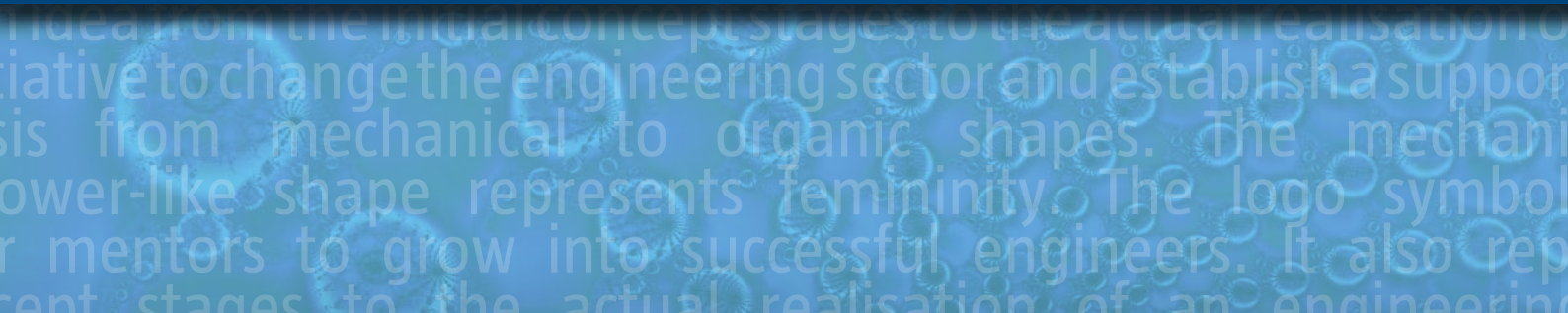
merSETA
MANUFACTURING, ENGINEERING AND RELATED SERVICES SETA

Nelson Mandela Metropolitan University
for tomorrow

"Celebrating five years of success"

merSETA Chair in Engineering Development



Karl du Preez (Chair) and Meera Naidoo (Project Manager).

merSETA Chair in ED and NMMU staff celebrating five years of success.

INTRODUCTION

The merSETA Chair in Engineering Development (ED) was introduced in 2010 at the Nelson Mandela Metropolitan University (NMMU). Karl du Preez, a principal lecturer in Mechanical Engineering and the Director of the Advanced Mechatronic Technology Centre (AMTC), was appointed as the Chair.

This milestone arrangement between merSETA and NMMU, was a pilot programme and a first for merSETA with a tertiary educational institution.

The primary objectives of the programme is to:

- Provide technical assistance to technical high schools in the Eastern Cape region.
- Enhance the relationship of the tertiary educational institutions with TVET Colleges.
- Introduce a programme that would provide both academic and non-academic support to female students at NMMU.
- Provide support in order to enhance the development of specialised skills in the fields of mechatronics and renewable energy systems.

"The introduction of the merSETA Chair in Engineering Development has enabled the university to enhance its relationship with technical colleges, high schools and local industries. The programme provided much needed assistance to effective infrastructure and skills development in the Eastern Cape. It has also assisted in creating an engineering environment in the School of Engineering where students can flourish and experiment with new ideas." – Karl du Preez, merSETA Chair in ED at NMMU.

This publication summarises some of the highlights and successes of the first five years of the merSETA Chair in ED at NMMU.

HIGH SCHOOL COLLABORATION

Educator support

Technical high school educators at AutoCad training.

Prominently on the agenda for high schools is the up-skilling of technical educators through various forms of certified training modules in mechanical and electrical engineering.
A total of 56 educators have received certified training over the five year period.

Engineering awareness workshops

Visiting high schools in the rural areas of the Eastern Cape provided meaningful insight into the challenges faced by educators at these schools. The merSETA Chair in ED visited a number of schools and presented engineering awareness workshops to both learners and educators. These workshops incorporated matters relating to available career options in manufacturing, entry requirements for tertiary educational studies and new technologies in engineering. A total of 2720 learners attended the 17 workshops conducted by merSETA.

> *It was fantastic travelling with NMMU to rural schools in the Eastern Cape and to address learners, providing them with vital career decision making information.* – **East Cape Midlands College Public Relations Officer, Alicia Pienaar.**

East Cape Midlands College and merSETA addressing learners from Kwa-Komani Comprehensive Secondary School.

Meera Naidoo presenting the Principal of Kwa-Komani Comprehensive Secondary School in Queenstown with a career pathway poster.

Laboratory development at technical high schools

A number of laboratories have been upgraded, refurbished or maintained at technical high schools in the Eastern Cape. A major milestone was a tri-party agreement between Afrox SA, merSETA and NMMU to equip four technical high schools with Afrox welding equipment.

> *Our children have the potential and ability to do research. Having a resource like the merSETA Chair in Engineering Development will go a long way towards helping them realise their dreams* – **Gelvandale High School teacher, Fuaad Abrahams.**

NMMU presenting Logo automation hardware to Port Rex Technical High School in East London.

Khwezi Lomso High School's newly renovated drawing classroom.

Learners from Gelvandale High School with their Afrox equipment.

Engineering winter school – Somerset East

An engineering winter school was offered to learners from the rural areas of Somerset East, Cradock and Graaff-Reinet. The learners were exposed to various aspects of engineering and IT at a five-day winter school at NMMU. Visits to engineering laboratories and the local automotive industry were accompanied by various practical lectures dealing with engineering and IT related topics.

Class of 2014 at Somerset East.

Success stories from merSETA winter school

"In my matric year I was privileged to participate in the Incubator School for Maths and Science Development Programme initiated by merSETA. I was chosen to attend the Engineering awareness week by merSETA. At the end of the programme I was fortunate enough to get a bursary to study Mechanical Engineering at NMMU.

The merSETA bursary gave me an opportunity to excel. When I look back today I'm grateful for making use of that key merSETA provided me. In April 2015 I graduated from NMMU obtaining my NDip in Mechanical Engineering. In 2014 I completed my in-service training at LINDE + WIEMANN RSA and was offered a position as a Process Technician. I recently relocated to Cape Town at Faurecia Emissions Control Technologies as a graduate engineer. Participating in a graduate-in-training programme.

I am enjoying the work I'm doing, waking up every morning to take on a new challenge the job has to offer. My advice for aspiring engineers is never settle for anything less than the best." **– NMMU graduate engineer, Jean-Pierre Manuel.**

"My name is Tulethu Dyala. I was born in the small town of Alexandria in the Eastern Cape and matriculated from Ukhanyo Secondary School.

The day I was contacted by Meera Naidoo from merSETA was a life changing moment because from that day onwards I was given a chance to fulfil my goals and dreams. I received a merSETA bursary to study Electrical Engineering at NMMU.

In 2013 I joined wela the Women in Engineering Leadership Academy at NMMU. We get together as women in engineering to discuss some of the challenges that are faced by females in this male-dominated industry. Organisations such as these encourage women to join the engineering field.

I am really grateful to merSETA for giving me the opportunity to further my education and study what I love. I would also like to encourage more young women to consider the engineering field - we as women can do anything that we set our minds to ." **– Third-year Electrical Engineering student, Tulethu Dyala.**

Junior Cyber Junkyard Competition for technical high schools

The merSETA Chair in ED facilitated a competition between high schools and Technical Vocational Education and Training (TVET) colleges. In 2011 and 2013 seven high schools and three TVET colleges were invited to participate in the regional competition. In 2013, the Eastern Cape regional winner Daniel Pienaar Technical High School from Uitenhage, achieved second place at the National Junior Cyber Junkyard competition in Johannesburg.

Newton Technical High School learners with their automated pump system.

Winning schools at the National Junior Cyber Junkyard competition in 2013.

Maths, Science and Engineering Development Programme (MSEDP)

A partnership with the NMMU's Govan Mbeki Maths Development Unit (GMMDU) and the merSETA Chair in ED provided essential support to the realisation of a Maths, Science and Engineering Development Programme (MSEDP) in the rural area of Somerset East. This programme includes a Grade 10 to 12 Maths and Science Learner Incubator School, a Maths skills upgrade to educators as well as a Grade 12 Maths and Science examination preparation project.

With the assistance of various stakeholders, including merSETA, the GMMDU was able to introduce a desktop project called the Maths and Science TouchTutor™ Programme at various rural schools. This project includes the supply of desktops to schools as well as the supply of tablets to learners and are loaded with the TouchTutor™ resource.

Learners receiving their Casio calculators as part of the MSEDP in the Eastern Cape region.

Learners from the Karoo area who attended a 14-week Maths and Science Incubator School receiving their tablets with TouchTutor™.

> *The merSETA programme in the Eastern Cape rural areas has provided the Govan Mbeki Math Development Unit with much needed support to enhance the experience of learners via innovative digital resources and equipment including tablets. This has lead to a sustainable implementation of a Maths and Science development model in secondary schools in the Karoo region.* – **NRF Research & Development Chair, Prof Werner Olivier.**

TVET COLLEGE SUPPORT

One of the major interests of the merSETA Chair in Engineering Development was to build a strong relationship between the TVET colleges in the Eastern Cape and NMMU. The major objectives identified included the up-skilling of educators, laboratory development as well as the provision of academic articulation opportunities for TVET college students.

Up-skilling of TVET college staff

Various technical training workshops and short learning programmes were offered to the technical educators from TVET colleges.

TVET lecturers at a Renewable Energy short course.

ECM College lecturers at a Pneumatic short course.

Laboratory development at TVET colleges

In parallel to the up-skilling of technical knowledge of TVET college staff, a total of three laboratories were developed, maintained or upgraded. A Fanuc industrial robot was maintained and commissioned at PE College for utilisation in the NQF Level 4 Mechatronics qualification while a Logo PLC automation system was developed for the assessment of NQF Level 4 Electrical Engineering module at EC Midlands College. Fifteen Siemens Logo PLC training stations were designed, manufactured and commissioned at Ikhala College in Queenstown.

ECM College lecturers with the Logo PLC assessment stations built by the merSETA Chair in ED programme.

Ikhala TVET College staff with the Siemens hardware manufactured for the electronics laboratory.

> *On behalf of the college, I would like to express my sincere gratitude for installing the PLC software and hardware in our laboratories and training our staff members. We are grateful for what merSETA has done.* **– Deputy Principal, Ikhala TVET College, Mqondisi Bhikisha.**

Development of a career pathway poster

A career pathway poster was developed in conjunction with TVET colleges in Nelson Mandela Bay Metropole. This poster provided a visual realisation of qualification articulation pathways available to college students. The poster was distributed to various colleges and high schools and training sessions were conducted with respective staff members. The poster was also translated into isiXhosa to assist local high schools.

Career Pathway Poster (Xhosa)

> *This is fantastic. It gives a very simple, easy to understand and visual picture of the career pathways that currently exists for TVET learners.* **– Unity in Africa Foundation, Chairman of Trustees, Evan Dold.**

PROMOTING WOMAN IN ENGINEERING

The South African government identified the need for an increase in the number of women engaged in engineering, as a national priority. In 2011 the merSETA Chair in ED at NMMU established a Woman in Engineering Leadership Academy (wela). This academy focuses primarily on the support of female students in the school of engineering in order to enhance their academic experience and more importantly their successful completion of their studies. A typical programme includes various developmental workshops, guest lecturers, academic support as well as a portfolio development project for students.

Wela girls at a 7 Choices Workshop.

Dignitaries at the launch of wela programme.

> *I have already received invites from VW, Continental and Coca-Cola for graduate training. In all the interviews I attended, they told me they were impressed with my CV which wouldn't have been possible if it wasn't for wela.* **– Industrial Engineering student and wela member, Elisabeth Malatji.**

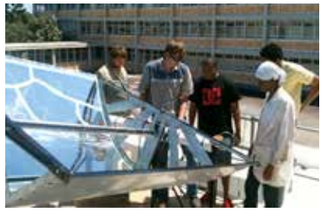
SPECIALISED SKILLS DEVELOPMENT

This project was initiated in order to enhance opportunities in new training programmes for industry as well as the development of specialised skills in the mechatronic and renewable energy fields. During the past five years, a number of projects were identified which students could participate in, to improve their skills. It assisted and enhanced their employability in local and national industry.

Solar parabolic trough collector

A postgraduate project, collaboratively supported by NMMU, AIDC and merSETA, resulted in the design, manufacture and commissioning of a solar parabolic trough collector. The solar collectors, which automatically tracks the sun, heats ambient air to temperatures in excess of 350°C, which in turn transfers the heat to a rock-storage insulated container.

> *The introduction of the merSETA Chair in Engineering Development at NMMU has been instrumental in the establishment of various research platforms in the Renewable Energy Research Group. This partnership has created an environment conducive to innovation where young minds can excel in engineering.* **– Manager of the Renewable Energy Research Group, Prof Russel Phillips.**



Parabolic trough collectors on the roof at NMMU.

Renewable charging station for touchpad

A BTech Mechanical Engineering student designed and manufactured two solar powered charging stations for electronic devices. One of the devices is fitted with an on-board battery system that can be charged and the other is a direct charging supply. The devices can be used to charge electrical devices like cell phones, touchpads and iPads.

Hercules Kok and the solar charging station.

> *Working on the NMMU Eco Car Project has been an invaluable learning experience in promoting the real world application of engineering theory, problem solving, time management, and working in a highly diverse team.* **– NMMU Mechanical Engineering student, Martin Badenhorst.**

Shell Eco-Car Marathon

The Shell Eco-Marathon is based on student teams producing an ultra-lightweight vehicle, built specifically to travel as far as possible on a litre of fuel. It aims to expose students to the concepts of efficiency, lightweight design and more economical solutions to the challenges presented to society in respect of carbon-footprints.

NMMU Eco-Car students.

This also exposes the team members to focus on science, technology and engineering in order to achieve these outcomes. In 2012, engineering students also manufactured a solar driven vehicle.

NMMU Solar Car students.

Solar driven vehicle (Gonzo 1)

In 2014 the students at NMMU's Renewable Energy lab were challenged to build a solar powered vehicle. The vehicle had to be cheap, reliable and rely solely on the sun as its source of energy - Gonzo 1 was born. Gonzo 1 was designed and manufactured by adapting two bicycles with four 200W solar panels and a direct DC motor. In November 2014 the engineering students tested the first prototype on Verneukpan in the Northern Cape and managed a speed of 37,1 km/h.

NMMU students testing solar driven vehicle, Gonzo 1.

> *We are looking forward to seeing what the results with our new design will be. We also want to thank all our sponsors, especially merSETA, who is making this project possible which gives the students of NMMU the opportunity to be a part of such an interesting and exciting project.*
> **– Mechanical Engineering student, Louwrens Kok.**

NMMU students at the launch of the Formula Electric Car.

Formula racing car

In 2013, the Formula Racing team designed and manufactured a single seater Formula Student Electric Racing vehicle. This project involved engagement with various stakeholders including automotive as well as manufacturing companies in the Eastern Cape.

> *Involvement of the merSETA Chair in Engineering Development in such cutting-edge technology has enabled our students to learn about technologies that are up-to-date in the automotive industry.*
> **– NMMU Formula Racing Manager, Trevor Stroud.**

NMMU contact:

Karl du Preez
merSETA Chair in Engineering Development
Tel: 041 504 3644
Email: karl.dupreez@nmmu.ac.za
http://amtc.nmmu.ac.za

merSETA Contact:

Christo Basson
Senior ETQA Manager and Partnerships
Head Office
Call free: 0861 637 738
Email: CBasson@merseta.org.za

Zwelethemba Ngayeka
Client Relations Manager - Regional Office
Eastern Cape
Call Centre: 0861 637 734
Email: zngayeka@merseta.org.za
www.merseta.org.za