UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en Inligtingtegnologie / Lefapha la Boetšenere, Tikologo ya Kago le Theknolotši ya Tshedimošo

EBIT 2B

Our graduates build a better future for all

A MESSAGE FROM THE DEAN

Technology is evolving on an exponential scale, and the Faculty of Engineering, Built Environment and Information Technology at the University of Pretoria is responding to this challenge by developing sustainable technologies for inclusive societies.

Our slogan, *Innovating our Tomorrow*, amplifies our thought leadership to stay relevant, be globally competitive, to re-invent ourselves and deliver graduates who will be ready to embrace the disruptive unknown with an awakened mind. EBIT is the only faculty at a South African university to incorporate the unique blend of the fields of engineering, built environment and information technology – the perfect platform for a re-imagined future. By encouraging students to embrace disruptive technologies such as online learning, as academics, we are preparing them for a new world beyond university, one that has been shaped by the forces of COVID-19 and which governs the way we live, work, educate and socialise. Our highly sought-after graduates make a positive impact on the world, and we teach them to become well-rounded, ethical and active citizens, who want to develop a peaceful, prosperous and sustainable environment for our re-imagined future. May this be what we all strive for.

Prof Sunil Maharaj
Dean: EBIT

UP: Faculty of Engineering, Built Environment and Information Technology

Message from the Deputy Dean: Teaching and Learning

Join the EBIT Generation

Dear prospective student

We live in exciting times that present us with numerous new innovations and opportunities. However, as a society, we also face many challenges. You are starting your studies in a time known as Society 5.0. This means that we are trying to answer both the future economic and societal challenges faced by humanity at its present and future stage, by using all the available technological advances.

In 2020, the use of e-learning systems became highly pertinent during the worldwide COVID-19 lockdown periods, when teachers and students had to adapt to remote teaching and learning. EBIT makes use of a hybrid model of teaching and learning, and focuses on student success through the use of all available digital resources. Although online learning has the potential to be challenging, the Faculty supports its students to increase overall module success rates and minimum-time completion rates, even amidst disruption.

We look forward to welcoming you to the University of Pretoria.

Prof Alta van der Merwe
Deputy Dean: Teaching and Learning

Hotline for prospective students: 076 440 3040

Join a top institution

QS World University Rankings by Subject

Engineering & Technology	Electrical & Electronic Engineering	Mechanical & Aeronautical Engineering	Chemical Engineering	Computer Science & Information Systems	Minerals & Mining Engineering
356	251–300	301–350	301–350	451–500	48

EBIT Dean, Prof Sunil Maharaj, appointed as the Chair of the Global Engineering Dean's Council (GEDC)

INNOVATION IS OUR BUSINESS

Find your passion in one of our many cutting-edge fields


disruptive technology


virtual and augmented reality


internet of things


machine learning


additive manufacturing


green building


artificial intelligence


digitisation


society 5.0


big data


smart grids


automation


smart cities


robotics

. . . and the Oscar goes to . . .

WORLD-FAMOUS EBIT ALUMNUS

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Nicol Verheem obtained a degree in electrical and electronic engineering from the University of Pretoria, and has since been honoured by the Academy of Motion Picture Arts and Sciences in the Scientific and Technical Awards (Sci-Tech). His company invented the Teradek Bolt.

Teradek Bolt is a wireless radio transmitter. It transmits uncompressed video with no delay over 3 km away. His innovative project started in 2010, when digital cinematography had really just started and cinematographers were eager to use cameras in new and far more flexible ways. This showed a big opportunity in untethering the monitor from the camera. Cameras were continuing to move to steadicams, dollies, jib arms and cranes; plus drones were taking off, but coax cables were holding things back. Teradek decided that this wasn't good enough.

The team developed a miniature wireless transmitter, small enough to mount on even a digital single-lens reflex (DSLR) camera. It was capable and sturdy, yet still affordable. However, the cube had a small but noticeable delay of about four frames. They then discovered Amimon's technology, which managed to send uncompressed video over a wireless signal without any delay, but the product was meant for living rooms rather than cine production.

Teradek and Amimon worked closely together to refine the technology and create the Teradek Bolt. Over 100 000 systems have been sold, and many more productions globally have benefitted from cameras being freed from their cables.

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The Science, Technology, Engineering and Mathematics (STEM) programme promotes creativity and encourages leaders to take risks in applying their knowledge. This will assist in developing problem-solving analysis and encourage adaptation to different scenarios. Programmes like these increase students' confidence and encourage them to tackle problems with determination to become next-generation innovators.

Innovation is the gift that keeps on giving and is revolutionising the world. It is the result of continuous inspiring ideas, processes and developments, and keeps everyone on the edge of their seats. My dream for Africa is that its people should feel valued and proud, standing hand-in-hand in unity despite their differences. We should accept our flaws, celebrate our successes and bring forth a remarkable generation. Africa has a rich cultural and ethnic diversity, a unique heritage and much more. I would like to contribute to ensuring a better life for all and the dissemination of knowledge that will equip people to make remarkable contributions. Everyone has the potential to make a difference, and today is the day to take the first step!

Information systems **Uwaiza Abdool Sattar**

The thrill of knowledge

Looking at the mesmerising world and listening to the voices of the people around me made me wonder where I will eventually fit in and what my contribution will be. I have come a long way since mumbling my first few words, forcefully crawling towards my most wanted toy and taking my first steps. The life cycle starts slowly, but with effort, great heights can be achieved.

After completing school, I enrolled at the University of Pretoria to study information technology. Suddenly, I was surrounded by career-driven students walking haphazardly into lecture rooms, voices echoing in hallways, and students anxiously searching for information in the libraries.

I AM a final-year BIT (Information Systems) student. This degree offers exciting opportunities in the new digital economy. I want to pursue my dream of becoming a systems analyst and driving the development and design of different systems that will improve the productivity of various businesses and organisations. The programme is constantly changing as a result of continuous innovation, and the consequent availability of new tools, resources and techniques.

As an EBIT student, I have been granted the opportunity to take on various leadership roles. In my second year, I had the privilege of serving as the Secretary of the JuniorTukkie Student Ambassadors Society and of EBIT House. This year, I am the Chairperson of EBIT House and the SRC Academics Representative. These roles have taught me the value of good human relations, team-building skills and the fostering of potential.

We are home to a generation of exceptional women

PLAY WOMEN IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM)

Mining engineering

Njabulo Matshiane

I AM a graduate mining engineer with a degree from the University of Pretoria. My father inspired me to become an engineer. I chose the University of Pretoria because, even then, it was the best engineering university in Africa. My sister had studied chemical engineering at UP and had gone on to complete her honours in industrial engineering.

My biggest obstacle in my first year was getting used to writing semester tests every day. This taught me that preparing for tests the week before was actually not enough. One must work consistently throughout the semester to be on top of every single module. Consulting with lecturers is also something I had to start doing if I did not understand a concept. I am grateful to the Department of Mining Engineering, which provides a lot of support to its students.

A highlight of my studies was the mining tour. This was the first time I had actually been underground in a gold mine, and it was an incredible experience. Another highlight was the year-end function of the Mining Alumni Society of University of Pretoria (MASUP). It was encouraging to see so many EBIT graduates leading big mining companies, which really shows the quality of a UP degree.

I would like to use the knowledge and skills that come with my degree to become an entrepreneur and start a company so that I can contribute to alleviating the unemployment rate in South Africa. My message to prospective students is to get a mentor through the STARS Mentorship Programme: someone who will guide you, advise you and help you settle in at UP. I also recommend that prospective students work consistently throughout the semester.

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Celebrating 60 years

The Department of Mining Engineering is proud to celebrate its diamond anniversary in 2021. With its history of 60 years of excellence in mining engineering education, the Department plays a significant role in mining teaching, learning and research at the University of Pretoria.

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Brand new research chair in XR Technology

The University of Pretoria supports research to challenge the obstacles associated with the Fourth Industrial Revolution (4IR). With the support of Exxaro, one of the country's top five coal producers, a strategic intervention has been launched to deal with challenges related to mining by utilising extended reality (XR) technology.

XR technology refers to all real and virtually combined environments, as well as human-machine interactions generated by computer technology, including augmented reality, mixed reality and virtual reality.

The establishment of the Exxaro Chair in XR Technology in the Department of Information Science is another milestone for the Faculty of Engineering, Built Environment and Information Technology. It recognises research in the field of multimedia, as well as the collaboration between the Faculty's departments of Information Science and Mining Engineering. The University's Vice-Chancellor and Principal, Prof Tawana Kupe, believes that this Chair will be a game-changer for training in mining operations, particularly mine safety.

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Interesting read Discovering botnet attacks

Prof Jan Eloff, Deputy Dean: Research and Postgraduate Education

There has been a significant increase in the number of interconnected devices over the past decade, mainly driven by the Internet of Things (IoT). IoT makes the world smarter by seamlessly connecting multiple devices. These range from small personal gadgets to autonomous vehicles. Current studies demonstrate that IoT applications will continue to grow around the world, and are expected to generate billions in revenue by 2025.

This technology permits multiple devices to connect and interact wirelessly, thus resulting in a large flow of data among interconnected devices. As exciting as IoT technology is, it comes with a multitude of cybersecurity challenges, such as data protection and network security. The most pertinent challenge facing IoT is network security.

IoT devices are vulnerable to cyber-attacks such as denial-of-service (DoS) and distributed-denial-of-service (DDoS) attacks. Therefore, most of the current research in IoT focuses on countermeasures that can prevent and detect security threats such as DDoS and botnets. A botnet is a group of interconnected computers controlled by a botmaster to launch attacks. A botmaster can then execute large-scale coordinated attacks such as malware and DDoS attacks.

Botnet attacks are very difficult to detect, as cybercriminals always explore new or unknown network vulnerabilities. The risks caused by botnet attacks can be mitigated by a network intrusion detection system (NIDS), which is a software system located strategically within a network. An NIDS often uses deep or machine learning algorithms to monitor and detect network attacks.

Researchers in the Department of Computer Science's Digital Forensic Science Research Group have been experimenting with a novel approach to simplify the detection of features that describe botnets.

Electronic engineering

Armand Steyn

I AM a BEng Electronic Engineering student at the University of Pretoria. My fascination in innovation and technology fuels my desire to constantly seek knowledge and expand my mind. EBIT not only enables, but also encourages this.

The manipulation of electricity to create technology is captivating and I've been able to experience this in action at the Department of Electrical, Electronic and Computer Engineering (EECE). The Faculty prioritises the overall development of its students. The academic staff members continually encourage us to strive beyond our limits. The Faculty is also incredibly interactive and hosts numerous events such as career exhibitions, health and fitness gatherings, and community outreaches.

My department offers world-class facilities to aid in our learning experience. One event I especially enjoyed was the highly anticipated annual robot race day, where I was a track official. Bearing witness to the knowledge acquired by the students to produce fully functioning microcontroller-based autonomous robotic vehicles was awe-inspiring. From my experience, the Faculty truly cares about and supports its students' progress in their studies.

I enjoy my course and look forward to my future learning experience. My dream is to bring innovative technology to the world and to further my knowledge in bioengineering technology in order to make a career out of it. EBIT is undoubtedly the best platform to bring this dream to fruition.

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Robot Race Day

Robot Race Day is an annual event hosted by the Department of Electrical, Electronic and Computer Engineering. It creates an engaging and enjoyable practical project for the third-year Microcontrollers module. Students compete against one another on a five-metre track for Microcontroller-based Autonomous Robotic Vehicles (MARVs).

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Interesting read Smart avos at UP

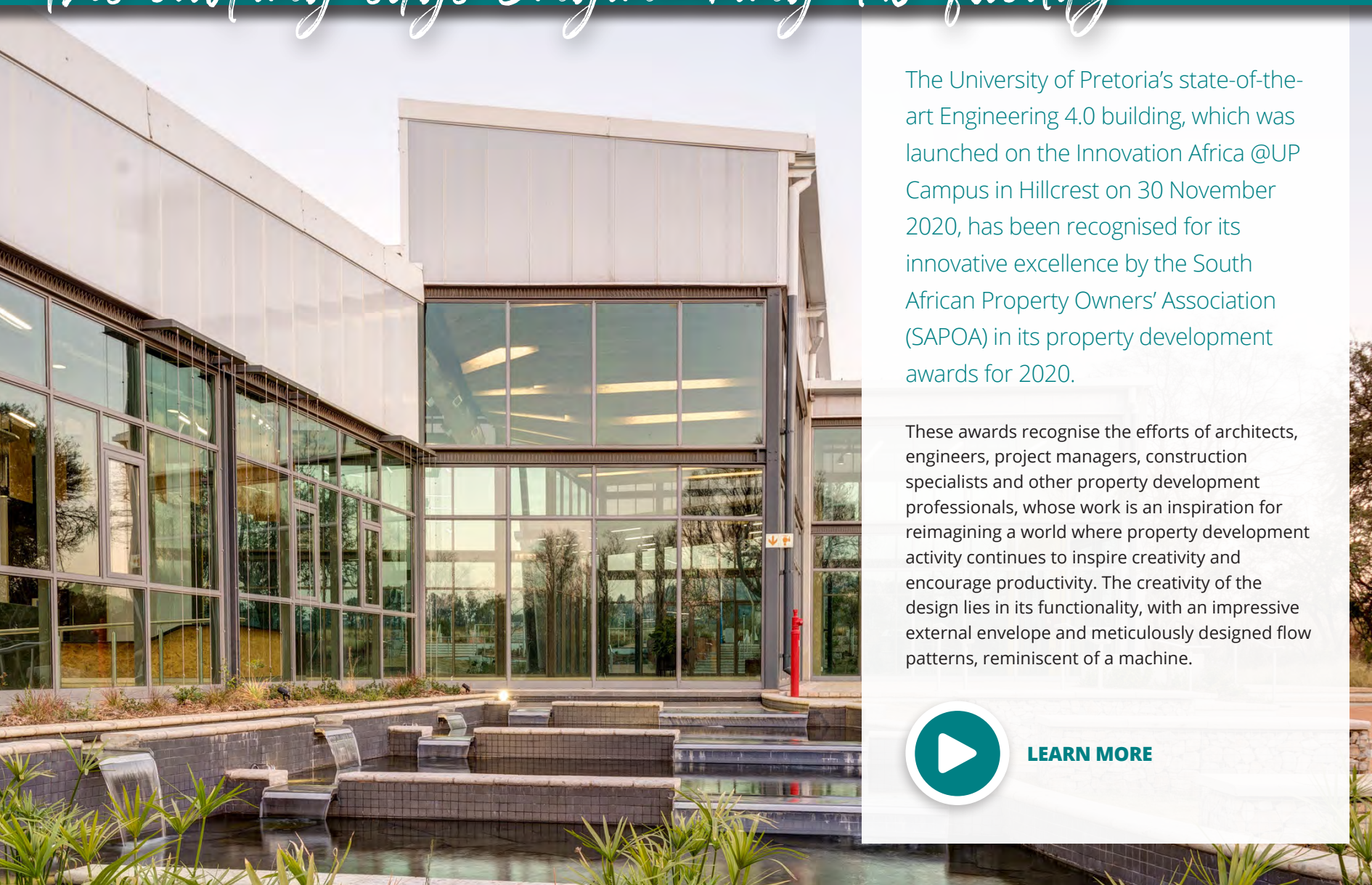
Read the full article

Ensuring that agricultural products intended for the export market arrive at their destination unblemished and suitable for further distribution and sale is a challenge experienced by producers in South Africa. Due to its reputation in smart transportation, the Department of Civil Engineering, located in the state-of-the-art Engineering 4.0 facility, was approached to devise a possible solution.

Based on its previous experience in determining the impact of transportation conditions on agricultural products, and optimising these conditions to ensure that products such as tomatoes and avocados arrive at the consumer in the best condition, the Department's researchers accepted the challenge. Its development of a concept known as "civiltronics" played an important role in finding an innovative solution. This entails the combination of traditional civil engineering with electronics, the Internet of Things (IoT), programming, computer science and additive manufacturing (3D printing).

ThIS flagship project involves monitoring the transportation by cargo ship of a consignment of avocados destined for Rotterdam in The Netherlands, from where it would be further distributed throughout the European Union. To optimise the data recorded during the transportation of the avocados, the team developed a measuring instrument with microsensors embedded in a number of 3D-printed avocados with a soft water-resistant outer covering that would be exposed to the same conditions as the real produce surrounding them.

The cutting-edge Engineering 4.0 facility



The University of Pretoria's state-of-the-art Engineering 4.0 building, which was launched on the Innovation Africa @UP Campus in Hillcrest on 30 November 2020, has been recognised for its innovative excellence by the South African Property Owners' Association (SAPOA) in its property development awards for 2020.

These awards recognise the efforts of architects, engineers, project managers, construction specialists and other property development professionals, whose work is an inspiration for reimagining a world where property development activity continues to inspire creativity and encourage productivity. The creativity of the design lies in its functionality, with an impressive external envelope and meticulously designed flow patterns, reminiscent of a machine.

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Engineers without Borders

Gerdus van der Laarse

During my final year at UP in 2020, I took office as the Head of Projects for Engineers Without Borders (EWP) UP. This is where my path first crossed with Moja Gabedi, the dumpsite-turned-urban garden located close to the University's campus.

My main role in EWB was managing and connecting people. There were always projects to be done, and people who wanted to help, but they did not necessarily always know about one another. This experience showed me how something as simple as facilitating communication can bring about real and good change in the communities in which we find ourselves. While different projects like installing gutters, building benches or fixing fences help the communities directly, something else also happens during community projects: people get into contact with each other, and ideas and perspectives are shared. The projects that we did not only helped the communities, but also helped the students doing them.

I believe that everyone who is in a position to help should do so if they can. Life is unfair. Some people are born with privilege and others are not. I believe people who have the luxury to not have to worry about things like food and shelter should try to help others in their own communities as well as others. All of us need help at some point or another in our lives. If you are not currently in a place where you need help, why not give it instead?

My advice to young men and women is to remember why they want to help, and what helping communities is all about: the people. While the time people spend on community projects is temporary, the time you spend with the people will stay in their hearts and yours forever.

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Community-based Project Module

In this module, all EBIT students engage with a section of society that is different from their own social background. The goal is for students to develop an awareness of personal, social and cultural values, as well as multidisciplinary and life skills, like communication, interpersonal and leadership skills.

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Interesting read Solar power from the moon

Read the full article

Researchers in the Department of Mechanical and Aeronautical Engineering have surprisingly needed to use the moon to help in their goals of improving solar energy. The researchers form part of a collaborative project called Solar Turbo Cogeneration Heat and Power that plans to commercialise small-scale hybrid concentrating solar power systems that use concentrated solar power to generate electricity and process heat for commercial use.

While worldwide solar capacity is growing every year, only about 1% of the worldwide solar capacity is concentrated solar power, as these systems are relatively expensive compared to other renewable energy sources, such as electric solar photovoltaic panels. One of the most important issues faced today with regard to solar concentrators is the trade-off between cost and optical accuracy. One of the reasons concentrating solar power systems are still relatively expensive is the optical systems used to concentrate the sun's rays. To achieve any kind of meaningful concentration efficiency, high-accuracy low-cost solar concentrators need to be developed.

To address this issue, investigations into vacuum membrane solar concentrating dishes with a novel design were done at UP. The design aims to reduce the high construction costs of solar concentrators by using low-cost off-the-shelf satellite dishes (commonly known as 'DStv' dishes in South Africa), with a focus on small-scale systems. The satellite dish is fitted with a reflective polymer membrane that has a thin layer of vapour deposited aluminium or silver on the front side, creating a reflective mirror surface.