it is anticipated that in the years 2015 and 2030 respectively, 97 million barrels and 118 million barrels of liquid fuels will be consumed on a daily basis. Ethanol can be produced easily by fermentation from various renewable resources; however, the major disadvantage of this process is its high production cost. To make the fermentation method cost competitive and to meet the great demand for ethanol in the present situation of energy crisis, research study has been directed in two areas, namely, the production of ethanol from comparatively cheaper source of raw materials and to study the new microorganism or yeast strains efficient for ethanol fermentation.

In this respect, inexpensive raw materials like by-products or wastes, such as, molasses, agricultural wastes, cellulose wastes, fruit wastes, vegetable wastes, municipal and industrial wastes can be utilized to produce ethanol cheaply. Though nowadays bio-ethanol can be derived from sucrose-based or starchy materials in some countries, yet, lignocellulosic and agricultural residues remain the cheapest material available in abundance worldwide. Many countries are looking forward to decrease their oil imports and are implementing programs to add ethanol to gasoline. Mauritius being an agricultural island has a great potential for easily available lignocellulosic biomass. Sugar cane cultivation occupies the highest function in the agricultural sector and the main biomass formed is bagasse, which is currently being burnt to produce energy. Molasses are also formed which is the most commonly used raw material in Mauritius for ethanol manufacture. However, molasses being limited, other sources such as agricultural wastes (500 tons/day) which are highly abundant in the local context were being looked into. To produce bioethanol from lignocellulose three major steps are of importance, firstly, the pretreatment, in which the raw material is treated to make cellulose accessible to enzymatic hydrolysis; secondly, the SSF (simultaneous saccharification and fermentation), in which cellulose is hydrolyzed to glucose and fermented to ethanol by yeast; and thirdly, the distillation, in which the ethanol is recovered. To optimize the bioethanol process every step need to be optimized but because each step depend on the former a general view needs to be kept as well.
It has been found that sulphuric acid is most commonly used for treatment of. Consequently, sulphuric acid was chosen for the acid hydrolysis technology for the purpose of comparison. This study has therefore aimed at comparing the three different technologies, concentrated sulphuric acid hydrolysis, the dilute sulphuric acid hydrolysis and the enzymatic hydrolysis for bioethanol production from the five mostly abundant lignocellulosic feedstock identified in Mauritius which are namely elephant grass, cane tops and leaves, peels of cane stalk, acacia and coconut husk.
There is practically no wholesome approach in ensuring total security of systems. In this revolutionized and digital world, the increasing need of security to protect individuals and information has led to a rise in developing biometric systems over traditional security systems. The quest for improving existing biometric techniques with a view to enhance the security of the systems is in demand. Finding more reliable, practical and more acceptable biometrics and techniques are attracting the attention of researchers. Recently, hand vein pattern biometrics has gained increasing interest from both research communities and industries. Though existing biometrics like face recognition, fingerprints and iris have existed since several years, the correct identification of an individual is still a challenge. In this work, a hand biometric security system using dorsal hand vein patterns and palmprints is being developed to address the challenges faced by these existing biometrics. Vein patterns are unique, stable and have strong immunity to forgery and thus they can become a potential good biometric which will offer secure and reliable features for person identity verification. In this research, palmprints features, which are also unique patterns, are fused with dorsal hand vein pattern to develop a multimodal hand biometric system.

Researchers are exploiting the different biometric phases by applying existing techniques or devising new ones to develop enhanced biometric systems. While the concepts of biometrics appear to be simple, there are many challenges in the implementation of biometric systems. The quality of image obtained at image capture influences the performance of biometric system. The factors, viz, the distance between hand placement and camera, illuminating conditions and hand orientation have not yet been investigated. Currently, there is no literature which demarcates techniques that can be applied on raw biometric images captured and enhanced biometric images, hence clearly denoting a research gap. Usually, in these high-dimensional data analyses, not all the measured variables are important for understanding the underlying structure or the underlying phenomena of interest. Not many prior researches have been conducted on all possible dimensional reductions techniques that can be applied on biometric data. In addition, though the deployment of biometric security has improved over traditional methods of security, much emphasis is placed on unimodal biometric, that is, where only a single trait is considered.
Thus, the problems of intra-class variations, unacceptable error rates and noisy data posed by these unimodal biometrics are cropping up, clearly showing the vital need for further exploration.

Despite extensive research, it is noticeable that there are scopes for developing techniques and/or to find out new ones to improve the performance of biometric systems. A detailed study on existing biometrics and their corresponding challenges have been carried out. A database of dorsal hand vein patterns and palmprints have been built using a digital camera, infrared filters in monitored environment. Since the performance of a biometric lies on the quality of image obtained at image capture, all the factors affecting image capture have been experimented and analysed. To address the need of feature representation, the hand features are taken as raw images and as enhanced images where a thinned version of the image is produced unlike existing research work. As a new approach to develop hand biometric security systems based on whole hand raw image, dimensional reduction techniques like Principle Component Analysis (PCA), Independent Component Analysis (ICA), Linear Discriminant Analysis (LDA), Locality Preserving Projections (LPP) have been adapted to hand features. The deployment of these dimension reduction techniques have yielded satisfactory results by providing an average recognition rate of 95% for PCA, 96% for ICA and 97.5% for LDA and 97.5% for good quality images obtained from a monitored environment. The performance of biometric system is affected by several factors such as translation of image during image capture. After the application of LDA, experiments prove that LDA outperforms PCA and ICA, since LDA caters for intraclass variations as well instead of only interclass variations. In this work, to avoid the biased of only one method over the oriented images; the images are aligned using the peaks and valleys of the fist of the hand. Local Binary Pattern (LBP) is yet another technique that has not been pioneered on enhanced hand images. This rotation invariant texture classification technique is applied on hand features, where the extracted features are then concatenated to form a histogram which is considered as the feature vector. The recognition rate using this method is nearly 100% for good quality images. To overcome the disadvantages of unimodal biometrics of the hand features, a multimodal hand biometric, using dorsal hand vein patterns and palmprints, has also been deployed. Fusion was experimented at feature extraction level and at score level. From the multimodal results, the biometric system has achieved 0% of the false acceptance rate and false rejection rate. Using this hand biometric deployed, a higher level of security can be achieved.
Keystroke Dynamics Optimization for Enhancing Textual Password Based Access Systems

Dr N Pavaday
Department of Computer Science & Engineering
Supervisor: Prof K M S Soyjaudah

With the number of security incidents in the headlines increasing, as well as growing pressure for geographic mobility, the need for reinforcing the de facto password scheme is becoming essential. In this thesis, the factors affecting seamless integration of keystroke dynamics into knowledge-based schemes are considered. The research addresses improving the performance of keystroke dynamics systems by focusing on four main aspects. First, it is focused on improving the results obtained using the covariance matrix for the Bayes classifier and using only a selection of captured features for the neural network. Next, the typing timing collection process is assessed under different conditions. The procedure for using a repeatable, reliable, and consistent timer for keystroke dynamics is detailed as well as its effect on performance. The third part evaluates typing of different types of strings commonly encountered in knowledge-based systems when keyed in by the same set of users. The supposedly normal characteristics of typing behavior are also evaluated before examining ways to optimize performance. The final section is focused on improving user interaction through audio-video aids and application of an innovative error-correcting scheme in keystroke dynamics.

Results of the research reveal, with a 99% confidence level, that the data do not follow a normal distribution for the password under consideration. An increase in error rates was obtained when a real password was used instead of a username and a password. For the Bayes method, the covariance matrix brings considerable increase in performance while, for a neural network, through careful selection of a subset of the features captured, it is possible to improve on performance. The chosen features are those with the least correlation among themselves. All the timers considered on the Windows and Linux platforms returned some erroneous values. Such timing noise, as well as background processes, severely impede the time-capture process and, hence, performance of the enhanced password mechanism. The query performance counter (QPC) achieved minimum fluctuations, which could be further decreased using priority. A pure normal distribution for typing hold and flight time features reduced errors. User typing consistency is affected by position of keys on the keyboard, use of audio-visual aids, and the keyboard inherent repeat rate. The use of N-gram and minimum edit distance allowed correction of typing errors and implementation of authentication systems that can be based on the type of errors made. The findings of this thesis indicate, although it is currently not possible to attain the performance specified by the European standard for access-control systems, reported results can still be improved by focusing on the collection process, user-keyboard interaction, and optimization of the data used by the classifiers.
RESEARCH SEMINARS

Seminar 1: Thursday 30 April 2015
Theme: Computer Science and Engineering

<table>
<thead>
<tr>
<th>Title</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Azure for Research</td>
<td>Mr Arnaud Meslier - Microsoft</td>
</tr>
<tr>
<td>Impact on Changing Parameters when Preprocessing Dorsal Vein Pattern</td>
<td>Mrs M M N M Heenaye Mamode Khan</td>
</tr>
<tr>
<td>A Quantitative Framework for assessing Agile Ontology Engineering Methodologies</td>
<td>Dr (Mrs) B Gobin</td>
</tr>
<tr>
<td>NuCarpool – Real-Time Dynamic Carpooling App for Mauritius using Push Service</td>
<td>Mr A Chiniah</td>
</tr>
<tr>
<td>The development of an expert system for domestic in-vessel composting using Fuzzy Logic in Mauritius</td>
<td>Mr S Kishnah</td>
</tr>
<tr>
<td>Cloud computing as an alternative for on-premise for Mauritian hotels</td>
<td>Mrs Z Cadersaib</td>
</tr>
<tr>
<td>Towards Quantitative Metrics for the Evaluation of VoIP security systems</td>
<td>Mrs S Armoogum</td>
</tr>
</tbody>
</table>

Seminar 2: Thursday 20 August 2015
Theme: Sustainable Materials and Environment

<table>
<thead>
<tr>
<th>Title</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>The application of Polymer Coated Aggregates (PCA) in flexible pavement</td>
<td>Ms R Rughooputh</td>
</tr>
<tr>
<td>Use of waste plastics and scrap rubber tyre in the wearing course of a bituminous pavement</td>
<td>Ms R Rughooputh</td>
</tr>
<tr>
<td>Assessing suitability of Environmental models for predicting concentration of mercury in air, water and soil as part of an environmental risk assessment</td>
<td>Mrs V Dookhun</td>
</tr>
<tr>
<td>Harvesting Energy Released During Composting For Water Heating</td>
<td>Mr Teeruth Raj Ramjutun</td>
</tr>
</tbody>
</table>
### Seminar 3:
**Thursday 27 August 2015**  
**Theme:** Coding, Control, Networks and Web Services

<table>
<thead>
<tr>
<th>Title</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Investigation in the Suitability of Adopting Wireless Web Services for a Supermarket</td>
<td>Mr R K Sungkur</td>
</tr>
<tr>
<td>Performance of Modified Asymmetric LTE Turbo Codes with Reliability-Based Hybrid ARQ</td>
<td>Mr Y Beeharry</td>
</tr>
<tr>
<td>Assessment of IPv6 Readiness and Adoption Strategy for Mauritius</td>
<td>Mr A Chiniah</td>
</tr>
<tr>
<td>Extremum Seeking Control of an Optical Cavity</td>
<td>Dr S Z Sayed Hassen</td>
</tr>
</tbody>
</table>

### Seminar 4:  
**Thursday 1 October 2015**  
**Theme:** Sustainable Manufacturing and Design

<table>
<thead>
<tr>
<th>Title</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Success Factors for Manufacturing Industry: A case Study at Company X</td>
<td>Mr D S Callychurn</td>
</tr>
<tr>
<td>Innovative Women Entrepreneurs in the Green Economy: Two Case Studies from Mauritius</td>
<td>Assoc Prof S Rosunee</td>
</tr>
<tr>
<td>A delayed-Cure Method for Shrink-Resist Treatment of Wool Fabrics</td>
<td>Assoc Prof N Kistamah</td>
</tr>
<tr>
<td>Creative Design Solution for an Environment Challenge</td>
<td>Dr A Vaidya Soocheta</td>
</tr>
</tbody>
</table>

### Seminar 5:  
**Thursday 8 October 2015**  
**Theme:** Energy

<table>
<thead>
<tr>
<th>Title</th>
<th>Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimisation of energy yield and power output from commercially available photovoltaic panels: A case study at the University of Mauritius</td>
<td>Dr R Ah King, Prof T Ramjeawon, Mr Y K Ramgolam &amp; Mr V Oree</td>
</tr>
<tr>
<td>Analysis &amp; Characterisation of Household Leaking and Real Power Consumption Using Net Metering Technique</td>
<td>Prof K M S Soyjaudah, Mr Y K Ramgolam, Mr A P Murdan &amp; Mr V Oree</td>
</tr>
<tr>
<td>Analyzing Energy Consumption of Mobile Phones in Mauritius</td>
<td>Dr T P Fowdur, Mr V H Hurbungs &amp; Mr Y Beeharry</td>
</tr>
</tbody>
</table>
Seminar 6: Thursday 22 October 2015
Theme: Sensor Networks and Systems

<table>
<thead>
<tr>
<th>Title</th>
<th>Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Based Labs for Low-Voltage Electrical Installations</td>
<td>Dr B R Rajkumarsingh</td>
</tr>
<tr>
<td>Development and Control of an Experimental Test Bed for a Microgrid using Labview</td>
<td>Dr S Z Sayed Hassen &amp; Assoc Prof I Jahmeerbaccus</td>
</tr>
<tr>
<td>Modelling and Simulation of an Inland Tsunami Prediction System using Wireless Sensor Networks</td>
<td>Assoc Prof K K Khedo &amp; Dr Y Bissessur</td>
</tr>
<tr>
<td>Prototype Implementation of a Marine Information System using Sensor Networks and GIS</td>
<td>Assoc Prof S Baichoo, Assoc Prof K K Khedo &amp; Mrs S Cheerkoot-Jalim</td>
</tr>
</tbody>
</table>

Forthcoming Seminars

Seminar 7
Theme: Sustainable Development and Energy

<table>
<thead>
<tr>
<th>Title</th>
<th>Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Materials in Green and Sustainable buildings in Mauritius</td>
<td>Dr B Y R Surnam</td>
</tr>
<tr>
<td>Regeneration of the Town Centre of Quatre-Bornes, Mauritius</td>
<td>Mrs Y Baguant-Moonshiram</td>
</tr>
<tr>
<td>Energy Management in Air-Conditioning and Buildings in Mauritius</td>
<td>Assoc Prof K Elahee</td>
</tr>
<tr>
<td>Optimisation of a cogenerated energy systems: The cane biomass flexi-factory case study</td>
<td>Mr A A H Khoodaruth</td>
</tr>
<tr>
<td>Enhanced Isolation and Irradiance in Near-tropic Region</td>
<td>Mr Y K Ramgolam</td>
</tr>
</tbody>
</table>
Seminar 8
Theme: Sustainable Development with ICT

<table>
<thead>
<tr>
<th>Title</th>
<th>Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Sustainable Green-Computing Framework for Clusters of ICT Equipments</td>
<td>Dr M R Doomun &amp; Dr O Gokhool</td>
</tr>
<tr>
<td>Support Framework to Optimize Access to Remote Bioinformatics Data</td>
<td>Dr O Moonian, Dr S Baichoo, Prof (Mrs) Y Jaufeerally-Fakim, Mrs Z Mungloo-Dilmahomud &amp; Ms A W Ghoorah</td>
</tr>
<tr>
<td>Setting up a Data Warehouse for Infectious Diseases</td>
<td>Dr (Mrs) S Baichoo, Dr O Moonian, Prof (Mrs) Y Jaufeerally-Fakim &amp; Mrs Z Mungloo-Dilmohamud</td>
</tr>
<tr>
<td>Building a Scalable Video Surveillance System for Suspect Behaviour</td>
<td>Dr S Baichoo, Dr M M N M Heenaye-Mamode Khan &amp; Mr S Pudaruth</td>
</tr>
</tbody>
</table>

Seminar 9
Theme: Sustainable Development

<table>
<thead>
<tr>
<th>Title</th>
<th>Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Biogas as an Alternative to LPG at the Cafeteria of the University of Mauritius</td>
<td>Dr (Ms) G Somaroo, Dr S Venkannah</td>
</tr>
<tr>
<td>Investigation into the Possibility of Treating ‘Used Oil’ through an Innovative ‘Combined Extraction and Adsorption’ Process</td>
<td>Dr V Seebaluck, Dr (Mrs) S L Summoogum Utchanah &amp; Mr A A H Khoodaruth</td>
</tr>
<tr>
<td>Sustainable Development of Ground Water Resources of the Eastern Aquifer</td>
<td>Assoc Prof (Ms) M D Nowbuth &amp; Assoc Prof A Chan Chim Yuk</td>
</tr>
<tr>
<td>Feasibility Study on the Use of E10 as Transportation Fuel for the Two Wheelers in Mauritius</td>
<td>Mr A A H Khoodaruth</td>
</tr>
</tbody>
</table>
Seminar 10  
Theme: Sustainable Materials and Systems

<table>
<thead>
<tr>
<th>Title</th>
<th>Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Use of Metals in the Jewellery Sector in Mauritius</td>
<td>Dr B Y R Surnam</td>
</tr>
<tr>
<td>Assessing the Durability of Low Strength Concrete using Coal Bottom Ash as a Partial Aggregate Replacement</td>
<td>Mr A S Cadersa &amp; Mrs J Rana</td>
</tr>
<tr>
<td>Investigation of the Effect of Fibre Processing on the Mechanical Properties of Screwpine Fibre Composite</td>
<td>Assoc Prof H Ramasawmy, Dr J Chummun, Prof D Jhurry &amp; Assoc Prof (Mrs) A Bhaw Luximon</td>
</tr>
<tr>
<td>Testing the Efficacy of Horizontal Ground-coupled Heat Pump for Pre-cooling Air in the Mauritian Context</td>
<td>Dr M Gooroochurn &amp; Mr H Shamachurn</td>
</tr>
</tbody>
</table>
The University of Mauritius organised its annual Research Week during the period 21 September 2015 to 25 September 2015. The presentations for the Faculty of Engineering were scheduled on 22 September 2015.

The presentation for the plenary session was:

- Building Industry Strength Software in Academic Institutes
  Prof T V Prabhakar*, Computer Science & Engineering Department, Indian Institute of Technology, Kanpur

The following abstracts and poster were presented:

ABSTRACTS:

- Graduates satisfaction Survey 2014 for the University of Mauritius
  F Khodabocus*, Director, Quality Assurance, UoM

- Eco Friendly wind turbine rainwater harvesting system
  K Vinayak*, M Gooroochurn, Mechanical & Production Engineering Department, UoM

- Comparative study on different photovoltaic systems simulation software
  B B T Maudarbocus*, H Shamachurn, Electrical & Electronic Engineering Department, UoM

- Classification of power quality disturbances using S-transform and probabilistic neural network
  N M Tilhoo*, H Shamachurn, Electrical & Electronic Engineering Department, UoM

- Multi-parametic optimization of Yagi Uda antenna for indoor use
  P Pillay Ramasawmy*, A Jugurnauth, A P Murdan, Electrical & Electronic Engineering Department, UoM

- An empirical categorisation of location based social networking systems
  A Mocktoolah*, K Khedo, Computer Science & Engineering Department, UoM

- An interoperable and scalable home automation system
  N Chooramun*, P Askoolum, Computer Science & Engineering Department, UoM

- Context aware algorithms for dynamic content adaptation in mobile learning platforms
  B Curum*, K Khedo, Computer Science & Engineering Department, UoM
• Development of a computational evacuation model for evaluating egress performance  
  N Chooramun*, Computer Science & Engineering Department, UoM

• Investigation of the .mu domain,  
  A Chiniah*, Computer Science & Engineering Department, UoM

• IVP6 assessment/adoption tool  
  A Chiniah*, Computer Science & Engineering Department, UoM

• Supermarket automation using QR codes  
  L J Leonardo*, Computer Science & Engineering Department, UoM

• Bioethanol production from fruit waste using alkaline pretreatment method  
  J Rosaye*, P Jeetah, R Mohee, Chemical & Environmental Engineering Department, UoM

• Decolourisation of synthetic waste water using activated cardon from rice husk  
  A Kheddoo*, P Jeetah, P Ramasami, Chemical & Environmental Engineering Department, UoM

• Decolourisation of textile effluent using maize cobs and rice husks as low cost natural absorbent materials  
  J Goorapah*, P Jeetah, Chemical & Environmental Engineering Department, UoM

• Learning from energy efficient lighting system in a new commercial building in Mauritius  
  K Boodhoo, V Dookhun*, Chemical & Environmental Engineering Department, UoM

• Odour emissions from composting processes  
  H Baleea*, G Somaroo, P Laurent, Chemical & Environmental Engineering Department, UoM

• Production of briquettes from textile wastes  
  C Jeebodhun*, G Somaroo, Chemical & Environmental Engineering Department, UoM

POSTER:

• Assessing the potential of producing biodiesel from algae  
  Kushboo Temil, S L Sumoogum Utchanah, Chemical & Environmental Engineering Department, UoM
# COMPLETED UoM FUNDED RESEARCH PROJECTS

<table>
<thead>
<tr>
<th>Title of Project</th>
<th>Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Use of Metals in the Jewellery Sector in Mauritius</td>
<td>B Y R Surnam</td>
</tr>
<tr>
<td>Setting up a Data Warehouse for Infectious Diseases</td>
<td>Dr (Mrs) S Baichoo&lt;br&gt;Assoc Prof O Moonian&lt;br&gt;Prof Y Jaufeerally-Fakim&lt;br&gt;Mrs Z Mungloo-Dilmohamud</td>
</tr>
<tr>
<td>Building a Scalable Video Surveillance System for Suspect Behaviour</td>
<td>Assoc Prof S Baichoo&lt;br&gt;Mrs M Heenaye-Mamode Khan&lt;br&gt;Mr S Pudaruth</td>
</tr>
<tr>
<td>Feasibility Study on the Use of E10 as Transportation Fuel for the Two Wheelers in Mauritius</td>
<td>Mr A A H Khoodaruth</td>
</tr>
<tr>
<td>Investigation of the Effect of Fibre Processing on the Mechanical Properties of Screwbine Fibre Composite</td>
<td>Assoc Prof H Ramasawmy&lt;br&gt;Dr J Chummun&lt;br&gt;Prof D Jhurry&lt;br&gt;Assoc Prof A Bhaw Luximon</td>
</tr>
<tr>
<td>Title of Project</td>
<td>Investigators</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| A Sustainable Green-Computing Framework for Clusters of ICT Equipments           | Dr M R Doomun  
Dr O Gokhool                                                                  |
| Sustainable Development of Ground Water Resources of the Eastern Aquifer         | Assoc Prof M D Nowbuth  
Assoc Prof A Chan Chim Yuk                                                       |
| Prototype Implementation of a Marine Information System using Sensor Networks and GIS | Assoc Prof S Baichoo  
Assoc Prof K K Khedo  
Mrs S Cheerkoot-Jalim                                                             |
| Modelling and Simulation of an Inland Tsunami Prediction System using Wireless Sensor Networks | Assoc Prof K K Khedo  
Dr Y Bissessur                                                                  |
| Support Framework to Optimize Access to Remote Bioinformatics Data                | Assoc Prof O Moonian  
Assoc Prof S Baichoo  
Prof Y Jaufeerally-Fakim  
Mrs Z Mungloo-Dilmahomud  
Miss A W Ghoorah                                                                 |
| Development and Control of an Experimental Test Bed for a Microgrid using Labview | Dr S Z Sayed Hassen  
Assoc Prof I Jahmeerbaccus                                                        |
| Testing the Efficacy of Horizontal Ground-coupled Heat Pump for Pre-cooling Air in the Mauritian Context | Dr M Gooroochurn  
Mr H Shamachurn                                                                    |
| Investigation into the Possibility of Treating ‘Used Oil’ through an Innovative ‘Combined Extraction and Adsorption’ Process | Dr V Seebaluck  
Dr S L Summoogum Utchanah  
Mr A A H Khoodaruth                                                                |
Introduction

Assistive technology has been defined as any item, piece of equipment or product system, whether acquired commercially, modified or customized, to increase, maintain, or improve functional capabilities of individual with disabilities. (Assistive Technology Act of USA, 1998). It has redefined the life of people with a wide range of cognitive and physical disabilities, thus enabling them to become more independent, productive, self confident and, better integrate the society. According to Steinkuller (1999) five percent of world blindness involves children younger than 15 years old and World Health Organisation reported that 1.5 million children are blind. The global status of blindness in children is estimated to be 0.8 per 1000 children (Schurink et al., 2011). The overall blind population of Mauritius is an estimate 7800, and 0.07 of this population are blind individuals younger than 20. The quality of life for children with visual impairment in Mauritius can be substantially improved by adapting a system of tactile colours that meets their specific needs. Due to visual impairment their overall development and social integration may be impeded.

The purpose of this study is to develop a system of colour coding that is tactile and can be integrated to assist them in their daily lives and activities, as well as serve as their pedagogical tools. The main objective of the research is to develop tactile technologies for colour recognition that would be accessible, affordable and integrated easily in any consumable products such as clothing, bags, shoes, books, utensils and, containers.

Methodology

‘Touch’ is one of the senses that visually impaired persons use to identify shapes, and textures of objects. It is known that their tactile perceptions are much sharper than a normal person (Cattaneo et al, 2008) The first part of the methodology reviewed several studies on the use of assistive technologies based on touch perception, and tools for the development of tactual profile. Different tools for the evaluation of adaptive behaviour and motor development was also investigated. Furthermore, research on child development and art therapy was also reviewed.

The preliminary research began with site visits to two blind schools of Mauritius; ‘Lizzie dan la main’ and ‘Lois Lagesse Trust Fund’. The aim of the site visits was to observe the visually impaired children and identify the problems they were encountering in their daily activities. Basic preliminary activities were conducted to have an initial interaction and experience with potential subjects.
The sample population was grouped according to their age and degree of blindness. Three groups were created and categorized as follows: 4 to 8 years old - 7 blind participants; 9 to 12 years old - 2 blind participants and; 8 to 15 years old - 5 visually impaired participants. All participants selected were from the pre-primary and primary level of the schools. The participants were tested for their motor dexterity using the ManuVis test and their adaptive behavior was assessed using the Vineland Adaptive Behavior test (VABS). They were given several exercises based on ‘Tactual Profile’ instrument and their tactile efficiency was evaluated.

Additionally, tactile shapes were developed and associated with primary and secondary colours. Different shapes with relief were created on fabric and paper using expandex binder. The tactile shapes were cut out and glued to several of their pedagogical toys such as the abacus, three dimensional geometrical shapes, coloured objects such as plates, cups, crayons and, so on. A tactile ‘Shape and Colour’ book was also designed with shape distinctions, colour matching exercises and algorithms (Fig 1). Moreover, six tertiary colours were developed and tested with the groups.

Results and Analysis

From the literature review, no data of a proper system of identifying colours through touch could be found. Devices that were designed for colour recognition for the visually impaired such as colour sensors were rather expensive. All other techniques seemed to be rather complicated and therefore, not appropriate for the task at hand. The development of tactile symbols to represent each colour was derived from the participants’ simplistic linear and geometric drawings. The participants were able to identify all the colours via touch after the symbols were applied. The children were very responsive to the relief symbols shown to them and they could easily associate each shape to each colour. The participants of each group performed well in their pedagogical activities. The evaluation of all the tests produced a mean score for each participant and this was used as a measure of the ability of the participants to adopt the new tactile technologies.

Conclusion

The tactile symbols have, so far, proved to be effective in its early implementation stage, in helping the visually impaired in recognizing colour.

Recommendation

Further works will be done on the application of these tactile symbols on items such as clothing, shoes and bags and their serviceability would be assessed. Further experimentation will be conducted to evaluate and implement additional colours.
References


Following the tragic event of mercury pollution in Minamata Japan in 1950, the health and environmental impact of mercury are still being felt, however fifty years after, important anthropogenic releases of mercury are still being observed. It is indeed ‘time to act’, hence the Minamata Convention was adopted and opened for signature on 10th October 2013. This convention will come into force ninety days after the 50th party has ratified the convention.

The Republic of Mauritius (REM) is strongly supporting this initiative and has signed to the convention during a diplomatic conference in October 2013. Being a small island state, such forms of pollution can impact highly on our sensitive ecosystem affecting coastal and marine resources jeopardising our ability to benefit from clean seafood, uncontaminated drinking water and pure air quality.

In February 2014, the UNDP in collaboration with the relevant Government Co-ordinating Agencies published a National Action Plan (NAP) on Mercury. This NAP was formulated based on findings of a preliminary inventory of prominent sources of mercury releases in Mauritius. As principal outcomes of the inventory, it was noted that ‘use and disposal of consumer products’ accounted for 51% of the national release and ‘fuel combustion’, including both fossil fuel and bagasse combustion were classified as second most important sources. Once emitted, mercury will cycle between major environmental compartments as described in the Technical Background Report for Global mercury assessment (AMAP/UNEP 2013 p2).

The following list highlights the clauses of the Minamata Convention that are relevant to the Republic of Mauritius and some possible actions that will have to be undertaken once the Convention will be ratified.

**Article 3: Supply and trade - Relevant aspect of article to REM: Providing written consent in export and import**

**Article 4: Mercury-added products - Review local imports and prohibit entry of consumables that may contain mercury**

**Article 8: Emissions - Control and reduction of emissions of mercury into the air from point sources**

**Article 9: Releases - Releases of mercury into the land & water from point sources**
Article 10: Environmentally Sound Interim Storage of Mercury, other than waste mercury - Identify interim facilities for temporary storage of mercury waste prior to recovery or recycling

Article 11: Mercury Wastes - Take appropriate measures to manage mercury waste in an environmentally sound manner

Article 12: Contaminated Sites – Conduct human health and risk assessment studies to assess impact of contaminated sites on the environment and to locate the mercury contaminated zones

Article 13: Financial mechanism - Developing countries are eligible for fund from the GEF trust fund to support projects that will enable coming into force of the Convention

Article 16: Health Aspects - Identification of populations at risk for reinforcing the countries’ engagement towards the convention

Article 18: Public Information, Awareness and Education - Campaigns of awareness, education on the negative health impact of mercury and how to manage mercury spills could greatly contribute to reduce the effects of exposure to the population of REM

Article 19: Research and development and monitoring - Perform detailed assessment of anthropogenic mercury emissions, develop environmental models to estimate levels of mercury and mercury compounds in vulnerable populations and in environmental media

Article 21: Reporting - Measures taken to implement the requirements of the Convention would eventually be reported to the Conference of the Parties (COP)

References:


Possibility of Using Fresh Concrete Waste in Concrete

Miss R Rughooputh, Lecturer
Mrs J Rana, Lecturer
Mr K Joorawon, Student

In Mauritius, about 1-4% of the total volume of concrete produced in a batching plant turns out to waste. Landfills are becoming scarce and transportation of the waste to landfills is costly. In this study, the possible use of Fresh Concrete Waste (FCW) is being highlighted to decrease its possible impacts on the environment and as solid waste management strategy. The compressive strength, modulus of elasticity and flexural strength of the modified concrete mixes decreased with the increasing FCW content. It was noted however that with 10% replacement of the FCW, a compressive strength of 22 N/mm² was recorded at 28 days. For same replacement, slight decreases were observed for the plastic density, modulus of elasticity and flexural strength respectively. Thus 10% FCW replacement can be used for blinding layer concrete, kerbs and footpaths, where concrete of compressive strength of 20 N/mm² is normally used.

The incorporation of recycled aggregates such as ceramics, rubber, glass and demolition wastes has been the purpose of numerous studies Topçu and Sengel (2004). Recycling of construction materials helps to protect the environment and to save the constrained landfill space and provides construction sustainability. Fresh concrete waste (FCW) is the slurry produced from the washout and cleaning mixing equipment and mixer trucks. The term FCW is also associated to the over-ordered concrete on site. FCW being in the fresh state cannot be disposed of directly to landfills; and if allowed to dry in an open atmosphere, the wind may spread the slurry particles over lakes, rivers and sea; thereby being a possible source of air pollution. Hence, locally, the fresh slurry is stored in confined containers at batching plants and left to harden for 24 hours before disposing off to landfill area. Moreover if the fresh slurry is allowed to dry in open atmosphere, the wind will spread the slurry particles over grass, lakes, streams and ocean. The air we breathe can be also contaminated by the slurry particle.

In previous experiments performed, the authors Sérifou et al., (2013), Correia et al., (2009) and Kou et al., (2012) used different types of processed FCW in the new concrete. Consequently, their findings conducted showed that physical and mechanical properties and durability of the new concrete were affected by the introduction FCW aggregates.

The aim of this study is to demonstrate the effect of local FCW on the fresh and hardened properties of concrete. Hence the objectives comprise determination of the properties of FCW, investigations on the fresh and hardened properties of concrete and assessment of the applications of FCW as aggregates.

The FCW had particle sizes ranging between 0 to 40mm, and about 75% of the particles were fine. The waste from the batching plant contained more fine than coarse particles. Thus, the FCW aggregates had similar specific gravity (2.80) as natural aggregates (NA) (2.86-2.90). However the water absorption of the FCW was very high. The coefficient of absorption was 15.8% for the FCW particles and 2.1-2.2% for NA.
Moreover, it could be noted that the use of FCW as aggregates reduced the plastic density of the fresh concrete. A drop of 7.17% in the fresh density was observed with a mix containing 30% FCW. These were primarily attributed to the shape, porosity and surface texture of the FCW. Incorporation of FCW in concrete reduced its modulus of elasticity, compressive and flexural strengths; and increased the water absorption and drying shrinkage of hardened concrete. The fluctuation in the properties of concrete was due to the increase in the air void content in the concrete, which in fact increased the porosity of the new concrete. Therefore concrete consisting of FCW has lesser durability. FCW caused degradation in the mechanical properties of concrete. The compressive strength decreased progressively with the increment of FCW content. The substitution of 10% and 30% of Normal Aggregate with FCW caused a drop of 22.4% and 50% respectively in the compressive strength values. This decrease illustrates the weak bonding between the aggregates and the old mortar. As a result of the drop in the properties of concrete, the use of FCW in concrete can only be used for non-structural purposes where the strength is not considered as important. It can also be used for construction of blinding layers, kerbs and footpaths.

This study is a first step towards supporting further research and applications. Durability testing (accelerated chloride tests, sulphate attacks testing) needs further to be addressed. Future research on FCW needs to focus on finding ways of improving the concrete compressive strength and mechanical properties. Moreover, investigations on the effect of FCW addition on cement reactivity and properties development are indeed essential to validate the use of FCW in concrete.

REFERENCES


The government of Mauritius has recently laid a lot of emphasis on the Ocean Economy. In the opening speech of a twoday National Dialogue on the Ocean Economy held in Jul 2013, the Prime Minister stated that the Ocean Economy has potential for enormous growth in the GDP as it can create high productivity jobs and hence improve the standards of living of citizens. To achieve this goal Mauritius should have the right regulatory regime together with the required level of skills in order to license and supervise ocean activities. For this to be possible, it is important to have realtime, updatet information of our maritime zones so as to tap the ocean in a sustainable manner. However, due to the insufficient amount of information, the marine resources of Mauritius are still underexploited.

The aim of this project was to create an application to collect data from the sea using wireless sensor networks and integrate these data with a Geographical Information System (GIS) to develop a marine information system. The latter would then hold a database of different sea parameters for further analysis.

A prototype marine monitoring application has been implemented to monitor various parameters of the sea, namely temperature, pH, salinity and turbidity. A wireless sensor network simulation environment, including the sensor nodes, topology and communication protocol has been developed to simulate the nodes at different locations in the sea and data transmission to the base station. The data collected at regular intervals for each parameter has been well integrated with the GIS tool used for this project (GeoTools) and were represented in easily understandable qualitative and quantitative formats to meet varying needs. An oil spill simulation has also been created to test how the application performs in such circumstances. Additional options, like report generation and analysis of the different parameters over time, have been included to make the application more useful.

The marine monitoring system may be extended to include various applications like identifying any pollution in the sea, locating suitable areas for aquaculture, preventing exploitation like illegal fishing, movement of marine animals, disaster management and so on.

The application developed will lead the way to further research and development in this field and contribute to the overall emerging economic sector, which is the Ocean Economy.
A massive amount of biological data is available online in public databases. For examples, Genbank for DNA sequences, Swiss-Prot for protein sequences, and the Protein Data Bank for 3D structures of macromolecules. These databases constitute a rich resource for biologists to gain better understanding of how the cell works. Several of these databases provide software utilities to allow data to be accessed remotely and programmatically. However, the main hurdles to remote data access in a highly dynamic environment (due to weekly updates) are the amount of network bandwidth required, and the programming skills necessary to use these utilities. This project presents a user-friendly software application that optimizes access time to remote bioinformatics databases.

The core of the software is a proxy server supported with a cluster of PCs through the peer-to-peer (P2P) approach. Given a new user query, the software connects to the remote database to retrieve the query results, and caches them on one of the local PCs that form part of the proxy server. If the same query is given again within a defined timespan by the same user or another, it retrieves the locally stored query results and sends them to the user (instead of connecting to the remote database again). The use of a proxy server allows optimizing external network bandwidth while providing fast response to user queries, and thus facilitating bioinformatics research and development.

The P2P approach is a distributed computing model based on the decentralized approach, whereby the participating computers have similar roles, acting as servers to provide resources for processing and storage of data, while also acting as clients, requesting for service from the other computers. Each participating computer is thus referred to as a peer and can initiate a communication session. This approach is an important departure from the historical and more widely used client-server model where participating computers have distinct roles either as servers, providing computing resources, or as clients, which request service from the servers.

This project uses both P2P and client-server approaches. The proxy service is implemented using a P2P approach while user PCs are clients to this proxy service and the proxy service is itself a client to the remote database servers.

P2P approach represents high potentials for resource sharing and is expected to play a major role in the future development of distributed computing. The main attraction of P2P computing on a large scale is that the participating computers can belong to different administrative domains and responsibility of their maintenance and upgrade is thus shared by different organizations.

A High Performance Support Framework for Bioinformatics Research

Project Team: Assoc Prof O Moonian
Dr (Mrs) S Baichoo
Mrs Z Mungloo-Dilmohamud
Miss A W Ghoorah,
Prof Y Jaferally-Fakim

Research Assistant: Mr M S Buctowar
Having used a P2P approach for the development of the proxy server makes the proposed software extensible; one conceivable extension to the project is to have a proxyserver making use of computing resources from different organizations interested in performing bioinformatics research, in Mauritius. These organizations can contribute resources and benefit from optimized access time by saving on international network bandwidth. At the same time, their researchers can devote time to their biological problem instead of spending precious time and effort on learning programming utilities.
Over the past decade, the ever-increasing development in wireless technologies has led to a rising demand for radio spectrum. Radio spectrum is a scarce non-renewable natural resource and spectrum assignment is generally performed by governmental agencies, which allocate the rights for the use of the frequency bands for long periods over big geographical expanses (Wang and Liu, 2011). In Mauritius, the national regulator is the Information and Communication Regulatory Authority.

Studies conducted by the spectrum regulatory agency of the United States, the Federal Communications Commission (FCC), showed that many licensed spectrum bands were either use in confined geographical regions or over only specific time periods and therefore the average utilization of such bands is between 15% to 85% (Youssef et al., 2014). Spectrum measurements performed in an urban area in the United Kingdom over a 24-hour period also confirmed this trend as shown in Figure 1 (Mehdawi et al., 2013). It was noted that significant portion of the spectrum is unused particularly in the TV band region and between the 1 GHz and 2 GHz regions. The average spectrum occupancy for the frequency band from 180 MHz to 2400MHz is only around 11% (Mehdawi et al., 2013). Therefore, the problem with radio spectrum is not only the scarcity of the band but also the underutilization of a big portion of the licensed radio spectrum.

Cognitive radio (CR) is an innovative flexible communication technology that aims at addressing the issue of spectrum efficiency. The term cognitive radio was coined by Joseph Mitola III in 2000 and he defined CR as “a really smart radio that would be self-aware, RF-aware, user-aware, and that would include language technology and machine vision along with a lot of high-fidelity knowledge of the radio environment” (Mitola, 2000). CR is a very active research area and there are various techniques than govern the many aspects of the technology. The CR device (secondary user (SU)) senses the environment, identifies temporarily unused spectrum known as ‘spectrum holes or white space’ and uses that portion of the spectrum until the licensed primary user (PU) returns. The CR then moves to another slice of the unused spectrum to avoid interference. This technique is known as dynamic spectrum access and is illustrated in Figure 2 (Min Song et al., 2012).
In CR networks, it is important to maintain high quality of service (QoS) for the licensed PUs and also to improve the QoS for SUs. Queueing system is a technique that can be used to improve QoS in CR networks (Khedun and Bassoo, 2015).

Figure 2: Dynamic Spectrum Access (Vilar, 2015)

Two types of queueing systems that are of particular interest are the non-preemptive and preemptive priority queueing. PUs are high priority users, since they are the spectrum licensees and in the preemptive priority technique, upon the arrival of the PUs, SUs are forced to interrupt transmission and vacate the channel. On the other hand, the non-preemptive priority technique enables SUs to complete their transmission even if PUs arrive. These two priority queueing techniques can be studied in a multichannel system, the M/D/s model, which consists of s channels licensed to s PUs. In the M/D/s model each PU has its own communication channel and SUs shift from different channels for transmission depending on availability of the channels. Larger value of s leads to a better QoS for the SUs as they have access to more empty time slots to complete transmission.

Figure 3: M/D/s priority queueing where s= 2.

It can be observed that SUs generally have a higher waiting time, as they are not the priority users. It is also noted that the waiting time of SUs following the non-preemptive technique is less compared to the preemptive one as the SUs are allowed to complete transmission before vacating the time slot. However, the PUs following the non-preemptive technique have a slightly higher waiting time compared to PUs of the preemptive technique.

In order for CR systems to be more widely adopted, it is essential that the QoS of SUs are improved even though they are not licensed users. However, the improvement will definitely lead to slight degradation of the QoS of PUs and if the application of the PUs can tolerate such degradation, CR systems will lead to improved spectrum efficiency.

References:


Use of Building Energy Modelling to Analyse Energy Efficiency Measures for the MSB Building

Dr M Gooroochurn, Lecturer
A Bheekun, Student

According to the International Energy Agency (IEA, 2014), the building sector has the potential to be the most cost-effective sector for reducing energy consumption by improving energy efficiency in buildings. In Mauritius, the Government has similar vision of reducing the dependence on fossil fuel and the promotion of energy efficiency in the building sector by introducing the new Energy Efficiency Building Regulation (EEBR) under the Building Control Act (BCA) 2012 for new buildings. On the other hand, an energy audit management scheme (EAMS) has been devised by Mauritius to target energy performance improvement for the existing building stock. Along this line, this research work consists of an assessment of the energy performance of the existing Mauritius Standards Bureau (MSB) building at Moka in view to studying the relevance of energy efficiency measures reported in literature.

An energy audit was the first step for the energy assessment of the MSB building. The building consists of various highly specialised laboratories and administrative offices. Data collection for the building services included lighting, air conditioning, office and specialized equipment and appliances. From the energy audit it was estimated that equipment constituted 52% of the total energy consumption followed by AC and lighting representing 38% and 10% respectively.

The total energy consumption for the different services was estimated to be around 315000 kWh with an energy performance of 62.8 kWh/m²/year for the building. Electrical energy consumption for the period 2011 to 2014 were also analysed from the CEB bills. The trends denote that the consumption were highest during the summer months than in winter period. One of the main factors identified for the variation in the load is the temperature difference leading to increased use of air conditioning system and the addition of new equipment.

The second step for the energy assessment of the MSB building was to use an energy modelling tool. The building project model was constructed using the Design Builder Version 4.2 Software as shown in figure 1.0 in order to assess the energy performance of the building.

Figure 1.0: Final rendered 3D version of the building model

The actual building energy performance is 57.9 kWh/m²/year. Thus, a +5.5% difference between the simulated results and the actual energy consumed by the building were noted. The difference can be attributed to the temperature used for the simulation which is an average monthly temperature which differs from the actual temperature.
◊ **Effect of the windows glazing of the building on cooling load**

The results obtained show that double glazing and single tinted glazing are more efficient in reducing the cooling load.

◊ **Effect of shading on the cooling load**

Windows without overhang or blinds are prone to excessive glare and built-up heat increasing the cooling load. Simulation of window and local shading and their combination showed a decrease in the cooling load. Therefore a combination of local shading overhang 1m and blind would reduce the total building load of the model by 5.4% with an energy performance of 56.97 kWh/m²/year.

◊ **Effect of roof finishes on cooling load**

The roof is a major part of building envelope and is affected by solar radiation, therefore different insulated materials were used to simulate the energy performance of the building model. It was observed that the roof finishes affect the cooling load and that not all the insulated materials are appropriate for Mauritius, e.g. concrete tiles increase the cooling load while other insulated materials improved the cooling load in the range of 0.73% to 1.21%.

Green roof is known to reduce cooling load significantly in building therefore the building model was simulated with green roof. It was found that retrofitting the roof with a green roof reduced the total cooling energy from 114893 kWh to 104678 kWh representing 9% of energy saving on cooling.

◊ **Effect of insulation of the walls of the building envelope**

Normally, thermal insulation of walls provide thermal barrier minimizing heat flow through building envelope thus reducing energy consumption of the building. Different materials for wall insulation were used in the simulation. All the insulated walls had a slight increase in the cooling load thus not reducing the total load of the building. In light of the findings, insulation of building walls need to be studied prior to its integration into the building envelope.

◊ **Effect of lighting energy efficiency**

Lighting improvement optimization was considered by replacing the fluorescent tubes with LED ones. Energy savings of 21% of energy are possible on lighting while cooling load also decreased by 1.5%, hence a total saving of 2.9% is possible.

◊ **Analysis of renewable solar energy potential**

With the implementation of the PV system in the building energy model, a total of 183093 kWh of electricity can be generated on-site. Moreover, the following effects of the PV system on the building model could be noted:

- Decrease in cooling load by 5.1% i.e. from 114893 kWh to 109093 kWh
- Decrease in the amount of electricity purchased from the utility to 117735 kWh
- Drastic improvement in the energy performance of the building from 60.23 kWh/m²/year to 23.13 kWh/m²/year
- Decrease in CO₂ production by 80% i.e. from 157572 kg to 30829 kg
Optimisation of the existing building

Different retrofits were studied and the best one chosen for the optimization of the existing building model. The optimization of the existing building model showed the following improvements:

- Shading: reduction in cooling load by 14.4% while total load reduced by 5.41%;
- Roof insulation: further improvement in the cooling load by 6.71% while total load reduced by 2.27%;
- LED lighting: lighting load and cooling load improvement by 20.7% and 0.18% while total load reduction by 2.51%;
- PV implementation: 66.3% improvement in total load.

Therefore, the optimized building had a total saving of 20.5% in cooling load, 20.7% in lighting load and the carbon emissions reduced by 86%. The energy performance of the optimized building was 18.29 kWh/m²/year. The total cost for implementing the proposed solution was estimated to be around Rs 17.2 million with a payback period of approximately 13.5 years.


B. Rajkumarsingh and N. S. Poonye “Modeling of Power Line Communication Channel for Automatic Meter Reading System with LDPC Codes”, accepted for publication in GSFT Journal of Engineering Technology, Volume 3, Number 1, Sep 2014.


A. A. Buglow and V. Bassoo, Femtocell Power Control Scheme Based on the Maximum Frame Utilization Technique, 2015 IEEE EUROCON Conference, 8th to 11th September 2015.


T. P. Fowdur and B. N. Furzun, “Performance of IEEE 802.11n LDPC Codes with Modified Reliability Based Hybrid ARQ and Unequal Error Protection” Accepted in IEEE Eurocon 2015 Conference.


A. Sookun and R. T. F. Ah King, Performance Analysis of Evolutionary Algorithms in Distribution Network Reconfiguration, 50th International Universities Power Engineering Conference (UPEC 2015), 1 - 4 September 2015, Staffordshire University, Stoke-on-Trent, United Kingdom.

R. Gopaul and R. T. F. Ah King, Firefly Algorithm for Optimal Reactive Power Dispatch, 50th International Universities Power Engineering Conference (UPEC 2015), 1 - 4 September 2015, Staffordshire University, Stoke-on-Trent, United Kingdom.

L.Latchoomun, R. T. F. Ah King and K. Busawon, A new approach to model development of water distribution networks with high leakage and burst rates, 13th Computer Control for Water Industry Conference (CCWI 2015), 2 - 4 September 2015, De Montfort University, Leicester, United Kingdom.

L. Latchoomun, R. T. F. Ah King, K. Busawon, D. Mawooa, and R. G. Kaully, Laboratory investigation of the leakage characteristics of unburied HDPE pipes, 13th International Conference on Computing and Control for the Water Industry (CCWI 2015), 2 - 4 September 2015, De Montfort University, Leicester, United Kingdom.

# Ongoing MPhil/PhD Projects

## List of UoM Staff Registered on MPhil/PhD (by Research)

<table>
<thead>
<tr>
<th>Name of Candidate</th>
<th>Title of Project</th>
<th>External Supervisor (ES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAHADUR Goonesh K (CILL)</td>
<td>PhD title: Integrating Micro-Electronics in Textiles</td>
<td>Dr M Bradshaw, Assoc Prof S Rosunee (AS)</td>
</tr>
<tr>
<td>RAMJUG-BALLGOBIN Rajeshree (Mrs) (Electrical &amp; Electronic Engineering Department)</td>
<td>Control of continuous dynamical systems with discrete measurements and application to wastewater treatment systems</td>
<td>Prof H C S Rughooputh, Dr K Busawon - UK (AS)</td>
</tr>
<tr>
<td>CADERSA Abdus Salaam (Civil Engineering Department)</td>
<td>A Comparative Life Cycle Assessment of recycling options of Coal Ash on the island of Mauritius</td>
<td>Prof T Ramjeawon (Main Supervisor), Assoc Prof Chan Chim Yuk (AS)</td>
</tr>
<tr>
<td>CALLYCHURN Devkumar Sing (Mechanical and Production Engineering Department)</td>
<td>Developing Decision Support System for Environmentally - Sustainable Manufacturing Strategy</td>
<td>Prof K D Barber, University of Bradford, UK (AS)</td>
</tr>
<tr>
<td>CHINIAH Aatish (Computer Science &amp; Engineering Department)</td>
<td>Data Management in Erasure-Coded Distributed storage systems</td>
<td>Assoc Prof A Datta (AS)</td>
</tr>
<tr>
<td>DHOOKIT Jean Lindsay (Computer Science &amp; Engineering Department)</td>
<td>Simulating the Effect on Traffic of a Second Harbour</td>
<td>Dr Swet (ES), Dean of Faculty (AS)</td>
</tr>
<tr>
<td>MUNGLOO-DILMOHAMUD Bibi Fatema Zahra (Mrs) (Computer Science &amp; Engineering Department)</td>
<td>Computational methods for robust feature selection in the context of gene expression profiling and biomarker discovery: robust and novel methods</td>
<td>Prof Carlos-Andrés Peña-Reyes, Switzerland (Main Supervisor), Prof Y Jaufeerally-Fakim (AS)</td>
</tr>
<tr>
<td>DOOKHUN Vimi (Mrs) (Chemical &amp; Environmental Engineering Department)</td>
<td>Assessing Environmental Risks Associated with Persistent Toxic Substances</td>
<td>Prof R Mohee, Dr Clift, University of Survey (AS)</td>
</tr>
<tr>
<td>KHOODARUTH Abdel Anwar Hossen (Mechanical &amp; Production Engineering Department)</td>
<td>Cogeneration in Industry in Mauritius: Energy and Exergy Efficiency Analysis</td>
<td>Assoc Prof K Elahee</td>
</tr>
<tr>
<td>MOLOO Raj Kishen (Computer Science &amp; Engineering Department)</td>
<td>A Scalable Mobile Learning Framework in Intermittent Connectivity Network</td>
<td>Prof T V Prabakar from IIT, India (Main Supervisor), Dr K K Khedo (AS)</td>
</tr>
<tr>
<td>Name of Candidate</td>
<td>Title of Project</td>
<td>External Supervisor (ES)</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>MUDHOO Ackmez (Chemical &amp; Environmental Engineering Department)</td>
<td>Accounting of Greenhouse Gas Emissions for Different Treatments of Organic Wastes.</td>
<td>Prof R Mohee (Main Supervisor) Assoc Prof Bhola Ram Gurjar (Assoc Supervisors)</td>
</tr>
<tr>
<td>OREE Vishwamitra (Electrical &amp; Electronic Engineering Department)</td>
<td>Developing of a multi-objective optimization framework for integration of renewable energy in the planning of electricity generation expansion</td>
<td>Prof J Fleming, Sheffield University Dr S Z Sayed Hassen (Co-Supervisors)</td>
</tr>
<tr>
<td>PUDARUTH Sameerchand (Computer Science &amp; Engineering Department)</td>
<td>Categorisation and summarisation of Mauritian Legal Judgements using machine learning Techniques</td>
<td>Prof K M S Soyjaudah (Main Supervisor) Assoc Prof R P Gunputh (Assoc Supervisor)</td>
</tr>
<tr>
<td>RAGEN Arvindra Kumar (Chemical &amp; Environmental Engineering Department)</td>
<td>Investigating the applicability of constructed wetlands for wastewater reclamation and reuse in the Mauritian domestic sector</td>
<td>Candidate's Committee: Assoc Prof M Nowbuth Assoc Prof R T Ramessur Assoc Prof A Ruggoo</td>
</tr>
<tr>
<td>RAMGOLAM Yatindra Kumar (Electrical and Electronics Engineering Department)</td>
<td>Evaluation of Commercially available solar modules for optimum photovoltaic system design in Mauritius</td>
<td>Prof K M S Soyjaudah</td>
</tr>
<tr>
<td>RAMSAMY-IRANAH Sabrina Devi (Mrs) (Applied Sustainability &amp; Enterprise Development Department)</td>
<td>Investigation into Functional and Aesthetic Clothing and Fabrics for the Visually Impaired</td>
<td>Assoc Prof S Rosunee (Main Supervisor) Dr N Kistamah (Assoc Supervisor)</td>
</tr>
<tr>
<td>SEETOUL Jeetendranath (Computer Science &amp; Engineering Department)</td>
<td>A Framework/Mechanism for Secure Communications in Ubiquitous Computing</td>
<td>Prof T V Prabakar</td>
</tr>
</tbody>
</table>
List of MPhil/PhD (by Research) Students

<table>
<thead>
<tr>
<th>Name of Candidate</th>
<th>Scholarship</th>
<th>Title of Project</th>
<th>External Supervisor (ES)</th>
<th>Administrative Supervisor (AS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABEL Patricia Julie (Ms) (F/T)</td>
<td></td>
<td>Computer Modelling of the Thermo-Physiological Comfort of Single Layer and Multi-Layer woven Fabrics</td>
<td>Dr R Unmar (Main Supervisor) Assoc Prof S Rosune (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>AMIC Seeven</td>
<td></td>
<td>Heuristic Search Procedures for Cryptanalysis</td>
<td>Prof K M S Soyjaudah (Main Supervisor) Dr G Ramsawock (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>BALLOO Parvesh</td>
<td></td>
<td>Assessing Risks of Seawater Intrusion from Desalination Practices</td>
<td>Assoc Prof M Nowbuth (Supervisor)</td>
<td></td>
</tr>
<tr>
<td>BAKUNZI Theotime (Foreignor) (F/T)</td>
<td>Sponsored by Government of Rwanda</td>
<td>Face Image Reconstruction for Face Recognition</td>
<td>Assoc Prof S Baichoo (Supervisor)</td>
<td></td>
</tr>
<tr>
<td>BAYNATH Purvashi (Ms) (P/T)</td>
<td></td>
<td>Username and Password Authentication through Keystroke Dynamics Artificial Neural Network/ Neuroevolution and other evolutionary Algorithms</td>
<td>Prof K M S Soyjaudah (Supervisor)</td>
<td></td>
</tr>
<tr>
<td>BEEHARRY Yogesh (F/T)</td>
<td>TEC Postgraduate Scholarship</td>
<td>Combined Iterative Source Channel Decoding Strategies for digital Communication Receivers</td>
<td>Prof K M S Soyjaudah (Main Supervisor) Dr T P Fowdur (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>BHURTUN Bhima Dev (F/T)</td>
<td></td>
<td>Robust Image and Video Transmission Techniques</td>
<td>Prof K M S Soyjaudah (Main Supervisor) Dr T P Fowdur (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>BOODOO-JAHANGEER Nazmeen (Mrs) (P/T)</td>
<td></td>
<td>Face and Ear Biometrics for Person Authentication</td>
<td>Assoc Prof S Baichoo (Supervisor)</td>
<td></td>
</tr>
<tr>
<td>BOODOO Sajaad (P/T)</td>
<td></td>
<td>Development of an Active Acoustic Noise Control System with Improved Performance</td>
<td>Assoc Prof R Paurobally (Main Supervisor) Dr Y Bissessur (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>BRIZMOHUN Ravina (Ms) (P/T)</td>
<td>MRC Postgraduate Scholarship</td>
<td>Life Cycle Assessment of Electricity Generating Systems in Mauritius</td>
<td>Prof T Ramjeawon (Supervisor)</td>
<td></td>
</tr>
<tr>
<td>Name of Candidate</td>
<td>Scholarship</td>
<td>Title of Project</td>
<td>External Supervisor (ES)</td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>BUNDHOO Muhammad Ali Zumar (F/T)</td>
<td>UoM Postgraduate Scholarship</td>
<td>Effects of Microwave and Ultrasound Irradiation on Energy Production from Anaerobic Digestion and Dark Fermentation of Municipal Solid Wastes</td>
<td>Prof R Mohee (Main Supervisor)  Prof Mohamed Ali Hassen (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>COONJAH Irfaan Muhamad (P/T)</td>
<td></td>
<td>Design and Analysis of a Modified Open SSH Virtual Private Network using UDP as base</td>
<td>Prof K M S Soyjaudah (Main Supervisor)  Dr C Catherine (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>CURUM Brita (Miss) (P/T)</td>
<td>UoM Scholar</td>
<td>A Context Aware Framework for Dynamic Content Adaptation in</td>
<td>Asso Prof K Khedo</td>
<td></td>
</tr>
<tr>
<td>ESSACKJEE Ismael Adam (P/T)</td>
<td></td>
<td>The Impact of Distributed Generation on the Mauritian Power Sector</td>
<td>Assoc Prof R Ah King</td>
<td></td>
</tr>
<tr>
<td>FELICITE Louis Eric Orlando (P/T) (PhD)</td>
<td></td>
<td>Humic Acid Generation and Nitrogen Volatisation during Composting of Municipal Solid Wastes</td>
<td>Prof R Mohee</td>
<td></td>
</tr>
<tr>
<td>GUNASEE Sanjana Devi (Ms) (F/T)</td>
<td>TEC Scholar</td>
<td>Comparing thermoChemical treatment of Solid Wastes using thermo gravimetric analysis</td>
<td>Prof. R Mohee (Main Supervisor)  Assoc Prof J Gorgens (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>IMRITH Manoj Kumar (F/T)</td>
<td></td>
<td>Bioinspired Textiles for Optional UV Protection</td>
<td>Assoc Prof S Rosunee  Dr R H Unmar (Co-Supervisors)</td>
<td></td>
</tr>
<tr>
<td>INDOONUNDON Deevya (Ms) (P/T)</td>
<td></td>
<td>Channel Dependant and Content Aware Multimedia Communication Strategies</td>
<td>Prof K M S Soyjaudah  Dr T P Fowdur (Co-Supervisors)</td>
<td></td>
</tr>
<tr>
<td>KHODABACCHUS Muhammad Yaasir (F/T)</td>
<td></td>
<td>Security and Privacy in Cloud Computing</td>
<td>Prof K M S Soyjaudah (Main Supervisor)  Dr G Ramsawock (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>LATCHOOMUN Lekhram singh (P/T)</td>
<td></td>
<td>Leakage Reduction Control of the Water Distribution System in Mauritius</td>
<td>Assoc Prof R Ah King (Main Supervisor)  Dr K K Busawon (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>MAUTHOOR Sumayya (Ms) (F/T)</td>
<td>TEC Scholar</td>
<td>Industrial Waste Management in Mauritius Using Recycling and an Industrial Ecology Approach</td>
<td>Prof R Mohee (Main Supervisor)  Mr P Kowlesser (Industrial Supervisor)</td>
<td></td>
</tr>
<tr>
<td>Name of Candidate</td>
<td>Scholarship</td>
<td>Title of Project</td>
<td>External Supervisor (ES) Administrative Supervisor (AS)</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>MIHLALL Yaswarree (Miss) (P/T)</td>
<td>MRC Postgraduate Award</td>
<td>Controlled Composting of Lignocellulosic Wastes to produce the Best Substrate for the cultivation of the Pleurotus Sajor Caju Mushroom</td>
<td>Prof R Mohee (Supervisor)</td>
<td></td>
</tr>
<tr>
<td>MOCKTOOLAH Asslinah (Ms) (P/T)</td>
<td>A Discoverability &amp; Privacy Framework for Proximity Based Mobile Social Networking</td>
<td>Assoc Prof K Khedo (Supervisor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOHABEER Heman (F/T)</td>
<td>TEC Postgraduate Scholarship</td>
<td>Efficient Neural Networks Agents</td>
<td>Prof K M S Soyjaudah (Supervisor)</td>
<td></td>
</tr>
<tr>
<td>PEER Adeela Ahmad Iqbal (Miss) (F/T)</td>
<td>TEC Postgraduate Scholarship</td>
<td>Enterprise Development and the Participation of Women: The Case of Mauritius</td>
<td>Assoc Prof S Rosuneet</td>
<td></td>
</tr>
<tr>
<td>RAGPOT Prateema (P/T)</td>
<td>TEC Postgraduate Scholarship</td>
<td>Enhancing Digital Audio Transmission with Unequal Error Protection and Error Concealment Techniques</td>
<td>Prof K M S Soyjaudah Dr T P Fowdur (Co-Supervisors)</td>
<td></td>
</tr>
<tr>
<td>RAGO Yogeshwari Pooja (Miss) (F/T)</td>
<td>UoM Scholar</td>
<td>A Comparative Assessment of the Potential of Energy-from-Waste (EFW) Technologies in Mauritius</td>
<td>Prof R Mohee Dr D Surroop (Co-Supervisors)</td>
<td></td>
</tr>
<tr>
<td>RAJCOOMAR Sachindev Avinash (P/T)</td>
<td></td>
<td>Life Cycle Assessment and Economic and Social Evolution of Recycling in Mauritius</td>
<td>Prof T Ramjeawon</td>
<td></td>
</tr>
<tr>
<td>RAMTOHUL Avinash (P/T)</td>
<td></td>
<td>Framework for Service-based Architecture for e-government in SADC</td>
<td>Prof K M S Soyjaudah (Supervisor)</td>
<td></td>
</tr>
<tr>
<td>Mr SOOBEN Darmanaden (P/T)</td>
<td></td>
<td>Energy Efficiency Analysis in the Cold Chain in the food Industry in Tropical Regions</td>
<td>Prof R Mohee (Main Supervisor) Prof Francis Meunier - Conservatoire Nationale des Arts et Métier (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>SOOBHANY Nuhaa (Ms) (F/T)</td>
<td>TEC Scholar</td>
<td>Comparative Assessment of nutrients and heavy metals content during the composting and Vermicomposting of the organic fraction of Municipal Solid Waste (MSW)</td>
<td>Prof. R Mohee (Main Supervisor) Assoc Prof V K Garg (Assoc Supervisor)</td>
<td></td>
</tr>
<tr>
<td>VEERAPEN Shanmuga (F/T)</td>
<td></td>
<td>Optimising Grid Integration and Market Penetration for Wind and Solar Technologies</td>
<td>Prof K M S Soyjaudah (Supervisor)</td>
<td></td>
</tr>
</tbody>
</table>
Contact Details

Associate Professor ROSUNEE Satyadev
Dean, Faculty of Engineering
Tel: 403 7805
Email: s.rosunee@uom.ac.mu
Website: http://sites.uom.ac.mu/foe/

Dr. SURROOP Dinesh
Head of Department, Chemical and Environmental Engineering
Tel: 403 7819
Email: d.surroop@uom.ac.mu
Website: http://sites.uom.ac.mu/foe/index.php/departments/cee

Mrs. BAGUANT-MOONSHIRAM Yashwaree
Head of Department, Civil Engineering
Tel: 403 7858
Email: k.baguant@uom.ac.mu
Website: http://sites.uom.ac.mu/foe/index.php/ce-home

Mrs HEENAYE-MAMODE KHAN Maleika Mehr Nigar Mohamed
Head of Department, Computer Science and Engineering
Phone: 403-7758
Email: m.mamodekhan@uom.ac.mu
Website: http://sites.uom.ac.mu/foe/index.php/departments/cse

Dr FOWDUR Tulsi Pawan
Head of Department, Electrical & Electronic Engineering
Tel: 403 7888
Email: p.fowdur@uom.ac.mu
Website: http://sites.uom.ac.mu/foe/index.php/eehome

Dr SURNAM Baboo Yashwansingh Ranveersingh
Head of Department, Mechanical and Production Engineering
Tel: 403 7823
Email: y.surnam@uom.ac.mu

Associate Professor KISTAMAH Naraindra
Head of Department, Applied Sustainability and Enterprise Development
Tel: 403 7849
Email: dharma@uom.ac.mu
Website: http://sites.uom.ac.mu/foe/index.php/tthome