

A year in the life
of the NWU
Faculty of
Engineering



NWU - FACULTY OF ENGINEERING

WE DO NOT RUN FROM CHALLENGES - WE RUN TOWARDS **SOLUTIONS!**

The NWU Faculty of Engineering functions as a dynamic training hub for world-class, versatile and innovative engineers.

We focus on equipping engineers and researchers for integrated energy as well and Industry 4.0 solutions. We are the BRICS University Networks partner on energy.

INTERNATIONALLY KNOWN

The BEng programmes of the faculty are formulated to meet not only the set requirements of the Engineering Council of South Africa (ECSA), but also to equate internationally by means of the Washington Accord. Member countries that ascribe to the Washington Accord include Australia, Canada, Chinese Taipei, Hong Kong China, India, Ireland, Japan, Republic of Korea, Malaysia, Russian, New Zealand, Singapore, South Africa, Sri Lanka, Turkey, the United Kingdom, and the United States of America

THE FACULTY CONSISTS OF FOUR SCHOOLS WITH EIGHT **UNDERGRADUATE PROGRAMMES:**

Chemical and Minerals Engineering

- Eng degree in Chemical Engineering
- BEng degree in Chemical Engineering with Minerals Processing

Electrical, Electronic and Computer Engineering

- BEng degree in Electrical and Electronic Engineering
- BEng degree in Computer and Electronic Engineering
- BEng degree in Electromechanical Engineering
- BEng degree in Mechatronics Engineering (Brand new as from 2020)

Mechanical Engineering

- BEng degree in Mechanical Engineering
- BEng degree in Electromechanical Engineering

Industrial Engineering

BEng degree in Industrial Engineering

RESEARCH CHAIRS

- DST/NRF Chair in Coal Research (SARChi)
- DST/NRF Chair in Biofuels and Other Clean Alternative Fuels
- DST/NRF Chair in Nuclear Engineering (SARChi)
- ESKOM EPPEI Specialisation Centre for Emission Control

RESEARCH ENTITIES

- Centre of Excellence in Carbon-based Fuels
- Unit for Energy and Technology Systems
- Multilingual Speech Technologies (MuST)

HOSTED ENTITIES, PLATFORMS AND INSTITUTES

- DST HySA Infrastructure Centre of Competence in hydrogen production, storage, reticulation and safety codes and standards
- DTI Centre for Advanced Manufacturing

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THE NUMBERS SPEAK FOR THEMSELVES













staff:







students:

in faculty:

students:



CUTTING-EDGE RESEARCH WITH MASTER OF ENGINEERING (MENG)

- Chemical Engineering
- Computer and Electronic Engineering
- Electrical and Electronic Engineering
- Computer and Electronic Engineering
- Industrial Engineering
- Mechanical Engineering
- Nuclear Engineering
- Development and Management Engineering

Master of Science in Engineering Sciences (MSc): (fully research-based)

- Chemical Engineering
- Computer and Electronic Engineering
- Mechanical Engineering
- Nuclear Engineering

Philosophiae Doctor in (PhD):

- Chemical Engineering
 Computer Engineering
 Computer and Electronic Engineering

- Electronic Engineering
 Electronic Engineering
 Electrical Engineering
 Electrical and Electronic Engineering
 Mechanical Engineering
 Nuclear Engineering
 Industrial Engineering

Postgraduate diplomas in Engineering:

Postgraduate Diploma in Nuclear Science and Technology

Short courses and training centre:

- Siemens training centre
- Various short courses on integrated energy solutions

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A message from the Dean Prof Liezl van Dyh

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-disciplinary 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 2019 narrative. In this publication you will find selected stories from 2019 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 2020 story of our Faculty together with all of you.



Faculty of Engineering celebrates exceptional alumni

He is an alumnus of the North-West University (NWU), an entrepreneur and a professional engineer whose expertise and experience are recognised in the international arena of distillation, heat exchange, absorption, gas scrubbing and related process operations.

He is the founder and CEO of the company Mass & Heat Transfer Technology Pty Ltd, and we are proud to call him one of ours!

Christo van den Heever was recently inaugurated in the Faculty of Engineering's Alumni Hall of Fame during a formal occasion that was held at the NWU's campus in Potchefstroom.

Christo matriculated at Welkom Gimnasium and graduated from the former Potchefstroom University for Christian Higher Education in 1982.

He has 35 years' experience as a certified, professional mechanical engineer and currently performs work of a conceptual nature in engineering, design and development. He provides guidance to senior and lead process engineers, mechanical engineers and project managers.

Christo's engineering company was responsible for the designing, construction and commissioning of South Africa's first continuous hydrothermal liquefaction

plant, which was launched at the NWU in March 2017. This resulted in the production of bio-oils, bio-char, bio-chemicals and bio-gas, and the research is headed by Prof Sanette Marx.

Christo is also the sponsor of an annual third-year student engineering competition at the NWU, which demonstrates his loyalty to and good relations with the faculty.

"My advice is to rather do everything in your power to offer value for the client's money spent, than trying to impress or please the client."

Under his mentorship, the design and fabrication of various plants saw the light. They include:

- Forty-six chemical plants of various types and products
- Five beer and cider brewing plantsTwo grain whiskey plants, and one
- Iwo grain whiskey plants, and or craft whiskey plant
- More than 520 heat exchangers
- More than 120 distillation columns

When asked about his recipe for success, Christo says it's not about making money, but rather about identifying a need that people might have regarding businesses, and fulfilling it properly.

"Success requires hard work and includes a lot of failed attempts," he says. "It also requires a ather do everything in your power to offer value for the client's money spent, than trying to impress or please the client. When you do that, you are focusing on the project's outcome. Also remember that money does not equal success – the feeling of positively contributing towards a need, now that's success," he says.

About his inauguration in the Faculty's Alumni Hall of Fame, Christo says it's an unexpected and very special gesture that he will cherish forever. "For the very first time in my 35-year career, I've been told that I'm 'successful'. I usually just get a 'thank you for the work done', or a payment in my bank account. This is a very special moment in my life and I am honoured to receive this special award," he says

It is a great honour for the NWU to inaugurate Christo van den Heever as an Esteemed Alumnus of the Faculty of Engineering.





NWU Engineering leaves a

sweet, bitter and creamy taste

Final-year students from the School of Chemical and Minerals Engineering at the North-West University (NWU) recently had the opportunity to show that their course entails much more than poring over their books.

These aspiring engineers competed against one another to see who could produce the best beer, cheese or chocolate.

Although producing these products forms part of the annual curriculum, the Faculty of Engineering decided that this module

should not stop at the theory in the class-room.

Professor Quentin Campbell, director of the School of Chemical and Minerals Engineering, attended this day in person to show his support to these students.

"The beer, chocolate and cheese competition is held to show that academic activities need not be boring," says Prof Campbell. "Engineering focuses on empowering the students to showcase the theory that we teach in class in a practical

manner. If one can have fun while doing it all the better."

Route 96, a local brewery in Potchefstroom, made their facilities available to the faculty for this function. It was the most suitable place for the students to not only present their own beer, but to also learn from professional craft beer producers in our midst.

Marco van Deventer, manager of Route 96, was very chuffed with the attendance on the day. "In future I would like to give











the students a tour of our brewery before they start making their own beer, just to share a few tips from the industry with them."

The day started with students running about to decorate their own stalls according to the theme of their beer. Among the Chemical Engineering students each group had to brew a beer and make two kinds of cheese – a hard cheese and a soft cheese.

The Mineral Engineering students' assignment took them to chocolate and liqueur, where a lot of interesting combinations saw the light.

The excitement was high when the judges stood ready to review every beer, cheese, and chocolate. There was a panel of judges where a few well-known Potchefstroom faces could be seen – among others Fanie Smit of Garnish catering services, Lukas van Deventer, owner of

Route 96, and André Swanepoel, representative of the craft beer guild of Potchefstroom.

"The general feeling of the judges was that this year's standard was much higher than that of last year," says André Swanepoel. "This year's Chemical Engineering students impressed the judges with their high-quality beer that was presented excellently."

He also mentioned the importance of involving external judges and moderators. "The public is also invited to come and give their opinion about the beer. This is an important process for the continuation of the curriculum. I am also very excited about the contribution that this event makes to the culture of craft beer in Potchefstroom."

The overall winner of the beer brewing was the team called VaalBrau. The team consisted of Caitlin van der Mer-

we, Rainere Cilliers, Kelebogile Chokoe, Albert Hartley, Chanelle-Marié Koen and Leandri Dekker. This group of final-year students made an American Pale Ale that won them a first place. VaalBrau's hard cheese, a gorgonzola with three different flavours – a chilli, an apricot and a fig – also won the first prize.

The John Beer group won the prize for the best soft cheese with their presentation of a pepper Feta. Nikki van Tonder, Marcus Keulder, Schalk Kok and Julian Pretorius are the proud members of this group.

Jonedine van der Merwe and Anel Scheepers walked away with the first prize for chocolate and liqueur.

Of course, a genuine Beer Pong League was part of the day after all formalities were completed, and the students and the public could end their day on a high note.



NWU ensuring relevance in the teaching environment

As a strategic initiative to ensure relevant and up to date study modules and programmes for students, the North-West University's Centre for Teaching and Learning (CTL) unit has launched various workshops for academic staff where the opportunity is given to transform and update these modules and programmes.

Recently, a two-day workshop was presented to academic staff of the Faculty of Engineering. The workshop facilitator. Dr Andre Bechuke, says the CTL's ultimate goal is to inspire academic staff to enhance their skills in terms of both teaching and learning and to provide academic support to students on their path to academic success. "Carpe Diem is the workshop we present, which provides lecturers with the opportunity to redesign or review their programmes or modules, while they are guided through structured activities and work collaboratively within multidisciplinary teams. As a process, it focuses on effective learning design where learning outcomes are scaffolded and aligned to content, activities, assessment, and feedback, along with the embedding of innovative teaching practices and digital technologies."

The NWU's Deputy Vice-Chancellor for Teaching and Learning, Prof Robert Balfour, explains the importance of developing the NWU's academic staff. "Teaching and Learning are the core business of higher education in South Africa. The quality of education, whether in continuing education, post- or undergraduate programmes, depends on academic knowledge, skills and the andragogic knowledge utilised and developed by academics to ensure that teaching and learning are collaborative and should lead to critical, innovative and stimulating thinking. Student as well as staff development is complementary in terms of our commitment to a quality education experience," Prof Balfour savs.

The first step in the Carpe Diem process is to identify the essential aspects of the module or programme that will be redesigned or reviewed. This is followed by the compilation of a storyboard prototype which entails the unpacking of the learning, teaching and assessment of the module. The aim is to demonstrate how the module components align and form a logical flow. Academic staff then has to build a prototype of the revised modules

or programmes. This includes developing activities and testing them in a real and practical manner. This step also serves as a screening opportunity to establish whether the face-to face and online components of the course will complement each other.

According to Dr Bechuke, teams then get the opportunity to test each other's module designs and activities. "Valuable feedback is provided according to an evaluation form that addresses aspects such as inclusivity, active engagement, authenticity and alignment. During the steps of reviewing and adjusting, teams use the feedback gained in the previous steps and work together to refine their design. Prototypes are improved by making alterations where needed. Resources that will be needed are listed, clear deadlines are set and ultimately, the responsible persons are nominated to roll-out and complete the design."

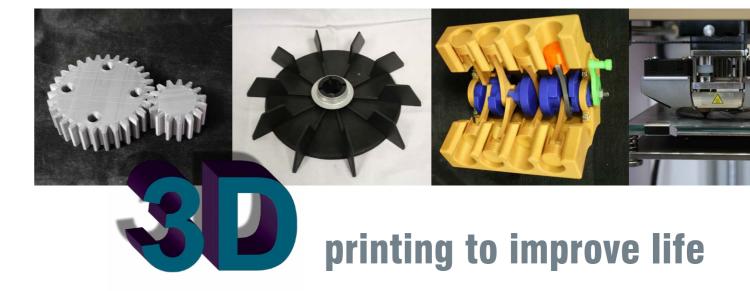
This is just another initiative from the North-West University to ensure that students get a well-rounded, quality education that will empower them to enter the professional labour market.







Group photo from left to right: Santie Pieterse, Maria van Zyl, Lisa van der Westhuizen, Vanessa Olivier, Liana Venter, Kobus le Roux, Ruveix van Coller, Prof Kenny Uren, Tabitta Lalendle, Dr Andre Bechuke.



Staff and students at the North-West University's Engineering Faculty are in the process of giving the traditional way of manufacturing products a huge blow by implementing their wide variety of world class three-dimensional printers.

According to CP Kloppers, a Mechanical Engineering lecturer, the purpose of this easier and faster way of manufacturing, is to give the community access to products that will make life a bit easier.

"We have three-dimensional printers that can basically print any product from plastic, various types of metals and carbon fibre. If a household product may have broken, or you need to manufacture an ornament, toy, invention or part of a specific device, we're here to assist in manufacturing it at a very affordable price. We have even manufactured artificial limbs," he says.

The Makerspace Center was established at the School of Mechanical Engineering in Potchefstroom to do just what it says to take product ideas from individuals and to help them create a final, useful product. Kloppers says they already deliver a variety of products at commercial level, but their aim is rather to promote the growth of this technology. "We manufacture a few parts for a South African aviation manu-

facturing company which then supplies it to Boeing and Airbus. For this purpose, we must meet the highest standards and use only the best materials. Because of the fact that we are part of a university, our goal is not to make money from this, but rather to promote research outputs," he says.

The 3-D printer revolution is relatively new to South Africa, and Kloppers believes it will cause a total change in the commercial and medical manufacturing industry. "At international level, there is a lot of funding and research spent on this. We just bought a bio-printer which enables us to print organic material. The reality of this is that human cells can be used to be reproduced as human tissue. This may sound absurd, but theoretical research has already shown that bio-printing technology can print "living" skin, organs, a nose or an ear that originates from a person's own cells. In the event of injury to a person in a fire or car accident, his own cells can be reproduced and transplanted as human tissue. The chances are then quite slim that it will be rejected by the body, mainly because it is reproduced from the same original tissue. However, this is a reality that might only be available in future, but the point is, the technology already exists. Much research needs to be done and ethical clearance must be in

place before we can start experimenting with this." he says.

Kloppers says, as part of their community involvement, they have established various entry level 3-D printers and computers at the local Ikageng Township, to create awareness about this technology. "We have a few masters degree students who visit the centre on a weekly basis to evaluate community members' manufacturing ideas and assist them with expertise. We then train them to work with a 3-D printer. The result is to manufacture a product that will improve individuals' lives. "The Department of Science and Technology provides funding for this and sees it as a way to stimulate entrepreneurship. If an individual designs and manufactures a product, it may lead to a business that will make a positive contribution to the country's economy," he says.

With this manufacturing facility, the NWU aims to positively influence students' thinking by demonstrating that nowadays, the production or manufacturing of almost anything, is possible. "With this technology we can move away from slow and often unaffordable manufacturing processes. We must use it to our advantage," Kloppers says.

For more information on this, CP Kloppers can be contacted at 018 299 1316 or cp.kloppers@nwu.ac.za.







Once you meet an academic researcher, it often does not take long to realize whether this person has a true passion for his work, or if it it's just a day job which pays the bills. When you meet Professor Elvis Fosso-Kankeu, a researcher at the North-West University's Faculty of Engineering, it quickly becomes evident that one has to do with a researcher that will do everything in his power to benefit humankind.

His research within the School of Chemical and Minerals Engineering has recently been awarded with the Engineering Research Capacity Development Award at the recent national NSTF-South32 Awards. These awards are the largest science, engineering, technology and innovation awards in South Africa and are known as the "Science Oscars" of recent times.

Prof Fosso-Kankeu received the award for his research contribution towards the improvement of water quality in the country. His research focuses on the prediction of the dispersion of inorganic and organic pollutants from industrial areas into the water sources, the monitoring of surface water quality and development of sustainable treatment methods for the remediation of water pollution.

He has pursued a particular interest for work in communities affected by extreme water scarcity and pollution as well as on innovative technologies to assist the power industry to minimise their footprint by ensuring a zero liquid effluent discharge. He has therefore coupled community-based projects with innovative projects and explored a wide range of avenues to disseminate his findings.

In recognition of his expertise, he is continuously invited by international peers to review manuscripts. He is currently reviewing for more than 21 internationally accredited journals and served as external examiner of more than 25 thesis and dissertations from various universities. Prof Fosso-Kankeu published around 160 papers including conference proceedings, journal articles, book chapters and books; more than 120 of these were published in the last five years.

He has also been involved in the mentoring and supervision of more than 60 fourth year students and more than 12 masters and PhD students from several universities successfully completed their degrees. He is currently supervising 8 fourth year students, five Masters students, six PhD students and one postdoc fellow.

"I am currently teaching two modules directly related to my research, namely Biotechnology II and Separation Processes II. It is therefore with all the enthusiasm that I carry out my task, keeping the students up-to-date with the recent development."

Prof Fosso-Kankeu is so humbled by his recent award - it is almost as if he is re-

luctant to talk about it. When one receives such an award, the feeling of accomplishment and value is overwhelming. The feedback you receive from your peers is quite amazing and is much appreciated. To me, this means that my research has significant impact on changing people's lives for the better. Access to water, specifically on the African continent, remains an alarming issue. I will continue to do everything in my power to eradicate this problem which affects the lives of millions of people."

He adds that he is merely the receiver of this prestigious award, and not the sole contributor towards it. "I wish to thank my almighty God and all my students and peers from around the country and the world. This was not possible without each one of you. My advice to every researcher is to collaborate with others. Don't try to be a one-man-band. There is much more to explore and achieve when you reach out to others."

The Director of the School of Chemical and Minerals Engineering, Prof Quentin Campbell, congratulated Prof Fosso-Kankeu for his groundbreaking research and for receiving this prestigious award. "It is indeed a privilege to have Prof Fosso-Kankeu on our team. His dedication and work ethic is an inspiration to his colleagues and students, and his humble reaction to this award serves to remind us all of our ultimate purpose in academia," Prof Campbell said.

Young female scholars inspired to become engineers

As we celebrated the women of South Africa during the month of August, the North-West University's Faculty of Engineering has once again launched its very own initiative to take these celebrations to the next level. Some 150 girls from various High Schools all over South Africa were given the opportunity to explore the different exciting fields of Engineering during the Faculty's 4th annual Femmegineering Celebration.

According to Professor Leenta Grobler, a senior lecturer and project manager, the days of men dominating the Engineering scene is still an evident and alarming fact. "Despite an improvement in recent years, there remains a serious shortage of women pursuing careers in Engineering. Traditionally, this field of study remained largely unexplored by women. The North-West University aims to change this - one semester at a time."

Over the past few years, the North-West University's Faculty of Engineering has put much focus on females in Engineering through its various initiatives. The attendees included Grade 10, 11 and 12 girls who's Maths and Science marks could possibly enable them to study Engineering. This celebration took place at the North-West University's Potchefstroom Campus.

Academic staff and senior students gave the scholars an insightful taste of the various fields of Engineering. They experienced practical experiments in chemical, mechanical, computer, industrial, electric and electronic engineering.































Even engineering students sometimes wear superhero capes!





Photo: This is a part of the wheelchair obstacle course that was built for the Potchefstroom Hospital.

One of Albert Einstein's most famous quotes was: "We can't solve problems by using the same kind of thinking we used when we created them."

This is certainly the mind-set of second-year students at the Faculty of Engineering at the North-West University (NWU) who recently had their first taste of the engineering world when they had the opportunity to work on practical local community projects.

Various projects were tackled with the aim of improving the quality of life of the local community. Some projects were identified by themselves, but most of them were needs from various areas in the local community. Under the leadership of Hannes du Toit and Pieter Tolmay various projects were identified.

"Clients had different concepts and development needs. After they saw what we had achieved in the past, they realised that our students could address their development needs," explains Hannes.

"We naturally jumped at the opportunity and these projects became part of the subject Professional Practice."

He explains that the projects not only provide the students with a broader framework of the whole engineering process, but they also create the practical opportunity for exposure in the students' second year of study.

More than 50 student groups recently showcased their products during a final exhibition. Although this will be the last year that this subject is taught at the Faculty of Engineering, it did not dampen this group of second-years' enthusiasm.

According to Hannes it is sad that the subject will not be presented from 2020 onwards, as it gave undergraduate students a taste of what they could expect in practice. Various organisations like the Potchefstroom Hospital, Cross Conect and the Potchefstroom Animal Welfare Society (PAWS), benefited from these projects.

According to Hannes the faculty will continue with community projects, but with a multidisciplinary approach.

"The plan is to have a five- to eight-year plan for every project. By keeping the members of the relevant organisation involved with the project during this period, it will eventually become a self-sufficient and sustainable project. The idea is also that this approach will eventually help to address unemployment in the communities involved."

The building and engineering work was previous handled by first-year students, but Hannes has changed that since last year so that the second-year students now have to handle this. "This was 'n good decision, as we definitely can see an end product of a better quality."

Apart from the building work, the students also have to handle the planning, marketing, finances and implementation successfully themselves. "These projects prepare the students for the reality that they have to face one day. Many former students who have contacted me in the past could not stop talking about the value of what they have learnt here," says Hannes.

The students built various items of playground and gymnasium equipment. Among other things they built a wheelchair obstacle course for the Potchefstroom Hospital.

"Every organisation to whom we spoke compiled a kind of wish list for us. We wanted to make sure that the project does not bore the students, but it also should not be so difficult that it is not feasible," says Hannes.

Collapsible book shelves, a device that can produce ropes from two-litre plastic bottles, classrooms and greenhouses that can be assembled and disassembled quickly, feed mixers, mobile baths for animals, and a safe pit toilet that prevents children falling into the hole, are only a few of the innovative ideas that the students came up with.

"We now look forward to taking the faculty's community engagement to the next level, and to continue to make a real difference in people's lives."



Photo: This group of students built a collapsible dog bath.







After many years of commitment to community engagement and development, staff and students of the North-West University's (NWU's) Faculty of Engineering will now turbocharge these initiatives as the saying goes.

According to Hannes du Toit, the faculty's project manager for community engagement, they decided to take their projects and initiatives to the next level.

"The extent of the need around us is frightening. After nine years of initiatives through the engineering subject Professional Practice (or FIAP, as it is known among the students), it has now undergone restructuring," says Hannes.

"The emphasis was changed to integrate community engagement with various modules in order to develop projects of a better quality for the greater benefit of communities."

In a nutshell, the purpose of the subject is to give engineers the opportunity to develop management skills by working in groups of six to identify the needs of communities and develop solutions, which includes the manufacturing of a prototype of a product.

This already provides practical experience at an early stage of training. Some of the projects included, among other things, a mobile animal clinic, aids and equipment for old-age homes and schools for the handicapped, playgrounds for schools, infrastructure for a legal clinic in a township, and aids for occupational therapy at a state hospital. All of these were developed by students to meet the needs of genuine clients.

According to Hannes, the new plan regarding community engagement was recently submitted and approved by the management of the Faculty of Engineering.

"We look forward to addressing the various needs of different communities more intensely. The approved framework makes provision for, among other things, other faculties of the NWU and even other

These initiatives have to have a sustainable impact on the communities involved.

tertiary-education institutions across the country becoming involved. It provides the opportunity to be able to serve communities with our expertise in a more sustainable manner," he says.

Communities such as the Social and Justice Centre in Orange Farm, the Amelia after-care centre in Potchefstroom, the Potchefstroom Animal Welfare Society, Cross Connect in Krugersdorp and various other organisations have already been identified.

Apart from lecturers and students being involved in these projects, a management committee consisting of various role players, including community leaders where each project will be rolled out, is also envisaged. The purpose of this is to train these role players to be sustainable in the communities

"It does not help to identify a need, address it, and then it disappears again. These initiatives have to have a sustainable impact on the communities involved. The ideal will be to identify some of our students who can act as role players in the communities. Students coming from traditionally disadvantaged communities and who have the opportunity to receive a tertiary education are also expected by these communities to give something back to the community where they grew up."

According to Hannes, these initiatives will also fit in with the NWU's teaching policy that students have to develop, among other things, a social and ethical responsibility during the time of their education at the university. He says that it creates an opportunity for the students to take ownership of the projects and to better understand what the needs in local communities entail.

On the strength of the approval of these new community-development plans, components of the community projects will now also be integrated with some of the NWU's engineering curriculums. Industries and businesses are approached to support the projects with funding and expertise.

"The greater goal of this new approach is to accomplish the transfer of skills. The projects are seen only as a starting point, after which communities must be stimulated to take them further and address more needs with the skills that they have been taught. Engineers are not psychologists, social workers or counsellors, but we can definitely also have a major socio-economic impact on a totally different level," says Hannes.



NWU researcher receives prestigious award

The South African Institute of Electrical Engineers (SAIEE) recently hosted it's 107th Annual Banquet, which saw Prof Jan de Kock from the NWU's Faculty of Engineering being awarded for his excellence and involvement in the engineering industry.

According to the SAIEE President, Dr Hendri Geldenhuys, an Engineering Excellence award is made to a Member, Senior Member or Fellow who has excelled in Electrical Engineering and demonstrated above-average involvement in supporting the SAIEE with its aims and objectives as well in their capacity that supports and mentors those with whom they interact in the workplace.

"Prof de Kock, a Professional Engineer who became a member of the SAIEE in 1986, currently serves as an elected Council Member for the past four years. His dedication to attending council meetings from far and his contribution to bringing the North-West University and SAIEE closer together makes him the ideal candidate for this award. Prof de Kock is a Fellow and serves on various committees and is also a stalwart of the SA Universities Power Engineering Conference for many years. He supports the SAIEE CPD Programme in sharing his wealth of academic expertise. He has vast industrial experience in the design, commissioning, and performance assessment of generators and synchronous machines. The valuable contributions of his time, effort and expertise to our institute make Prof de Kock a deserving candidate for this award," Dr Geldenhuys said.

The South African Institute of Electrical Engineers is a professional association with more than 6 000 members and representing electrical and electronic engineers, technologists and technicians in Southern Africa.



Photo: Prof Jan de Kock receives his award for Excellence in Engineering from the sponsor of the award, Francesco Pagin (Fluke) and Dr Hendri Geldenhuys (SAIEE President) on the right.

Rely on engineers for your baby's health

Those who have the privilege of bringing a child into this life want to ensure that their baby receives the best possible healthcare and that abnormal health issues are diagnosed and addressed as soon as possible if this occurs.

To measure a newborn baby's weight, height and outer limits of the head over a period of at least two years, is very important to determine whether the baby experiences healthy growth. These measurement results can often give a good indication of the degree of brain development, bone development, malnutrition, obesity or normal growth. Unfortunately, it's a fact that faulty or defective devices are often found in clinics and hospitals that play a major role in monitoring your baby's health. This availability of these basic devices is furthermore often lacking in state facilities.

Experts at the North-West University's Faculty of Engineering have come up with research that can eliminate this problem. Prof Leenta Grobler's research on an automated baby scale which does measurements digitally, without the possibility of human error or inaccuracies, is currently in the development phase. "The scale is designed so that it offers the least irritation or discomfort to the baby. During a process where the baby is placed in the scale for a few seconds, electronic measurements are made by means of surrounding sensors mounted on the scale," says Prof Grobler.

The scale's automated technology enables the results to be made available electronically, immediately after the measurements are completed, without the possibility that a person may make a mistake while recording the results on the baby's file.

"The development of the baby scale has to go through a final round of fine-tuning to make sure it works accurately. Once completed, we will apply for permission from the North-West University Ethics Committee to do certain tests of this device on human subjects. If everything goes according to plan, we will be able to offer this device to clinics and hospitals in the near future," says Prof Grobler.





As we see ourselves in a modern world where the evolution and development of technology enjoys first priority, the North-West University's Faculty of Engineering initiated a one of a kind problem solving and smart manufacturing competition specifically aimed at high school girls.

With sponsorship from the SETA for Manufacturing, Engineering and Related Services, merSETA, the aim of this competition was to encourage South African girls to identify problems in their own community that may be addressed by technology. Semi-finalists (teams of 2-4 girls) were recently selected from all over the country and hosted at the university for a mentoring and training workshop, after which teams pitched their ideas and solutions for the ultimate prize of a once in a life-



time technology tour of Silicon Valley in the United States and attendance of the Girls in Tech Catalyst Conference in June 2019.

According to Prof Leenta Grobler, project leader, 38 girls from in 18 teams were invited to pitch their problem solving ideas. "Boys in general tend to be more analytical whereas girls tend to be more creative and while engineering may not be the most obvious career choice for many girls, it is a field of study that desperately needs their creativity to solve future problems. It is also a field in which women can really excel, that is why it is important for you to encourage participation from the girls in your school."

The teams got involved by identifying a problem worth solving in their community, related to food, security, water, the environment, health or energy. They then had the opportunity to explore the idea using craft materials to showcase their solution, thought about how they would test their solution.

"We named the competition Modiragatsi, because it is the Setswana name for "performer". Women are those performers who will change South Africa and find solutions for problems that we have not even identified yet. The girls really took ownership of this competition and identified relevant problems where they could make a difference. The winning team, by names of Carli Swart and Berli Roodt from Waterkloof High School, identified that anxiety and associated panic attacks are real and serious problems for many people on the autism spectrum. Their idea was to develop a special wearable device which can detect when a patient is experiencing a panic attack and automatically apply moderate pressure to the patient's body, to activate the parasympathetic nervous system which can then naturally relieve the symptoms of the panic attack.

The first runner up team consisted of four team members. They were Molebogeng Diseko, Thendo Sikhauli, Oreabetse Maphangela and Lesedi Mono from Carleton Jones High School. They identified the problem that a lot of purified drinking water is wasted to flush toilets and water gardens. Their idea is to harvest and locally store grey water, which is then reused for these activities as and when necessary.

"The sponsored prize will now really give these two girls an opportunity to explore the possibilities within the various fields of engineering. We look forward to seeing many girls like Carli and Berli in the future, shining their way to the top of a profession in engineering. The NWU, together with our merSETA partners are privileged to be able to help pave the way of women in science," Prof Grobler said.

Photo: The winning team of the NWU's first ever Modiragatsi competition is Carli Swart and Berli Roodt from Waterkloof High School.

Students impress during the Leopards Lair entrepreneur Competition

Have you ever wondered what it would be like to be a participant in the popular television show "Shark Tank", or the British version named "Dragon's Den", where entrepreneurs pitch their business ideas to a panel of investors? Twelve finalist students from the North-West University and the Vaal University of Technology have recently experienced just that, when they took part in the NWU's own version of this competition. Welcome to the Leopard's Lair!

Blood sweat, agony, stress and hard work went into various business idea projects which were recently pitched to a panel of academic-, industry- and business experts. The final fifteen projects, out of a 180 entries were identified as finalists for this year's Leopard Lair Competition where student contestants had the opportunity to get valuable input and coaching from industry leaders, before the compe-

tition's final event took place. Prize money of a whopping R100 000 were up for grabs between the top three winners!

Leopards Lair 2019, was facilitated by the NWU's bhive Enterprise Development Centre (EDC) and is an initiative backed by strong support from the Technology Transfer Office and the Faculty of Engineering.

According to Johann Landsberg, manager of the bhive EDC, the competition was decided over several rounds. The participants first submitted their Idea to Concept proposal after which 40 students were invited to take part in the Business Model Canvas phase of the competition.

From here, 20 students proceeded to the next round during which they had to produce a video pitch and face off against

each other. The next, 12 participants faced an independent panel of business owners, investors, successful entrepreneurs and members of academia to battle it out for a place on the winners' podium.

According to Johann, the annual business competition is one of the ways in which the NWU is actively promoting entrepreneurship as an innovative career alternative for graduates.

"Through initiatives such as Leopards Lair, the NWU aims to address the challenges many start-up entrepreneurs face," says Johann. He adds that empowered entrepreneurs will be able to make informed and creative decisions that will positively impact South Africa's strained economy. In short: an entrepreneurial mind-set will henceforth be a crucial commodity within the ever changing world of work.

Melanie wins big by fighting period poverty

Melanie Pieterse is a young entrepreneur on a mission. As the winner of the North-West University's (NWU's) Leopards Lair competition, this final-year student in industrial engineering not only impresses as a start-up fempreneur, but she is also actively supporting fellow entrepreneurs. All while working towards bettering the lives of young schoolgirls across the country. How is she doing this? Through her entrepreneurial venture called The Period Package.

With research indicating that as many as 30% of girls in South Africa are missing out on school when they are menstruating because they cannot afford sanitary products, Melanie's social entrepreneurial venture aims to not only address period poverty, but also to motivate women to support each other and by doing so celebrate their unity.

The Period Package is based on a subscription system and sees subscribing women receiving a special care package each month. The package contains sanitary products as well as a pick-me-up surprise product to ease the period blues associated with that time of the month.

This product – which can also take the shape of access to a specialised service or event invitation – is sourced from other fempreneurs and in this way promotes the cycle of entrepreneurial support. For each subscription a donation of sanitary products is made to a less fortunate girl, enabling her to stay in school and enjoy the benefits of her education.

Melanie explains that the idea is to empower local entrepreneurs to join her network and in doing so create a support network for entrepreneurs. The first rendition of The Period Package saw a dietitian, Hanli Etsebeth - a dietitian blogger, include an eating plan tailor-made for women on their period.

Melanie laughs when she tells the story of how she first got interested in entrepreneurship, way back when she was in primary school. At that stage the concept of entrepreneurship was still foreign to her, but she knew she had to be clever to raise money to use at the school's tuckshop.

She used what she had at her disposal, namely a sizeable storybook collection. And before long she ran her own book exchange from her dolls house in her parent's backyard by charging her friends R5 a book. Interestingly enough, her first contributor towards the monthly subscription box, Hanli, was one of her childhood "customers" at the book exchange.

"I guess that's where it all started," says Melanie and adds that she is very thankful about the support and guidance she is receiving from the NWU's bhive Enterprise Development Centre (EDC) in further developing her concept.

One of her prizes is business development support, including business incubation, coaching and mentoring as well as networking opportunities as sponsored by the bhive EDC.

* The first runners-up were Ruben Kriel, Henco Kriel and Niel Behnke* with their venture, Wicked Vapes. The start-up venture, Bean, was the second runner-up. This team comprised of GD van Tonder en Ruben Steenberg.





Dean makes history

It was an enormous honour for the Faculty of Engineering at the North-West University (NWU) to inaugurate its executive dean as the first female professor of this faculty.

Prof Liezl van Dyk, an industrial engineer, recently delivered her inaugural address for a full professorship to an audience of about 120 guests during a prestige event.

In her address on the fourth industrial revolution, she provided an overview of the history of several industrial revolutions the world has experienced so far, and the development that has taken place over several decades up to where we stand at the beginning of the fourth industrial revolution today.

As a sign of emotional support and congratulation to this former director of the School of Industrial Engineering, all the staff members of the school attended Prof Van Dyk's inaugural address. Not only was this school established under her guidance in 2017, but she is also the first person from this school to be promoted to professor.

The NWU Puk Choir brought the house down when they performed the NWU's University Anthem, and three other works,

from the first floor of the engineering building. The acoustics of this building seem to have been designed especially for choir performances, because the sounds heard in the foyer of this building were superb!

Prof Van Dyk's spouse, Prof Tobie van Dyk, their children, Karla and Tobias, her relatives and friends, were also part of the audience. The faculty management and two of the NWU's deputy vice-chancellors also congratulated her on what is surely the biggest milestone in an academic's career

"This is another occasion on which we experienced what the essence of the NWU involves. Congratulations to you, Prof Liezl. We look forward to experiencing your leadership skills at the School of Industrial Engineering, in the faculty and the professional industry," said Prof Linda du Plessis, deputy vice-chancellor for planning and campus operations in Vanderbijlpark.

During the course of 2019, three other staff members from the Faculty of Engineering were also inaugurated as professors. They are Prof Willie Venter, Prof Johan Rens and Prof Marelie Davel.



Photo: Prof Liezl van Dyk has been inaugurated as the first female professor in the NWU's Faculty of Engineering. With her is Prof Linda du Plessis, deputy vice-chancellor for planning and campus operations in Vanderbijlpark.



Photo: Prof Johan Rens during his inauguration as professor of the Faculty of Engineering.



Photo: Prof Marelie Davel during her inauguration as professor of the Faculty of Engineering

His passion is rewarded with a professorship

Photo: Prof Willie Venter during his inauguration as professor of the Faculty of Engineering.



It is no secret that the Faculty of Engineering at the North-West University (NWU) is one of the faculties that is held in the highest repute in the country. This faculty lately inaugurated another expert from their stable as professor to expand their profile of expertise even further.

Prof Willie Venter, a computer engineer, recently delivered his inaugural address.

Prof Venter is a beloved colleague with many miles of experience behind him. His inaugural address was held in the Senate Hall on the campus in Potchefstroom, where the former deputy vice-chancellor, Prof Fika Janse van Rensburg, praised him during the opening and welcome part of the event. "Willie is a fixer. He wants to use his science to make the world a better place for all," he said.

Prof Venter was born in Kroonstad in 1957 and matriculated at the Afrikaans high school in the same town. He refers to this phase as a "humble beginning to this career". He paid special homage to one of former teachers, who also attended the inaugural event. "This man made an enormous impression on my life. Mr Koos Smit, thank you that you have come to celebrate with me today."

Prof Venter left South Africa from 1987 to 1989 to study computer engineering at the Iowa State University in America. Here he completed his PhD and then returned to plough back his knowledge at the NWU as associate professor in electronic and computer engineering.

During his time at the NWU he has found his research niche and thus far has made an exceptional contribution to the industry – at national as well as international level. He was also a mentor to 33 MEng and PhD students who completed their studies under his supervision. One of these

"Make sure you grab every opportunity the future may hold!".

students was his eldest son, Gert Venter, who was also the proud recipient of the NWU Chancellor's Medal.

The opportunities that computer engineering offers to South Africa and the world are close to Prof Venter's heart. In his inaugural address he explains in the smallest detail how any industry can benefit from this specialist field. From robots, modern technology, cars that can drive themselves to logistics transport. He says that this industry offers more career

opportunities than all the other fields of engineering combined.

"Too many opportunities have passed because too few computer engineers are available to address the needs. My biggest dream is to especially address these opportunities and make a positive difference," he says.

Prof Daryl Balia, deputy vice-chancellor of the campus, handled the formal inauguration and congratulations. "We as university, community and nation want to be the leaders with respect to technology and opportunities. With experts like Prof Venter in our midst we can take computer engineering forwards. Congratulations and all the best with your task," Prof Balia said

As part of his acknowledgements, Prof Venter mentioned his mother, sister, cousin and colleagues who were present at this prestige evening. However, he made special mention of his two sons, Gert and Willem, and his wife, Arthurita. "You have always been my pillar of strength. I am so proud that my two sons share my love for engineering. Thank you for what you mean to me."

Prof Venter concluded with a final thought to the audience: "Make sure you grab every opportunity the future may hold!".







NWU's Engineering still at the forefront

A great honour was recently bestowed upon the North-West University's Faculty of Engineering when their program in Mineral Processing has been named under the top 100 best programs in the world in this field.

This announcement was made by the Academic Ranking of World Universities, also known as the Shanghai Rankings. It is an independent organization that specifically focuses on higher education and consists of experts from various fields of study, which annually publish a list of top universities and research. The Shanghai Order is considered one of the three most influential rankings in the world.

According to Prof Marco le Roux, programme leader, the field of chemical engineering with mineral processing involves the processing of mined ore to a useful product such as gold, coal or diamonds.

"This program is largely similar to chemical engineering and many of the principles overlap with each other. A profession in mineral processing or chemical engineering is currently regarded as one of the scarcest professions in South Africa and there is currently a great need for experts in this field," he says.

Prof le Roux adds that they are very active in research and it is no secret that this faculty is known as the leaders in coal processing in the country. "We have a very good international stance on our research and over the past 10 years, we managed to deliver approximately 30 postgraduate students in coal mining, as well as a lot of accredited articles and conference contributions. We are currently specialising in dry coal processing and drying of ultra-fine coal." He says the use of water in coal processing places increasing pressure on our already scarce water re-

sources. "South Africa is a dry land, which means we must use this resource with utmost care and responsibility. It is thus very important to establish processes that are more environmentally friendly. We train our students to be able to make a positive contribution towards the environmental problems of our country and the world."

The undergraduate qualification in Chemical Engineering with Mineral Processing is a 4-year degree, not only recognised by the Engineering Council of South Africa, but also by several organisations in the USA, Canada, Australia, New Zealand, the United Kingdom, Ireland and Hong Kong.

Please check out this short video for more information or contact Prof Marco Le Roux at marco.leroux@nwu.ac.za or 018 299 1990



New wheels for Snippie



As the car sped away, the Swart family were left aghast at the aftermath of a reckless deed. Their six-year old whippet, Snippie, was the victim of an accident that left her paralysed from the waist down.

Mom Carien was as devastated by the injury suffered by their beloved Snippie as she was by the trauma that afflicted her 10-year old son Hanco. She posted a video account of the act on Facebook, hoping that the culprits would see the damage they inflicted on her family.

Whether or not the wrongdoers saw the Facebook post, is not clear, but fortunately GJ Stols, a third-year mechanical engineering student at the North-West University's (NWU's) campus in Potchefstroom did see Carien's post.

He immediately addressed the problem and designed a two-wheel carriage for Snippie's hind legs.

"I saw the video of Snippie that was posted on Facebook and it was very traumatic to see the poor dog paralysed. I love animals and I wanted to help them, so I contacted the family, told them who I am, and offered to build Snippie's wheels," explains GJ.

The design took about a day and Turnmil Engineering manufactured the various parts free of charge. After about two weeks Snippie was ready to try out her new "legs".

"Snippie immediately started moving around and sometime later I saw how she was able to run at full speed next to Hanco riding his bike," says GJ.

Snippie is running again and Hanco is smiling. This is all that GJ had hoped for.

"I could see the boy loves his dog very much. She is one of his best friends."



Expose yourself to as much as possible

Christoff Briers is only one of the many success stories of North-West University's (NWU's) Faculty of Engineering. Today he is at the head of production planning at Simmer Engineering, an engineering company in Alberton that specialises in manufacturing.

According to him his passion for the manufacturing industry is to a great extent due to his exposure to and involvement in the NWU's well-known solar car project.

Christoff was one of only four students who worked on the first solar car initiative in 2012. "It was a madhouse," he says. "I think we did not exactly know what we were letting ourselves in for. We had to

build a solar car from nothing and compete against international competitors."

Christoff says they were one electrical and three mechanical engineering students who became involved in this initiative under the leadership of Prof Albert Helberg. "My responsibility was the suspension, braking and steering system of the 'Bat Mobile' - as the media christened our black carbon fibre solar car

"However, we did not plan for the car to be black - at that stage there was just not enough time to paint it, and we had to participate in our first Sasol Solar Challenge just like that," he laughs.

The Sasol Solar Challenge competition is hosted in South Africa. Teams from across the world compete with their solar car technology to see which car drives the most kilometres from Pretoria to Cape Town using only solar energy.

Although the route from the starting line to the finish is the same distance for everyone, teams have to try and drive additional kilometres along the route in order to determine in the end which team's solar car was able to drive the biggest distance in the given time.

During their debut journey in 2012, the NWU's solar-car team came first in the Olympia class, and was crowned joint winners of the Fédération Internationale de l'Automobile's Alternative Energy Cup.

This team also walked away with the safety award and the Spirit of Africa award an enormous achievement in their first year of participating in the Sasol Solar

In 2014 the team obtained an overall fourth place, and in 2015, during the Bridgestone World Solar Challenge in

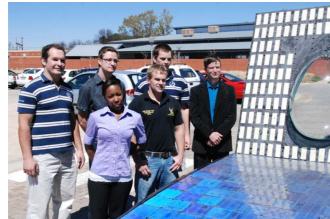


Photo: Christoff Briers (left) when he was involved in the NWU's first solar-car project in 2012.

Australia, an 11th place, "I should also mention that at that time our solar car were the first solar car from Africa that was able to complete this gruelling competition," he adds.

In 2012, while Christoff was still involved with the solar car project as a student, he started working as a junior engineer at a diamond mine at the same time. Something not every student is able to do! He was involved at the mine for two years before he decided to return to the manufacturing industry.

Currently, he works in conventional manufacturing, as well as manufacturing for the mining, railways, heating, ventilation and air conditioning industries. "My work basically involves making sure that the right quality parts are delivered to our clients on time. This includes production optimising, implementation of new systems, workshop planning and the coordination of activities in the production environ-

If it hadn't been for the exposure he had gained during the solar car project, he would probably have discovered his interest in the manufacturing industry only at a later stage. "My activities during the solar-car project involved a lot of conven-

> tional manufacturing and I was therefore able to gain knowledge in this field even before I started working," says Christoff.

"This stimulated my interest to learn more about the industry. I enjoyed it so much to see how a functional part can be manufactured from a simple block of metal. This is my fifth year back in the manufacturing industry, and I will exchange it for nothing."

Christoff says his winning recipe is that since his student days he has exposed himself to different disciplines, for example during the solar car project. "This also includes the 'softer' disciplines

like how to work together in a team under pressure, and how to build relationships with suppliers. There were many nights that we did not sleep because we had specific targets to reach."

He says that taught him that hard work is always rewarded. The NWU has worldclass lecturers - most of them with their own success stories in the engineering industry. I salute the NWU for the exciting engineering career that still lies ahead for

The solar car's blood, sweat and tears were worth the trouble!

Multifaceted knowledge is the big prize with which Esté Heese, a former student at the North-West University's (NWU's) Faculty of Engineering, walked away after she was part of this university's wellknown solar car team. This also boosts her career at Eskom today.

This young engineer-in-training is prepared to take on any project or department and attributes this trait to her experience with the Sirius X25 - the NWU's solar car in 2016.

"The solar car project exposes you to various disciplines," explains Esté. "In my current work environment I have to master exactly this - I have to involve different professions and disciplines to complete

Three years ago Esté was part of the dynamic NWU team that managed the solar car project during the Sasol Solar Challenge. Her duties included research on the possible use of thermo-electric generators and strategic planning, among others.

After this exhausting race from Pretoria to Cape Town the team raked in the awards. Their accomplishments included crossing the finishing line first of all the African teams and in the overall fourth place, and walking away with the awards for Technological Innovation and Team Professionality and Safety.

However, she singles out one very valuable element of her solar car experience - the multifaceted knowledge she gained across various fields and professions.

This even includes disciplines like marketing and the finer art of making speeches and preparing presentations.

"This experience enabled me to communicate my work on various platforms and definitely strengthened my interpersonal relations in the professional workplace,"

Esté adds that she is grateful for the support network that the Faculty of Engineering offered her during her student days. "The lecturers are really outstanding in their fields," she boasts proudly.

In the industry she often notices her lecturers being consulted for their specialist knowledge.

"The way in which they taught us to prepare reports I find particularly useful, especially since it is an important part of my day-to-day work," she says.

Esté says that her mentors in the workplace regularly compliment her on the quality of her reports. "This skill makes me stand out above the rest of the engineers-in-training."

Esté is positive about the future of engineering in South Africa and encourages all students who are currently battling this challenging field to enjoy every moment. "All the blood, sweat and tears are definitely worth your while. If you ever have the opportunity to become part of the solar car project, grab it with both hands, as it provides you with extra learning opportunities that can open many doors for you!" says Esté.



NWU

engineers

stimulating

the future

of green

energy

It's a well-known fact that South Africa is burdened with challenges towards energy use and efficiency, but thanks to the North-West University's Solar Car projects, students like Raynard Du Preez are able to make a positive difference - one day at

Before Raynard du Preez was the system engineer he is today, he was part of the NWU's Solar Car projects for four consecutive years as an engineering student. A platform, which gave momentum to his optimism and curiosity in the field of energy use and efficiency. The Faculty of Engineering's solar car projects are widely known as a symbol of engineering excellence in the pursuit of energy efficient transport technology at the NWU.

In 2012, Du Preez first participated in this project as part of the research and analysis team, but through hard work and dedication, he became an electrical engineering mentor to his peers in his final year of study during





the 2016 Sasol Solar Challenge, where he assisted in development and strategy.

The 2016 NWU solar car, the Sirius X25, has an outstanding reputation as it was awarded with multiple prizes in solar car challenges. In 2014, the team obtained fourth place overall and second place among the South African teams. The year 2015 did not disappoint as the team obtained 11th place in the Bridgestone World Solar Challenge in Australia and was the first African team to complete the challenge. Du Preez remember these proud moments very well as he was also the driver of the solar car in 2014 and 2015. "Being part of this team was a once in a lifetime opportunity," Du Preez says.

He currently works as a system engineer for the well-established engineering company, JR Engineering. "My role as system engineer is to design energy management systems for commercial and industrial buildings. These energy management systems are designed to monitor all energy systems within a building or industrial plant," he says.

Du Preez adds that he is proud and privileged of the fact that they contribute to a greener and more intellectual way of living by transforming buildings into energy-efficient, smart buildings. "The experience gained from my time on the NWU's Solar Car project gave me a different perspective of multidisciplinary engineering and importantly, opened up my eyes to the endless opportunities of going green! By working in different disciplines on the project, like research and development, race strategy and vehicle development, I now have a better understanding of engineering for the future," he says.

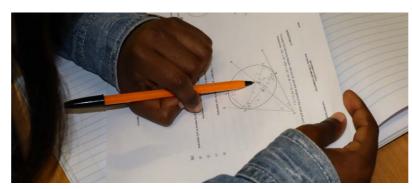
"In the early stages of the solar car project, students and lecturers were exposed to engineering problems that you would not necessarily come across in class." He remembers how, as the project grew, more lecturers and post graduate students got involved, giving their expert advice and resources, helping to make the project a huge success. "I am so proud to have been part of this team and I'm convinced that it gave me a jumpstart in my career."

Du Preez does not stand down to any obstacles and lives to grab every opportunity that cross his path. Ambition drove him to be the founder of a growing engineering company, DPI (Du Preez Innovations), which focuses on sustainable technological innovations in the sectors of energy and transport. "It is still early days for this company, but I know that through perseverance, hard work and dedication, nothing can stand in one's way towards success - a valuable life lesson I've learned from my experience in the various NWU's Solar Car projects," he says.











The impact of a second chance

A second chance in life is not destined for everyone, and when it comes across your way, you have to grab it with both hands and make the best of it. This is precisely what 33 young people at the North-West University's (NWU's) Faculty of Engineering did when they enrolled in the Xcel programme at the beginning of the year.

They might not be first-year Engineering students yet, but should be able to say that very soon...

This programme offers a second chance to students who want to improve their previous Grade 12 Senior Certificate exam results in mathematics and Physical Science. In 2016, Elza Hattingh, the NWU's Xcel programme manager, welcomed the first 12 students who wanted supplementary schooling, to improve their matric results at the end of the year to get a better chance of admission to a university.

"Since I have been managing the selection processes for admission to engineering studies for the past 20 years, I've come to realise the great need for a second opportunity to write the Grade 12 exam," says Elza. "We have decided to establish this programme where students enrol at the NWU for a year to redo the entire Grade 11 and 12 school curriculum in mathematics and physical science.

"The reasons for these students' poor school results in mathematics and physical science range from inadequate school-level education to difficult domestic conditions, unbalanced dedication to sporting participation, illness or the lack of academic purposefulness during Grade 12," she adds.

After four years, this programme proved itself as a runaway success. During the June examinations, some of the students improved with as much as 45% on their previous Grade 12 results. "The class average shows an improvement of 21% in mathematics and 25% in physical science when compared to 2018's matric exam," says Flza.

"We have a strict selection process for those who want to enrol for the Xcel programme because we want to be sure that the selected students are truly serious to improve their previous results. We also make sure their goals are realistic and em-

phasise the seriousness and hard work that the programme entails.

"Here students have to make a choice – they work hard towards a professional career, or they drop out and end up in the labour market without a tertiary qualification. We have chosen the right lecturers for this great task, and I can honestly say they are doing a phenomenal job. They make sure the students perform to the best of their abilities."

Although the programme is offered at the NWU, the Gr 12 national preliminary examination and final Grade 12 Senior Certificate examination are conducted under the supervision of the Department of Basic Education at a neighbouring high school. The same papers are written as those written by the rest of the country's matrics. "Over the past two years we have not only achieved a 100% matric pass rate, but each of those students also enrolled for tertiary education," says

She says the class week consists of 24 hours of learning in these two subjects, which is supported by a two-hour tutorial session in each subject where students can get guidance and assistance from the lecturers. They also enrol for a university subject and take two additional short courses, which contain more or less the same content as first-year subjects at university level. The students learn to work independently and against time and to take responsibility for their own studies. In this way, they are prepared to handle the workload and work volume at university.

Elza says class attendance is contractually compulsory. "Students may miss a class if they can submit a medical certificate. We follow a serious approach to self-discipline and responsibility to prepare students for what awaits them at university. When they enter the university gates next year, they should be comfortable with the pace and volume of work and what to expect.

"The Xcel programme not only offers a second chance of a better Grade 12 result – it empowers our young people to live to their full potential. I am so proud to see them flourish and aim at a career in engineering or the natural - or health sciences, where it was not possible a year ago," says Elza.



NWU Engineering gives her dreams wings – literally!

She is inspired by the people around her – by friends, family and, in her professional career, by her lecturers. Today Dr Angelique Janse van Rensburg is someone who in turn inspires others by her absolutely unquenchable passion for what she does – being an engineer!

As former student and former lecturer at the Faculty of Engineering of the North-West University (NWU), she is currently employed as senior cell-engineer (battery systems) at the German company Lilium. This company is known for its recently launched aeroplane that is going to turn the traditional way of air transport on its head.

Dr Janse van Rensburg is responsible for Lilium's battery technology to develop solutions for the company's electric aeroplane with a vertical lift-off and landing ability. According to her, a dream came true ...

Lilium specialises in the development of technology that will enable the public to make use of affordable and accessible city flights. The company recently announced the first successful test of its full-scale electric five-seater aeroplane. This was the latest in a series of successful tests for the growing electric flying industry, which aims to operate "flying vehicles" above cities within the next decade.

Before she joined Lilium, Dr Janse van Rensburg was a research engineer and senior lecturer at the NWU's Faculty of Engineering. Apart from the lectures in electric circuit techniques and linear systems, she supervised postgraduate students, published her cell-related research and consulted for the industry.

"At the moment I am living my dream. Initially, I would never have thought that a girl from KwaZulu-Natal would have the opportunity to work for an international company in Europe as an engineer, but in hindsight I also realised that anything is possible when one wants something badly enough," she says to engineering students during her recent visit to her alma mater in Potchefstroom.

Dr Janse van Rensburg has been part of the Lilium team since April 2018, and the excitement is visible when she speaks about the possibility of being able to link communities to one another through their technology.

"Nothing like this has ever existed, and the world is watching our progress very closely. The proposed five-seater model will be able to fly 300 km on electric energy alone and at a speed of 300 km per hour," she explains.

"The fact that it can take off and land vertically means that it only needs a small area to pick up and drop passengers. This can reduce traditional travelling times by as much as five times, especially in cit-



Photo: Dr Angelique Janse van Rensburg, with her former PhD supervisor, Prof George van Schoor.

motors, the advantages are, among other things, no noise pollution and no carbon dioxide emissions into the atmosphere."

During her guest lecture to the engineering students she was secretive about the company's technology, but did mention that Lilium is currently in an advanced stage of development with their "Lilium let"

"What I can say to every one of you is that the world lies at your feet. Anything is possible if you work hard at your dream. Prof George van Schoor, a researcher and senior lecturer at the faculty's School for Electrical and Electronic Engineering, introduced me to this world of advanced engineering. If it were not for him, I would not have been in this job that I am in today.

"Students at the NWU are in the privileged position that they can obtain knowledge and information from world-class mentors. Make sure that you use this opportunity! The work that I currently do, and the technology that we are developing, will enable me in the near future to give something back to the country that gave me this world of opportunities. I salute each one of my lecturers who helped me to realise my dream," she concluded.

For more information about the Lilium Jet, please visit https://lilium.com/

NWU Master's students – the best of the best!

Students from the North-West University's (NWU) Faculty of Engineering and Faculty of Natural and Agricultural Sciences recently showed what they are made of when they defeated their peers from other universities.

This happened during the South African Telecommunications, Networks and Applications Conference (SATNAC) held in Ballito, KwaZulu-Natal where NWU master's degree students won two of the three Best Paper awards.

Four students from the Telkom Centre of Excellence, hosted by the NWU (Telkom CoE @ NWU), presented results from their work to both industry and academia during the technical sessions of the conference. The highlight of the event was during the closing session when the three Best Paper awards were announced, and the top two positions went to the NWU.

The SATNAC conference is the flagship event of the Telkom Centres of Excellence programme and the largest peer-reviewed South African conference in telecommunications technology.

It is widely attended by leaders from government, industry and academia. In 2019, the Minister of Higher Education, Science and Technology, as well as the Minister of Communication and Digital Technologies informed attendees about government's latest imperatives and policies regarding the role of telecommunication in training, and economic and social upliftment in South Africa.

The group chief executive officer of Telkom presented a new growth framework for telecommunications in South Africa. Various industry leaders presented their vision on the role of telecommunications technology in South Africa to the large conference audience as well as the viewers of Business Day TV.

Jacques Mouton from Engineering received the Best Paper award for his paper titled "Performance Evaluation of a Clustering-Based Automatic Modulation Classification Method", that was supervised by Dr Melvin Ferreira and Prof Albert Helberg. Jacques' paper presented an elegant and fast way of automatically classifying digital transmissions under

noisy conditions without requiring a prior machine-learning training phase.

Jaco du Toit from Natural and Agricultural Sciences presented the second-placed paper "Heuristic Data Augmentation for Improved Human Activity Recognition", supervised by Prof Tiny du Toit and Prof Hennie Kruger. Jaco demonstrated the significant advantages of augmenting additional information from images and using this to improve the automatic recognition and differentiation between standing and sitting poses of people in images.

Other students of the Telkom CoE @ NWU that presented papers at the SAT-NAC 2019 conference were Nicolaas Maree and Tipharah van Dyk. Nicolaas presented a paper on the topic "Affective Computing and Deep Learning to Perform Sentiment Analysis", compiled under supervision of Prof Lynette Drevin, Prof Tiny du Toit and Hennie Kruger.

Tipharah van Dyk, an MEng (Computer Engineering) student under supervision of Prof Albert Helberg and Dr Melvin Ferreira, presented a paper, "Invertibility Testing as an Improvement on the Decodability of Matrix Network Coding" to acclaim and was invited to comment on her research experiences during radio and television interviews

"I would like to recognise all parties that supported these achievements. We are proud of the way you represented the NWU at SATNAC. I realize that these achievements are a result of hard work on the parts of both students and supervisors." Prof Helberg said.

Photo: Students and academics from the NWU's Faculty of Engineering and Faculty of Natural and Agricultural Sciences recently attended the South African Telecommunications, Networks and Applications Conference. They are from left to right Prof Albert Helberg, Herman Blackie, Jacques Mouton, Dr Melvin Ferreira, Jaco du Toit, Nicolaas Maree and Tipharah van Dyk.





Our collaboration with BRICS countries

The BRICS Network University (NU) was initiated by the Department of Higher Education and Training in 2016 and was formed through a network of universities from the BRICS countries which aimed at developing:

- Multilateral short-term joint educational training,
- Masters and PhD programmes, as well as
- Joint research programmes in various knowledge fields.

According to the NWU's Vice Chancellor, Prof Dan Kgwadi, the NWU supports the academic BRICS initiatives in order to share knowledge in a "partnership" for development and economic growth and industrialisation. "The NWU has already entered into agreements with several BRICS universities for the exchanging of knowledge and skills. In an increasingly competitive society it is also vital that innovation be emphasised," he said.

BRICS NU identified six thematic areas for collaboration, namely: Energy; Computer Science and Information Security; Ecology and Climate Change; Economics; Water Resources and Pollution Treatment; and BRICS Studies.

The objective is to provide a platform for the BRICS countries, particularly the leaders of International Thematic Groups (ITGs), to share research experiences and country-specific insights in these knowledge fields, and to explore possibilities for leveraging the cooperative force of BRICS UN to enhance scientific knowledge in the six thematic areas.

The North-West University (NWU) and the University of Limpopo are leading the BRICS NU International Thematic Group (ITG) on Energy for South Africa.

As part of our Faculty's involvement at the BRICS-countries, some of our staff either visited or collaborated with peers from China, Russia, India this year:

Mr Jan van Ravenswaay, Executive consultant and extraordinary lecturer

"A strategy and plan has been developed that outlines South Africa's participation in the BRICS Network University (NU) International Thematic Group (ITG) for Energy. This strategy and plan should have clear objectives and goals with role definitions and responsibility allocation to ensure that we can benefit fully from this opportunity. As part of the NWU's Faculty of Engineering's SA-UNESCO Conference, a BRICS Energy Session was held. Thirteen papers were presented aligned with the BNU ITG on Energy Focus of "Energy for Development. The BNU ITG on Energy is working towards the 2020 meeting in Russia and the various activities, aligned with the BNU ITG on Energy Roadmap, will be actively pursued."

Prof. Martin van Eldik, Director: Business Development and Stakeholder Engagement

"As part of the 6th SA-UNESCO conference on the Mafikeng campus, the BRICS Network University International Thematic Group (ITG) on Energy held a break-out parallel session. The aim of the session was to identify common chal-

lenges and opportunities to pursue joint project and funding proposals within the ITG Energy Theme and more specifically in terms of energy for development. The session consisted of invited speakers from the different focus areas of the ITG, followed by post-graduate students from different universities across South Africa on related topics."

Dr Dmitri Bessarabov, Director: DST HySA Infrastructure Center of Competence

Dr Bessarabov was invited by the Moscow Institute of Physics and Technology to deliver a presentation at the 6th All Russia Conference on Fuel cells and Power Plants. He presented on Electrochemical hydrogen compression and separation. He also co-authored three academic papers with Russian colleagues during 2019 and was invited to serve on the review panel for one of the PhD students from a Russian University. HySA also has Russian visiting professor appointed, Prof Alexandr Avdeenkov.

Prof Leenta Grobler, Group leader: Medical Device development platform

Prof Leenta Grobler visited China on two occasions this year. The first was to raise funding for further development, specifically the clinical trails, of the NeuHand™ system. During the trip, she presented to a range of industry, government and venture capital representatives in Haiko, Nanjing and Huzhou. The second trip was to raise funding for her Medical Device development and commercialisation platform. The platform will enable data-driven screening, diagnostics, rehabilitation,

and therapy in a multidisciplinary fashion. To this aim, she participated in the 2019 China Zhejiang "Xingyao Nanhu Yangtze Triangle Elite Summit" and the second session G60 Science and Creation Corridor Talent Summit Press conference. Recently, the Science and Technology department of Zhejiang province, China responded to the presentation in the form of a Memorandum of Agreement for the establishment of a Medical Devices Research and Development platform at the incubators in Zhejiang Province.

Mr FR Bezuidenhout, Technology Transfer and Innovation Support Office

FR Bezuidenhout represented the NWU at the International Science and Technology Cooperation Conference hosted by the BRICS Technology Transfer Centre, based in Kunming, China. This conference provided excellent network opportunities with representatives from all the BRICS countries. FR presented some of the Faculty's commercialisation projects during one of the conference sessions. A key breakthrough from the conference is that in 2020, a BRICS website portal will be launched to link research, funding and technology transfer opportunities across BRICS countries.

Prof Quentin Campbell, Director: School of Chemical and Minerals Engineering NWU brings Russian coal technology to SA

Water is a scarce commodity in drought-stricken South Africa. One area where water can be saved is in the processing of coal. Large amounts of water are traditionally used in coal washing.

Keeping this in mind, two engineers from the North-West University's (NWU's) School of Chemical and Minerals Engineering visited Siberia earlier this year with the aim of bringing their dry coal beneficiation technology to South Africa.

"The BRICS-sponsored trip to Russia was the first step in our dream to expose postgraduate students and staff to coal beneficiation technologies developed elsewhere in the world," says Prof Quentin Campbell, director of the school.

Prof Campbell explains that the Russians use the Sep-Air processing unit. "This processing method shows significant potential for the inevitable future of dry coal-processing practices in South Africa."

He says the unit can process large quantities of ore and can easily be adapted to handle large particle sizes. It has simplicity in its design, operation and maintenance, which makes it an appealing alternative.

According to PhD student Nikki Hughes, the main aim of the visit was to become acquainted with the Sep-Air technology. "In order for us to simulate and model it for South Africa's needs we first needed to learn how to operate it." Nikki says they did this through various experiments and by observing closely how the unit is used.

"I have learnt from our visit that one can indeed find very simple solutions to complex problems if you are prepared to think outside the box. Exposure to other trains of thought is key to evaluating whether we are still in a box of our own," says Prof Campbell.

The visit paved the way for collaboration between the NWU and the Gormash Export LLC company, which owns the SepAir system, by signing a memorandum of understanding. This will enable further research opportunities for researchers and students.

The most important outcome was that the agreement included the opportunity to obtain a working computer-based model of a Sep-Air unit.

"This will allow us to further develop it specifically for South Africa and in the process not only conserve water but also have access to a new way of making coal even more economically attractive," says Nikki



Photo: Nikki Hughes (second from left), a chemical engineering doctoral student, and Prof Quentin Campbell (third from left), director of the School of Chemical and Minerals Engineering, visited Gormash-Export LLC in Novosibirsk, Russia to look at their Sep-Air dry coal beneficiation technology. Their host and owner of the company, Andrey Stepanenko, is second from the right. With them are workers of Gormash-Export LLC.





Our new language policy

- to the benefit of all

The NWU's Language Policy has passed the drawing board stage and is ready for action. We asked Johan Blaauw, director of the Language Directorate, to tell us more about the progress made with the implementation of the NWU's language plans in 2019 and what lies ahead for 2020.

What does the language plans entail and how do they relate to the Language Policy?

Answer: The NWU Language Policy is but a theoretical framework, so language plans have to be put in place to enable us to implement it. These plans are customised for each of the main domains in which the policy applies, namely teaching-learning, student life, administration and the linguistic landscape of the NWU.

Are we on schedule with the implementation of the language plans?

Answer: Yes, we are. Some aspects of the plans are already being implemented, such as multilingual study material and the compilation of multilingual terminology lists, while the major work is planned for 2020.

What has been accomplished so far, especially during 2019?

Answer: Each faculty has developed its own language plan to give effect to the Language Policy in its unique environ-

ment, as has Student Life.

What steps will be taken in 2020?

Answer: 2020 will be the first year of implementing the Language Policy via the language plans.

We have to keep in mind, though, that implementation will be a process, unfolding over the next few years. Importantly, the language plans are living documents that will be developed and refined during implementation.

"It is always a great idea to implement great ideas, not only in business, but in our education system as well in order to see a faculty flourish."

We know what we want to achieve in terms of multilingualism, for instance developing Setswana and Sesotho to become fully fledged academic languages. How exactly we are going to get there is not cast in stone. What we do know for certain is that multilingual pedagogies (teaching approaches) will play a very important role.

In simple terms this means that the various multilingual repertoires or language skills staff and students bring into the classroom will be used to achieve effective teaching and learning. The Faculty of Education will also offer short learning courses to teaching staff to develop their skills in this regard.

Is there a date for finalising the implementation somewhere in the future?

Answer: The short answer is no. Our policy is one of additive multilingualism, so we will constantly be adding to our multilingual offering.

Can you tell us what the final outcome of the implementation should be? (In other words, what will the final overall "language picture" at the NWU look like?)

Answer: Our dream is to create a university where everybody will feel welcome in their languages and be able to use their languages to teach, learn and interact freely.

We want to have a university that will enable students to complete their studies from start to finish in their mother tongue, for example in Setswana, or in any of the various languages of learning and teaching that will be available at the NWU.

The Faculty of Engineering's Language Plan

The approval of the North-West University Language policy in 2018 brought forth the need to investigate how multilingualism can be deployed within each faculty. With their language plan, the Faculty of Engineering wants to balance the need for Engineering that communicate effective in a predominantly English professional world, while also growing the diversity of student corps and to accommodate students in a multilingual way, especially in the first years of study.

The aim of this language plan is to facilitate the education of engineers who will be professionally fluent in English (exit outcome), taking cognisance of the fact that these students enter our educational system from multiple multilingual and multicultural contexts. Hence, implementing deliberate interventions near the education system entry points so as to optimize access and success. This will be accomplished by the following objectives:

 Utilise existing and planned bi- and multilingual practices of the Faculty of Natural and Agricultural Scien ces (FNAS) with respect to common modules from the BEng Curricula that are presented on Potchefstroom Campus; Use innovative approaches and technology – in collaboration with FNAS – to transmit/ capture/ flip the Mafikeng Campus' English classroom experiences to/on the Potchefstroom Campus for the other common modules from the BEng Curricula that are presented in English on Mafikeng Campus;

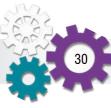
Over a 4-year time-span (2020-2023), through individual Engineering Education research projects, increase access to a diverse student population and enhance bilingualism and multilingualism, through innovative practices and the use of technology in all engineering modules in the first year, as well as first semester of the second year;

When the majority of the 2020 first year intake reach their final year (2024), all final year communication (receptive and productive) will be in English only;

 To establish within the NWU Centre for Engineering Education (CEE), internationally recognized expertise with regard to bi-/multilingualism and the use of language technology in Engineering Education. Hence, to position this as a research area within the CEE so as to enable the sourcing of external research funds.

George Nyirenda, a senior student in Mechanical Engineering and a tutor at the Faculty of Engineering, says there is much logic behind the new language plan. "Having been a tutor for the firstyear Mathematics and Computer Aided Design modules offered, I have found that one of the most important aspects that attract students to seek a tutor, is the ability of the tutor to speak Setswana - a language that many students prefer to be taught in. It has come to my attention that students always choose to raise their hands to an assistant, or tutor, who they believe will have the greatest potential to communicate with them. It is exciting to know that I will be part of a project like this, being in the forefront of student education in multilingual based education. It is always a great idea to implement great ideas, not only in business, but in our education system as well in order to see a faculty flourish."





We welcome our new PhDs!

In 2019, no less than 19 students obtained their PhD degrees! We are so proud of you all and look forward to see where this distinguished qualification will take you. Hats off to each one of you!

Title

They include:

Name		
Ivallie		

Arif, Samrana A computational model for the description of electrostatic precipitator performance

Stols, Jan Antonie Implementing a remote condition monitoring system for South African gold

Kruger, Gert Lodewikus

Cooperative control of an active magnetic bearing and sensorless drive system

Alabi, Micheal Omotayo

Framework for effective Additive Manufacturing education at South African

Nyalunga, Gezekile Portia

Quantifying uncertainties of aspects of the neutronics modelling of the Kozloduy-6 system using SCALE 6.2.1

Pelser, Wiehan Adriaan

Development of an integrated cost model for steel production planning

Campbell, Kristy

A critical analysis of emission quantification methods in the ferrochrome industry

Coetzee, Rojanette

Development of the Respect for People model for lean implementation in the South African context

Storm, Markus Erasmus

An integrated methodology to measure and verify energy conservation under incentive-based irrigation pumping programmes

Van Rensburg, Martha Johanna A comparison between high airflow drying and adsorption assisted drying for the dewatering of fine coal

Neser, Henri Energy based visualisation of a Brayton cycle power conversion unit for the purpose of condition monitoring

Pascoe, Bertie Improved control processes to sustain electricity cost savings on a mine water reticulation system

Coetzee, Gert Hendrik

The influence of particle size on the pore development of coal chars during gasification

Khoza, Samukelisiwe Nozipho Purity An integrated thermal-hydraulic system CFD model of a prismatic block HTR core using Flownex

Brand, Johan Francois Industrialisation of underground coal gasification in South Africa and the

commercial optimisation of the Theunissen UCG project

Bhero, Ernest Enhancing cross border operational efficiency with techno-social systems

Budeli, Lalamani Critical success factor model to optimize power plant life cycle management

Sihlangu, Sinenhlanhla Fortunate Uncertainty and sensitivity analysis of aspects of the neutronics of a prismatic

block-type HTGR

Smith, Neville James A novel approach to Waste Composition Analysis in developing countries





To Apply:

Visit www.nwu.ac.za and click through to the Faculty of Engineering.

Inquiries:

Angie Danster at (018) 299 1985 or angie.danster@nwu.ac.za

Students flourish during final year projects

At the end of each academic year, final year students from the faculty get the opportunity to showcase their passion toward their field of study. All final year students from the Schools of Industrial, Mechanical, Chemical and Electric, Electronic and Computer Engineering recently presented their final year projects to their supervisors and lecturers

- The School of Industrial Engineering held their project day on 13 and 14 November.
 All the students presented their posters and thereafter they held a final year dinner at the Dampad restaurant.
- The School of Electric, Electronic and Computer Engineering held their project day on 13 November in which their top three best project presentation were Lucas van Wyk, Gerbrand Haasbroek, Jacques Kotze, Willem Venter and Elmo van der Merwe. The overall top presenter in the school was Riekert Janse van Vuuren, where he showcased his DC power quality standards project.
- The School of Chemical and Minerals Processing held their project day on 14 November. Thereafter, they held their final year social braai. The top performing student was A Labuschagne. His project title was Anaerobic digestion of hydrothermal liquefaction aqueous phase in a thermophilic and mesophilic packed bed reactor
- Lastly, the School of Mechanical Engineering held their project day on 21 November. They also had a tree planting session in which they planted a tree for the class of 2019, so that many years from now they can come and visit the faculty and see it as a remembrance of the time they studied at the NWU. The top presentation for the group was Waldo Oosthuizen. His project entailed the development of a Traversing wake survey system to measure the drag coefficient of an airfoil.

NWU top of class in 2019 Greenovate Engineering Awards



Photo: Prize winner, Lucas van Wyk, with his supervisor, Dr Henri Marais.

For the first year, the North-West University's Faculty of Engineering has recently taken top honours in the Greenovate Engineering Awards 2019.

The Greenovate Awards is a joint venture initiative between Growthpoint Properties and the Green Building Council South Africa, launched in 2015. This student programme aims to educate and reward the young minds and future leaders of South Africa for innovation and green building in the built environment.

The programme has two streams: the Greenovate Property Awards, offered for the fourth time in 2018, and the Greenovate Engineering Awards, now in its second year.

A total of eight universities competed again this year where NWU student, Lucas van Wyk, supervised by Dr Henri Marais, won first prize in the 2019 Greenovate Engineering stream. His final year project, a grey water management system, is concerned with improving the means in which grey water is integrated into irrigation systems. By doing so, the irrigation schedule is intelligently adjusted to optimise the use of grey water while minimising the use of potable water.

Lucas won prize money of R30 000 and a laptop. In 2018, the NWU received second place in this competition.

Student wins medal for shedding light on power

Electricity generation and supply continue to be a challenge in South Africa where the public electricity utility, Eskom, can at any time, at short notice, introduce load shedding and leave citizens in the dark.

The cash-strapped Eskom needs to find ways of generating electricity more economically if it wants to survive. The brilliant dissertation of a master's student of the NWU not only suggests a solution to this problem, but investigates ways to optimise the use of natural resources for power generation.

Jean-Pierre van Niekerk's dissertation earned him the coveted Theodor Stewart Medal in the master's category of the students' competition at the annual conference of the Operations Research Society of South Africa (ORSSA) in Cape Town in September.

Burning the midnight oil pays

For this year's competition, Jean-Pierre's supervisor, Prof Fanie Terblanche of the School of Industrial Engineering, nominated his dissertation, which Jean-Pierre completed in 2018.

"The medal is a reward for many hours of hard work and it means a lot for my career," says Jean-Pierre, who works as a data scientist for Standard Bank. "I believe it is only by the grace of God that I was able to successfully complete my studies."

Jean-Pierre is one of the first master's students to have graduated from the NWU's School of Industrial Engineering — a feat he shares with his twin brother, Thomas.



Jean-Pierre van Niekerk (right) and Prof Fanie Terblanche at the ORSSA conference in Cape Town.

The answer lies in mathematical modelling

Jean Pierre's dissertation on ways to minimise the cost of power generation considered the multitude of operational aspects that power utilities have to take into account. These include ageing infrastructure, stringent emissions legislation and operational limitations.

"Apart from the financial objective, the optimisation problem is also concerned with meeting the forecasted load demand to prevent grid instabilities."

Jean-Pierre says given the magnitude and complexity of the problem, his dissertation proposes a mixed integer linear programming formulation to solve the non-linear Unit Commitment and Environmental Economic Load Dispatch (UCEELD) challenge that power utilities face.

"I found that the proposed mathematical model and solution approach have the ability to solve a realistically sized problem within a reasonable time," he says.

In his dissertation, Jean-Pierre included other important aspects of the power generation problem, such as thermal generation, water consumption, outage constraints and demand uncertainty.



Dr. Hasan Darwish (left), senior lecturer in the NWU School of Industrial Engineering, is the well-deserved winner of the 2019 Teaching Excellence award from the SA Institute for Industrial Engineering (SAIIE). His colleagues, Teresa Hattingh and Philip Venter (right), shared in this occassion at the annual SAIIE Gala-evening on 15 Nov 2019







Prof LJ Grobler, a research professor at the North-West University's (NWU's) Faculty of Engineering and Director of CFAM Technologies, shares his opinion on the importance of research for business, and business from research.

Nurturing new entrepreneurs and entrepreneurial companies is seen as one of the key aspects of revitalising the South African economy. Numerous programmes and initiatives developed by government and private institutions aim to achieve this. Students and youth are encouraged to start their own businesses to become entrepreneurs. These initiatives are mainly driven by development agencies and business schools at universities and other tertiary institutions.

Despite these initiatives, we do not seem able to achieve the required results in developing new entrepreneurial businesses. What are the reasons for this? It is well accepted that research forms the fundamental base for innovation and subsequent commercialisation. However, in South Africa we are often unable to turn research into commercially viable entrepreneurial businesses.

In the USA, it is common to learn of businesses that started in a "garage" and have subsequently grown into mega-businesses. In most cases, research and innovation are the recipe for success. These companies' sustainable competitive advantage is therefore encapsulated in new technology-based products or services that challenge the status quo and provide new value streams or opportunities. Some examples are Uber, Airbnb,

Why do we not grow new businesses?

Tesla and SpaceX, to name but a few. One could argue that Tesla and SpaceX did not start in a garage. Fact is, Elon Musk started his first businesses, which he eventually sold to become PayPal, in a garage. He then used the same principles to develop Tesla and SpaceX.

Where is SA going wrong?

So what are we doing wrong in South Africa? Like the USA, we also acknowledge the importance of research and innovation. It is no secret that South Africa has some of the best universities and researchers in the world.

Findings of a recent analysis of South Africa's scientific performance show the country more than doubled its research publication numbers from 3 617 in 2000 to 7 468 in 2010. Throughout this period, South Africa also improved its international publications ranking by two positions, and was ranked 33rd in the world, according to a research paper by Prof Anastassios Pouris in the South African Journal of Science.

Considering these successes, shouldn't we be seeing a much greater increase in economic growth as a result? It is obvious that we should, but the problem is that we are not. I am of the opinion that we should focus more on the development of techno entrepreneurs than just business entrepreneurs. Techno entrepreneurs have the advantage of offering a competitive product or service that creates a barrier to entry for competitors. That is not necessarily the case for business entrepreneurs, unless they can clinch agreements to secure access to technologies. This is something that young business entrepreneurs will have difficulty in obtaining. Unfortunately, most of our entrepreneurial development

initiatives focus on the development of business entrepreneurs.

A person in the street derives little benefit

Large public or private enterprises are often approached by universities to fund research projects. Government also makes research funding available to assist in this regard. If the researcher can promise the sun, moon and stars, funding is usually granted and the researcher can apply it to technology research and development. In many cases, business and government departments' wallets are open to it, mainly because they realise its importance and consider research as part of their social obligation. Unfortunately, in many cases, once the research project is completed, the end product is often regarded as an article in an academic journal, without the person in the street gaining any benefit from this research on a commercial level.

Business owners and researchers often tend to have two different goals in mind. The business owner wants to grow and develop his business, while the researcher is more interested in finding funding for his particular research project. Very little, if any emphasis, is usually placed on innovation and commercialisation.

It is my opinion that focused research with commercialisation as the end goal can only be successful if it is one of the strategic objectives from the start. CFAM Technologies, a multimillion-rand organisation based in Potchefstroom, has demonstrated the success of such an approach. What started off as a research project by a master's student in 1998 has grown into a thriving organisation that is currently the only manufacturer of twin-screw food extruders in Africa. This enterprise saw the

light of day in 2007 as a spin-off company from the North-West University's drive towards research and innovation. We would not have seen the massive successes in CFAM today had it not been for a sound foundation of research and innovation, accompanied by proper entrepreneurial business understanding.

The company now designs and supplies turnkey food and feed processing plants

in Southern Africa and has even installed a plant in Ireland. More than 70% of all instant maize porridge products in Southern Africa are produced with CFAM's extruders. Combined, the CFAM extruders and plants impact more than R1 billion of the annual GDP of South Africa. If we could see the connection between research and entrepreneurial skills more often, South Africa would have many more newly created job opportunities, which would lead

to the alleviation of poverty and sustainable economic growth.

The time has come for researchers and businesses to think commercialisation from the start of a research project, not at the end or, worse, never. A culture and mind-set of commercialisation could be just the solution South Africa needs to make its research and innovation talent pay off.





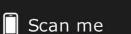


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NWU - North-West University



Our student association



During 2019, the Ingenium student association had lots of fun, won awards, studied hard and gave the necessary support to students and staff of the Faculty.

It is their aim to be a prestigious academic student association distinguished through advancing a culture of ambition, innovation, and honor amongst all students of • the NWU's Faculty of Engineering. Ingenium effectively represents the interest of all engineering students and promotes the following:

Accessibility of Ingenium amongst the engineering students;

- Effective communication between the engineering faculty and its students;
- Academic Integrity;
- Accountability, fairness, and trans-





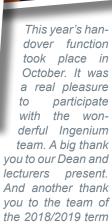
chairperson. Guess, got invited to the Faculty of Engineering evening 2019 where she won the Dean's award for excellent student leadership. We salute you Inge!

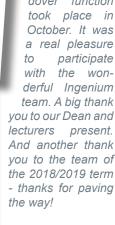


We really had fun at the Ingenium camp held in November. A huge thank

We are excited to share that Ingenium has won 3rd place as best NWU Academic Student Association for the term 2018/2019. We also received 1st place for media and communication, 2nd place for finances as well as for barefoot day, 3rd for mini open day and 4th for ar-











It all starts here