



UNIVERSITY OF MAURITIUS
FACULTY OF ENGINEERING

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ELECTRICAL AND ELECTRONIC ENGINEERING
DEPARTMENT

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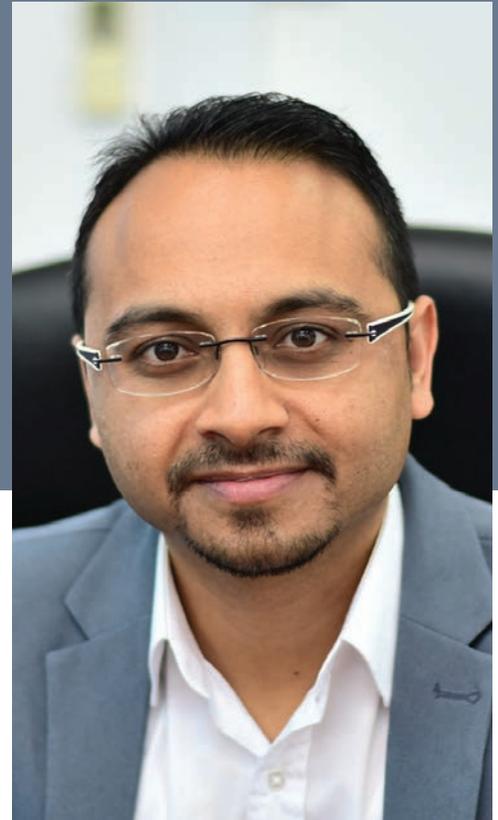
September 2020 Edition 1

Message from

the Head of Electrical and Electronic Engineering Department

3 October 2018-2 October 2020

Dr Y K Ramgolam



The Electrical and Electronic Engineering Department (EEED) is thrilled to issue the very first edition of its newsletter. Its aim is to provide our students, partners and all stakeholders more information on the achievements of EEED.

Year 2020 has been a very challenging one for everybody. COVID-19 pandemic has affected all the academic activities of the Electrical and Electronic Engineering Department. Following the lock-down in March 2020, all in-person instructions were cancelled at the University of Mauritius (UoM) and we moved to remote learning. Thankfully, the department had already prepared itself for online teaching and learning. Two Masters level programmes were developed with our international partners for online delivery as from January 2020, and all staff of the department had followed in-house trainings on “Online Teaching and Learning Platforms” by the staff of the Centre of Innovative & Lifelong Learning (CILL) in June 2019 for the development and servicing of the programmes.

We are pleased to announce that all the engineering programmes offered by the department, namely the BEng (Hons) Electrical and Electronic Engineering (EEE), BEng (Hons) Electronic and Communication Engineering (ECE), BEng (Hons) Telecommunications Engineering with Networking (TEN), and BEng (Hons) Mechatronics Engineering (MTX) (jointly with the Mechanical and Production Engineering department), have been revisited in order to enforce internationally bench-marked standards for engineering education and expected competence for engineering practice. EEE and ECE were revisited in 2016, TEN in 2019 and MTX in 2020.

The department had already prepared itself for accreditation of EEE and ECE programmes and a visit for provisional accreditation was planned for 18-19 June 2020 by the Engineering Council of South Africa (ECSA).

However, due to the pandemic, the visit has been postponed to 2021.

We are also working closely with the University of Arizona (UA) for the development of a BSc Electrical and Computer Engineering programme. The latter will be serviced jointly by UA and UoM and students will benefit from a joint degree after successful completion of the course. Students may also have an opportunity to study at UoM and at UA as well during the course of the degree.

Staff of the department are continuously attracting research funds from local and international institutions in order to engage in high-end research and we are keeping pace with international institutions by producing high-impact factor publications. We are also actively involved in a number of committees and boards of a number of institutions in Mauritius. Staff of the department have also been recently appointed as consultants in a number of projects for other institutions in Mauritius. Our staff are passionate in their endeavour and are committed to high standards of teaching and learning in order to enhance our students’ experience at the University.

Lastly, we are very thankful to alumni and friends of our department for the gifts which have helped us to improve our laboratories. The department is indeed very grateful for this. ■

Electrical and Electronic Engineering Department



The Electrical Engineering Division was initially set up with the foundation of the School of Industrial Technology in 1968. In the early 1970s, the school started to offer a joint Diploma in Mechanical and Electrical Engineering to cater for the shortage of engineers in Mauritius and the growing demand for such professionals by the industry.

The B.Tech Electrical Engineering course was first offered in September 1976. The division became known as the Department of Electrical and Electronic Engineering in the early 1980s. The B.Tech programme was converted into BEng (Hons) Electrical Engineering

in the mid-1990s. The Department now offers a number of undergraduate programmes to meet the requirements of the electrical, electronic and telecommunication industries. The Department has a group of sixteen highly motivated academic staff who are passionate and committed to provide high level education to the engineers of the fourth industrial revolution. The department strives to keep pace with leading universities by continuously improving the quality of education and engaging in high end research. We provide a vibrant learning environment to our students with state of the art and well equipped laboratories. Seven technical staff look after the four laboratories of the department. The department makes every effort to produce graduates with all the attributes required to make a positive impact in the society. The total number of students enrolled in programmes offered by the department in 2019-2020 was 288 and the total number of graduates from the department in 2019-2020 is 73.

Graduates from the department find their place in the working environment very quickly and significantly contribute to the economic, social and sustainable development of the island. ■



Front row: R Ah King, R Ramjug-Ballgobin, V Bassoo, Y Ramgolam, K Jhugursing, P Bhugawn, N Sujeebun
Second row: A Jugurnauth, H Shamachurn, B Rajkumarsingh, S Sayed Hassen, A Muttea, Y Bissessur, I Jahmeerbacus, D Cuppoor,
M Beekaroo, A Purahoo, V Oree, M Hosany

Paving the way to International Recognition

Message from the Accreditation Coordinator of EEED.

Assoc. Prof. R T F Ah King



Engineers contribute both to economic development of the country and services to the society. Since the establishment of the Department of Electrical and Electronic Engineering at University of Mauritius in 1968, the aim is to provide quality education to students to enable them to prepare for career in the electrical, electronic and communication engineering sector. Our departmental programmes have evolved over the years to adapt to the ever changing requirements for engineers in this modern society. An important milestone was the decision to go for accreditation of our BEng (Hons) Electrical and Electronic Engineering and BEng (Hons) Electronic and Communication Engineering programmes in 2013. Subsequently, other programmes have been revised to follow pace with the accreditation process with our BEng (Hons) Telecommunication Engineering with Networking in 2019 and the BEng (Hons) Mechatronics Engineering which is run jointly with the Department of Mechanical and Production Engineering in 2020.

The obvious choice was through the Engineering Council of South Africa (ECSA) which is a regulatory body in South Africa for accreditation of engineering qualifications. The Washington Accord provides for recognition of engineer graduates of accredited programmes of each signatory, of which South Africa is one. Accreditation ensures recognition of our programmes for future mobility of engineers given that the world has become a global village.

Outcome-based criteria have been developed by Accreditation bodies for evaluating engineering qualifications. Thus, our programmes have moved from a performance-based to an outcome-based assessment. According to ECSA, accreditation criteria are defined for three stages in the lifecycle of a programme: planning, students at halfway point and producing graduates. The department has recently completed the first cycle of the BEng (Hons) Electrical and Electronic Engineering and BEng (Hons) Electronic and Communication Engineering programmes (which started in academic year 2016/2017) in academic year 2019/2020 and ECSA visit is expected for its evaluation. ECSA uses a number of criteria for Accreditation of Programmes. The Credits, Knowledge Profile and Coherent Design criterion focus on the content of the programme when analysed by knowledge area must not fall below the minimum credits in each knowledge area comprising of Mathematical sciences, Natural sciences, Engineering sciences,

Design and synthesis, and Complementary studies. A very important criterion is the Assessment of Exit-level Outcomes to ensure that all graduates satisfy each exit-level outcome defined in the relevant standard at the level indicated by the range statement. Quality of Teaching and Learning is verified by ensuring that the programme provides an effective teaching and learning process toward achievement of the outcomes as evidenced by the content, learning objectives and expected outcomes. Resourcing and Sustainability is fulfilled by the Programme being adequately planned, resourced, led and executed to ensure that it is sustainable over the period of accreditation.

The accreditation process has substantially brought changes to the structure of our programmes and lead to the development of new modules such as design projects and the harmonisation of modules involving natural sciences and mathematics. Specific modules in the third year and fourth year have been identified to assess Exit Level Outcomes. Outcome-based learning enables our graduates to be equipped with the required skills to succeed in their professional career. A quintessential skill of an engineer is to Identify, formulate, analyse and solve complex engineering problems creatively and innovatively. Through the four years of study, students learn to apply knowledge of mathematics, natural sciences, engineering fundamentals and an engineering speciality to solve such complex engineering problems. Through three different levels, student builds up design skills to finally undertake a group design project to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes. In the final year, students carry out an individual final year project which assess their aptitude for investigations, experiments and data analysis. Student have to demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology. Professional and technical communication are essential for an engineer to communicate both orally and in writing his solutions to engineering audiences and the community at large. With today's ever increasing adverse impact that man has created on the environment, students have to demonstrate

critical awareness of the sustainability and impact of engineering activity on the social, industrial and physical environment. Student's competence to work effectively as an individual, in teams and in multidisciplinary environments is assessed in group projects. In the final year project, students demonstrate competence to engage in independent learning through well developed learning skills. Student have to demonstrate critical awareness of the need to act professionally and ethically and to exercise judgment and take responsibility within own limits of competence. Finally, students have to demonstrate knowledge and understanding of engineering management principles and economic decision-making in their future role at management level.

Moderation is a form of review to ensure quality and consistency in an assessment. Thus, in our departmental programmes, every assessment is internally moderated except where there are Exit Level Outcomes, an external moderator who is a professional engineer is appointed. Overall, each programme is overseen by an External Examiner who is an established academic appointed from overseas.

Through the process of accreditation, the department has improved its infrastructure in terms of equipment for its laboratories. The Electrical Power and Machines Lab, Electronics Lab, Microprocessor, Instrumentation and Control Lab, and Communication Lab have all received new hardware and software to better develop the practical skills of our students. ■



A note from the External Examiner, **Prof. Beatrice Lacquet,** **University of the Witwatersrand,** **South Africa.**

I have been involved as the external examiner for two of the programmes in electrical engineering since 2017. Having performed this service at a number of other universities on the sub-continent I was excited to be afforded the opportunity to get to know the electrical type engineering programmes offered by the University of Mauritius better.

In preparation for this task I read up on the goals and strategies of this island government and its people to take its rightful and probably larger than life role in the African continent development as expressed in the Africa2063 strategy. It was clear that the strategy was to place Mauritius at the forefront of the digital era development and to modernise to exploit all revolutions from 4IR and beyond.

It was good to see that the University of Mauritius responded to this challenge and other reasons to become known to provide internationally accredited professional qualifications also in engineering.

Over the past few years the Department held several seminars and workshops to prepare their new workplace relevant curricula for presentation to the Engineering Council of South Africa (ECSA) for accreditation. I noted with interest the thought and energy that went into the development of the new curricula, the change of mindsets to adopt outcomes-based engineering education, the struggles to get to grips with the assessment of outcomes, and the other challenges to think differently about the education process.

You have made huge strides towards the goal to provide accredited programmes that would be recognised under the Washington Accord. You should all be very proud of the advances you have made. I have seen the growth and the improvements. Of course, there are some gaps, mostly to do with consistency of documentation, very few cases where the level of assessment still has to match the year of study, etc – at times experienced departments in the rest of the world also struggle. As they say, the proof of the pudding is in the eating.

If you can embed the outcomes-based education and assessment of outcomes firmly in the programmes and your systems such that it is not something that is paid attention to every five years just before accreditation, you would have achieved the perfect state!

Good luck with the accreditation visit by ECSA. You are well positioned to present your programmes to peer evaluators. They will give you valuable feedback and recommendations – it is part of the development process. Ensure that they talk to your graduates, many of whom I have had the honour to interview for their projects. They are your best products and evidence to put on the table. You should be proud of these young men and women that you have shaped to become valuable engineers. ■

Beatrys Lacquet

August 2020

Optimising students' learning experience

with accreditation of B.Eng. (Hons) programmes

Dr Iqbal Jahmeerbacus holds a B.Tech (Hons.) Electrical and Electronic Engineering from the University of Mauritius, an MSc in Power Electronics and Control from the University of Bradford, UK, and a PhD in Electrical and Electronic Engineering from the University of Mauritius. He is currently an Associate Professor in the Department of Electrical and Electronic Engineering. His research interests include Power Electronics and its applications in motor drives, power systems, renewable energy and power quality.



Since the last seven years, the department of Electrical and Electronic Engineering has actively taken part in the process of application for accreditation of its B.Eng. (Hons) programmes. As such, the following four-year undergraduate programmes have been thoroughly reworked to meet international standards:

- B.Eng. (Hons) Electrical and Electronic Engineering
- B.Eng. (Hons) Electronic and Communication Engineering
- B.Eng. (Hons) Mechatronics Engineering (offered jointly with the MPE department)
- B.Eng. (Hons) Telecommunications Engineering with Networking

One key objective of this ambitious project is to align the programme content with the requirements of the Washington Accord, set by the International Engineering Alliance (IEA). The above programmes are going through a stringent quality assurance process with the aim of receiving full accreditation. Consequently, the programme quality has been remarkably enhanced and would further facilitate the mobility of our future professional engineers across the globe.

In this article, we consider three aspects of the programme features under accreditation, and show how they add value to the learning experience of our current and incoming undergraduate students.

1. Knowledge areas

It is essential that students develop the necessary skills, including creativity, innovative aptitude, understanding of theory as the foundation for practice and effective communication, which they can eventually apply as professionals. To meet the educational requirements for the accredited B.Eng. (Hons) degree, the knowledge profile to be acquired by students should satisfy five knowledge areas, namely: Mathematical sciences, Natural Sciences, Engineering Sciences, Design and Synthesis, and Complementary Studies. Such a distribution enables students to acquire a solid foundation in science and mathematics during the

first two years and apply their knowledge in the engineering modules during the third and final years. Moreover, complementary studies draw towards concepts outside engineering (e.g. economics, management, professional communication and sociology), while being essential for broadening the student's perspective of the world and for practising as an engineer.

2. Notional hours

Since time flies really fast during the four years of undergraduate studies, it is important that students learn how to effectively plan their study and free time. Proper time management is essential for coping with heavy workloads and meeting with deadlines. The notional hours prescribed for each B.Eng. (Hons) programme gives a good indication of the time required by a typical student to achieve the learning outcomes. The time allocation for each module covers both contact hours (lectures, labs, tutorials), and self-study time. The programmes have been designed so as to decrease the contact hours and increase independent learning time as students advance from the first to the final year of study, hence giving them better flexibility to plan their time allocation for study.

3. Exit Level Outcomes

Engineering practice often requires working in collaboration with people from non-engineering backgrounds, or with engineers from other fields of expertise. Engineers are also called upon to solve complex, previously un-encountered problems that demand an understanding of fundamental principles as well as specialized technology. These engineering problems might also be vaguely defined and demand interdisciplinary collaboration. Our B.Eng. (Hons) programmes and assessment procedures are designed so as to ensure that students demonstrate these skills in a university-based, emulated workplace situation. Student learning is assessed through laboratory works, assignments, tests, oral presentations (continuous assessments) and examinations in modules related to the field of specialisation of the B.Eng. (Hons) degree. The effectiveness of these assessments is ensured through a set of well-defined criteria, among which

is the achievement of graduate attributes (also called Exit Level Outcomes or ELOs). ELOs are core competences required for engineering practice and have been classified into eleven categories as follows:

Problem solving, Application of scientific and engineering knowledge, Engineering design, Investigations, experiments and data analysis, Engineering methods, skills and tools, including information technology, Professional and technical communication, Sustainability and impact of engineering activity, Individual, team and multidisciplinary working, Independent learning ability, Engineering Professionalism and Engineering Management

Demonstration of ELO achievement is made through a range of modules, especially in the third and final years of each programme. For instance, open-ended design projects in interdisciplinary team or individual modes enable students to analyse engineering problems, as well as develop, build and test working solutions. In the process, they discover and learn on their own, while recognising the importance of team work for providing sustainable solutions to complex engineering problems. They also demonstrate competence to communicate their findings effectively through technical reports and oral presentations.

To conclude, the alignment of our B.Eng. (Hons) programmes with the requirements for accreditation has significantly improved the learning experience of our students, by developing multidisciplinary competences throughout their studies. The skills acquired through independent learning, time management, effective teamwork and complementary areas of study would certainly contribute to make future graduates more competitive and better prepared to practise as professionals. ■

Spotlight on IEEE ELECOM 2020

International Conference on Emerging Trends in Electrical, Electronic and Communications Engineering (ELECOM)



The Department of Electrical and Electronic Engineering has organised two editions of its International Conference on Emerging Trends in Electrical, Electronic and Communications Engineering (ELECOM) in 2016 and 2018.



The first International Conference on Emerging Trends in Electrical, Electronic and Communications Engineering (ELECOM 2016) was held at Voila Hotel, Bagatelle, Mauritius during 25–27 November 2016.

The main theme of this conference was “Advances in Research Through Innovative Technologies” which covered a wide spectrum of theoretical and applied issues in electrical, electronic, communications engineering and computing/IT. Twenty eight papers were accepted following a rigorous blind review process and screening using Turnitin.

There were three keynote addresses by the following experts: Prof. Michael Faulkner from the Victoria University (Fifth generation frontier, mm-waves); Prof. Miloud Bessafi from University of Reunion Island (High spatial resolution mapping of the monthly climatology of global solar radiation observed in Mauritius); Prof. Krishna K. Busawon from the Northumbria University (Design and implementation of chaos based communication systems). The conference proceedings were published by Springer in their Lecture Notes in Electrical Engineering series.

The second International Conference on Emerging Trends in Electrical, Electronic and Communications Engineering (ELECOM 2018) was held at Maritim Crystals Beach Hotel, Belle Mare, Mauritius during 28–30 November 2018.

In line with the main objective of ELECOM 2016, ELECOM 2018 has also brought together industry professionals, academics, and individuals from government agencies and other institutions to exchange information and ideas on electrical, electronic, communications engineering and computing.

The conference theme was “Smart and Sustainable Engineering for Next Generation Applications” and thirty-eight papers were accepted following a rigorous blind review process and screening using Turnitin. Among the accepted papers, three papers formed part of a special session on Open Research Challenges in 5G Multimedia Communications and four of them were from the workshop on Fascination with Systems Engineering.

There were four keynote addresses by the following experts: Prof. Saeid Sanei from the Nottingham Trent University (Multitask Cooperative Networks and their Applications); Prof. Beatrys Lacquet from the University of the Witwatersrand (Bridging the Skills Gap for Industry 4.0); Prof. Nikola Djuric from the University of Novi Sad (Continuous Electromagnetic (EMF) Investigation Using Wireless Sensor Network (WSN)); and Mr. Stuart Michie, ABB Ability Manager, Southern Africa (How to Run the World Without Consuming the Earth (How Digitalisation Will Help Secure Our Future)).

The conference proceedings were again published by Springer in their Lecture Notes in Electrical Engineering series.

The third edition of ELECOM conference (ELECOM 2020) will be held as a virtual event during 25–27 November 2020. The conference is technically sponsored by IEEE Mauritius Section and the conference proceedings will be published by IEEE. ■

Visit us at www.elecom2020.com/

Dr. Robert T. F. Ah King/General Chair



Huawei Seeds for the Future



The 'Seeds for the Future' is Huawei's biggest global flagship Corporate Social Responsibility program in which Huawei leverages its world-leading ICT technologies to nurture ICT professionals.

Participating students have the opportunity to gain valuable experience within a global business environment, and experience cross-cultural work practices and Chinese culture.

Initiated by Huawei in 2008, the program seeks to develop local ICT talent,

enhance knowledge transfer, promote a greater understanding of, and interest in, the telecommunications sector, improve and encourage regional building and participation in the digital community.

The University of Mauritius was selected for the program and it was first launched in May 2017 with ten students going to China for training. Many University of Mauritius students have benefited from the Seed for the Future Programme since 2017, and most of them were from the Department of Electrical and Electronic Engineering.





Huawei Seeds for the Future



Seeds for the Future 2018



Seeds for the Future 2019

The Dean's Merit

Dean's merit list recognizes and celebrates the academic excellence of our highest achieving undergraduate students. This list includes all students who have passed in all modules as prescribed in the curriculum, have achieved a Cumulative Point Average (CPA) of 70 or above in an Academic Year and who are not graduating.



Top performer in each programme in 2019 - 2020

BEng (Hons) Electronic and Communication Engineering:

Vikram Doorgakant

BEng (Hons) Electrical and Electronic Engineering:

Chiranjeev Ramlukon

BEng (Hons) Telecommunications Engineering with Networking:

Pravish Kumar Chiniah

BEng (Hons) Mechatronics Engineering:

Pravind Vellapanaiken

BSc (Hons) Electronics with Computer Science:

Pushkal Bechoo

The Department congratulates the best performers. Please visit the Dean's Merit List for additional best performers of each level.



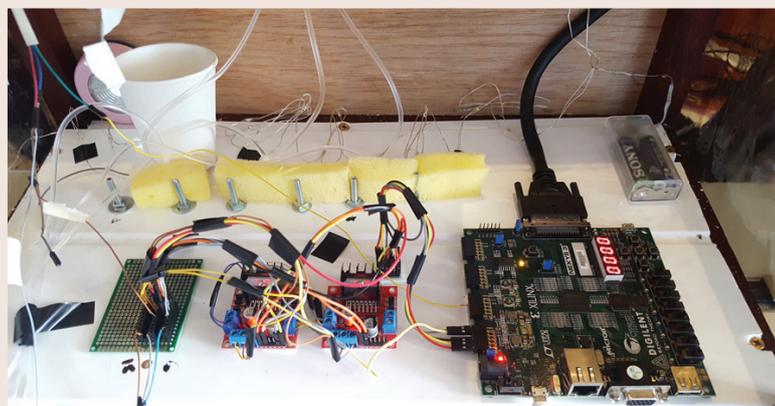
Student Project

“Cocktail Vending Machine” was designed and implemented as part of the project assessed for partial fulfillment of the module Electronic Systems Design.

Team Members: Yashtir GOPEE; Yogindersing GAJADUR; Krishna KULLOOTEE

The machine allows users to select a combination of flavors of juices through a touch screen instead of traditional buttons and allow the user to pay for the drink through coins widely used in Mauritius (1, 5, 10, 20). The system consists of 3 peristaltic pumps, a coin detector, a touch screen, and a Field Programmable Gate Array (FPGA) to process the different operations. The FPGA was programmed using VHDL, a Hardware Description Language.

FPGA is a semiconductor IC where a large majority of the electrical functionality inside the device can be changed prior to or during operation of the machine. FPGAs are used in autonomous cars, aerospace and defense industry, medical devices, communication systems, data centers and mining of cryptocurrencies. FPGA is quickly rising to become the first choice of computation in the implementation of data mining and machine learning projects. The project was exposed at the Swami Vivekananda International Convention Centre (SVICC), Pailles during Innovtech 2019 to showcase the potential of our students. ■



IEEE UoM Student Branch Revival



The IEEE UoM Student Branch at the Science/Engineering show

Founded in 1884 with Alexander Graham Bell and Thomas Edison, the IEEE interconnects engineers around the world and serves over 400,000 members worldwide.

The IEEE student branch of the University of Mauritius (IEEE UoM stb.) was revived in December 2019 with a goal to promote engineering through fun and enriching activities. The vision brought forward by the newly elected branch officers was to bring equity and equality through various community outreach projects as well as provide a panoply of opportunities to foster development and hone the leadership skills of the young engineering students.

The first project co-organized with the Faculty of Science at the level of the student branch, was the Science/Engineering Show 2020 from the 17th to the 20th of February. The aim was to expose young teenagers to STEM subjects as a means of arising their interest in Science/Engineering field. The branch officers met with over 600 students hailing from different colleges throughout the country, and showcased various engineering projects tailored to the targeted audience through aesthetical visual presentations and demos.

At the IEEE UoM Student Branch there is a deep culture for gender inclusion. On this line of thought, women participation is highly encouraged during all the activities and talks are organized to encourage the feminine wing to rise. For the occasion of the International Women in Engineering Day (INWED 2020), young female engineering students and lecturers from UoM collaborated along many female engineers across the world to showcase their individual contribution as to how they shape the world.



IEEE UoM Student Branch promoting STEM to ninth grade students during show

The activities of the IEEE UoM stb. are not limited in terms of scope. Brainstorming on new ideas to innovate and improve the lifestyle of the local people is highly encouraged. During the Covid-19 pandemic, a group of dynamic engineering students worked on a ventilator prototype when the impact of the virus was at its peak on the island. Seeking help from the IEEE Mauritian section and the engineering communities, the project was highly appraised by the Ministry of Health.

While the IEEE UoM stb. is still growing and learning, we strongly believe that we are on the right track in order to provide support to young minds and to help them excel and grow as an all-rounder. ■

Bright minds from Rodrigues



Jacques Alex Larry EMILIEN, BEng(Hons)
Mechatronics Engineering, 2016-2020

“University life was exciting and challenging. Time felt slow in the beginning, but by the time I blinked, four years had gone by. Independency is the most suitable word to describe my experience here. I was given opportunities to express my ideas and more importantly defend them. For sure, time management was chaotic, lunchtime was mostly ‘kan gagne ene letemp’, but it only made the ‘roti’ taste ten times better. I believe I found myself during the process, it adjusted my outlook on the world. I’ve had the chance to meet great people and learn from great minds.

Don’t be mistaken, it is not all sunshine and rainbows, you will come across many hardships, as did I, but I pushed through driven by passion. Coming to university has to be your choice, and it has to be done with passion and dedication.

When you come to university, don’t set yourself the goal to leave with a paper saying you have a degree/diploma, rather aim to leave as a matured individual with the mindset and capabilities of a degree/diploma holder. While it might not be an easy journey, it is worth the hassle.”

The EEE department regularly hosts a number of outer-island and international students. Here are a couple of students from Rodrigues who have made quite an impression on our staff through their academic performance, and above all their remarkable personality. See what they have to say about studying at UoM.



Jean Alberto SUNGLEE, BEng(Hons) Telecommunications
Engineering with Networking, 2016-2020

“I am Sunglee Jean Alberto, a student from the Faculty of Engineering studying Telecommunication Engineering with networking. I am from Rodrigues, an Island situated 500km from Mauritius. I enrolled in this course in 2016, the University of Mauritius was a place where I learnt so many things. It allowed me to learn both academic and interpersonal skills. Throughout my journey at the University I discovered different cultures and being a student at this University allowed me to increase my networks and discovered amazing individuals from whom I learnt lots. I started playing badminton, a sport not known to me and for which I have developed a passion. To sum up, I can say that it was a great adventure to be part of the University of Mauritius.”

Awards



EEED congratulates Y Beeharry & V Oree for the award of Doctor of Philosophy by the University of Mauritius



Dr Yogesh Beeharry

Improved iterative Turbo decoding strategies for LTE and DVB-RCS receivers

With the advent of high-speed logic circuits and the ever increasing demand for data communications, digital communication systems have become extremely attractive. The greatest advantage of digital communication is that it offers more reliability in a noisy communications environment through the application of channel coding. Channel coding became a very dynamic research area since the publication of a landmark paper by Shannon in 1948 in which asymptotic bounds on the performance of channel codes were established. Another theorem put forward by Shannon which is called the separation theorem advocates the separate optimization of the source and channel coding blocks. Nonetheless, several research studies have demonstrated that the combined optimization of the source and channel coding blocks, especially in iterative decoding schemes such as Turbo codes, can provide significant gains in error performance over separate decoding schemes. Turbo codes (binary and non-binary) are founded on the concept of message passing technique in an iterative manner between two concatenated decoders. Their astounding performance has led to their widespread adoption in several telecommunication standards such as Long Term Evolution (LTE) and the DVB-RCS standard. This work proposed novel mechanisms for enhancing the error performance of the Turbo decoding algorithm.



Dr Vishwamitra Oree

A multi-criteria decision-making framework for the integration of variable renewables in generation expansion planning.

Traditionally, generation expansion planning has focused on ensuring adequate capacity to meet the generally predictable system demand at minimal cost. During the last two decades, new paradigms in power systems planning have emerged that are mainly driven by commitments to decarbonise the power sector. In particular, there has been fast growing integration of variable renewable energy sources in the electricity grid, leading to increased variability and uncertainty in the net demand which is supplied by conventional generation. As a result, power system planners are now compelled to account for operational constraints of generating units in their models in the form of operational flexibility.

The latter describes the ability of the power system to respond to enhanced fluctuations in net demand. Yet, operational flexibility has been largely overlooked or considered only for limited planning horizons to reduce the prohibitive problem size resulting from the integration of operational dynamics at much shorter timescales in a generation expansion planning exercise that usually spans over decades. This work proposed an effective framework to integrate operational flexibility in the long-term generation expansion planning of power systems with high levels of variable renewable energy integration in a computationally tractable way.

Notable Alumni

Department of Electrical and Electronic Engineering

Leckraj Raja Rai BASGEET

1990 -1994

Tell us about yourself.

I am Rai BASGEET and have been a student in Electrical & Electronics Engineering from 1990 to 1994, whereby I graduated with a First Class Honours and was also a Gold medallist. I also hold an MBA with specialisation in Marketing from the University of Mauritius. I am also a Certified and Professional Registered Engineer, with the Council of Registered Professional Engineers (CRPE) Mauritius.

I have just turned half a century old ... Married with Sudha since Y2K, I have 2 wonderful children Yashveer (who has just turned 18) and wants to be a computer engineer and Dhoopshikha 17 years, who still looking for her way in the brave new world ...

I am also very much involved in social activities through JCI international up to 2010 and since 2011 through Lions Club of Port Louis Doyen. I was President of LCPLD in 2015/2016 and still am a very active member.

Share your experience as a student at EEED.

The memories I recall of being a student at the EEED are wonderful ones , challenging, but time is a wonderful high pass filter, as it allows us to recall only the **good old** days – The time spent has forged me the way I am today. In the early 90s', there were around 400 students on the campus and 20 students reading for EEE.

The facilities we had were limited – laboratory equipment, access to books, opening to the world – These were the pre-Internet days ... prehistory if we just think of what has happened over the past three decades.

However these limitations did not prevent all of us to excel and this is what I would refer to as "*frugal innovation*". The friendship, but intense competition which existed amongst fellow students, pushed forward our will power to succeed and always be creative and innovative into an environment where there is always lots of noise and you learn how to filter these out, get the pure signal and amplify it ...

Also the limitation in documentation, (today's students would never understand this as they have on the other side a tsunami of information),

was greatly compensated by fabulous lecturers such as Dr. Lam, Mr. Burton and Prof. Katakol just to name a few ... We also setup the IEEE chapter and all the great documentation we obtained thereafter. I am still a proud member of IEEE.

Also as the documentation was limited at that time, this forced us as students to push ourselves and understand better the underlying principles of engineering ... and here I recall of Maxwell's equations ... which I still now feel, are very close to God's writings of how the universe functions ...

EEE students were always known as the "**nerds**" and the ones you don't mess us with ... I don't know how much same is true today; however this perception existed as the EEE students, were really focussed on achieving their objectives and create out a new whole world. Also the second year examinations were always considered as the most challenging ones and if you succeeded same, it was a guarantee for you to complete your degree with flying colours...

However, I can ascertain you that we had great time and fun too; when first year students were joining university and the "ragging" which happened, but always in the positive spirit, great parties for the students' nights and *camaraderie* with students form the other faculties, which we still share as they also have grownup to be great professionals. With some friends, we had formed a hiking team to know our island better ... and one of our achievements was to climb the Pieter Both ...

How did your EEE degree help you in paving your way to success?

After my EEE degree, I joined Ireland Blyth Ltd and worked in the contracting department for one year, whereby I implemented a Building & Management System (BMS) for the 3 new towers which were being constructed namely MCB Tower, State Bank Tower and Medcor (Air Mauritius building).

As I had specialised myself in Communications Engineering – my end of year project being on Wideband CDMA, the basis for 3G and forthcoming communications systems – I had the opportunity to join Mauritius Telecom



(MT) where I have been working for the past twenty five years.

I started my career at MT, as a Junior Engineer in the Access Networks and I was responsible of the Installation & Maintenance Control Centre (IMCC). At first, I felt there was little engineering in what I was doing; however it turned out, that these were the years where I built skills to interact better with both internal and external *customers*. Eventually I was requested to step in and lead the access construction network, whereby I was leading a team of 60-70 staff, many of them being twice my age at that time ... and again this helped me to build my character and better understanding of human relationship in place of work. One thing, which is for sure, is that as much as it is easy to design, implement and optimise networks ... it is altogether so much more challenging, the way humans think, behave and act ...

I had a **career break** in April 1997, when Cellplus Mobile Communications Ltd. was created to manage the mobile arm of Mauritius Telecom. I was amongst the first four engineers to join Cellplus and the years, which followed, were really "**crazy ones**" whereby we were working at least 16 hours every day to create a new world. I was responsible of Mobile Networks Planning and eventually in 2001, became the Head of Cellplus Mobile Networks Division. In the next five years, we transformed Cellplus by,

- Being the best network in the island and thereby became market leader in 2001.
- Implementing 3G in Rodrigues island in 2003 under the brand name "Celloh!"
- Introducing the 3G technology in 2005



amongst others. I would recall those days of being extraordinary ones and all these was achieved through an extraordinary team of only 40 – from the rigger to myself leading the technical department –

In 2007, following a restructuration in MT, I became the Head of Networks Planning for Mauritius Telecom and with my team we were responsible to implement the broadband infrastructure, NGN networks, evolve the ISP network, introduce FTTC (Fiber to the Cabinet), implement the IPTV infrastructure etc...

From 2011 to 2015, I was requested to lead the Business Development Division of Mauritius Telecom, which as its name suggests was very much related to seeking new Business opportunities in the ICT field. During my tenure in this department, MT

- Acquired Telecom Vanuatu Ltd.
- Setup the Innovation team which created great apps such as
 - 7 to 8 digits conversion (when all mobile numbers had a leading 5)
 - Speed Cameras Location and Alert
- Provided Ministry of Education with 26,000 Tablets for secondary students.

Eventually in 2015, I was promoted as Chief Technical Officer (CTO) for Mauritius Telecom whereby the following were the key achievements,

- Through an acceleration programme, Mauritius Telecom was able to achieve the implementation of **FTTH (Fiber to the Home) across the whole island in a record 3 years** when the initial plan was over a **7 years period**.
- Implemented the Mauritius to Rodrigues Submarine (MARS) Cable again over a record period of **2 years instead of the 3 years**, that was initially planned.

- Implemented a **Tier 4 Uptime certified Data Centre** at Rose Belle.
- Implemented the **SAFE City project** with some 2000 video and 75 traffic sites. The Prime Minister himself inaugurated the project in August 2019.
- Setup of an island-wide **350 Free Hot Spots, Wi-Fi Mauritius**, which provide a free service for underprivileged Mauritian.
- Upgraded the ISP network with **virtualised and SDN** (software defined network) elements.
- Implemented a **state of the art 4G/LTE** across the whole island and **pilot testing 5G** in Ebene area.
- Implemented award-winning application **Traffic Watch** in 2016.
- Implemented the **csu.mu** application for the PMO's office.

These achievements namely for the FTTH project were recognised by the FTTH Council Africa 2017 and 2018 and most importantly during the event in AfricaCom 2017. Mauritius Telecom also won an award at AfricaCom 2016 for the Traffic Watch application.

Post COVID-19 lockdown, Mauritius Telecom has again undergone a reorganisation as the focus is on **GROWTH**. I have thus been entrusted since May 2020, the responsibility to lead the International Business Development Department of Mauritius Telecom and my main responsibility now is how to make Mauritius Telecom **grow inorganically** through acquisition or promotion of new key technologies and know-how.

What is your message to prospective students who may wish to pursue a degree in our department?

EEE is a fabulous adventure. The Learning does not stop when you finish

your degree. In fact it is where the whole story, of your life starts.

One thing, which is for sure, is that no one will be responsible for your career, except yourself. You would have well-wishers and naysayers; however know what you want to achieve in life and work relentlessly towards it ...

My advice, to fellow students, is to have an open mind especially in the new upcoming fields whereby EEE, Computer Science and Robotics are all merging to create a new whole world. Stay open and tuned to,

- Artificial Intelligence
- Blockchain & Cryptocurrency
- Cloud Technologies
- Big Data & IoT
- Cybersecurity

Always be an active learner, as after 5 years only 20% of what you have learnt in your university days remain relevant and so more so, with the acceleration happening in all technology fields these days.

My final recommendation would be – **LEARN ALWAYS and LEARN FAST -**

Can you comment on the performance of EEED graduates who are currently working at your institution?

The culture of excellence that was on-passed to us when we were students at EEE Faculty, continues to be the key motivation factor of the great engineering graduates, we have at Mauritius Telecom.

Today all the achievements, that you hear happening at Mauritius Telecom, certainly has the workmanship and culture of excellence, that is ingrained into these passionate engineers, during their formative years at UoM. ■

Industry Focus



ABB is a leading global engineering company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels. With a history of excellence stretching back more than 130 years, ABB's success is driven by 110,000 talented employees in over 100 countries.

EEED is very thankful to ABB for the donations of a Variable Frequency Drive and an Inverter. The equipment are being used for laboratory experiments.

As part of its ongoing collaboration with industry, the Department of Electrical and Electronic Engineering received a Variable Frequency Drive (VFD) Demo case from ABB (Mauritius) Ltd. The ACS580 VFD is housed at the Microprocessors, Instrumentation and Control Laboratory and is fitted with an inverter-fed 3-phase asynchronous motor, adjustable loading unit, control panel and computer interface. The demo kit enables students to get hands-on experience on the operation of industry standard motor drives. In the process, students reinforce their knowledge of variable speed drives technology, drive set-up procedures, speed control and safe working practices.

An inverter is a power electronic device which is connected to a PV system for converting the DC power into an AC power. The inverter offered by ABB has been mounted on a stand and interfaced with an energy meter and overcurrent protection equipment for a demo kit. Inputs to the inverter are taken from a variable power supply to mimic a PV string. The kit is then used to simulate the operation of a grid tied PV system in the lab sessions of the module Renewable Energy Systems.



INVEST IN EEED

We are a group of highly motivated colleagues who are passionate and committed to provide high level education to the engineers of the fourth industrial revolution. In addition, we are actively involved in cutting edge research in the fields of Electrical Engineering, Power Systems, Renewable Energy, Electronics, Signal Processing, Control Systems, Telecommunication Engineering, Networking, Internet of Things, Energy-Efficient Buildings, Imaging Techniques and Applications, Wireless and Mobile Communications, Networking and Security, Robotic systems, Cloud Computing amongst others and contribute to the advancement in the society. We strive to maintain a constant growth of the department by forging collaborations with local partners and leading institutions globally.

Over the past year, we have been able to attract funding for a number of research and consultancy activities as below:

- Value of ongoing externally funded projects - Rs 1.8M
- Value of ongoing internally funded projects - Rs 2.7M
- Value of consultancy for the period Jan 2019 to July 2020 - Rs 1.2M

We invite industry partners to collaborate with the department in research and development.

We also invite Industry Partners to invest in EEED. Your investment in the Department of Electrical and Electronic Engineering plays a critical role in our ability to fulfill our mission and provides essential support for teaching and research activities.

Investment Opportunities are:

- Awards and Prizes to students.
- Funding of Laboratory Equipment and Lab naming opportunities.
- Patronage of workshops and flagship conferences organised by the department.

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Note of Thanks

The Newsletter team would like to seize this opportunity to sincerely thank all those who have contributed to the first edition of E³ Current. It has been an amazing experience to sit down together, brainstorm and come up with this piece of work. The team is highly grateful to Dr Bissessur for his support and photography, Dr Basso for working on the formatting of the document and Dr Beehary for chasing everybody and getting the information ready.

The department would like to thank you, the contributors and readers of E³ Current, for your interest in the newsletter and we encourage you to send us your invaluable feedback and ideas for further improvement.