NWU®

A year in the life of the

NWU FACULTY OF ENGINEERING 2021

“The scientist discovers a new type of material or energy and the engineer discovers a new use for it.”

—Gordon Lindsay Glegg,
British engineer and author

MESSAGE FROM THE DEAN

Prof Liezl van Dyk

At the NWU Faculty of Engineering we change the world for the better. We do this, first, by educating and developing exceptional engineers who can and want to change the world and, secondly, by finding answers to current and future real-life challenges of our industries and communities, through our cutting-edge as well as applied research.

We value our industry, academic and community partners, who enable us to develop relevant, sustainable, multi-disiciplinary solutions, as well as engineers with the ability and attitude to do the same.

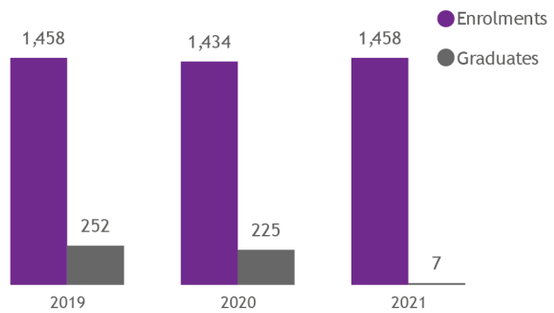
This is not an annual report of our Faculty, it is a 2021 narrative. In this publication you will find selected stories from 2021 that bear testimony to our dream and mission. It is stories of new exciting, innovative technologies, knowledge and solutions, but it is above all stories of the people of the NWU Faculty of Engineering who work together towards achieving our dream.

This publication is dedicated to each and every member and partner of our Faculty – those who are explicitly featured here, but also and more importantly, those who made these stories happen behind the scenes. I am looking forward to write the 2022 story of our Faculty together with all of you.

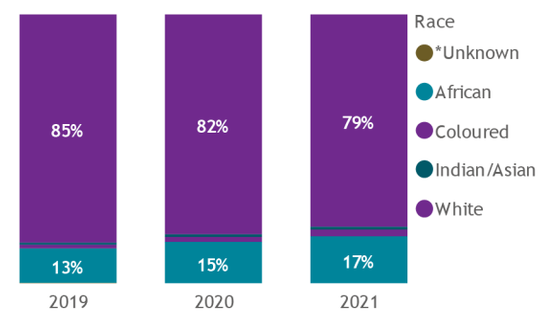
C O N T E N T

NWU® STUDENT ENROLLMENT AND GRADUATE TRENDS - *UNDERGRADUATE*

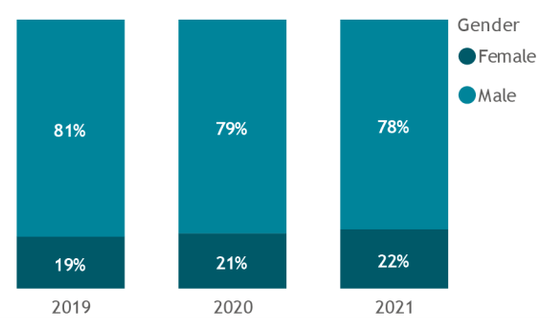
Number of Enrollments & Graduates



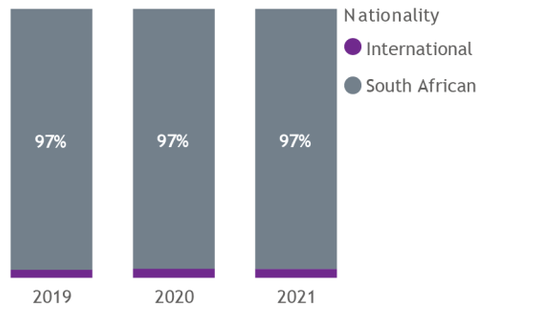
Enrollments by Race



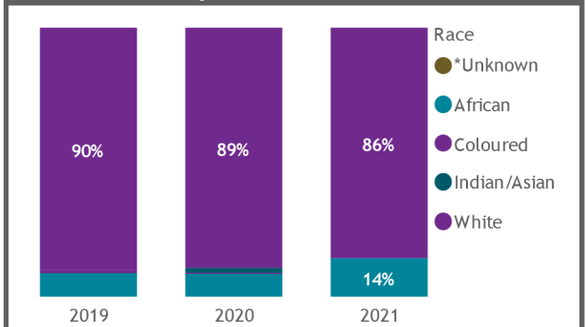
Enrollments by Gender



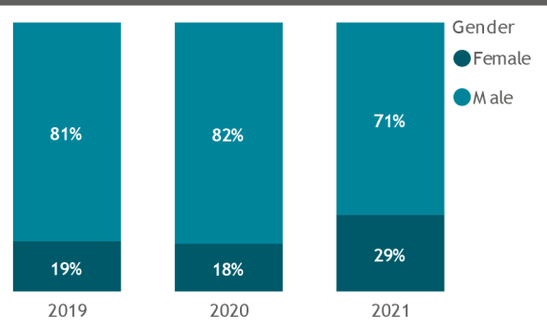
Enrollments by Nationality



Graduates by Race



Graduates by Gender



2019 | 2020 | **2021**

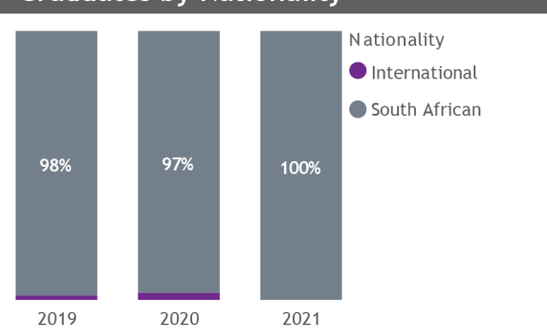
1,458
Student Enrollments

242
NSFAS students

447
Students in Residences

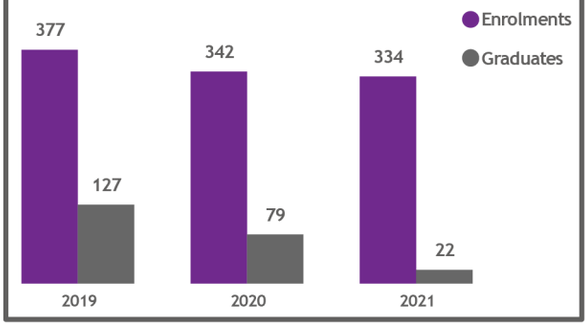
0.5%
Graduation Rate

Graduates by Nationality

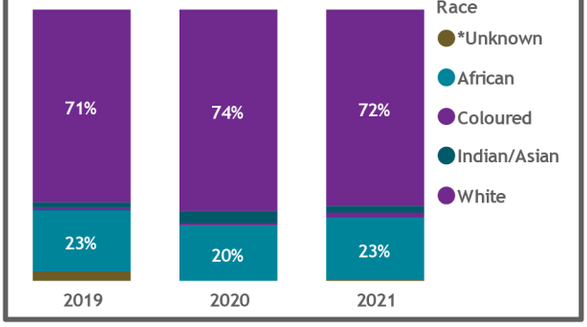


NWU® STUDENT ENROLLMENT AND GRADUATE TRENDS - *POSTGRADUATE*

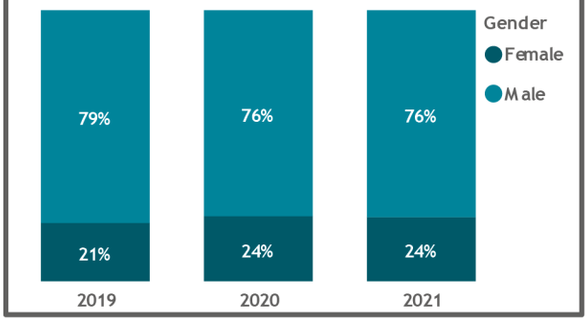
Number of Enrollments & Graduates



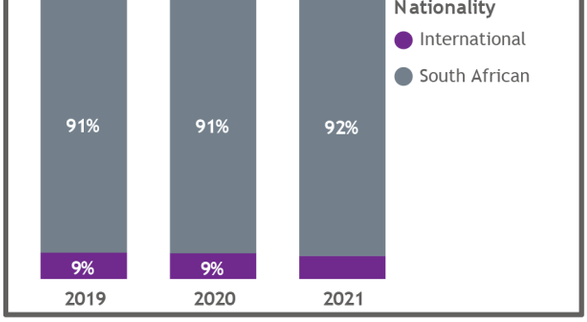
Enrollments by Race



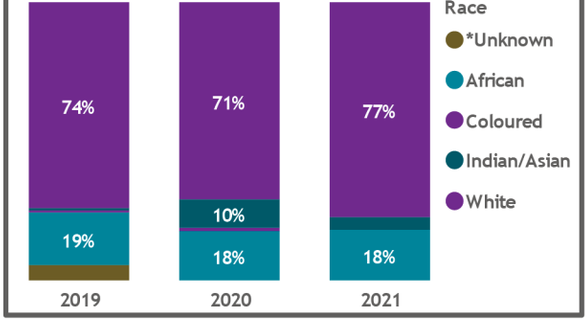
Enrollments by Gender



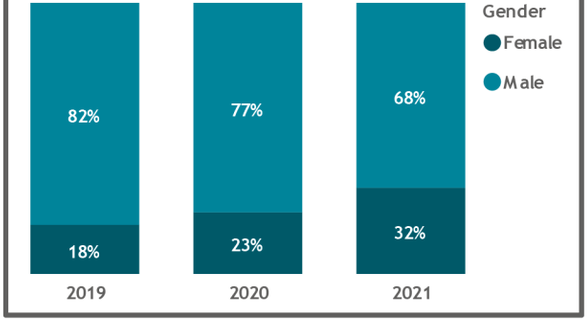
Enrollments by Nationality



Graduates by Race



Graduates by Gender

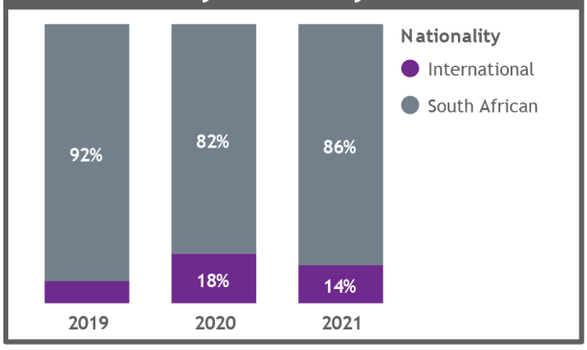


334
Student Enrollments

9
Students in Residences

6.6%
Graduation Rate

Graduates by Nationality



BIANCA BLOMERUS: ON TRACK FOR SUCCESS

BIANCA BLOMERUS: ON TRACK FOR SUCCESS North-West University (NWU) alumna and IT boffin Bianca Blomerus' balanced approach to work, relaxation, and the ability to seize opportunities, has put her on the fast track to success as an engineer at South Africa's state-owned freight rail operator, Transnet.

Through her hard work and tenacity at school, Bianca was awarded a Transnet bursary for her undergraduate studies, and she completed a degree in computer and electronic engineering in 2017 at the NWU's Potchefstroom Campus. It was a field she was all too eager to pursue, thanks to the support and encouragement of her high school teachers.

Thereafter, Transnet appointed her as an engineer in training (EIT) in the signalling field, where she was exposed to the various railway disciplines.

Bianca has since been appointed as a signalling engineer, and is now working with a multidisciplinary team of engineers on technological solutions to combat the theft and vandalism of railway infrastructure.
Stopping theft in its tracks.

"These projects are a first of their kind at Transnet, which is very exciting! I am currently working on a type of technology called distributed acoustic sensing. This makes use of fibre optics as a sensor and, by means of machine learning, the system can be trained to identify various theft activities within the railway environment", she explains.

Bianca is passionate about the role of women in engineering. "One of the highlights during my university years was the opportunity to be involved with organising the annual Femmegineering event.

"This really is a phenomenal initiative to inspire young high school girls and to show them that women are more than capable to pursue careers in science, technology, engineering and mathematics", she says.

"I also had multiple opportunities to mentor other students in various subjects, and although there was a financial incentive to it, it really was a very rewarding experience".

But it was not all work and no play, and her favourite spot on campus was definitely a dining hall called Dampad.

"I miss the delicious food, especially the pumpkin fritters and just taking a break and eating lunch with my friends. There is absolutely no situation, test or practicum, no matter how dire and difficult, that cannot be dealt with after some fresh perspective offered by a plate of home-cooked Dampad food". Bianca adds.

"These projects are a first of their kind at Transnet, which is very exciting! I am currently working on a type of technology called distributed acoustic sensing. This makes use of fibre optics as a sensor and, by means of machine learning, the system can be trained to identify various theft activities within the railway environment", she explains.

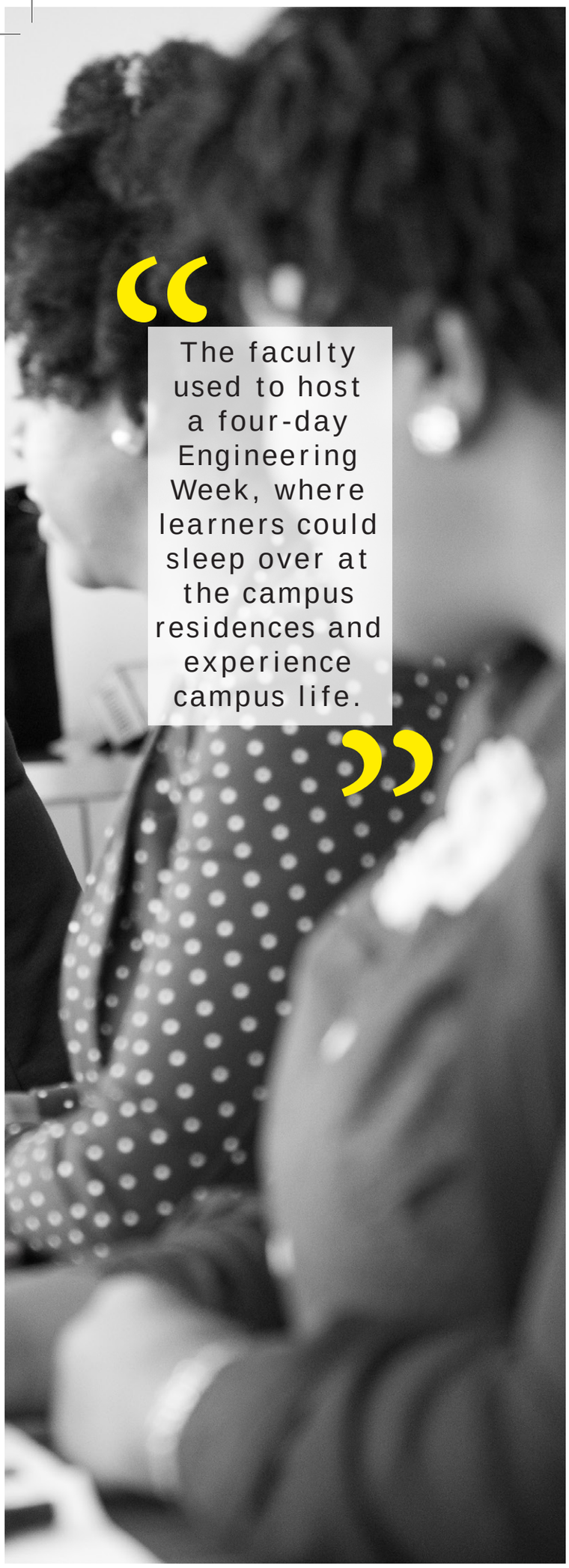
Reflecting on her time at university, Bianca shares that the NWU, and especially the engineering faculty staff, teach students so much more than just academic competency.

"Students learn about ethics, professional conduct, the importance of maintaining a balanced lifestyle, adaptability, flexibility and how to work in multidisciplinary teams, as well as handling difficult conflict situations within a group.

"Embrace all these experiences, even if you don't always like them", she advises. "Before you know it, you'll be starting your first job with the degree that you worked so hard for. It is an awesome feeling, but remember to stay humble. To earn respect and be accepted, you also have to treat everybody else with respect, no matter if they have a degree or not," she concludes.

NWU alumna Bianca Blomerus is passionate about engineering.

Calling all prospective engineers to take part in the NWU's Engineering Saturdays



The North-West University's (NWU's) Faculty of Engineering understands how the minds of young prospective engineering students work.

To this end, the faculty has established Engineering Saturdays; a programme that allows Grade 10 to 12 learners to visit the faculty to get an idea of the different engineering disciplines that are available at the NWU.

During these Engineering Saturdays learners will also receive information about the application process, what the curriculum entails, and if they will be able to work in another country with this qualification. Seven sessions will be hosted from 19 June to 31 July, with each session focusing on a specific discipline. According to faculty liaison officer Keabetswe Gopane, interested learners need to apply by 7 May 2021.

She adds that although these days are open to Grade 10 to 12 learners, preference will be given to learners who are currently in Grade 12. These Grade 12 learners should also meet the NWU's minimum requirements of a 70% average in mathematics and physical science to study engineering.

"The faculty used to host a four-day Engineering Week, where learners could sleep over at the campus residences and experience campus life. Unfortunately, due to Covid-19, we have to adhere to the regulations by having a smaller group of learners per day and ensuring we have as little contact between the learners as possible. Having a one-day event where learners come in the morning and leave in the afternoon minimises the risk of infection", says Keabetswe.

For more information and to apply to attend the Engineering Saturdays scan here:

CONTINENTAL PROGRESS KEY TO EVERYONE'S PROGRESS/WELLBEING?

The North-West University (NWU) is currently partnering with the Jomo Kennyata University in Kenya and aims to use Kenya's health facilities to trial and possibly market three of its recently developed Covid-19 solutions.

"We don't have the luxury of making a difference only in South Africa. We think of making a difference in Africa and the rest of the world", says Prof Leenta Grobler, acting director for business development and stakeholder engagement at the NWU's Faculty of Engineering.

Prof Grobler delivered the keynote address during the NWU's Africa Day Webinar titled: "Silencing the guns: creating conducive conditions for Africa development and intensifying the fight against the Covid-19 pandemic".

Among the practical applications developed by the NWU in the fight against the pandemic is the Tjoptjop Covid-screening application which was developed in a very short period. "We never had the intention of taking this to market. It was never the aim to generate any profit. It was to help teachers to focus on learning as opposed to collecting temperature data", explains Prof Grobler.

"We don't have the luxury of making a difference only in South Africa. We think of making a difference in Africa and the rest of the world"

says Prof Leenta Grobler, acting director for business development and stakeholder engagement at the NWU's Faculty of Engineering.

"However, I am extremely excited as we sit here today, that Tjoptjop is being used to screen at least 22 000 kids in South Africa on a daily basis".

"All these initiatives, including the automated remote PCR device which will help with testing turn-around times during pandemics, demonstrate how technology and digital health solutions can make a big impact in our world and make a tangible difference in Africa", she adds.

Africa Day is intended to celebrate and acknowledge the success of the Organisation of African Unity (now known as the African Union), which was created on 25 May 1963 in the fight against colonialism and apartheid.

Clement Manoko, executive director for corporate relations and marketing, was the master of ceremonies at the event.

Prof Leenta Grobler delivered the keynote address during the NWU's Africa Day Webinar.

This year's Africa Month is commemorated under the theme: "The year of Arts, Culture and Heritage: In the year of Charlotte Maxeke". Dr Maxeke rose above the limitations imposed by the apartheid regime to become a political leader and was highly educated despite the challenges of the 1900s. The Charlotte Maxeke Hospital in Johannesburg is named in her honour.

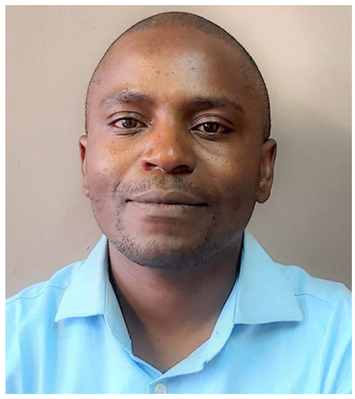
Meanwhile, as the African continent continues to make progress in improving the lives of its citizens, numerous challenges remain.

"As we sit here today, we are looking to other countries to support our people with things like vaccines. It's incumbent upon us not to look back and lament, but to look for solutions for the Africa that we want to see", says Clement Manoko, executive director for corporate relations and marketing at the NWU.

Well-known poet, Mandisa Mbongi, delivered a few moving poems in celebration of the NWU's Africa Day festivities.

Scan here to watch the recording of the webinar

COVID-19 PANDEMIC EXPEDITED ADOPTION OF 4IR PRINCIPLES



NWU PhD student Whisper Maisiri.

"A crisis is the birthplace of creativity and innovation. The coronavirus pandemic has challenged us to stop doing things the normal way and move from our comfort zones, especially in our educational system", says Whisper Maisiri, a PhD student in the Faculty of Engineering at the North-West University (NWU).

Whisper says the initiatives being implemented now, such as online learning, should have started even before the pandemic.

"The pandemic is facilitating the fast adoption of Fourth Industrial Revolution (4IR) thinking and principles. This is the best time to experiment with and adopt technologies that address the challenges posed by the pandemic and those that have been there before", he says.

4IR refers to the fusion of the advances in artificial intelligence, robotics, the Internet of Things, genetic engineering, quantum computing, and more. According to Whisper, 4IR technologies are not a one-size-fits-all.

"Though the pandemic is global, our challenges are still totally different from the developed countries. For instance, we still have areas in the country that are not easily accessible by road and do not have a reliable electricity supply. In this case, we can use drone technologies to deliver vaccines – not only during the pandemic, but also as a normal practice going forward".

Whisper says with the current Covid-19-related restrictions, it is difficult for students to have physical access to companies for vacation work and industry practice.

"In such cases, we can use virtual and augmented reality to give students access to practical industrial processes and applications. Companies are already doing this when training their employees", he adds.

He concludes that South Africa must choose the path best suited to its own development. "I would like to stress the point that we must be wise enough to select relevant technologies that address specific challenges in the country".

“We have massive challenges with youth unemployment and the pandemic has worsened the situation. To address this, we can use innovative technology to teach young people the relevant skills to assist them in becoming entrepreneurs”.

DEEP LEARNING STUDENTS SHINE AT NWU GRADUATION CEREMONY

Prof Marelie Davel with most of the recent MuST graduates, at her inaugural lecture in 2019. From left are Rhyno Strydom, Jacques Beukes, Nuette Heyns, Cristiaan Myburgh, Prof Davel, Tian Teunissen, Arnold Pretorius, Dewald Krynauw and Coenraad Mouton. Insert: Dylan Lamprecht.

The Faculty of Engineering at the North-West University (NWU) is rightly proud of the success of its new cohort of postgraduate students in the MuST (Multilingual Speech Technologies) research niche area. All seven master's degree students who joined MuST's 2019/2020 deep learning programme had their degrees conferred on 30 June 2021, with five of them having earned their degrees with distinction. They are Dewald Krynauw, Jacques Beukes, Christiaan Myburgh, Nuette Heyns and Coenraad Mouton.

The significance of these achievements lies in the fact that this postgraduate research programme is only three and a half years old. When MuST joined the Faculty of Engineering in January 2018 after the conclusion of the NWU's restructuring process, it had no postgraduate programme. The last set of MuST students had graduated in 2016, with PhD studies being located in a different faculty and in its previous programme, multilingual speech technologies for lesser resourced languages.

The new MuST research programme focuses on deep learning: these neural network-based architectures form an increasingly important set of tools in modern machine learning.

The programme opened with only two students: Arnold Pretorius, who received his master's degree in 2020 (also with distinction), and Tian Theunissen, who will receive his PhD at the 2021 winter graduation. In the second year of the programme, MuST took a leap of faith and accepted the entire group of shortlisted master's degree applicants. Prof Marelie Davel, director of MuST, explains:

"The seven final candidates impressed us – we did not know how to choose between them! Besides, we were by then convinced that we were onto something and we needed to expand our capacity. So we took them all in".

The deep learning programme includes both theoretical and application-oriented studies: the recently graduated master's degree students produced two studies exploring convolutional neural network theory (Coen Mouton and Christiaan Myburgh), two on the interpretability of space weather models (Dewald Krynauw and Jacques Beukes), two applications of speech processing (Rhyno Strydom and Nuette Heyns), and a bespoke solution for an industry partner (Dylan Lampbrecht). Studies also produced codebases and publications. All the students presented their work at conferences, with the work of three of the students having been selected for inclusion in special-edition journals.

Two of the graduating students felt no need for a break from research and are continuing with their PhD studies: Coen relocated to the MuST Hermanus lab and plans to continue focusing on deep learning theory. He aims to become a fully-fledged researcher in this field. Nuette has enrolled for a PhD at the NWU Unit for Languages and Literature in the SA context.

She uses machine learning techniques to work on quantitative transtextuality detection, which is an umbrella term for different methods to reuse and reference text, for example, to associate current news and world events with social media posts.
The deep learning programme aims to prepare students for future careers that are expected to require much flexibility.

As Dewald puts it: "The job I currently do did not even exist two years ago". He is currently working as a blockchain developer with the Telos blockchain core team. He also develops DeFi (decentralised ***finance) apps***.

Jacques has been bitten by the blockchain bug too and works with Dewald on DeFi apps. His immediate goal is to continue to sharpen his blockchain skills while looking for an opportunity to incorporate machine learning in his work. He hopes to continue to find opportunities to help create something interesting and useful.

Another master's degree graduate to join the world of DeFi is Rhyno, who now works as a junior quantitative software developer at Invictus Capital. One of his roles includes scripting logic for algorithmic trading strategies in different markets.

He aims to further his career in DeFi by using his newly acquired knowledge in data science to analyse financial markets. "I found my time with MuST very enriching. The research group emphasises clear thinking and is open to the sharing of ideas. They helped me gain a new perspective on things, and I definitely made some new friends along the way".

Christiaan mainly works on developing single-page web applications and has taken up live streaming as a "passion project". He reflects on his time as a master's degree student: "MuST is filled with passionate people who never hesitate to help out and point you in the right direction. I am truly grateful to have had the opportunity to be part of such a caring and driven group".

Dylan works as a machine-learning engineer/ software developer on language models to understand and interpret large pieces of text. Although preferring diversity in his work, he foresees that he will continue to move in the direction of machine-learning research and development.

MuST's first machine-learning alumnus, Arnold, has worked as a data scientist at Saigen, a speech analytics venture co-founded by a former MuST colleague, since the start of 2020.


TESLA

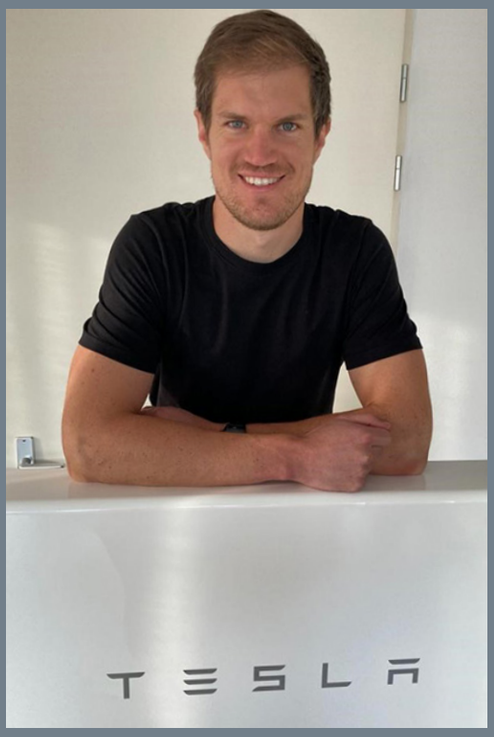
GREIG'S CAREER IS IN THE FAST LANE AT TESLA

Working for Elon Musk's Tesla Inc. is a dream come true for North-West University (NWU) alumnus Greig Swanepoel. Greig works for electric vehicle and clean energy company Tesla in Amsterdam in the Netherlands, where he is an application engineer for residential energy products in Europe, the Middle East and Africa.

Headquartered in Palo Alto, California, Tesla's current products include electric cars, battery energy storage from home to grid scale, solar panels and solar roof tiles, as well as other related products and services. Greig completed his BEng (2016) and MEng (2018) in electrical engineering at the NWU's Potchefstroom Campus.

"I was always interested in how things worked, and as a child I often took devices apart. So, engineering seemed like the natural choice", he says.

While studying, he worked on the Faculty of Engineering's famous solar car project, obtaining hands-on experience of the potential of solar energy. He gained insight into the vehicle's highly efficient solar system, combined with vehicle drive train and telemetry. Working on the car also helped him to see first-hand how he could apply his engineering knowledge to real-world problems. It also propelled him into a career in renewable energy.



NWU alumnus Greig Swanepoel works for Tesla in Amsterdam, where he is an application engineer for residential energy products in Europe, the Middle East and Africa.

Before joining Tesla in Amsterdam, Greig worked at the SOLA Group, a company that does solar installation in South Africa. Projects he worked on included designing large off-grid batteries, as well as solar and diesel systems for private islands in Seychelles and Mozambique.

Two important lessons that Greig learnt while at the NWU – and which he still applies today – are to be both an active listener and an active learner. In his view, it is better to take the time to understand a concept or principle rather than simply memorising things.

"Each person is an expert in something, so every conversation is an opportunity to learn something if you're really willing to listen", he says.

Greig says, having been exposed to a wide range of international professionals, he can honestly say that the NWU equips its engineering students to comfortably compete on an international level.

INGENIUM
A YEAR IN REVIEW

The past year was filled with new challenges that everybody had to overcome. Students were reintroduced to the somewhat foreign concept of sit-down examinations after about a year of online learning. Ingenium, the faculty's student association, started the year by welcoming the first-year students to the faculty in groups, to ensure Covid compliance. It is such an exciting time of the year when the first-year students are introduced to a new phase of their lives. We provided them with guidance and even campus tours to aid in the adjustment from school to university.

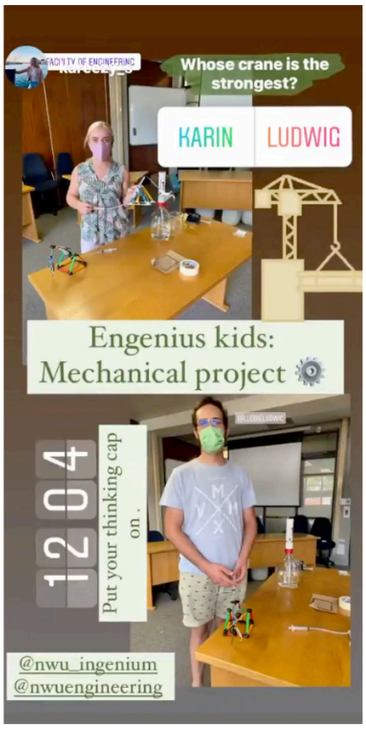
We also hosted events whenever circumstances allowed, including a virtual open day, a drive-in movie night and a spectacular Engineering Dinner. Although large in-person events could not take place for most of the year, we socialized via online events that consisted of chess tournaments, Among Us game nights and a general knowledge showdown.

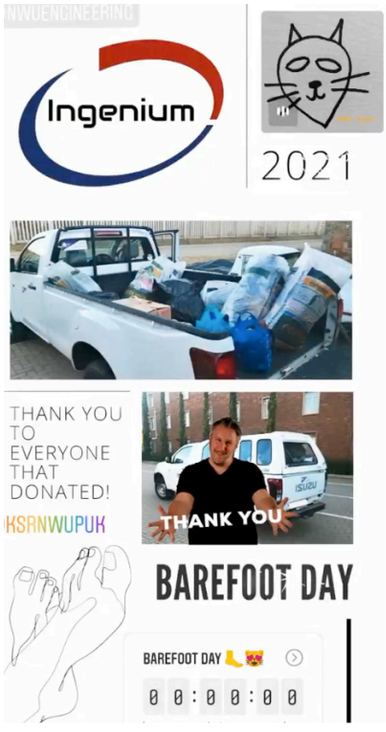
Investing back into the community and country is also something of importance to us. We participated in various campaigns including the NWU Blood drive. Donating blood is a simple deed of kindness that can save up to three lives! We also helped communities in need by donating food and school supplies. Lastly, we participated in various AKSA events that were focused on mental health and environmental sustainability.

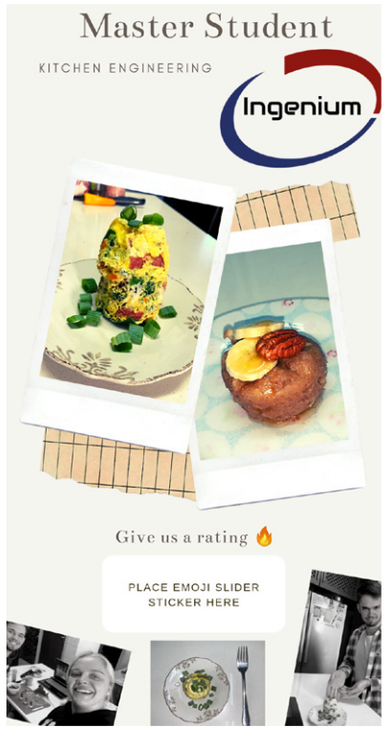
Ingenium is proud of its achievements as a student association in such a challenging year. We are proud to say that we walked away as prize winners. Our committee worked extremely hard to better the student experience and to keep improving the Faculty of Engineering.

Exciting news! Our student association will have a new name from 2022. We will be known as the Engineering Student Chapter. This new chapter, pun intended, will introduce exciting new positions to the student association to be more representative of the university. We look forward to building on Ingenium's legacy in 2022!

INGENIUM HIGHLIGHTS







LIVING HIS DREAM ALL THE WAY OVER IN GERMANY

All our dreams can come true if we have the courage to pursue them. This is true for Mattheus van Niekerk, an alumnus of the NWU Faculty of Engineering.

Mattheus studied for his BEng Mechanical Engineering degree at the NWU from 2009 to 2012 on the Potchefstroom Campus, and then continued his studies by completing his MEng Mechanical Engineering degree through the Centre of Research and Continued Engineering Development (CRCED) in Pretoria from 2013 to 2014.

"I am currently working as a mechanical design engineer for Tesla in Berlin, Germany. I am part of the team working to build the new Gigafactory for Tesla in Berlin", says Mattheus. His duties include designing and the managing of design consultants for all mechanical systems required as part of the factory operations.

His greatest accomplishments, he says, were obtaining his BEng and MEng degrees and being able to reach his goals by working for his dream company, Tesla.

Achieving these goals did not come easily, as he had to learn to manage his time between study/work and his personal life, ensuring that he never gave up, no matter how difficult the task seemed. What greatly assisted him was that he set goals for himself and did whatever it took to achieve them.

From a young age he was always interested in finding out how things worked and why they worked the way they did. "Engineering was a logical choice for me. I was initially planning on studying chemical engineering, but changed to mechanical engineering shortly before submitting my application, because I found the mechanical systems more interesting. I never regretted my decision to change fields", adds Van Niekerk.

"If you want something, work for it. Nothing in life is free, and if things come easily to you, you are not challenging yourself enough. Always give your best and don't be afraid to take on any challenge. Let a passion for making a difference and making your mark be your motivation, not money".

Mattheus van Niekerk

MAKING GREAT STRIDES IN HER CAREER AS AN ENGINEER

"If the dream is big enough, the facts don't count", says Alicia Celliers, an alumna of the Faculty of Engineering at the North-West University (NWU).

Alicia completed her Bachelor of Engineering in Mechanical Engineering studies from 2009 to 2013. She is currently a project engineer at Single Destination Engineering (SDE). SDE is an engineering design company specialising in power generation and commercial projects.

Her motivation for studying engineering came from her fascination with wanting to understand how things work, and the automotive industry lured her into engineering. She explains that she was and will always be a huge Top Gear fan.

Alicia was recently a speaker at the virtual event of the Top 5 Industry Trends for Mechanical Design in 2021. The event was about the right tools that enable cloud collaboration, remote working environments and best practice solutions to give teams the edge they need to deliver their best outputs. She presented information about the industry's challenges and lessons, and what this new year holds for the industry in South Africa.

Alicia adds that some of her greatest achievements have been managing an eight-week FEED stage of a mini LNG plant in Nigeria, with no deadlines missed and executed penalty free. She also managed a fast-tracked plant modification of a 6 x GE TM2500 Gen4 to a 4 x GE TM2500 Gen8 aero-derivative turbine.

Alicia Celliers

She was the chairperson of the central branch of the South African Institute of Mechanical Engineering (SAIMechE) from 2018 to 2019. Alicia became a shareholder in SDE before the age of 30. She was also invited to be a guest speaker on the early career development of engineering professionals at Electra Mining Africa 2020.

A lesson learned during her years of study, she says, was that it is never too late to start studying for an examination paper or test. Procrastination is a reality and you need to start studying eventually, even if you first need to clean your flat, rearrange your textbooks alphabetically and finish that one season of your favourite series.
Some of the things she misses about being a student at the NWU are the social interaction, going to Impala, Picassos, Bourbons and the Draak.

"To every young girl aspiring to be an engineer: do not be afraid to pursue your dream. Yes, engineering is still basically a man's world, but if you really want to make your mark, you can. You will mostly be the only woman in a meeting or at a site visit. Does that really matter?" concludes Alicia.

NEW NWU CENTRE FOR CHILDREN WITH DEVELOPMENTAL DELAYS WILL FOCUS ON THE WHOLE FAMILY

When children have disabilities or developmental delays, the whole family can be affected. This is why the Care2Kids division of the Centre for Health and Human Performance at the North-West University (NWU) is embracing a family-focused intervention.

Explaining the need for a family-centred approach, Hanlie Degenaar, a speech-language pathologist leading the Care2Kids multidisciplinary team, says there are many risks to children in South Africa that impact their development.

"These risks include poverty and a lack of resources in poor communities, communicable diseases (especially HIV negative but HIV-exposed children), poor quality health and educational care, as well as the risk of poor home environments providing insufficient quality stimulation", she says.

All of these could affect a child's language and communication-interaction development, which are key to cognitive development, psychosocial health and academic performance.

"These risks include poverty and a lack of resources in poor communities, communicable diseases (especially HIV negative but HIV-exposed children), poor quality health and educational care, as well as the risk of poor home environments providing insufficient quality stimulation", she says.

IMPACT ON FAMILY MEMBERS

"A developmental delay may have a lasting effect on a child's development and a psychosocial impact on the child's family", says Hanlie. "This may lead to family members experiencing stress, depression and feelings of helplessness. Accordingly, not only do children with developmental delays and disabilities have special needs, but families have unique needs as well".

According to Prof Leenta Grobler, acting director for business development and stakeholder engagement in the Faculty of Engineering and parent of a child who overcame a developmental delay, she experienced the benefits of this family-centred approach. Still, as an engineer, she also realised the severe lack of accessible enabling technology within this setting.

"While some technology is developed to aid early childhood intervention, devices designed for the first world often are unaffordable, not sufficiently simple or robust, or just not compatible for use in our local setting".

This awareness prompted her to act. In 2019, she and a colleague, Dr Henri Marais, started to collaborate with the Care2Kids team to co-create user-centric solutions to use in the local context.

ENGINEERS AS PART OF THE HEALTHCARE TEAM

The engineers quickly realised the need to become fully immersed in the therapy setting so that they could understand the context in which the solution is needed. This would allow the solution to be seamlessly integrated into the therapy being provided.

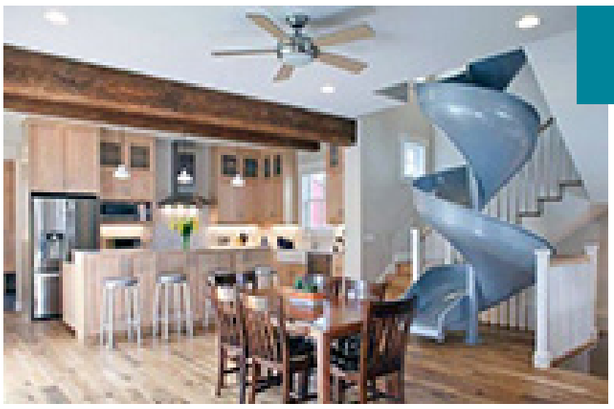
This prompted the dream of a Fourth Industrial Revolution-enabled facility offering therapy and rehabilitation surveillance, which will facilitate both family-focused assistance and medical device development, according to Prof Grobler.

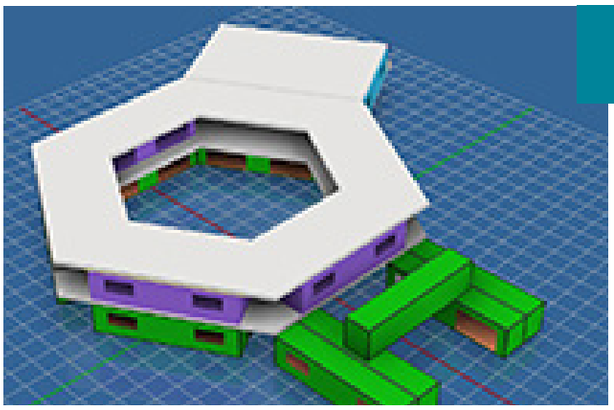
“The Faculty of Engineering then applied for strategic funds from the NWU to develop an intervention surveillance centre to facilitate both family-focused intervention and medical device development”, she says. “In this facility, engineers will become part of the healthcare team, enabling them to understand where technology should be introduced”.

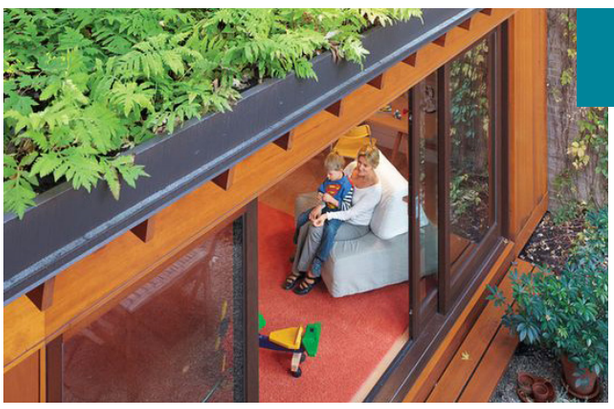
To this end, the surveillance centre’s custom-designed family, child, and adult intervention spaces will be equipped with 360-degree filming technology and virtual/augmented reality headsets.

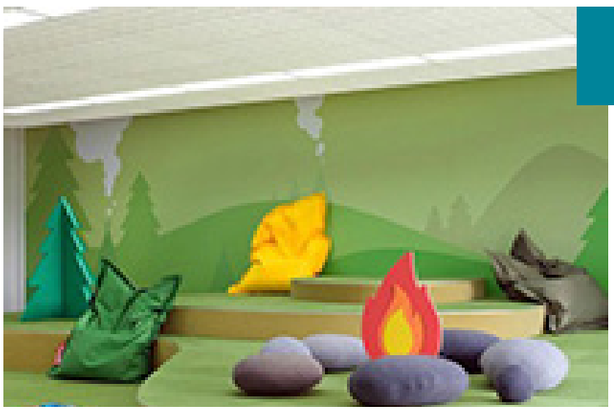
The centre will also boast a sensory garden and paediatric nutrition education centre where feeding problems will be addressed in a family-focused manner.

Planning and design are underway, and implementation will commence as soon as all of the necessary approvals have been given.









These are some of the conceptual ideas for the intervention surveillance centre.

New partnership will give chemical engineers a huge advantage

The School of Chemical and Minerals Engineering at the North-West University is partnering with a software company that will put them on the cutting edge of development.

The partnership with METSIM, the premier modelling software company, will allow the design of new processes and push existing flowsheets to maximum efficiency.

Prof Quentin Campbell, director of the School of Chemical and Minerals Engineering, says METSIM and the NWU found new common ground in the education of final-year students, focusing on the advanced simulation of minerals processes.

“The vast and diverse minerals industry in South Africa is a driver for innovation. With the help of process simulation software like METSIM, new processes can be designed and existing flowsheets can be optimised”.

He says that the humble material and heat balance of complex minerals processing systems can be evaluated with multiple simulations that take centre stage and are incorporated with an almost complete engineering solution.

“With this simulation-based approach to teaching, the students will be guided through the different stages of ***process design specific to the minerals*** industry. Mass and heat balances, dynamic simulations and heap leaching, contouring, communication and gravity separation, mining sequencing, operating-cost optimisation and basic engineering will all form part of the new integrated approach”.

Campbell says METSIM is a robust cradle-to-grave evaluation tool that can enhance productivity and allow decision-making based on facts generated in close to real-time.

“This collaboration will not only give the NWU graduates an advantage when it comes to minerals process simulation but will also strengthen industry ties for the future in integrating METSIM even more in the South African minerals and mining sector”.

“The fruits of this collaboration will be apparent in the near future”, he concluded. For more information, visit

At the launch of the new partnership were Dr Frikkie Conradie (NWU), Frikkie van der Merwe (NWU), Calvin Morrison (vice president for the European, Middle East and African countries at METSIM), Inge Coetzee (NWU) and Prof Quentin Campbell (NWU).

NWU AMONG THE BEST IN ENGINEERING STUDIES

The North-West University (NWU) is one of the top institutions in South Africa in engineering studies. This is according to the latest rankings by subject by Times Higher Education (THE) that list the NWU in the third position (the same as last year) among nine local higher-education institutions in the field of engineering.

THE placed the NWU in the 401 to 500 category globally — the same category as in last year's ranking. The NWU was measured against 1 188 universities worldwide.

The rankings were announced on 6 October and highlight the universities that are leading across the engineering disciplines, which include general engineering, electrical and electronic engineering, mechanical and aerospace engineering, civil engineering, and chemical engineering.

The engineering rankings used the same performance indicators as the Times Higher Education World University Rankings of 2022. These are grouped in five areas: teaching (the learning environment); research (volume, income and reputation); citations (research influence); international outlook (staff, students and research); and industry income (knowledge transfer).

Commenting on the rankings, Prof Dan Kgwadi, vice-chancellor and principal of the NWU, remarked that these rankings underline the relevance of the NWU's offerings for the industry, both locally and internationally.

"We are proud of our achievements, as we are dedicated to being an internationally recognised university in Africa. We are committed to delivering quality graduates that have the potential to excel in their chosen careers and in doing so also make valuable contributions in our country".

The official hashtag for the Times Higher Education World University Rankings by subject is #THEUniRankings. To learn more about the NWU's achievement in engineering, visit

Times Higher Education previously released the subject rankings for physical sciences, life sciences, clinical and health sciences and psychology on 16 September. To read more about these rankings:

NB! The rankings for social sciences, business and economics, education and law will be released on 13 October. The subject rankings for arts and humanities will follow on 3 November.

NWU COMPETITION DISCOVERS AND DEVELOPS NEXT GENERATION OF FEMALE ENGINEERS

Are you a high school girl looking at the world around you and imagining ways in which you can make it better? You may be part of the next generation of female engineers who, with fresh, innovative ideas, will make a profound impact not only on South Africa and Africa, but also globally!

You now have the opportunity to kick-start your career in engineering and at the same time be in line to win a once-in-a-lifetime prize if you triumph as overall winner.

The North-West University and the Manufacturing, Engineering and Related Services Sector Education and Training Authority (merSETA) have joined forces to discover, develop and support future female engineers through the annual Modiragatsi innovation competition.

Modiragatsi gives high school girls between the ages of 15 and 18 the opportunity to try their hand at and shine in the one thing engineers are known for – problem-solving! Even though engineering is traditionally a male-dominated field, it is a well-known fact that female engineers excel in creative problem-solving.

The competition is called Modiragatsi because it is the Setswana word for performer. Women are those performers who will change South Africa and find solutions to problems that have not even been identified yet.

“As a female engineer working not only as an academic and researcher but also in the field as a medical device developer, it is clear that my approach in finding engineering solutions differ greatly from those of my male colleagues”, says researcher and innovator Prof Leenta Grobler.

“I think that as a woman I see problems differently, since I focus on the intended user and actively involve them in the product development journey. I firmly believe that women have an important role to play, especially when it comes to engineering products that are aimed specifically at female users”.

“I firmly believe that women have an important role to play, especially when it comes to engineering products that are aimed specifically at female users”.

She says finalists in the competition will be empowered with new skills in design thinking, creative problem-solving, advanced manufacturing methods, mobile application development and introductory robotics.

See a problem? Find a solution and win! All participants in the competition have to do is to identify a problem about which they feel passionate or that they have experienced themselves. They must then develop a concept solution that is technology-based.

For the first phase of the competition you have to submit a 250-word summary and either a two-minute video or a 15-slide slideshow explaining the problem and the proposed solution to the problem you identified.

The semi-finalists will consist of teams of two girls and their maths or science teacher and will be selected from all over the country. They will be hosted in an online mentoring training programme facilitated/ run by the NWU's Faculty of Engineering during the winter school holidays.

After the mentoring programme, teams will pitch their ideas and solutions for the ultimate prize: a once-in-a-lifetime technology tour for the girls and their teacher of Silicon Valley in California and attendance of the Girls in Tech Catalyst Conference in June 2022. The Faculty carries the torch for female engineers.

The NWU's Faculty of Engineering is proudly led by a female dean, Prof Liezel van Dyk. It also boasts a significant number of inspiring female role models that include, among others, Prof Sanette Marx, an expert in the field of biofuels, Prof Leenta Grobler, an expert in the field of digital health, and Ms Nthabiseng Modiri, a researcher in carbon-based products.

The faculty constantly aims to increase the number of female engineers who are available for the industry to employ and to promote gender equality in the workplace.

In addition to the Modiragatsi competition, the NWU's partnership with merSETA to develop a dedicated Women in Engineering (WiE) programme has brought about a number of projects that include:
• The Femmegineering Event: a conference for high school girls to expose them to engineering as a career.
• The i-code-robot, which is a three-day short course to up-skill primary school teachers in coding and robotics to prepare them for this new curriculum matter.
• The Femmtor Bursary Scheme for deserving female undergraduate and postgraduate students.
For more information on Femmegineering, visit www.engineering.nwu.ac.za/ femmegineering.

For more information about the competition, visit: http://engineering.nwu.ac.za/engineering/modiragatsi-girls-competition, or contact Prof Leenta Grobler at 018 299 4058 or leenta.grobler@nwu.ac.za

NWU engineering student scoops awards for Covid-19 innovations

Karin Schutte

Karin Schutte, a third-year mechanical engineering student at the North-West University (NWU), recently walked away with R35 000 worth of prizes at the Mahlale Innovation Consortium (MIC).

The MIC is an alliance of five higher education institutions, formed in response to a request by the Manufacturing, Engineering and Related Services SETA (merSETA), to promote local manufacturing of ventilators to contribute to the National Ventilator Project.

The competition consisted of three categories and Karin entered her work into two of the categories.

In the Innovation category, she received the third prize with her design of a motorised personal protective equipment (PPE) stand that will help medical staff to change their PPE faster.

Karin scored first place in the Engineering category with her design of a ventilator database and courier service to locate ventilators, not in use and transport them to parts of the country with a higher concentration of Covid-19 cases, and thus in greater need of ventilators.

"I thank Prof Leenta Grobler from the Faculty of Engineering for motivating me to enter this competition", she says.

"It helped to broaden my horizon and made me realise that there are numerous problems currently in the health sector that mechanical engineers can address.

I encourage all students to enter competitions like these - their ideas could help improve the lives of many people and that truly is the ultimate goal of engineering".

The NWU is proud of Karin and looks forward to all her future innovations.

NWU ENGINEERING ENCOURAGES ENTREPRENEURSHIP IN COMMUNITIES THROUGH I2P LAB

The Faculty of Engineering on the North-West University's (NWU's) Potchefstroom Campus recently added an Idea2Product (I2P) Lab to their technology arsenal.

The I2P Lab is a national initiative funded by the Department of Science and Innovation (DSI). It was born from the DSI's FabLab concept, but where the FabLab was mainly aimed at staff and students, the I2P Lab focuses on community engagement and making 3D printing, scanning and related technology accessible to everyone.

Typical equipment one would find in such a lab include a 3D printer and scanner, a laser cutter, a Computer Numerical Control (CNC) machine, hand tools, and an electronic station.

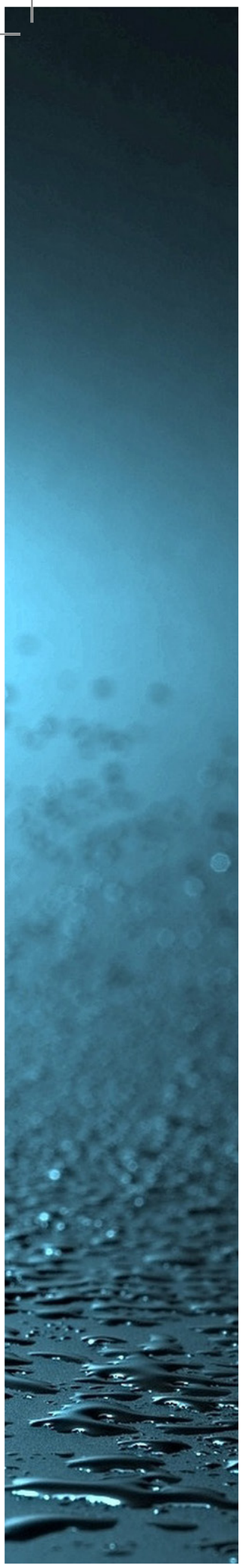
Adri Benadé from the School of Mechanical Engineering says the main aim of the lab is to empower staff, students and especially community members by teaching them more about 3D printing and related technologies, and giving them access to technology and expertise at an affordable price which will accelerate innovation and economic development.

“Anyone with an idea are welcome to visit the lab to create a prototype of a final product”, says Adri.

“We are focussing especially on struggling communities, and by using this lab people from rural areas can now develop products to sell within their own and neighbouring communities”.

“This could lead to an increase in new ideas, new products, and new mini economies that would lead to improving economic conditions in underdeveloped regions”, she adds.

According to Adri, some equipment will also be placed at a special needs school in Potchefstroom to assist with skills development. To find out more, please contact Adri at 018 299 1335 or send an email to adri.benade@nwu.ac.za



NWU FACULTY OF ENGINEERING HELPS SCHOOLS TO UTILISE ELECTRICITY AND WATER MORE EFFECTIVELY

The School of Mechanical Engineering at the North-West University (NWU) is using their energy management expertise to assist schools through its Energy and Water project.

This project forms part of the faculty's drive and passion to give back to the community. Volkskool in Potchefstroom, is already benefitting through this project.

According to Prof Martin van Eldik, the project was launched by Prof Willem den Heijer in response to the daily reality of electricity shortages and the ever-present threat of load shedding in South Africa.

"This, in conjunction with other factors, has led to a continuous and steep increase in the cost of electricity. Industries, businesses, and households are negatively affected by the increasing costs, which in turn affect their ability to maintain production levels, provide services and sustain their livelihoods", says Prof Van Eldik.

Prof Van Eldik says the increasing cost of electricity also puts public schools' ability to remain financially sustainable at risk. "School fees and subsidies on which schools often depend does not increase at the same rate that the cost of electricity and energy in general increases. This results in substantial pressure on their annual budgets", he adds.

More about the project

The project entails comprehensive stakeholder engagement and energy audits to determine how, where and when energy is consumed. Systems that consume electricity are studied in conjunction with their operations and the need they address within a school.

Electricity bills and metering data are then used along with mathematical models to identify opportunities where electricity can be utilised more efficiently. The project focusses on utilising existing equipment and infrastructure more efficiently to minimize and potentially eliminate costly investment capital – which is often not available.

"We then make recommendations to stakeholders in terms of the potential electricity and cost savings. The implementation of these measures will then depend on the required intervention(s) and the resources needed. A similar path is followed in terms of water resources", says Prof Van Eldik.

He says the engagement that follows from this project not only gives stakeholders access to expertise and resources, but also benefits fourth-year engineering students who are actively involved".

"It is our vision to expand this engagement to more schools within our community, thereby growing the knowledge and abilities of our engineering students in the field of energy management while giving back to our community and environment", Prof Van Eldik adds.

NWU HARNESSES OZONE TECHNOLOGY AS COST-EFFECTIVE COVID-19 COMBATANT

The North-West University's (NWU's) researchers and innovators are working towards solutions to effectively destroy viruses, bacteria and fungi, including the Coronavirus, on a large scale. As the Covid-19 pandemic continues to rage, fast-working, low-cost disinfection solutions are essential in tackling the crisis.

The NWU has taken up this challenge by revisiting a patent that was filed years ago for producing ozone. The result is a newly designed and updated ozone generator which can be used to treat water and fresh produce can also disinfect areas and surfaces. This can have a meaningful impact in safeguarding public spaces such as universities, schools, hospitals, clinics, libraries and even public transport.

The new Ozone generator design is inspired by a NWU patent. According to FR Bezuidenhout, commercialisation specialist of the NWU's Technology Transfer and Innovation Support Office, the existing NWU patent for producing ozone is the original invention of Barend Visser, physics inventor in the Faculty of Natural and Agricultural Sciences. When compared to other products currently on the market, the technology is very economical.

The project is likely to have a long-term impact, says Dr Emile Kotzé, head of the Health Clinic on the Potchefstroom Campus, who is contributing health expertise to the ozone generator project.

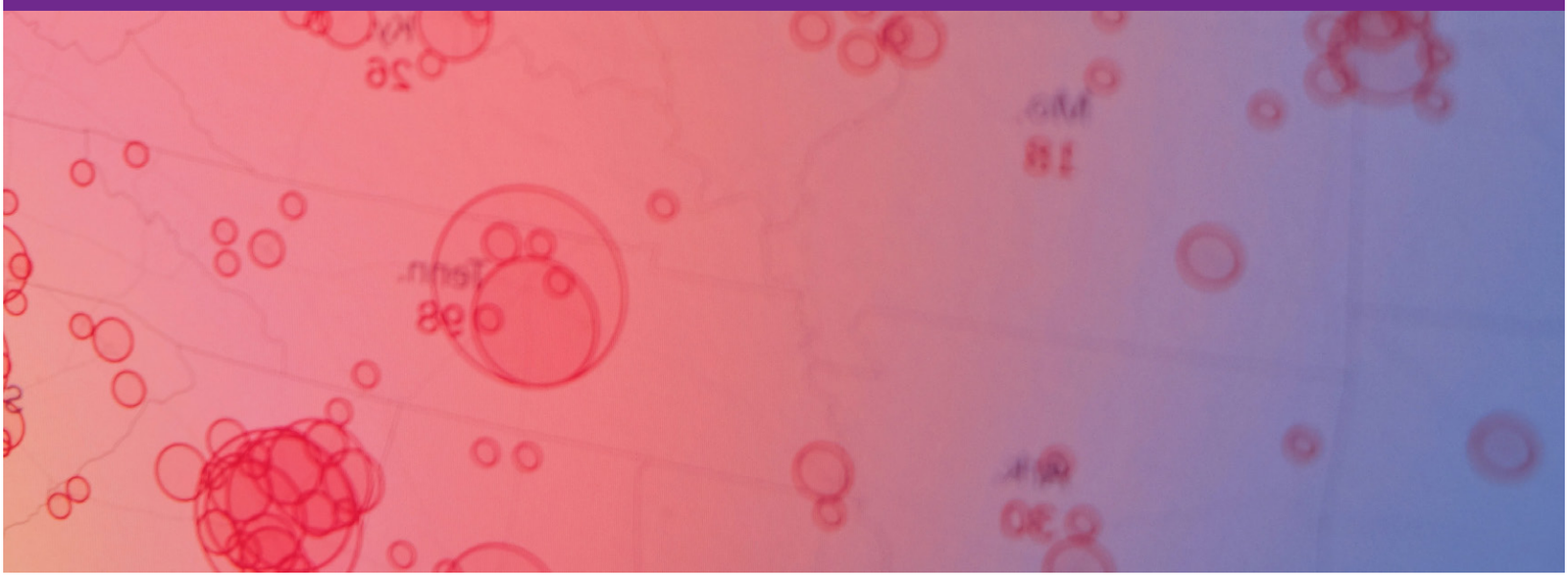
"The need for this equipment will not end with the pandemic but will continue for years to come as we will also have to address future health needs in South Africa. This is a good cost-effective and viable alternative for cleaning public surfaces, buildings and areas", says Dr Kotzé, a medical doctor.

The ozone project is also valuable in research terms, he says. "We learn new information as we are working on the project. A lot of important research has already been done and new research will follow as we go along".

At the beginning of the Covid-19 pandemic, the NWU assembled a team to investigate how to appropriate existing technologies towards solutions for the pandemic, according to FR. "We realised that Barend's invention holds a lot of untapped potential. We believe that this exciting technology will also be used long after the pandemic in addressing other health challenges such as tuberculosis".

The new ozone generator combines capable sensors with generation technology to create a smart sensing product that is able to automatically control the amount of ozone generated and deployed in a specific area, says FR. "We believe this could be a long-term cost-effective disinfection solution for all industries. The newly updated design is four times more effective in terms of ozone yield", he says.

It can also be produced much more cost effective than the original version. "The team put a lot of work into updating and testing the ozone generator.



It was a mammoth task that employed the expertise of various roleplayers, departments and faculties of the university. It was inspiring to see how everyone's dedication contributed in realising the innovation and potential impact of the project".

This truly multidisciplinary project involved many staff members and stakeholders, from the Technology Transfer and Innovation Support Office and the NWU Health Clinic to staff and students in computer and electronic engineering at the Faculty of Engineering, occupational health and safety experts from the Faculty of Health Sciences, the NWU's financial staff and management across all the various testing sites.

The Ozone generators are now in further testing phases. The testing of an initial 10 ozone generator prototypes has already started in August 2020. These units were extensively tested in different-sized rooms to determine the amount of ozone they were able to emit.

FR says they have now produced an additional 200 demo units after concluding the testing of the prototypes. "Our goal is to place them within operational environments while at the same time continuing with the tests. We had to plan carefully as all tests have to be performed while there are no people present in the testing areas".

The testing sites include the NWU Health Clinic and the Ferdinand Postma Library on the Potchefstroom Campus.

"The development is ongoing and we are currently investigating an even higher yield generator for which we have employed the talents and expertise of a final-year engineering student, Izak Adendorff, to design our very own sensor technology that will be able to measure ozone in real time".

FR says when all testing is completed they aim to produce units for further deployment on the NWU's campuses and thereafter go into full commercial production. The ozone generator holds promise in safeguarding public spaces for health purposes.

Staff and students from the Faculty of Engineering are actively involved in developing the ozone generators. They are Gerno Visser, Marnus Smith, Duhan Janse van Rensburg and Izak Adendorff. With them is the inventor, Barend Visser.

Some of the role players in developing the ozone generators include Mark Greef, FR Bezuidenhout, Leslie Barends, Dr Emile Kotze, Prof Johan du Plessis and Dr Stefan Linde. They were present when the ozone generators were installed in testing areas on the Potchefstroom Campus.

NWU RESEARCHERS LOOK TO STOCHASTIC PROGRAMMING FOR BEST MARKETING RESULTS

In an economy where every sale counts, North-West University (NWU) researchers have been looking at ways to help retailers improve the decision-making process in their marketing campaigns.

Chanel Bisset and her supervisor Prof Fanie Terblanche from the Faculty of Engineering in the research field of engineering analytics, recently conducted a study on a stochastic programming approach for marketing campaign optimisation. According to Chanel, the main focus of this study was linear programming under uncertainty, also referred to as stochastic programming.

“Stochastic programming originated during the 1950s and was later extended into prominent application areas, including energy, production planning and finance”, she explains.

“One research opportunity identified is that retailers require predictive models that can accurately describe customer behaviour and predict future sales to maximise profitability”.

For the study, the two researchers formulated a two-stage model by combining two base models identified from literature.

“A two-stage stochastic programming model consists of two decisions made at two different periods”. Chanel says. “The first decision is made without any knowledge of the future outcome and is mainly based on judgment and experience. The second decision is influenced by the random outcome’s realisation which is based on a probability distribution”.

She adds that retailers need to make these decisions concurrently and need predictive models that can assist them with this decision-making process.

The model’s first-stage decision includes whether a customer should be targeted for a promotion campaign in a specific period given the marketing cost. The second-stage decision is based on whether the retailer should promote the product in-store.

“If the customer is targeted, there is still uncertainty if it will positively influence the probability that a customer will react to the promotion campaign. Retailers are constrained to a budget and can only target and promote specific customers and products during the promotion campaign”, says Chanel.

“This model will assist retailers by only targeting the most valuable customers, and also clearly predicts if a product should be promoted in-store as part of the second-stage decision”.

“A deterministic version of this model is also formulated where all the probabilities and additional data are known. The results of the two models are compared by using simulated data”, concludes Chanel.

Chanel Bisset

NWU'S PROF LEENTA GROBLER – A RISING STAR

Prof Leenta Grobler, the acting director for business development and stakeholder engagement in the Faculty of Engineering at the North-West University (NWU), is a true trailblazer and not even the Covid-19 pandemic can hold her back. She was recently announced as a semi-finalist in the category Public and Private Service of the annual Accenture Rising Star Awards.

These awards aim to recognise, celebrate and connect young South Africans professionals between the ages of 28 and 40 who display great leadership qualities and strive towards achievement, success and making a difference.

In 2020 Prof Grobler, as team leader of the faculty's Digital Health group, together with her team, developed the TjopTjop health screening app to assist schools, businesses, and other institutions to easily collect and store health screening information from students, pupils, staff and clients. For this initiative they received an international award from the Covid-19 Innovation Challenge of the United Nations (UN) Africa Innovation and Investment Forum in 2020.

In the same year, Prof Grobler and her team manufactured face shields for members of the community and partnered with the Central University of Technology to reverse engineer a ventilator last used in the Vietnam war to create a ventilation solution that will not be susceptible to loadshedding for South African clinics and hospitals. They then went on to create not only a remote monitoring system for ventilators, but also a digital interpreter for the PCR tests performed to diagnose Covid-19.

"I am grateful for the loyalty, dedication and support from my team who help me create and develop life-changing technology that will shape the future of healthcare in developing countries, and thankful to the NWU for giving me the platform to thrive," says Prof Grobler. "Being nominated in the Accenture Rising Star Awards is a huge honour. I am so proud to be recognised alongside some of the most influential leaders in our country".

Prof Leenta Grobler is one of the NWU's rising stars.

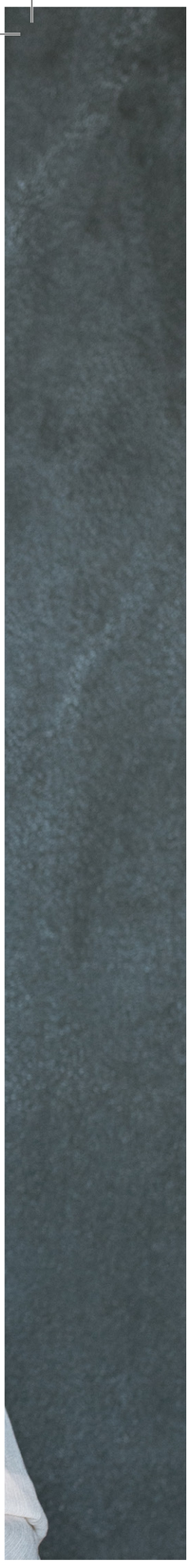
Staying humble and having a willing and enabling attitude helped her build meaningful relationships with people in various sectors, which is absolutely vital in her current role at the faculty.

She adds that it has been a long road to get to where she is now. For 14 years she has supported many of her older colleagues from the sidelines, gaining experience and learning from them – even though her role in their successes was often invisible.

"I am a firm believer that women will change the world for the better if they are given the opportunities and confidence to try. I hope to be a role model for girls by leading by example – showing that engineering is not only a career option girls can succeed at, but also a sector they can thrive in – which will lead to better products and services for all of us", she says.

The university applauds Prof Leenta for flying the NWU flag high, and looks forward to all future ground-breaking developments and partnerships she will embark on.

NWU'S FEMMENGINEERING EVENT UNLEASHES THE POWER OF YOUNG WOMEN



“I am seriously considering computer engineering. It seemed like too big of a dream before, but seeing the amazing work females can achieve in the world of engineering has motivated me so much”.

In South Africa, despite gains achieved for women, engineering roles in numerous organisations are still predominantly occupied by men. To encourage more young girls to study towards science, technology, engineering and mathematic (STEM) qualifications, the Faculty of Engineering at the North-West University (NWU) kicked off its Femmengineering initiative in 2015.

This year from 9 to 13 August, over 200 learners attended the successful annual event that was once again held virtually due to the Covid-19 lockdown regulations.

The jam-packed programme included presentations from NWU students, alumni, academics, lecturers and industry partners.

Sabine Dall’Omo, chief executive officer of Siemens Southern and Eastern Africa, kicked off the event with the keynote address on 9 August. On 10 August Corneels Schabbort, senior lecturer at the School of Chemical and Minerals Engineering, Joani Bijzet, an NWU alumna who currently works at Anglo America, and Caitlin van der Merwe, a master’s student, discussed all things related to chemical engineering.

On day three Prof Johann Holm, an electronic engineer, Annemarie van Coller, an electrical and electronic engineer, and Ian Thomson, a master’s student in computer and electronic engineering, talked about computer, electrical, electronic and mechatronic engineering.

Mia Mangaroo-Pillay, an industrial engineer helped the young girls understand the industrial engineering industry, and Lize Pieters, an NWU alumna and employee at Deloitte, also inspired the participants on day four.

On the fifth and final day of Femmengineering 2021, Dr Marina du Toit, lecturer at the School of Mechanical Engineering, Marne Jordaan, an NWU mechanical engineering graduate, and Karin Schutte, a third-year mechanical engineering student, shared information about the School of Mechanical Engineering.

“This workshop has been really helpful. I hadn’t considered the NWU before, but I will definitely be applying here next year”, said Kiara Vallabh, a Grade 11 learner who attended the Femmengineering initiative.

“I am seriously considering computer engineering. It seemed like too big of a dream before, but seeing the amazing work females can achieve in the world of engineering has motivated me so much. I love the initiative of empowering women - I can definitely say I felt empowered throughout this week”.

Prof Leenta Grobler, the acting director for business development and stakeholder engagement in the Faculty of Engineering, thanked all the speakers and organisers who availed themselves for this great initiative.

“We also thank the Manufacturing, Engineering and Related Services SETA for their generous sponsorship that allowed us to make the event free for all the learners to attend. We look forward to hosting an even bigger event next year that will reach learners across Southern Africa”, she added.

The North-West University (NWU) celebrated the torchbearers of its teaching excellence during a virtual event. The best-of-the-best lecturers of 2020 were acknowledged for their work in taking teaching and learning to higher levels during the annual Teaching Excellence Award (TEA) ceremony, which was streamed online on 25 March.

The NWU is renowned for teaching excellence, having produced past winners of the Higher Education Learning and Teaching Association of Southern Africa: Distinguished Teaching Excellence Award – a showcase of the most esteemed and celebrated university teachers in South Africa. While continuously striving towards excellence in teaching and learning, the NWU was in past years ranked as one of the best-performing universities in South Africa with respect to teaching and learning.

At the NWU, academic members, as university teachers, are annually invited to showcase excellent teaching contributions by participating in the NWU TEAs.

Forty-six university teachers from all eight faculties and multi-disciplinary fields received awards. The respective faculties received the following number of awards:
Faculty of Economic and Management Sciences – four awards
Faculty of Education – sixteen awards
Faculty of Engineering – two awards
Faculty of Health Sciences – six awards
Faculty of Humanities – three awards
Faculty of Law – three awards
Faculty of Natural and Agricultural Sciences – nine awards
Faculty of Theology – three awards

Two university teachers displayed exceptional levels of excellence in their teaching and learning contributions within their respective disciplines. Prof Roelof Burger and Dr Teresa Hattingh were awarded the Distinguished Teaching Excellence Award (DTEA), the highest institutional award bestowed upon a university teacher.

Prof Roelof Burger is from the School of Geo and Spacial Sciences in the Faculty of Natural and Agricultural Sciences. His expertise and exceptional teaching and learning contributions are in the fields of climatology, meteorology and remote sensing.

Dr Teresa Hattingh is a senior lecturer and programme manager in the School of Industrial Engineering in the Faculty of Engineering. Dr Hattingh's teaching and learning contributions and involvement extend to a national and international footprint in emerging fields of industrial engineering education.

Prof Dan Kgwadi, vice-chancellor, expressed his appreciation for the high calibre of university teachers at the NWU. He thanked all 2020 TEA winners for their exceptional contributions to the South African higher-education landscape.

Prof Linda du Plessis, vice-principal, and Vice-Chancellor: Planning and Vanderbijlpark Campus Operations, congratulated all TEA winners and stated that awardees' teaching contributions underpin the NWU's reputation for quality, employability and responsiveness to market and national higher-education needs. She said that academics' roles are not restricted to university halls and classrooms.

MORE ABOUT THE NWU TEACHING EXCELLENCE AWARDS

The NWU's TEAs aim to acknowledge university teachers for their role, commitment, dedication and contributions to the quality and excellent teaching and learning within multi-disciplinary fields and with respect to student success.

Awards were presented in three categories:
(a) Emerging Teaching Excellence Award (ETEA),
(b) Teaching Excellence Award (TEA), and
(c) Distinguished Teaching Excellence Award (DTEA).

The NWU's DTEA is the highest accolade awarded to university teachers. It honours exemplary teaching at the highest institutional level.

DTEA nominees are nominated and recommended for the award after consideration of nominees' portfolios by evaluation panels. Nominees' portfolios are then submitted to an external evaluation panel, followed by (a) a presentation by the nominees and (b) an interview with the panel.

Each DTEA nominee is evaluated on their distinct contribution to teaching and learning within the institutional, national and international higher-education landscape.

THE FOLLOWING CRITERIA APPLY:

Notable success in the scholarship of teaching.
Innovative strategies employed in teaching and learning.
Reflection on teaching and learning that presents the nominee's development and progress over time within their teaching and learning context.
An institutional, a national and an international teaching and learning presence .
Nominees' reflection on the student voice about trends in higher education.
Recognition of nominees' faculty leadership contributions in terms of curriculum development in the faculty and beyond.

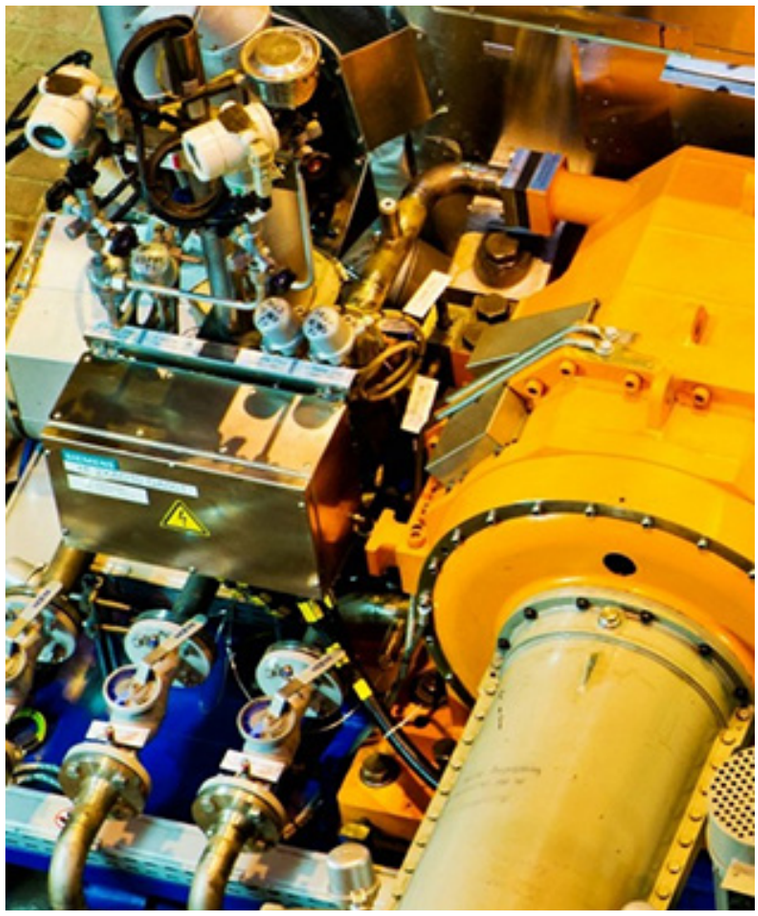
Prof Roelof Burger receives his award from Prof David Modise, executive dean of the Faculty Natural and Agricultural Sciences.

Dr Teresa Hattingh receives her reward from Prof Marco Le Roux, director of the Centre for Engineering Education.

THE 2020 NWU TEACHING EXCELLENCE AWARD WINNERS

Distinguished Teaching Excellence Award
Prof Roelof Burger, Faculty of Natural and Agricultural Sciences
Dr Teresa Hattingh, Faculty of Engineering
Teaching Excellence Award
Dr Lettie Botha, Faculty of Education
Dr Byron Bunt, Faculty of Education
Prof Roelof Burger, Faculty of Natural and Agricultural Sciences
Ms Janet Chalmers, Faculty of Education
Dr Dirk Cilliers, Faculty of Natural and Agricultural Sciences
Ms Wilma Coetzee, Faculty of Natural and Agricultural Sciences
Dr Louw de Beer, Faculty of Education
Dr Luiza de Sousa, Faculty of Education
Prof Elmien du Plessis, Faculty of Law
Dr Jean du Toit, Faculty of Humanities
Dr Philip du Toit, Faculty of Theology
Dr Ewie Erasmus, Faculty of Education
Prof Fazel Freeks, Faculty of Theology
Dr Allison Geduld, Faculty of Law
Dr Teresa Hattingh, Faculty of Engineering
Prof Marietjie Havenga, Faculty of Education
Mr Werner Kaiser, Faculty of Engineering
Prof Ankebé Kruger, Faculty of Health Sciences
Dr Leandi Lammertyn, Faculty of Health Sciences
Dr Dorothy Laubscher, Faculty of Education
Dr Shani le Roux, Faculty of Health Sciences
Dr Ananka Loubser, Faculty of Humanities
Dr Elma Marais, Faculty of Education
Dr Rachel Mayimele, Faculty of Education
Dr Deborah Mokgojwa, Faculty of Economic and Management Sciences
Mr Cobus Oosthuizen, Faculty of Health Sciences
Dr Kelebogile Paadi, Faculty of Economic and Management Sciences
Prof Rialet Pieters, Faculty of Natural and Agricultural Sciences
Prof Johan Potgieter, Faculty of Health Sciences
Dr Lynn Preston, Faculty of Education
Dr Salome Romylos, Faculty of Education
Dr Frances Siebert, Faculty of Natural and Agricultural Sciences
Dr Lynndle Square, Faculty of Natural and Agricultural Sciences
Dr Pieter Swarts, Faculty of Education
Dr Sune van der Linde, Faculty of Natural and Agricultural Sciences
Dr Annette van der Merwe, Faculty of Natural and Agricultural Sciences
Dr Wanda van der Merwe, Faculty of Education
Dr Corné van der Vyver, Faculty of Education
Mr Abie van Oort, Faculty of Health Sciences
Dr Germarie Viljoen, Faculty of Law
Dr Elize Vos, Faculty of Education
Dr Hannelie Yates, Faculty of Theology
Prof Johan Zaaiman, Faculty of Humanities
Emerging Teaching Excellence Award
Mr Kgosietsile Frenk Monnagaaratwe, Faculty of Economic and Management Sciences
Mr Ruhann Steyn, Faculty of Natural and Agricultural Sciences
Dr Johannes-Hugo van Schalkwyk, Faculty of Economic and Management Sciences
Recipients of the 2020 NWU Distinguished Teaching Excellence Award are Prof Roelof Burger and Dr Teresa Hattingh.

NWU's McTronX is at the forefront of dynamic modelling and control of large-scale industrial systems



The North-West University's (NWU's) McTronX research group has been at the forefront of dynamic modelling and the control of large scale industrial systems since 2003.

Led by Prof George van Schoor, the group is multi-disciplinary and comprises four full-time staff members. These staff members include Prof Kenny Uren, who specialises in systems modelling and control, Dr Henri Marais, who specialises in embedded systems and process monitoring, and Prof André Grobler, who specialises in thermal modelling of electrical machines and electrical machine design.

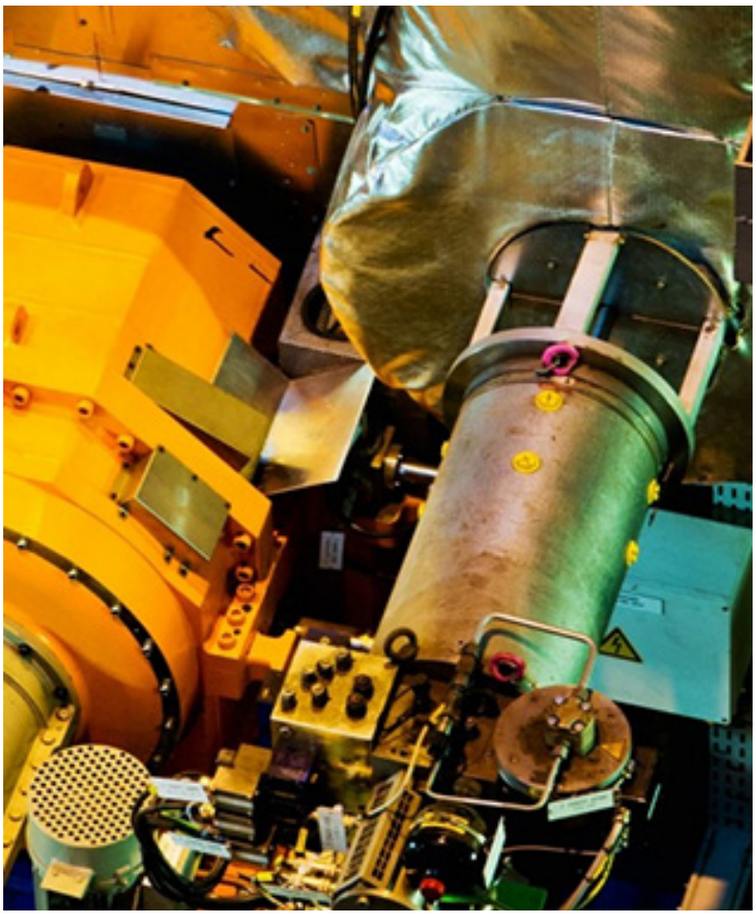
The group also works closely with other academics, including postgraduate students from almost all the engineering disciplines and industry partners such as Hochschule Zittau/Görlitz (University of Applied Sciences, Germany), Sasol, Denel, M-Tech Industrial, the CSIR, Eaton, Omnia and SAAB Grintek.

The research group initially aimed to address the needs of the pebble bed modular reactor (PBMR) project underway in South Africa between 2003 and 2009.

These needs involved dynamic modelling and control on the main thermohydraulic cycle, as well as active magnetic bearings (AMBs), seen as an enabling technology.

The main activity of the research group now is the dynamic modelling and control of large-scale industrial systems or processes. The name McTronX, according to Prof Van Schoor, is an acronym for the field of mechatronics.

"It was chosen due to the strong developments in the field of AMBs, a product of mechatronics, in the initial years since the establishment of the research group. This drive resulted in a number of laboratory demonstrator systems," he says. The group's work has not gone unnoticed.



Active magnetic bearings.

The NWU's McTronX Research Group consists of Prof George van Schoor, Prof André Grobler, Dr Henri Marais and Prof Kenny Uren.

In 2013 they received a research grant from Sasol for a project called Advanced Process Monitoring and Control in Petrochemical Environments. In 2016 the focus of the project shifted towards energy visualisation of large-scale industrial processes that are characterised by a number of subsystems exchanging matter and energy to accomplish a common goal.

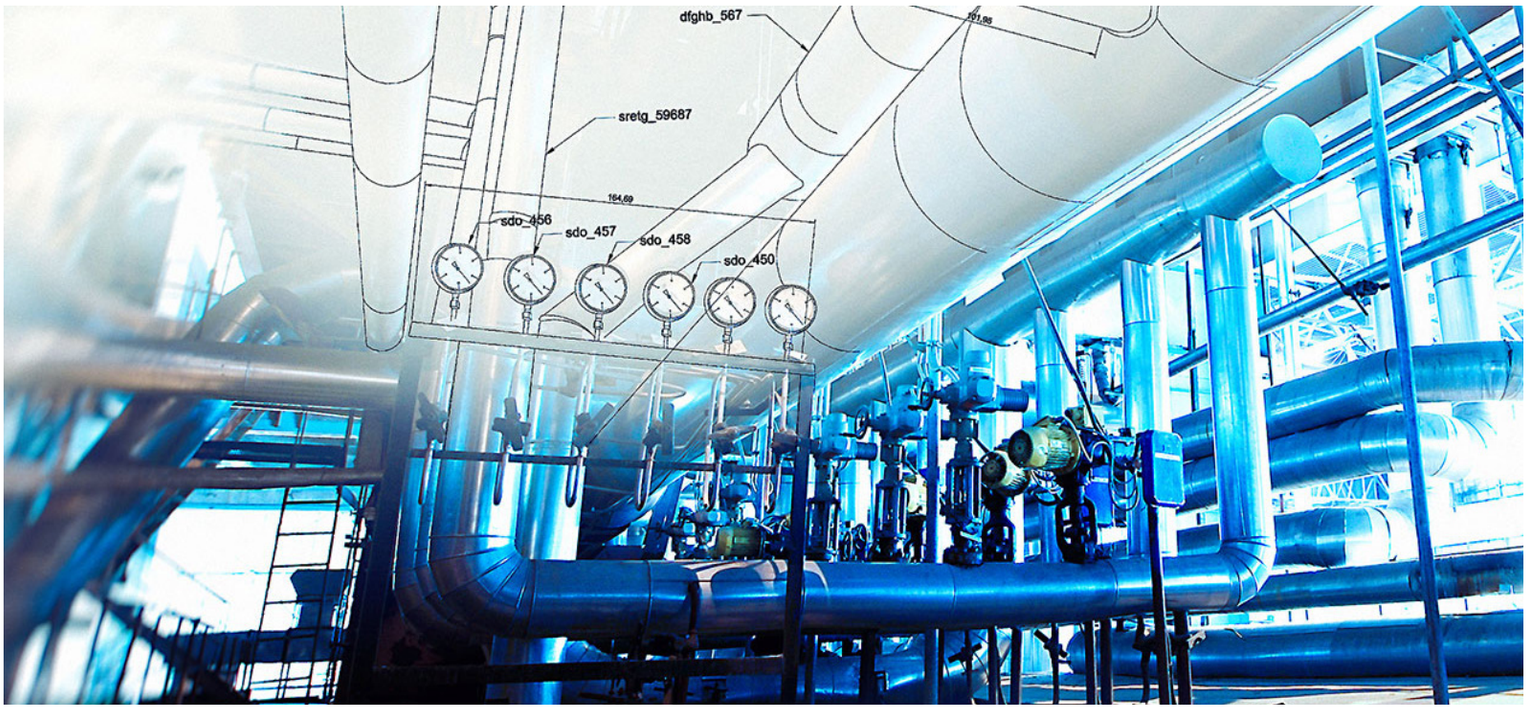
Prof Van Schoor says the group's current research studies focus on process monitoring of industrial systems and a lab-scale two-tank heated system that was developed in-house during 2020. He says the system is well instrumented and will be used to validate energy-based process-monitoring algorithms.

Another study the group recently completed involved the modelling and development of a 3D printed peristaltic pump. The idea was to look at alternative actuators for robotic applications. The study indicated that electrostatic actuators such as peristaltic pumps are ideal for robotic actuation.

Prof Van Schoor says since rapid physical conceptualising is becoming more important in industry, the idea was then to manufacture this pump using an additive manufacturing approach. He says that a unique electrical circuit-equivalent model was developed to assist in the design of future pumps.

"These examples clearly indicate that modelling and control contribute to the improvement of industrial processes. The improvement can be quantified in terms of specific objectives, of which energy efficiency, product quality or plant reliability are the most prominent", says Prof Van Schoor.

He adds that the group has had a standing research relationship with the University of Applied Science Zittau/Görlitz since 2004. Numerous student exchanges to and from both universities have been facilitated, resulting in excellent research work produced.



NWU'S PARTNER CONSORTIUM LAUNCHES VENTILATOR DESIGN COMPETITION FOR STUDENTS

For many Covid-19 patients who experience breathing problems, the difference between life and death is access to working ventilators.

During the Covid-19 pandemic, news reports have often highlighted the shortage of this lifesaving equipment and its related services – not only in South Africa, but also globally. This continues to be an issue of grave concern.

This is why a new competition by the Mahlale Innovation Consortium (MIC), of which the North-West University (NWU) is part, seeks to find alternative means for emergency ventilations. The quest is especially for equipment that can be used in states of emergency for the decentralized treatment of non-intensive care Covid-19 patients to reduce hospitalization.

The MIC has launched a competition that gives students an opportunity to design ventilator solutions and related services and business ideas that can make significant contributions to the fight against the pandemic. The aim is to flatten the curve of health-related pandemics such as Covid-19.

COMPETITION ELEVATES STUDENTS' INNOVATIONS

"The challenge enables participants to gain real industry experience, practical employability skills and enhanced business and people skills, all within a set time frame. The best ideas seem impossible at first, but in this new age they could change the world", says one of the competition judges, Prof Leenta Grobler, vice-chair of the project team and spokesperson for the competition.

Prof Leenta is the acting director for business development and stakeholder engagement at the NWU's Faculty of Engineering.

"The competition will encourage the new generation to rethink a positive future and to make more ventilators. Of course, being able to picture a future like this is not the same thing as knowing what to do to make it a reality, but by entering the competition we will help them to put their ideas into practice".

Registered South African students and learners can enter their creative and innovative ideas, concepts and self-improvised solutions in three categories.

The first category is an open category for any service or product that they have implemented to flatten the curve during Covid-19. The second is an innovation category for any new business idea, invention or innovation that can be used to combat Covid-19 or other health-related threats in the future, and the third category is an engineering category for any improvements, innovations or concepts that will reduce the shortage of ventilators in South Africa. The virtual prize-giving, took place on 30 June.

For more information on the competition or to enter, visit the MIC website at: http://mahlaleinnovationconsortium.co.za/

MORE ABOUT THE MIC

The MIC is an alliance of five higher-education institutions — the NWU, the Central University of Technology Free State, Tshwane University of Technology, University of Johannesburg and the Vaal University of Technology – in response to a request from the Manufacturing, Engineering and Related Services SETA (merSETA). MIC promotes the local manufacturing of ventilators to contribute to the South African government's National Ventilator Project.

NWU ENGINEERS TAKE UP THE CHALLENGE

As part of the consortium, the NWU is making significant contributions with a specific focus on digital health devices and remote monitoring.

"When newspapers all over the world flooded us with news of a critical ventilator shortage, merSETA reached out to academic institutions to address this shortage, but also to use this as an opportunity to address the skills gap in the medical device sector in South Africa", says Prof Leenta.

She says that as the NWU engineers spent time with healthcare workers in the local communities, they realized that there was another crisis behind the ventilator crisis.

"The biggest constraint was not the ventilators, but rather the number of trained intensive care unit (ICU) staff members who were able to monitor the ventilators. They have critical skills that cannot be transferred in a short period of time, making them the most critical resource to protect and empower".

Prof Leenta says the NWU's contribution to the Virovent Skills Challenge is a universal, non-invasive remote condition-monitoring system. It is a low-cost, high-impact digital system that enables remote patient care and support for ventilated patients both in hospitals and at home.

She says this comprises an online data-capturing device between the ventilator and the patient and a web-based remote monitoring dashboard that – in addition to detailed patient-specific information – also performs a digital solution to reduce the sensory overload of ICU staff.

"In doing so, our patented solution enables better outcomes for all: fewer nurses will be able to safely monitor larger numbers of patients, while we will also protect this critical resource – our ICU staff – during future pandemics".

Study into large-scale potential to store renewable hydrogen

Power fluctuations sometimes associated with renewable energy resources could become a thing of the past through research under way at the North-West University (NWU) on new and better ways to store hydrogen.

The HySA Centre of Competence (Coc) at the NWU explains the storage problem as follows:

Electrical energy produced from renewable energy sources such as wind and solar is used to generate hydrogen through the process known as water electrolysis. Hydrogen is then used as a fuel for proton exchange membrane (PEM) fuel cells to produce electricity and to mitigate the intermittency in renewable energy sources.

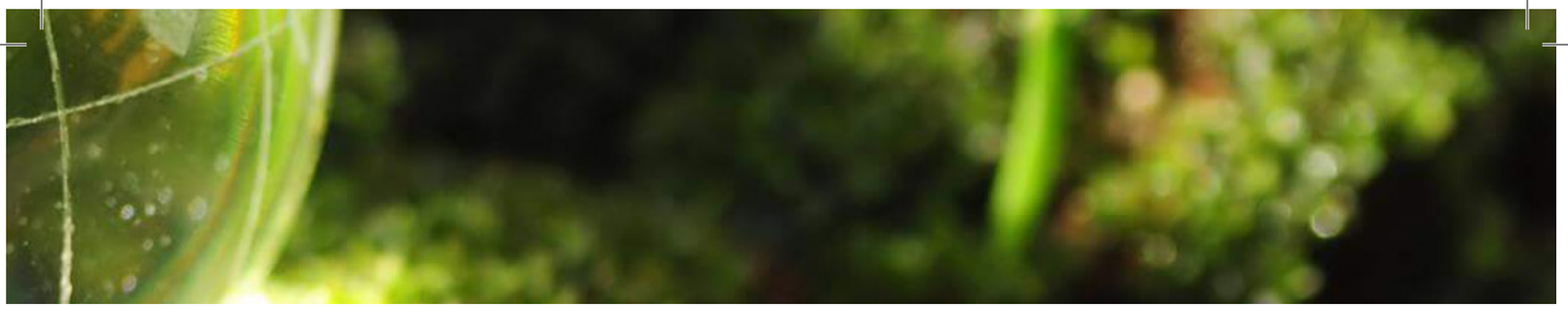
Despite this, there remains a need to store surplus energy in the form of hydrogen to eliminate power fluctuations.

HySA believes that resolving these fluctuations through better hydrogen storage methods could open up a host of possibilities for the application of renewable hydrogen, beyond stationary and mobile power applications. For example, renewable hydrogen can be used as a feedstock in many industrial processes, including for steel manufacturing, margarine production by hydrogenation of vegetable oils, floating glass production, chemicals and petrochemicals production.

These applications are currently limited, because hydrogen is difficult to store given its low volumetric density. Traditional hydrogen storage technologies are reported to be expensive, energy intensive and inefficient.

It is in this light that, HySA CoC, co-hosted by the NWU and the Council for Scientific and Industrial Research, and led by Prof Dmitri Bessarabov, has embarked on various research projects to seek alternative hydrogen storage methods.

One of these used Liquid Organic Hydrogen Carrier (LOHC) technology, where hydrogen is stored in the form of a heat transfer oil traded as Marlotherm-SH. This oil is a mixture of dibenzyltoluene isomers, which have been used in many industrial applications such as an insulating oil in electrical transformers, indirect heating of reactors, pharmaceuticals, etc.



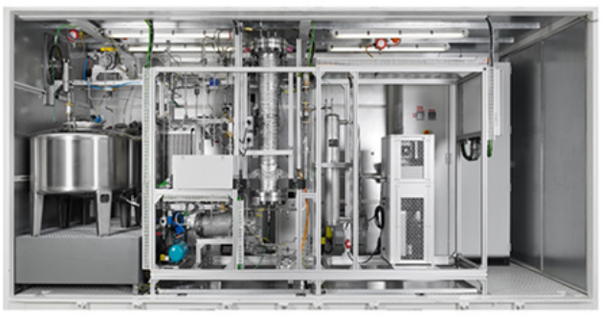
HOW LOHC WORKS

Renewable hydrogen produced from water electrolysis can be chemically bound to the LOHC molecule (for example, dibenzyltoluene) and in this way the handling of gaseous hydrogen is eliminated. This is simply hydrogen storage by a catalytic hydrogenation reaction to produce a hydrogen-rich molecule (perhydro-dibenzyltoluene). Hydrogen is released from this molecule through a catalytic dehydrogenation process, producing a hydrogen-lean molecule (dibenzyltoluene).

This is a reversible process and the molecule allows numerous cycles of hydrogenation and dehydrogenation.

Dibenzyltoluene can be stored under normal conditions (ambient temperature and pressure) for long periods of time without self-discharge, and this allows seasonal energy storage, according to HySA. Furthermore, dibenzyltoluene-based LOHC is non-toxic, non-flammable and non-explosive. Unlike diesel or gasoline, it is also not consumable and only hydrogen is released or stored.

This LOHC molecule is not classified as dangerous goods and can be transported using existing infrastructure for fuel, such as tanks, trucks and ships.



A pre-commercial hydrogenation plant procured in collaboration with Framatome GmbH.

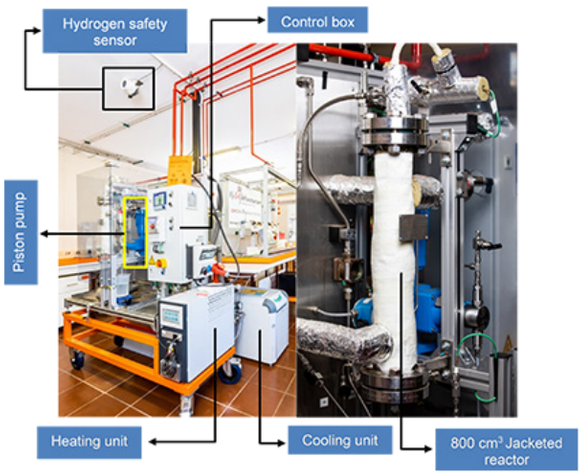
SOUTH AFRICA HAS POWERHOUSE POTENTIAL

HySA believes that South Africa has the natural resources to make it an international "powerhouse" for renewable energies in the future energy market. LOHC technology could play an important part in the storage, transport and trade of these renewable energies.

Currently the LOHC technology has been deployed in hydrogen refuelling stations for mobility and hydrogen logistics. The new developments are expanding in the rail and maritime industries.

So far, the LOHC technology in South Africa has only been piloted at HySA Infrastructure CoC. A pre-commercial scale hydrogenation system for the hydrogen storage has recently been commissioned jointly with Framatome, and is currently in operation. This system is fully automated and has the capacity to store 4 Nm3/hr of hydrogen.

These are exciting developments in the **promising field of renewable energies, with** results eagerly awaited as the hydrogenation project proceeds.



Laboratory-scale hydrogenation system.

THERE'S MORE TO WIND AND SOLAR POWER THAN ELECTRICITY

In the past decade, renewable energy sources such as solar and wind have made some inroads in supplying "green" energy to the country's power grid. To be self-sustainable with the use of renewable electricity, methods of energy storage are required, as solar and wind are naturally fluctuating and not constant sources of energy.

This is one of the research areas under investigation at the North-West University (NWU), but there is much more that solar and wind energy can do than just generate electricity, says Nicolaas Engelbrecht. He is a research engineer at the Hydrogen South Africa (HySA) Infrastructure Centre at the Potchefstroom Campus.

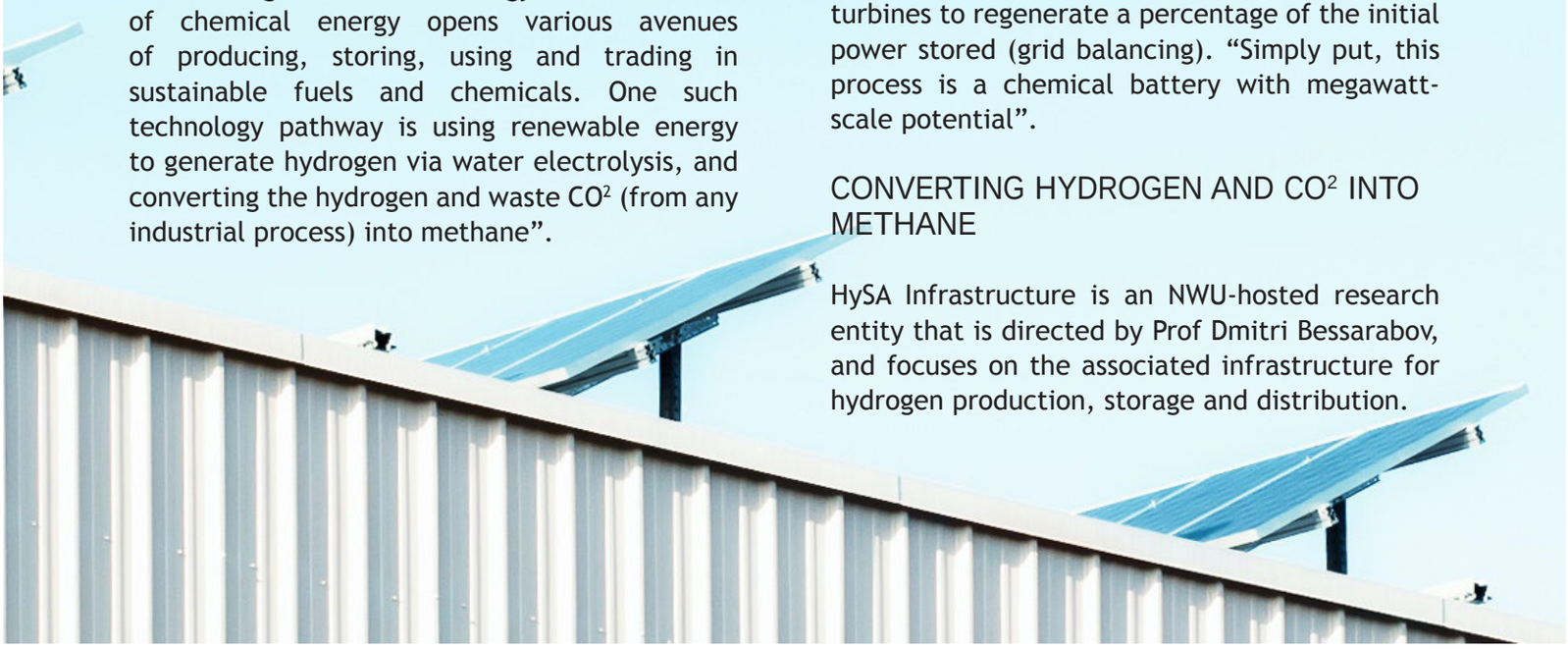
"Converting electrical energy into a form of chemical energy opens various avenues of producing, storing, using and trading in sustainable fuels and chemicals. One such technology pathway is using renewable energy to generate hydrogen via water electrolysis, and converting the hydrogen and waste CO^2 (from any industrial process) into methane".

Nicolaas says methane is known for its high-energy density, industrial-scale transport by ship and pipeline, its combustibility to regenerate power in gas turbines and, recently, its use as an automotive e-fuel (a fuel that is not of fossil fuel origin, and made from renewable sources)."The fact that the synthesis of methane recycles CO^2 – the primary culprit in global greenhouse gas emissions – makes this methanation process carbon neutral".

According to him the concept of renewable energy storage is such that during a surplus of renewable electricity, methane is produced and stored. He says when the demand for electricity increases or the solar and wind potential is particularly low, methane is combusted in gas turbines to regenerate a percentage of the initial power stored (grid balancing). "Simply put, this process is a chemical battery with megawatt-scale potential".

CONVERTING HYDROGEN AND CO^2 INTO METHANE

HySA Infrastructure is an NWU-hosted research entity that is directed by Prof Dmitri Bessarabov, and focuses on the associated infrastructure for hydrogen production, storage and distribution.



A methanation technology demonstrator was recently developed, built and tested at HySA. The core of the demonstrator features a micro-engineered reactor that supports the catalytic reaction of hydrogen and CO^2 into methane.

The reactor was built in collaboration with the German Fraunhofer IMM research institute.

“The reactor contains 1 800 microchannels which support heat and mass transfer properties that are not typically achievable with conventional reactor technologies”, says Nicolaas.

The reactor has a dual purpose as a heat exchanger, as during the methanation process about 18% of the total chemical energy is converted into heat, which is recoverable for use elsewhere.

Nicolaas says although the methanation process has been demonstrated at laboratory scale only, a processing capacity of close to 1 kilowatt (kW) was achieved at an overall efficiency of up to 76%.

“This efficiency is deemed high considering the size of the reactor investigated here. The production of methane is therefore a viable method of storing renewable energy in a chemical form for various end-uses”.

Other multifaceted research is under way at HySA Infrastructure, such as the conversion of a significant portion of 55 kW photovoltaic sun energy into renewable hydrogen at the NWU’s Faculty of Engineering.

The facility has a hydrogen storage capacity in the order of 4,5 megawatt-hours (MWh). The energy park also supports the storage of hydrogen in other chemicals such as long-chain organic molecules with significant hydrogen storage capability (LOHCs), and in the future, there are plans to investigate ammonia for hydrogen storage as an equally promising technology route.

Nicolaas says HySA Infrastructure is further active in postgraduate student training, research publication and attracting third-party and international funding towards the NWU.

“Other currently active projects include the purification of typical industrial and hydrogen-containing gas streams, hydrogen compression via electrochemical methods, the flameless combustion of hydrogen for high-quality heating, as well as safety applications, and an extensive project portfolio on high energy density LOHCs”.

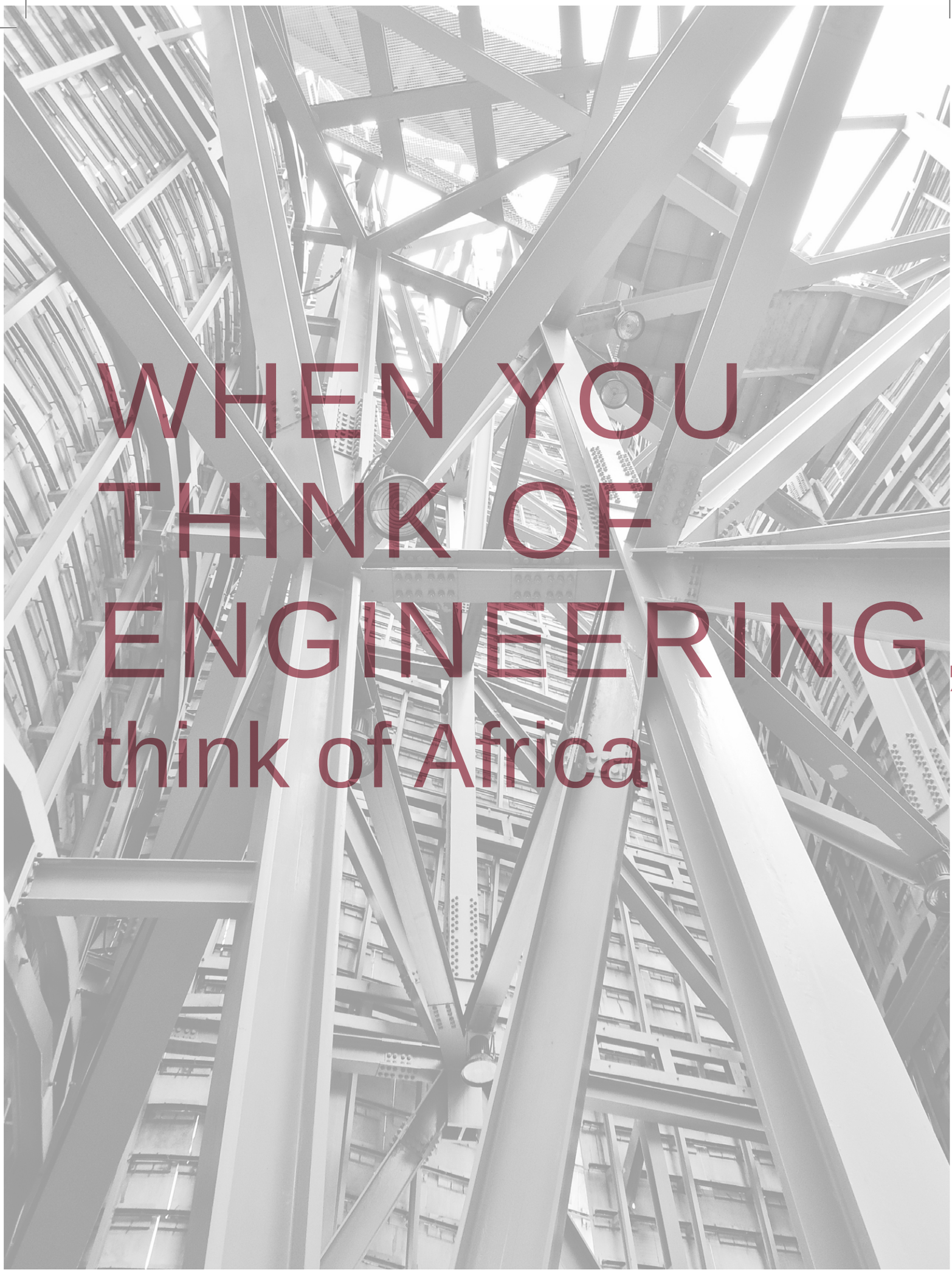
Recent scientific publications related to this article:

N Engelbrecht, RC Everson, D Bessarabov. 2020. Thermal management and methanation performance of a microchannel-based Sabatier reactor/heat exchanger utilising renewable hydrogen. Fuel Processing Technology, 208:106508. https://doi.org/10.1016/j.fuproc.2020.106508

M du Toit, N Engelbrecht, SP Oelofse, D Bessarabov. 2020. Performance evaluation and emissions reduction of a micro gas turbine via the co-combustion of H2/CH4/CO2 fuel blends. Sustainable Energy Technologies and Assessments, 39:100718. https://doi.org/10.1016/j.seta.2020.100718

HySA’s renewable hydrogen-to-methane demonstrator.

Nicolaas Engelbrecht, a research engineer at HySA, says there is a lot of potential for solar and wind energy beyond just electricity.


WHEN YOU
THINK OF
ENGINEERING,
think of Africa

When you think of engineering, German engineering in particular comes to mind, while it is extremely uncommon to think of Africa. This is the opinion of Mia Mangaroo-Pillay, an industrial engineer and lecturer at the North-West University's (NWU's) School of Industrial Engineering.

Through her PhD thesis titled "A Lean implementation framework encompassing South African Ubuntu", Mia's goal is to showcase the value of indigenous African knowledge in the engineering sphere so that when people think of engineering, they think of Africa". (The basic idea of "Lean" is to maximise productivity and customer value while minimising waste.)

Mia is completing her PhD in industrial engineering with the NWU and her study intends to design a Lean implementation framework that is customised to South African culture.

"My study aims to incorporate Ubuntu management principles into a Lean implementation framework", she says.

Her study focuses on Lean philosophy, which is a continuous improvement philosophy for businesses. While Lean has its origins in the car manufacturing industry, it has since expanded into other industries and is associated with the improvement of an organisation, eradication of waste, and an increase in profits.

Lean may have become a global phenomenon, says Mia, but it has suffered a low successful implementation rate which some attribute to a misunderstanding of the philosophy.

"However, it is widely known that Lean is not just a toolkit for business, but rather a cultural change that an organisation should make".

For successful implementation, buy-in and commitment are required from all levels within the organisation. Mia says research suggests there is a need for local adaptations of Lean for successful implementation.

"But, with South Africa being a rich melting pot of diversity, it is hard to say we have 'one culture'. However, Ubuntu is the one cultural phenomenon that all South Africans understand. It is a part of us and how we live as a nation and is akin to our national culture", she says.

"The research suggests that, incorporating Ubuntu management principles into a Lean implementation framework, will bridge the gap in understanding Lean".

With this framework, Mia says South African organisations will be able to implement Lean with better buy-in from employees.

"I believe that this research also gives us the platform to showcase that indigenous African knowledge has a part to play in, and can make a valuable contribution to the field of engineering".

Mia Mangaroo-Pillay

Whisper's PhD research could help South African industry embrace digital transformation

Just as offices, shops, classrooms and lecture halls are embracing digital transformation and the Fourth Industrial Revolution, so must the manufacturing industry.

Known as Industry 4.0 or I4.0, the transformation is essential for the sustainability of local manufacturing. This prompted a PhD Engineering student at the North-West University (NWU) to help the South African industry develop the skills and competencies needed for a digital future.

For his PhD Engineering research, Whisper Maisiri is conducting a study titled "Developing an Industry 4.0 competency maturity model (I4.0CMM)". The model he is developing will be used to assess and guide I4.0 competency requirements and development using industrial engineering capability functions.

"Factors that inhibit the sustainable adoption of I4.0 have not been contextualised to the South African manufacturing environment in literature, and I4.0 skills requirements in the engineering profession are not clearly defined", he explains, adding that there is a lack of tools to assess and align workforce competence with I4.0 requirements.

"Embracing and adopting I4.0 is unavoidable for manufacturing organisations to survive and grow their global competitiveness. However, I4.0 is not a 'one-size-fits-all', and exploring ways to achieve the sustainable adoption of I4.0 in developing countries such as South Africa is essential to achieve inclusive and sustainable development growth".

According to Whisper, a significant amount of research has focused on technological advancement and little attention has been given to human factors. Realising that people are the true authors of the digital story and that successful sustainable adoption of I4.0 depends on technology and people, he decided to focus on the human side. Specifically, he is focusing on competency requirements and development in engineering.

"Competency requirements and competency development are directly linked to the South African National Development Plan and the United Nations 2015 Sustainable Development Goals. Both feature and emphasise an end to poverty and protecting the environment, and include prosperity.

If people have the right competencies (knowledge, skills and abilities), I4.0 and future developments could be sustainably adopted in developing countries such as South Africa. Therefore, focusing on developing an I4.0CMM was essential to me", says Whisper.

He notes that the I4.0CMM model could add value in aligning skills development and industry skills requirements.

"The industry can use the model to assess the 'as-is' I4.0 capabilities of their workforce and provide guidance on the employees' skills requirements to contribute meaningfully to I4.0 and future requirements.

Furthermore, the model could add value in guiding engineering education to develop graduate attributes that will meaningfully contribute to the adoption of I4.0 and future developments in the manufacturing industry."

Whisper's PhD study is supervised by Prof Liezl van Dyk and co-supervised by Dr Rojanette Coetzee. So far Whisper has five publications – one in an international journal, three in local journals and one an international conference proceeding – that are available online.

Whisper Maisiri

RESEARCH OUTPUTS

Maisiri, W. & Van Dyk, L. 2019. Industry 4.0 readiness assessment for South African Industries.

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Young female innovators shine during Modiragatsi Youth Innovation Competition

The Fourth Industrial Revolution is upon us and the Faculty of Engineering at the North-West University (NWU) and its partners understand that it is necessary to equip the youth with skills that will benefit them in the long run.

In 2019 the Faculty of Engineering and the Manufacturing, Engineering and Related Services Sector Education and Training Authority (merSETA) joined forces to develop and support future female innovators through the Modiragatsi Youth Innovation Competition.

This year, Siemens and KISCH IP came on board to further augment the experience. Prof Leenta Grobler, director for business development and stakeholder engagement at the Faculty of Engineering, then expanded the initial offering into a fully-fledged innovation incubator for South African youth.

During this year's winter recess, 120 high school learners between the ages of 15 and 18 as well as 80 university students completed an extensive online course in design and computational thinking, user experience design, mobile application development, intellectual property protection and start-up conceptualisation and pitching training.

Learners then had the opportunity to enter the Modiragatsi competition in any of the five categories, with the top spot of overall winner also up for grabs.

Each of the category winners walks away with an intellectual property evaluation by KISCH intellectual property director Ursula Baravalle, who leads the Patent Department, and Izaan Kuschke who is a senior associate.

The category winners will also be aided in the development of a prototype of their idea by the NWU's Faculty of Engineering, and will receive entrepreneurship mentoring by Prof Grobler. They also win free attendance to one of the Faculty's Engineering Saturdays and two short learning programmes of their choice presented by the faculty.

Paballo Diyase from the High School for Girls in Potchefstroom came out on top in the Healthcare category and was also announced the overall winner. In addition to the prizes she won as category winners, she walked away with a R80 000 scholarship from Siemens to study engineering, and an all-expenses-paid technology tour to Europe for her and her teacher.

"Throughout the competition, I was challenged to push my innovation and creativity to the next level with regard to problem solving. I also enjoyed interacting with the other young ladies who were just as driven to address the problems faced by our society", says Paballo.

"This competition has allowed me to make new friends from all over the country. Karin Schutte, an NWU mechanical engineering student, was my mentor. She helped and guided me and was pleasant to work with. Overall, the experience was empowering and insightful".

HERE ARE THE FIVE CATEGORY WINNERS:

Food, Energy and Water category: Onkagile Baraganye and Refentse Lekgoane from Setswakgosing Secondary School for their Agro-Tswaing Food Security App. In this category, honourable mention was made of the Smart Water Meter concept of Christine Esterhuizen and Emma Nel from Eunice High School for Girls.

Gender-based Violence Prevention category: Neo Thobejane from Marobathotha High School for her GBV navigator.

Healthcare category: Paballo Diyase from The High School for Girls in Potchefstroom for her Nutri-spoon.

Nature Conservation and Tourism category: Hesme van Aswegen and Isabella Ramos from Eunice High School for Girls for their home-use waste to energy concept.

Township Economy category: Hannia Kempen and Kerryn Hodgson from The High School for Girls in Potchefstroom for their sorting plastic collection trolley.

2020 WINNERS ANNOUNCED

The 2020 Modiragatsi Competition was postponed due the Covid-19 lockdown, and therefore these entries were evaluated in conjunction with the 2021 entries.

The top four entries were:

- Amy Vockerodt and Nina Mertz from Hoërskool Waterkloof
- Caitlin Stapelberg from Leeuwenhof Akademie
- Caleigh Avery from Edenvale High School
- Thobeka Mkhonza from Thanibezwe High School

The winners of the Student Accelerator competition where NWU students had to solve various problems using technology, were Maiar Ahmed for her Smart Purifying Facemask, and Nelize Van Schalkwyk for her Nova Workout Management App.

The NWU applauds the Faculty of Engineering and merSETA for a job well done. We look forward to the future innovations the annual Modiragatsi Youth Innovation Competition will yield.

Paballo Diyase from the High School for Girls in Potchefstroom is the overall winner of the 2021 Modiragatsi Youth Innovation Competition.

The overall winner for the 2020 Modiragatsi competition was Amy Vockerodt and Nina Mertz from Hoërskool Waterkloof for their illuminating safety glove for car guards.

CREATING APPETITE TO STUDY

engineering

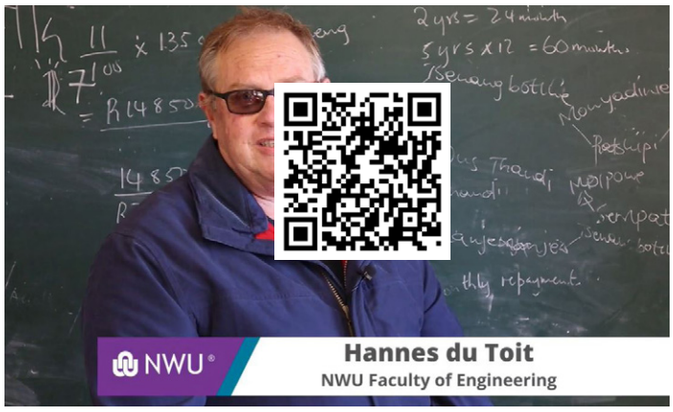
Engenius Kids is one of the Engineering faculty's initiatives for high school learners where they can get a taste of what it's like to think like an engineer.

The aim is to expose high school learners to the different engineering fields and motivate them to work hard in school.

We make engineering fun while educating the school learners on engineering concepts. This opens the door for appetite to study engineering.

See the video below of our Engenius Kids initiative for 2021.

https://www.youtube.com/watch?v=f_jnRClhYCQ



AWARDS CEREMONY

30 SEPT 2021

The faculty held its annual awards ceremony on 30 September 2021, to celebrate the top performing students from 2020. Although they have their masks on, the proud smiles are visible in their eyes. We are delighted with this young group of upcoming engineers!

We are proud of these Smarty Pants!

INGENIUM – our ingenious project

Ingenium is the liaison project of the Faculty of Engineering is handled by the students themselves. It aims to make a positive social impact in the local community.

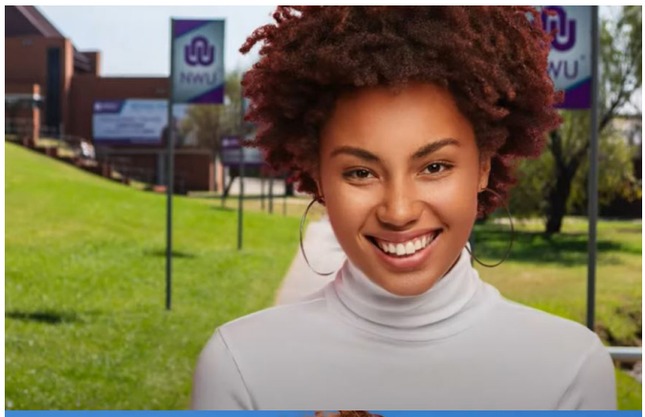
Here, the aim is for our students to successfully share their accumulated knowledge and skills, such as extensive critical thinking, problem solving and manufacturing, with their community.

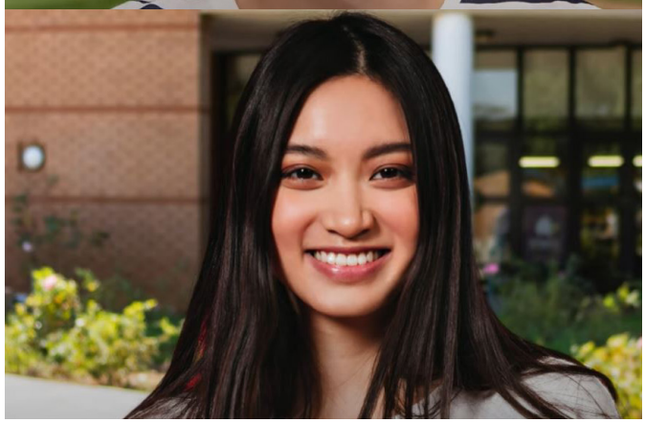
A further - secondary - aim of the project is to expose students, especially at the Faculty of Engineering, to the socio-economic problems facing their fellow citizens. This will hopefully lead to increased sensitivity to the problems and ultimately to combating them.

The Academic council within the Student Campus Council, awarded Ingenium as the best Student Rag Community Service Academic Student Council (ACC) for the term 2020/2021.

They also obtained second place on the overall ranking list of ACC and received a third placement for the Word Wise Week.

CELEBRATING A MILESTONE





Graduating in the year 2021 had its challenges. Because of the global Covid-19 pandemic, we could not offer an on-campus graduation ceremony. We still virtually celebrated them on 30 April 2021, as they graduated into a time of great opportunity.

The world needs poets, educators, philosophers, scientists, analytical scholars, engineers, business people and entrepreneurs. We want to change the world for the better.

We do this, first, by educating and developing exceptional engineers who can and want to change the world and, secondly, by finding answers to current and future real-life challenges of our industries and communities, through our cutting-edge as well as applied research.

After witnessing the many graduates' names at the ceremony, we can proudly say that we are able to change the world for the better.

A campaign was launched on the university's social media platforms. Allowing you to virtually capture a moment in front of special landmarks across our campuses.

You can re-visit the virtual graduation ceremony here:

P R O M O T I O N T O

A Full Professorship is granted as an honorary title and position. To achieve this title is **significant. The position** comes with greater prestige, with the aim to focus more on research. The professor is a symbol of what the university is all about, what learning and research essentially are and is the public face of the university.

By accepting the tile of professor, these people are called upon to transcend the boundaries of the discipline, to think big thoughts, dream big dreams and share those ideas publicly. And this is exactly what the following staff members has done.

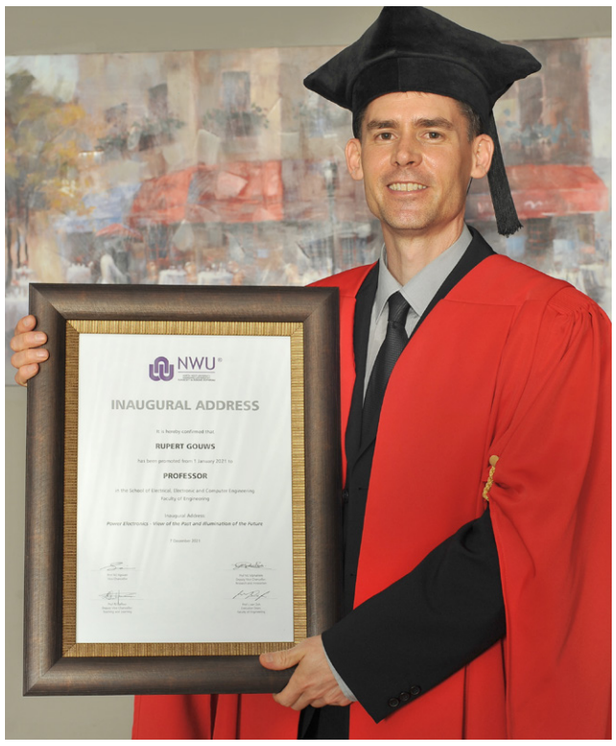
PROF KENNETH RICHARD UREN

Prof Kenny Uren's research focuses on applying energy-based analysis and graph theory to characterise, monitor and control large-scale industrial systems. These complex large-scale systems introduce unique challenges such as system nonlinearities and multi-domain physics.

It is envisioned to develop new control techniques based on energy signatures (pictures) that are identified as optimal for a specific plant. It is foreseen that these control techniques will play an increasing role in the current Industry 4.0 realm. In all this, the core requirement is to be able to develop dynamic systems models.

Through mathematical models we can gain insight into real-world systems. This however requires both scientific knowledge but also skill that are only gained through experience, hence the research title: "Dynamic systems modelling: A Science or an art?"

FULL PROFESSORS



PROF RUPERT GOUWS

Prof Rupert Gouws gave his inaugural lecture on: "Power Electronics – View of the Past and Illumination of the future".

As the need for green and effective utilization of energy continues to grow, the advancements in the energy and power electronics industry are constantly driven by this need, as both industries are intertwined for obvious reasons.

Power electronics is the application of solid-state electronics to the control and conversion of electric power.The developments in the power electronics industry has over the years hinged on the progress of the semiconductor device industry.

The semiconductor device industry could be said to be on the edge of a turn into a new era, a paradigm shift from the conventional silicon devices to the wide band gap semiconductor technologies.

"While a lot of work is being done in research and manufacturing sectors, it is important to look back at the past, evaluate the current progress and look at the prospects of the future of this industry". Prof Gouws shared.

PROF DMITRI BESSARABOV

Prof Dmitri Bessarabov is leading research and technology development in the area of electrolytic hydrogen production, with focus on proton-exchange membrane (PEM) technology, as well as hydrogen storage and applications. His last research was titled: "Membrane Science and Technology for Hydrogen Applications".

One of the key objectives includes development of the technology to reduce the costs of hydrogen production and storage. Multidisciplinary approach is used, including computer modelling, material science, and electrochemical engineering.

NWU®

A year in the life of the

NWU FACULTY OF ENGINEERING 2021