



Stellenbosch
UNIVERSITY
IYUNIVESITHI
UNIVERSITEIT

Engineering
Eyobunjineli
Ingenieurswese

2025

ANNUAL REPORT
JAARVERSLAG



forward together
sonke siya phambili
saam vorentoe

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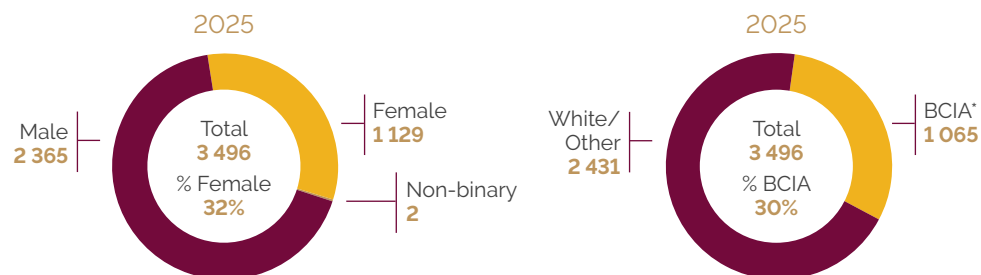
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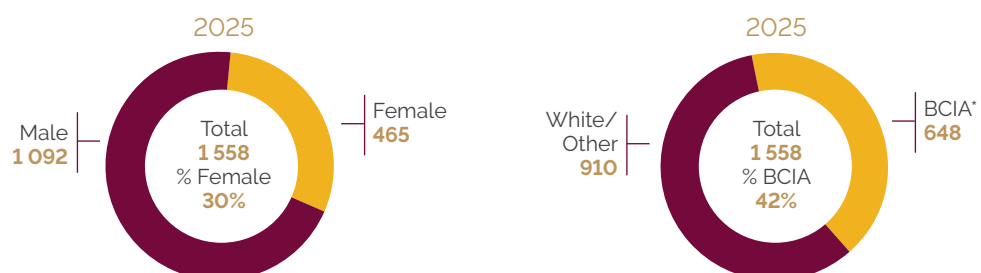
At a Glance



Undergraduate Student Demographics

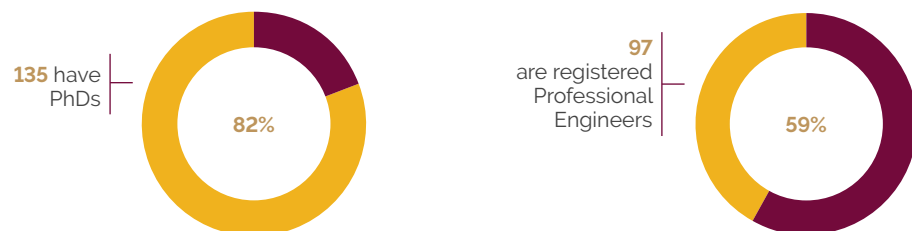


Postgraduate Student Demographics



Academic Staff

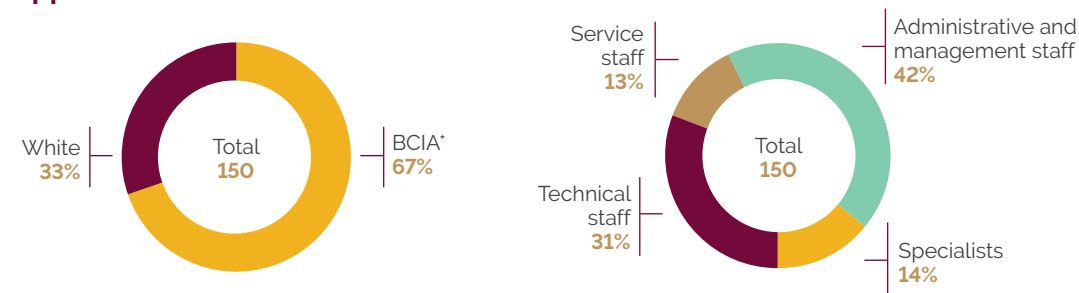
163 permanent academic staff



*BCIA = Black African, Coloured, Indian and Asian



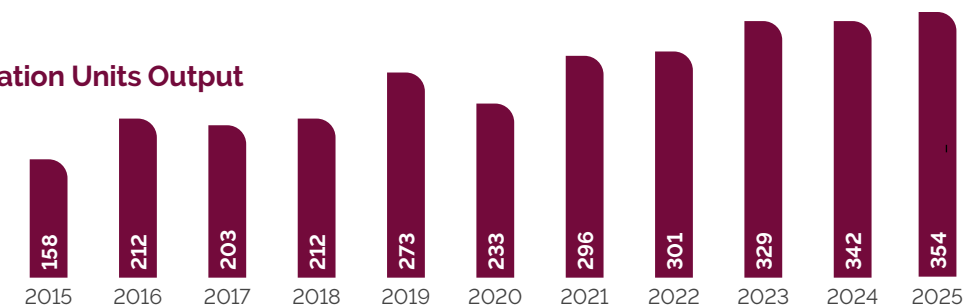
Support Staff



930 Graduates (Dec 2025 & March 2026)



Publication Units Output



62 NRF-rated Academics 2025



From the Dean

The year under review saw the Faculty of Engineering at Stellenbosch University (SU) continue to position itself at the forefront of engineering education and research by critically engaging with the opportunities and challenges posed by artificial intelligence, evolving accreditation requirements and changing student needs.

A transformative, inclusive student experience

Transforming students into confident, capable engineers starts with selective admission. We regularly review our undergraduate selection criteria and admission strategies to ensure our students are set up for success. Thereafter, we monitor their progress through regular student feedback and incorporate student concerns into Faculty decision-making.

Because non-academic challenges, including psychological and financial ones, can hinder student success, the Faculty supports students by providing access to two educational psychologists and, from 2026, a full-time student counsellor at the Centre for Student Counselling and Development.

Through partnerships, the Faculty creates opportunities for financial assistance for undergraduate and postgraduate students, including the DW Ackerman Bursary Fund, BMW IT Hub South Africa bursaries, the TymeCube Bursary and Internship Opportunity, and other industry-sponsored postgraduate support.

Our passion for technology and innovation naturally led us to explore AI-enabled student support initiatives. During weekly sessions of the MindJoy pilot, an AI-powered educational platform, lecturers were empowered to design AI tutors that guide students through tutorials and practicals.

Networked and collaborative teaching and learning

Affirming the collaborative spirit that drives innovation to new heights at the Faculty, a multidisciplinary teaching team, led by Prof Karin Wolff, our engineering teaching and learning advisor, received the esteemed 2025 National University Teaching Award (NUTA) for their "creative, thought-provoking and inclusive pedagogy".

Prof Debby Blaine of the Department of Mechanical and Mechatronic Engineering completed an SU Teaching Fellowship, a prestigious programme supporting in-depth research projects.



Lauren van Breda, one of the award-winning NUTA team's 12 core members and 24 collaborators; Prof Karin Wolff, team leader; Prof Celeste Viljoen, Dean of Teaching and Quality Assurance; and team member Natalie White.

Over four years, the Department of Industrial Engineering's master's programme in Engineering Management grew from 12 to 66 graduates, building a strong alumni network committed to a better future. Its hybrid online model enables global professionals to balance their studies with work.

To maintain our strong record of compliance with professional accreditation requirements, preparations for the next Engineering Council of South Africa accreditation cycle across all engineering programmes are well underway. This will include our response to the recently gazetted Identification of Engineering Work, which provides that professionally registered persons must educate engineers.

Research for impact

To strengthen capacity in strategic research areas that address urgent national and global challenges, two new research chairs were awarded to the Department of Mechanical and Mechatronic Engineering: the DSTI/NRF-SAIMI SARCHI Research Chair in Naval Architecture and Design to Prof Annie Bekker, and the ACWA Chair in

Concentrating Solar Power to Prof Craig McGregor.

The Faculty conferred an honorary Doctor of Engineering on Dr Colin Deiner for his extensive expertise in disaster management and response.

Support for emerging researchers continued through initiatives such as the Thuthuka Programme, awarded to eight engineering academics, and the Future Professors Programme.

Purposeful partnerships and inclusive networks

Collaboration reflects our commitment to responsiveness and to driving change. The annual Industry Showcase in Sandton highlighted our ongoing engagement with industry stakeholders and engineering partners.

We expanded our international network through a new partnership with Poznan University of Life Sciences in Poland, initiated by Prof Corné Coetzee and Prof Tomasz Garbowski, enabling joint research, exchanges and international engagement.

Through our longstanding collaboration with Northwestern University in Chicago, USA, we hosted students for a three-month internship on biomedical engineering projects tailored to local hospitals. Northwestern generously agreed to sponsor equipment for a makerspace in the General Engineering Building.

To further prepare industry-ready graduates, we provided access to internships, mentorships and vacation work opportunities. The Acorn and Oaks Alumni Mentorship Programme and a Virtual Industry Tour competition were initiated by alumnus Dr Andy Calitz, an electrical engineer and 2022 honorary doctorate recipient.

Employer of Choice

The Faculty strengthened its commitment to an inclusive, supportive workplace by hosting workshops on cultural competence, inclusivity and collaboration, with more than 90 staff members participating.

Staff excellence was recognised through Faculty awards, with Profs Tobi Louw and Jamie Cripwell from the

Department of Chemical Engineering receiving the Lecturer of the Year and Researcher of the Year awards, respectively.

The Faculty received major institutional recognition at the SU Research and Innovation Excellence Awards, including the prestigious DVC's Award for Interdisciplinary Performance, presented to the Institute for Biomedical Engineering, led by Prof Kristiaan Schreve. At the Innovus Technology Transfer Office's annual Inventors Awards ceremony, the Faculty received the Invention Disclosures Award and the Spin-out Company Award, highlighting its interdisciplinary collaboration, innovation and technology transfer.

A thriving Stellenbosch University

The University is investing significantly in the Faculty's teaching and research infrastructure across departments as part of a broader investment project worth R1,6 billion extending to 2028.

The renovation of the General Engineering Building, the Water Engineering Laboratory in the Department of Civil Engineering and the first phase of the Mechanical and Mechatronic Engineering laboratory upgrade were completed, providing improved facilities for teaching, experiments and research. The new Fire Safety Engineering Laboratory, for the growing master's programme in Fire Safety Engineering, and the Nanolaboratory are under construction.

Future outlook

Prof Deresh Ramjugernath, Rector and Vice-Chancellor, commended the leadership and dedication of the University's research community at the SU Research and Innovation Excellence Awards, noting: "Excellence is not a destination, but a journey of purpose and perseverance. Ideas lead to initiatives, initiatives to outcomes, and outcomes to impact." The Faculty is well prepared and future-fit for this journey.



Van die Dekaan

In hierdie verslagjaar het die Fakulteit Ingenieurswese aan die Universiteit Stellenbosch (US) voortgegaan met sy posisionering aan die voerpunt van ingenieursopleiding en -navorsing deur krities om te gaan met die uitdagings en geleenthede wat kunsmatige intelligensie, ontwikkelende akkreditasievereistes en veranderende studentebehoefes stel.

'n Transformerende, inklusiewe student-ervaring

Die transformasie van studente in bekwame, selfversekerde ingenieurs begin by keuring vir toelating. Ons hersien gereeld ons voorgraadse keuringskriteria en toelatingstrategieë om te verseker dat ons studente suksesvol kan studeer. Daarna monitor ons hulle vordering deur gereelde studenteterugvoerprosesse en neem studentebelange in ag by Fakulteitsbesluite.

Nie-akademiese uitdagings, insluitend sielkundige en finansiële, kan studentesukses belemmer. Daarom ondersteun die Fakulteit studente deur toegang tot twee opvoedkundige sielkundiges en, vanaf 2026, 'n voltydse studente-voorligter by die Sentrum vir Studentevoorigting en -ontwikkeling.

Deur vennootskappe skep die Fakulteit geleenthede vir finansiële ondersteuning vir nagraadse en voorgraadse studente, insluitend die DW Ackerman beursfonds, BMW IT Hub Suid-Afrika beurse, TymeCube beurs- en internskapgeleenthede, en ander bedryfsgeborgde nagraadse steun.

Ons voorliefde vir tegnologie en innovasie lei ons vanselfsprekend om KI-gesteunde studentesteuninisiatiewe te verken. By weeklikse sessies van die MindJoy loodsprojek, 'n KI-gedrewe opvoedkundige platform, is lektore in staat gestel om KI-tutors te ontwerp wat studente deur tutoriale en praktika begelei.

Genetwerkte en samewerkende onderrig en leer

Die gees van samewerking by die Fakulteit wat innovasie tot nuwe hoogtes aandryf, is bevestig deurdat 'n multidissiplinêre onderrigspan, gelei deur ons eie onderrig-en-leer-adviseur prof

Karin Wolff, die hooggeagte 2025 nasionale universiteitsonderrig-toekenning (NUTA) ontvang het vir hul "kreatiewe, tot nadenke stemmende en inklusiewe pedagogie".

Prof Debby Blaine van die Departement Meganiese en Megatroniese Ingenieurswese het 'n US-onderriggenootskap voltooi. Dis 'n invloedryke program wat diepgaande navorsingsprojekte ondersteun.

In vier jaar het die Departement Bedryfs-ingenieurswese se meestersgraadprogram in Ingenieursbestuur van 12 tot 66 gegradueerdes gegroei en 'n sterk alumninewerk opgebou wat verbind is tot 'n beter toekoms. Sy hibriede aanlyn model maak dit moontlik vir beroepslui om hul studie en werk te balanseer.

Om ons foutvrye lopie met die nakoming van professionele akkreditasievereistes voort te sit, het ons reeds begin met die voorbereiding van al die ingenieursprogramme vir die Ingenieursraad van Suid-Afrika se volgende akkreditasiesiklus. Die onlangs gepubliseerde Identifisering van Ingenieurswerk, wat bepaal dat professioneel geregistreerde persone ingenieurs moet oplei, sal verreken word.

Navorsing vir impak

Om kapasiteit te versterk in strategiese navorsings-areas wat oplossings soek vir dringende



Dr Colin Deiner ontvang 'n DEng, honoris causa.

nasionale en globale uitdagings, is twee nuwe navorsingsleerstoele aan die Departement Meganiese en Megatroniese Ingenieurswese toegeken: die DWTI/NSS-SAIMI SARCHI Navorsingsleerstool in Vlootargitektuur en -ontwerp aan prof Annie Bekker, en die ACWA Leerstoel in Gefokusde Sonkrag aan prof Craig McGregor.

Die Fakulteit het 'n eredoktorsgraad in ingenieurswese aan dr Colin Deiner verleen vir sy kundigheid in rampbestuur en -reaksie.

Steun vir ontluikende navorsers is voortgesit met inisiatiewe soos die Thuthuka Program, wat aan agt ingenieursakademiese toegeken is, en die Toekomstige Professore-program.

Doelgerigte vennootskappe en inklusiewe netwerke

Samewerking toon ons verbintenis tot die soek van antwoorde en die aandrywing van verandering. Die jaarlikse Bedryfstentoonstelling in Sandton is 'n glanspunt in ons voortgesette betrokkenheid by bedryfsbelanghebbende ingenieursvennote.

'n Nuwe vennootskap met Poznan Universiteit van Lewenswetenskappe in Pole brei ons internasionale netwerk uit, te danke aan prof Corné Coetzee en prof Tomasz Garbowski wat die gesamentlike navorsing, uitruiling en internasionale skakeling geïnisieer het.

Deur langdurige samewerking met Northwestern Universiteit in Chicago, VSA, het hul studente ons besoek vir 'n drie-maande internskap in biomediese ingenieursprojekte, afgestem op plaaslike hospitale. Northwestern het ruimhartig ingestem om toerusting vir 'n makersruimte in die Algemene Ingenieursgebou te borg.

Ter bevordering van bedryfsgereed gegradueerdes het ons toegang tot internskappe, mentorskappe en vakansiewerkgeleenthede verskaf. Die Akker en Eike Alumnimentorskap-program en 'n virtuele-bedryfstoe-competisie is deur alumnus dr Andy Calitz begin, 'n elektriese ingenieur en 2022-eregraadontvanger.

Die Universiteit Stellenbosch as voorkeurwerkgegewer

Die Fakulteit het sy verbintenis tot 'n inklusiewe, ondersteunende werksplek gestand gedoen deur werkswinkels oor kulturele bevoegdheid,

inklusiwiteit en samewerking te hou waaraan meer as 90 personeellede deelgeneem het.

Personeeluitnemendheid is erken deur Fakulteitstoekennings aan profs Tobi Louw en Jamie Cripwell van die Departement Chemiese Ingenieurswese vir Lektor van die Jaar en Navorsers van die Jaar onderskeidelik.

Die Fakulteit het aansienlike institusionele erkenning by die Universiteit se Uitnemendheids-toekennings vir Navorsing en Innovasie ontvang, insluitend die voortreflike AVK Toekenning vir Interdissiplinêre Prestasie aan die Instituut vir Biomediese Ingenieurswese onder leiding van prof Kristiaan Schreve. By Innovus Tegnologie-oordragkantoor se jaarlikse Uitvinderstoekenning-seremonie ontvang die Fakulteit toekennings vir uitvindingopenbaarmaking en afwentelmaatskappye, wat sy interdissiplinêre samewerking, innovasie en tegnologie-oordrag belig.

'n Florerende Universiteit Stellenbosch

Die Universiteit belê beduidend tot 2028 in die Fakulteit se onderrig- en navorsingsinfrastruktuur oor departemente heen as deel van 'n omvattende beleggingsprojek van R1,6 miljard.

Die opknapping van die Algemene Ingenieursgebou, die Departement Siviële Ingenieurswese se Wateringenieurswese-laboratorium, en die eerste fase van die Departement Meganiese en Megatroniese Ingenieurswese se laboratoriumopgradering is afgehandel, wat verbeterde fasiliteite vir onderrig, eksperimente en navorsing bied. Die nuwe Brandveiligheidslaboratorium, wat die groeiende magisterprogram in Brandveiligheids-ingenieurswese ondersteun, en die Nano-laboratorium is onder konstruksie.

Toekomsblik

By die Universiteit se Navorsings- en Innovasie-uitnemendheidstoekennings het Prof Deresh Ramjugernath, Rektor en Visekanselier, die leierskap en toewyding van die Universiteit se navorsingsgemeenskap geprys en gesê: "Uitnemendheid is nie 'n bestemming nie, maar 'n reis van doelgerigtheid en deursettingsvermoë. Idees lei tot inisiatiewe, inisiatiewe tot uitkomste, en uitkomste tot impak." Die Fakulteit is goed voorbereid en toekomsfiks vir hierdie reis.



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DEPARTMENT OF CHEMICAL ENGINEERING

A leader in both academic and practical excellence, the Department of Chemical Engineering is driving towards a sustainable future by optimising the utilisation of bioresources, essential for creating safe, biocircular and profitable industrial processes. Our researchers inspire students to pioneer innovative processes and leverage technologies effectively in full-scale production, shaping the future of industry. Four eco-warriors in the making, Hudson Nyikadzawanda (MEng), Dennis Chakawa (PhD), Tobias Obondo (PhD) and Chris du Toit (MEng) (above), demonstrate column reactors upgrading wastewater into valuable products using immobilised microbial cultures. Bacteria in the orange beads generate hydrogen, a clean energy carrier. Spirulina in the blue beads produces phycocyanin, a high-value natural pigment used in food, cosmetics and biotechnology.

Harnessing the power of community to enhance student experience

Student wellness underpins academic success. Building community beyond the lecture hall remained a high priority, with students and staff coming together through social events, academic initiatives and outdoor activities that strengthened connections.

At the postgraduate level, we were privileged to receive a large intake of students from African countries. To foster a sense of belonging in a foreign setting, we assigned numerous postdoctoral researchers to provide practical and emotional support throughout their studies.

Our Postgraduate Student Committee (PGSC) played a central role in fostering a connected postgraduate environment. Events such as the inaugural interdepartmental Engineering Postgraduate Quiz Night brought together students across the Faculty for an evening of fun, networking and collaboration. This was supplemented with the PGSC Hike, organised in partnership with Rotaract Stellenbosch, which provided students with another opportunity to engage with the broader engineering community outside the academic setting.

At the undergraduate level, the annual Undergraduate Social fostered connections among students, lecturers, and support staff in an informal setting. Held at the Lentelus Sportsground, the event featured a braai, volleyball games and a quiz, contributing to a vibrant and inclusive student culture.

Through these initiatives, the Department continues to support a well-rounded student experience that extends beyond the classroom.



Postgraduate students build community on the PGSC Hike.

Collaboration and outreach generate academic opportunities

National and international collaboration and innovative outreach shaped our teaching landscape, creating new opportunities for academic engagement.

A key highlight was the Department's undergraduate and postgraduate webinars for prospective students. This outreach provided prospective students with insights into chemical engineering as a field of study and introduced them to opportunities at Stellenbosch University. In addition, we launched an inspiring Alumni Series to showcase the diverse career paths of successful graduates and highlight their contributions across industries.

The annual Postgraduate Symposium, where selected postgraduate students presented their research, was once again hosted successfully. The symposium offered students a valuable platform to develop their presentation and communication skills while gaining confidence by sharing their research in a supportive academic environment.

Our interdisciplinary collaboration with the Department of Microbiology in the Faculty of Science is thriving. We are developing a high-throughput biofoundry for microbial strain development and isolation in support of micro-, small and medium enterprises in biotechnology.

By engaging with multiple stakeholders in the South African sugarcane industry, we aim to help advance diversification as outlined in the Sugarcane Masterplan. Our new partnership with the SA Canegrowers Association serves this purpose.

Research visibility was strengthened through participation in international conferences. Cherylynn Croome presented her work on the removal of metal ions from mine wastewater at the International Biosurfactants Conference in Germany, where Prof Robbie Pott also contributed as a presenter.

While Profs Jamie Cripwell, Robbie Pott and Cara Schwarz spent periods abroad at international research partners as part of their research leave, we hosted Dr Daya Pandey, an assistant professor of energy systems at the University of Leeds. Dr Pandey delivered a guest lecture on the valorisation of agricultural waste for energy and nutrient recovery, which is important for a circular bioeconomy.



Excited delegates register for the African Rainbow Minerals (ARM) Geometallurgy Symposium (above), where Prof Margreth Tadie (left), Chair of ARM Geometallurgy, presented research milestones.

The Department also hosted the African Rainbow Minerals (ARM) Geometallurgy Symposium, bringing together researchers, industry professionals and alumni to share developments in geometallurgy research in the South African context. AngloGold Ashanti strengthened our ARM Research Chair by generously donating a hyperspectral core imaging system capable of generating large datasets, thereby opening opportunities for collaboration with the School for Data Science.

Together, these activities testify to our continued efforts to advance research, strengthen partnerships and promote industrial innovation.

Recognition consolidates our reputation for excellence

The Department has recently celebrated impressive achievements, showcasing a strong commitment to research and innovation.

Two postgraduate students, Nawa Punabantu and Corine Mouton, received international and national recognition for their research contributions, respectively. Punabantu was awarded Best Young Author at the 66th Conference of the Scandinavian Simulation Society in Norway for his paper, "Constrained Multi-Objective Bayesian Optimisation of Simulated Moving Bed Chromatography". Reflecting on the experience, he sincerely thanked SACAC (South African Council for Automation and Control) for the research travel grant that enabled his participation.

Mouton received a Master's Fellowship Award at the South African Women in Science Awards for her work in thermodynamic modelling for sustainable separation processes.

At the SU Research and Innovation Excellence Awards, where Stellenbosch University celebrates its top minds, Prof Johann Görgens received a Research Output Award and a Postgraduate Supervision Award. Dr André Valkenburg garnered an Early Career Researcher Award for his ground-breaking PhD research on the sustainable synthesis of glycolipid biosurfactants.

Staff excellence was recognised through several awards. At Stellenbosch University's annual First-Year Achievement Awards, Prof Robbie Pott received a ROCTAS (Recognition of Contributions Towards Academic Success) award for his contribution to first-year student success. Likewise, Profs Tobi Louw and Jamie Cripwell were recognised at the Faculty of Engineering Awards as Lecturer of the Year and Researcher of the Year, respectively, and finance specialist Dimakatso Mashigo for excellence in administration.

The Department celebrated key academic milestones, with three professors delivering their inaugural lectures. In his lecture, Prof Tobi Louw critically examined the integration of machine learning in chemical engineering, while Prof Neill Goosen explored his accidental path toward optimising the food-water-energy nexus through resource recovery and sustainable catalysis. Prof Robbie Pott's lecture *From laboratory to lecture hall – growing bioprocesses and graduates* highlighted his dual commitment.

Overall, these achievements demonstrate a collective commitment to excellence and a promising future for research and education within the Department.



Profs Tobi Louw, Neill Goosen and Robbie Pott

ReSurfify scales up circular bioprocessing for sustainable surfactants



Top 20 finalist Dr André Valkenburg (on the right) at the 2025 EDHE-Absa Innovation Challenge with Mr Clement Motale, Managing Executive: GMCA Strategic Transformation and Partnerships at Absa.

A new Stellenbosch University spin-out, ReSurfify, made significant progress in 2025 by developing a proprietary continuous bioprocessing platform that boosts biosurfactant yields. Emerging from research in the Department of Chemical Engineering, it converts molecular innovation into scalable, industrially relevant technology.

Founders Dr André Valkenburg, who completed his PhD in Chemical Engineering under the supervision of Profs Robbie Pott and Eugene van Rensburg, and Jody Harvey, a master's candidate in Chemical Engineering, collaborated with the University's LaunchLab and Innovus Technology Transfer Office to commercialise their research.

ReSurfify's core technology is rooted in continuous bioprocessing for the synthesis of glycolipid biosurfactants. (Surfactants are substances such as detergents that, when added to a liquid, reduce its surface tension, thereby increasing its spreading and wetting properties.) The microbial fermentation pathways produce

amphiphilic compounds with tunable interfacial properties, which are then separated and purified to meet application specifications. In other words, the venture can convert waste vegetable oil into a powerful, sustainable cleaning ingredient.

In the 2025 EDHE-Absa Innovation Challenge, ReSurfify was among the top 20 national finalists. The programme helped enhance its techno-economic analysis, commercialisation strategies and scale-up plans, which are crucial for moving from bench-scale optimisation to pilot-scale demonstration. The long-term goal is to establish a commercial bioreactor facility. Finishing in the top 6 enabled the team to secure funding for pilot-scale development.

To improve volumetric productivity and process efficiency, ReSurfify is advancing a continuous production platform rather than a batch fermentation system. To succeed, the venture must address core chemical engineering challenges such as mass-transfer optimisation, reactor design and process intensification.

By valorising waste streams into functional chemicals, ReSurfify is aligned with circular bioeconomy principles. This can reduce reliance on imported petrochemical surfactants while addressing aquatic toxicity and persistence, with projected cuts in CO₂ emissions and hazardous discharges, and the creation of new value chains in bio-based chemicals.

By year-end, ReSurfify had positioned itself as a high-potential biochemical process technology venture, demonstrating how chemical engineering can integrate sustainable feedstocks, biological systems and scalable design, contributing to greener manufacturing and industrial biotechnology in South Africa.

Research Output



Research Themes

Extractive Metallurgy

The sustainable production of valuable minerals and metals from ore or metal-containing waste material is critical for a sustainable future. Extracting the metal values from natural ore bodies and complex engineered wastes requires various treatment processes. The group undertakes research into the fundamentals and application of such treatment processes. Key challenges include the changing characteristics of raw materials due to depletion of easy-to-process ore bodies, dealing with complex metal structures and associations in engineered wastes, and ensuring that new and existing extraction processes minimise energy and water use.

Separations Technology

The Separations Technology research group focuses on understanding the fundamentals and thermodynamics of separation processes involving hydrocarbons and other chemicals. Typical processes include distillation, liquid-liquid extraction, adsorption, supercritical fluid fractionation and membrane separation. Much of the work focuses on separating compounds where the underlying systems may exhibit azeotropy and association due to hydrogen bonding and where the systems may involve molecules with varying polarity and asymmetrical structure.

Bioresource Engineering

We can transition toward a more sustainable future by optimally using our available bioresources. This group focuses on developing industrial bioprocesses that are safe, sustainable and

profitable, either by employing biological resources (e.g. live organisms or active biological molecules) to transform raw materials into valuable products, or by using biological raw materials as inputs into processes. A robust interdisciplinary approach leads to frequent collaboration with other disciplines at Stellenbosch University and leading international institutions.

Water Technology

The group focuses on research and development to address local and international challenges in water provision by improving existing water treatment technologies and developing new technologies. The group's strengths include membrane technology (microfiltration, ultrafiltration, reverse osmosis, forward osmosis, membrane distillation and Donnan dialysis) and technologies suitable for developing economies. Current projects range from investigation and modelling of basic phenomena to technology development leading to implementation in the field.

Process Monitoring and Machine Learning

Advances in online monitoring and data collection present an opportunity to enhance chemical engineering processes' efficiency, sustainability, and profitability. This group's expertise rests in applying machine learning techniques to improve the operation and control of chemical plants, emphasising industry-ready solutions. Applications include fault detection and diagnosis, causality analysis, operational state identification and actionable advisories.

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2025–2026 Engineering Student Council



Kael Mostert
Chair



Lefa Maimane
Vice-Chair



Emily Roberts
Secretary



Chris Laubscher
Events Coordinator
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Dimpho Kgaladi
First-Year Mentor,
Transformation,
Queer and Women
Empowerment



Kwanele Dindikazi
Mental Health
& Sustainability



Naledi Chanthunya
General Executive
and Engineering Ball



Nozithelo Dubihlela
Mental Health
and Social Impact



Sybrand de Waal
Treasurer



Tumelo Mokoena
Marketing and
First-Year Mentor



Uyanda Maphumulo
Industrial
Liaison



Zongeziwe Mtshibiliki
Merchandise and
International Students



DEPARTMENT OF CIVIL ENGINEERING

The fast-changing global civil engineering industry demands engineers who can devise original solutions to keep pace with new technology and evolving requirements. The Department of Civil Engineering is dedicated to producing graduates capable of meeting these challenges by keeping its academic offering relevant to present-day needs. In South Africa, for example, the combination of dry seasons and urban expansion into fire-prone areas necessitates the design of buildings that remain safe, resilient and compliant. In the image above, Prof Richard Walls demonstrates fire dynamics to Fire Engineering master's students in the Techniques module using a demonstration model built by Mr Iliyaaz Williams.



Third-year Hydraulics 354 students turn up for the practical investigation of flow behaviour in an open channel flume. To recommend suitable lining materials for the refurbishment of wastewater canals, they'll use gravel and smooth-bed conditions to determine hydraulic roughness.



authentic glimpse into the academic experience of civil engineering students. Through relatable, creative examples — such as using everyday objects like Oreo biscuits to demonstrate complex concepts in stress analysis — students connected theory to tangible understanding. These moments of active, tactile learning help demystify challenging content and foster deeper comprehension.

Student engagement

was further strengthened through initiatives that brought together undergraduate and postgraduate students and staff. A good example is the Department's postgraduate engagement event, where mixed groups collaborated on a practical engineering challenge. These activities encourage peer learning, strengthen relationships across academic levels and foster a sense of community.

Together, these initiatives reflect a department that is intentional about creating an environment in which students are supported, engaged and empowered.

Celebrating staff awards and a career milestone

We take pride in our staff, who excel in their roles as lecturers, researchers and administrators.

At Stellenbosch University's annual First-Year Achievement Awards, Dr Humaira Fataar



Prof Richards Walls and Dr Humaira Fataar

Advancing student success through support and engagement

The Department of Civil Engineering prioritises student success and wellbeing through a focused, practical approach to support. Central to this effort is a dedicated student support system, led by a designated staff member who provides structured, accessible assistance to students facing academic challenges.

In a designated, welcoming space, students meet with Ms Alet Muller, who offers guidance on time management, effective study methods and practical strategies for recovery when plans come undone. This personalised support enables students to take ownership of their academic journey and equips them with tools to improve their performance and confidence. Students can book one-to-one sessions via an online system, ensuring an efficient, confidential process.

The value of this initiative is best reflected in student feedback. Two successful students, sharing their experiences, highlighted the positive impact of a consistent, approachable support structure. "If it had not been for that first visit," one admitted, "I would have felt too hopeless to continue my studies." The other student, who sought help after failing a first-year module, agreed: "You gave me practical steps to recover, but more importantly, you helped me believe I was still capable."

Complementing this support system is a strong focus on student engagement. The Department's #WhatWeLearnThisWeek campaign offered an

received a ROCTAS (Recognition of Contributions Towards Academic Success) award in recognition of her meaningful impact on first-year students' academic journeys.

Prof Richard Walls received two awards: the Society of Fire Protection Engineers (SFPE) Lucht Award for Contributions to Education, recognising his significant contribution to expanding opportunities for higher education in fire protection engineering, and the Rector and Vice-Chancellor's Research for Impact Award at SU's Research and Innovation Excellence Awards, which celebrate its best minds.

Following his promotion to full professor in 2024, Prof John Babafemi delivered an inaugural lecture titled *Sustainable concrete: exploring its breadth, length, depth and height*.

Prof Babafemi explained how his research promotes material efficiency and environmental sustainability in the construction industry's cement and concrete sector. His passion for teaching, research and administrative service keeps him motivated.

Civil Engineering's female academic staff achieves parity

The engineering sector has historically been male-dominated. However, the number of women studying engineering in South Africa has grown significantly in recent years, indicating a promising pipeline of female engineers entering the workforce. Equally encouraging is the growing presence of women in senior roles within academia in civil engineering.

Over the past decade, the proportion of female academic staff in the Department of Civil Engineering has steadily increased from 22% in 2016 to an equitable 50% in 2025. These women contribute to the Department's academic and professional strength, with all 14 holding doctorates and seven registered as Professional Engineers.

The growing representation of women in senior roles within the Department has successfully challenged the notion of a glass ceiling. Women

are now represented across all academic post levels and across various specialisations. By 2025, the Department included three female professors: Marion Sinclair in transportation engineering, Cristina Trois specialising in waste-to-energy, waste management and wastewater engineering, and Celeste Viljoen in structural engineering. The largest increase in female academic staff occurred in 2024, with the appointment of Dr Claudia Visagie in transport engineering, Dr Natalia Flores-Quiroz in fire engineering and Dr Talia da Silva-Burke in geotechnical engineering.

Two new female academics were appointed to vacant senior lectureships. Dr Caitlin Courtney began her career in the industry before completing a PhD in Civil Engineering at the University of

Cape Town. Her research focuses on circular economy solutions, including the use of reverse osmosis to recover water and fertilisers from wastewater. Dr Katelyn Johnson, who holds a PhD in Civil Engineering from the University of KwaZulu-Natal, is passionate about advancing research in engineering hydrology and climate change while shaping the next generation of engineers. She explains, "Engineering is about solving problems, but teaching engineering is about shaping the problem-solvers."

The Department also recruited two female academics through the national Department of Higher Education and Training's New Generation of Academics

Programme (nGap). This six-year development and induction programme recruits highly talented scholars as new academics in high-demand disciplines at South African universities. As the programme progressed, Drs Courtney Devine and Humaira Fataar were promoted to lecturer and senior lecturer positions in fire engineering and construction materials, respectively.

As more female engineers assume leadership roles and contribute to groundbreaking research, they not only inspire future generations but also help reshape the engineering sector into a more equitable and innovative field.



Prof John Babafemi

One engineer, a sabbatical and 3D-printed concrete

“Modern construction technology, such as 3D concrete printing, has the potential to increase labour productivity in SA construction, not cut jobs.” These are the words of Prof Gideon van Zijl, who, in 2016, took a sabbatical, incubated an idea, and returned to launch research on 3D-printed concrete (3DPC) in the Department of Civil Engineering.

The first MEng student in 3DPC, Jacques Kruger, enrolled in 2017 without access to a concrete printing facility. He was given a small budget to design, procure and lead the assembly of a laboratory-scale concrete printer. He completed the printer by early 2018, when his MEng was converted to a PhD, which he obtained in December 2019. His PhD comprises four highly cited journal article chapters. This in-house prototype printer is still used daily by a large team of research students.

In 2020, we inaugurated our second gantry-type 3D concrete printer, Optimus, which was designed and manufactured by two PhD candidates under the supervision of Profs Van Zijl and Kruger, and Drs Frederick Bester and Marchant van den Heever. This printing facility can produce larger concrete structures and structural elements.

Our 3DPC research activities have attracted interdisciplinary collaboration, spanning concrete materials science, fire engineering, structural concrete design, chemistry and building physics. Beginning with 3DPC materials development, the activities have evolved to include test methods, structural design, thermal comfort in 3DPC buildings, fire safety and the integration of 3DPC into conventional construction processes.

We are currently developing a design standard for structural 3DPC and circularity in construction. As part of the ERA-MIN project RecycleBim (short for Integrated Planning and Recording Circularity of Construction Materials through Digital Modelling), a large international consortium of 14 partners, our team led the work package on 3D printing for circularity. We hosted the final meeting in Stellenbosch in April 2025.

Achievements mounted, with over 100 papers published in leading international journals and conference proceedings; 14 PhD graduates and six more progressing towards graduation; placements in the Greenovate Engineering Awards and the Jac van der Merwe BEng Final-year Project; and several members receiving prestigious Wilhelm Frank Scholarships.



In the 3D-printing laboratory, Dr Kim Timm uses a gantry-type 3D printer to print substantial concrete elements.

Research Output



Research Themes

Structural Engineering

We investigate smart and green construction materials, steel and concrete structures, structural reliability, fire engineering, built environment sustainability, and digital construction. Structural reliability covers the probabilistic load and resistance provisions for structural design. Fire engineering investigates structural performance during a fire. Built environment sustainability considers the durability of materials and structures, objective modelling and minimisation of environmental impact. Digital construction develops 3D printing equipment and materials while designing and testing printed structures.

Civil Engineering Informatics

This theme covers the needs of civil engineering practices in an information-driven environment. Applying information technology is concerned with intelligent modelling of the design process, the support systems for engineering management, and the technical aspects of urban engineering. We develop real-time data processing methods for decision-making and modelling complex engineering problems with inherent uncertainties.

Construction Engineering and Management

Research into construction management investigates the management and development of multi-disciplinary capital projects. It focuses on modular construction, construction risk, design management, constructability, sustainability and advanced technologies in construction.

Water and Environmental Engineering

Enabling stewardship of our natural resources while developing infrastructure for the functioning of our society is central to modern-day civil engineering. For instance, ensuring reliable and sustainable water supply to human settlements. Water resource

development regards environmental requirements when designing large hydraulic structures such as dams, river abstraction works and bridges. A key concern is the medium-term effects of climate change on the continued design suitability of hydraulic and coastal structures.

Geotechnical Engineering

Large and impressive structures invariably require advanced support structures to ensure stability. We work on the challenges of problematic soils and mine tailings. Current research includes robust geotechnical analysis methods, designing high-specification structures on problem soils, and disposal method safety in mine tailings dams.

Pavement Engineering

This group is concerned with designing resilient, sustainable, and long-lasting roads for heavy traffic carried by our world-class network of national highways. Regarding materials science, the group evaluates the performance of secondary materials (crushed concrete, masonry, glass) for roads, accelerated testing of asphalt and environment-friendly bitumen stabilised materials, a performance-related seal design method for bitumen and modified binders, and a mix design and analysis system for asphalt bases.

Transportation Engineering

Road safety and intelligent transport systems (ITS) are top considerations in designing safe and efficient transportation systems. Our road safety research includes road crash causation, human factor influences, the role of geometric design, and public transport and pedestrian safety. Our ITS research covers public transport user information, multimodal database development, appropriate technology applications in developing countries and freeway management information applications for travel-time estimation and incident management systems.

Chair

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DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

The Department of Electrical and Electronic Engineering's state-of-the-art facilities enable cutting-edge research and foster critical thinking and problem-solving skills. Teachers and students work together in diverse research groups to advance knowledge in the fields of energy, data engineering, informatics, robotics and telecommunications. Our advanced laboratories, workshops and research facilities provide an ideal environment for inquisitive minds to develop practical solutions by applying theoretical knowledge. Above, Mr Teakay Shangase, one of our workshop assistants, is setting up a 3D printer.



The seven electronic engineering students behind the SLINQI satellite project, selected to represent South Africa at the Mission Idea Contest (MIC) in Tokyo, Japan.

Big ideas for nanosatellites

The Electronic Systems Laboratory (ESL) research group has continued to advance satellite systems and space robotics technologies by miniaturising the hardware and software required for autonomous rendezvous and docking. These capabilities of nanosatellites enable precise proximity operations, which are critical for in-orbit servicing, assembly, active debris removal and the management of formation-flying constellations.

These activities have provided students with a valuable opportunity to participate in a unique team mission as part of the Foundation for Space Development Africa's Africa2Moon project to deploy an African-designed and built low-frequency radio telescope on the Moon's far side.

The Africa2Moon mission presents technical challenges unique to the lunar environment, providing an ideal platform to test existing technologies and develop dedicated components for future lunar exploration. Through its involvement in the project, the Department is advancing research in satellite systems and space robotics while contributing to a landmark African-led space mission.

Seven electronic engineering students who were undertaking a side project were selected to represent South Africa in the Mission Idea Contest (MIC), a space-engineering competition in Tokyo, Japan. Their satellite project, Stellenbosch Lunar Interferometric Network for Quasi-static Imaging (SLINQI), was supervised by Dr Arno Barnard and will be presented by two MEng electronic engineering students, Nortier Geyer and Jandr  Frey. The SLINQI satellite is envisioned as a

shoebox-sized model that could travel to the Moon's far side, where, free from Earth's noise, it would work with a twin to create detailed 'snapshots' of space using radio waves rather than light.

The Department continues to push the boundaries of aerospace engineering while remaining committed to nurturing a new generation of engineers who will contribute to groundbreaking missions.

Leadership, research excellence and global impact

The Department of Electrical and Electronic Engineering continues to strengthen its reputation for excellence through the achievements of its staff, students and graduates. The year also



Prof Japie Engelbrecht, Chair of the Department of Electrical and Electronic Engineering

marked the appointment of the Department's new Chair, Prof Japie Engelbrecht, whose expertise in control systems for satellites, aircraft and autonomous vehicles positions the Department well for

future growth and innovation. Prof Kamper delivered his inaugural lecture, *The science and engineering of language acquisition in humans and machines*, highlighting his contributions to research in speech, language and machine learning.

The Department's postgraduate students and graduates earned recognition in both national and international arenas. Doctoral candidate Christiaan Geldenhuys and master's student G nther Tonitz secured second place overall in the specialised bioacoustics track of the IEEE

Detection and Classification of Acoustic Scenes and Events (DCASE) Challenge, BioDCASE 2025, for developing algorithms that detect Antarctic blue and fin whale calls in complex underwater recordings.

Ruben Smit, a PhD candidate in Electronics supervised by Prof Herman Kamper, received the Best Student Paper Award at the Workshop on Speech and Language Technology in Education (SLaTE), an international forum for research in speech-based educational technologies. Master's graduate Christopher Erasmus was awarded the 2025 Forestry Innovation Prize at the FAO World Food Forum and was named one of South Africa's winners in the Blue Sky Young Researchers and Innovation Awards.

The Department's global influence was further highlighted when *Electrical Machines*, co-authored by Professors Rong-Jie Wang, Maarten Kamper and Jacek Gieras, was translated into Chinese and published by China Machine Press, extending the reach of a textbook that has served as a leading reference in the field for more than two decades.

Together, these achievements reflect a department that continues to advance engineering knowledge, develop exceptional graduates and contribute to innovation on a global scale.

Biomedical engineering enhances virtual interaction

The Department is strengthening its focus on



Prof Herman Kamper

biomedical engineering by advancing research at the intersection of computer vision, artificial intelligence, image analysis, and virtual interaction. Recent advances in human pose estimation, immersive environments, and medical imaging are enabling applications in rehabilitation, human movement analysis, diagnostics and digital health technologies.

Obtaining precise human movement data has long posed challenges in biomedical research. On the one hand, markerless motion capture systems that rely on computer vision often lack anatomically precise data

for training and validation. On the other hand, highly accurate marker-based systems tend to be expensive and are not widely accessible. To bridge these gaps, students supervised by Prof Rensu Theart developed efficient, cost-effective methods for acquiring precise human movement data and mapping the real world into virtual space.

As part of their research towards advanced degrees, Chris-Mari Schreuder (PhD) and Liz  Steyn (MEng) collaborated with Mr Oloff Bergh, a managing analyst in the Neuromechanics Unit of the Sport Science Department, Faculty of Medicine and Health Sciences. They developed SUMediPose, a new multimodal dataset that uses anatomical key points to support advanced human pose estimation. This robust, anatomically precise dataset provides the medical and sport science communities with an excellent resource for developing the next generation of markerless motion capture systems.

Stefan Pelsers' MEng research focused on how low-cost webcams and modern convolutional neural networks (CNNs) can translate real-world objects into the virtual domain. CNN-driven object mapping showed promise for creating a virtual reality experience in which sight and touch align to enhance immersion.

Through their efforts, these students demonstrated how research can enhance the efficiency and cost-effectiveness of virtual applications for the benefit of society.



Prof Bernard Bekker



Prof Arnold Rix

Research envisions a **low-carbon energy future** for South Africa

In the global shift towards sustainable power, South Africa's exceptional solar and wind resources confer a distinct advantage. However, their availability does not automatically translate into a stable power supply. The variability of renewable sources places pressure on our national grid, which was historically designed for steady, centralised generation.

The Department of Electrical and Electronic Engineering is advancing research to address the challenge of integrating these variable power sources into a reliable power system. The complexity of this challenge requires advanced modelling, the integration of renewable energy and strategic partnerships. At the core of our energy research is the use of advanced modelling and probabilistic analysis to understand and manage uncertainty arising from the variability of renewable energy sources, shifting demand patterns and infrastructure constraints. By applying data-driven and model-based techniques, we can improve forecasting, risk analysis, and long-term system planning, thereby supporting informed decision-making for the national grid. For this expertise, we rely on the Power Systems Research Group, which focuses on data analytics, machine learning, and probabilistic methodologies.

Leading the Department's energy research are Professors Bernard Bekker and Arnold Rix,

who recently delivered their inaugural lectures. Prof Bekker's research focuses on power system planning, optimisation, and energy management, addressing the operational and economic challenges of increasingly complex electricity networks. His work improves system efficiency and helps ensure a reliable electricity supply.

Complementing this is Prof Rix's research on integrating renewable energy into power systems, emphasising system stability, forecasting and performance in low-carbon energy environments. His work bridges theoretical modelling and practical implementation, thereby supporting the large-scale deployment of renewable energy technologies.

The Department's energy research is further strengthened through collaboration with the Centre for Renewable and Sustainable Energy Studies (CRSES), led by Prof Cristina Trois. This international and interdisciplinary partnership focuses on developing scalable, real-world solutions to improve grid stability. Prof Trois and Dr Chantelle van Staden are co-investigators on The Stability of the South African Power Grid project, led by Prof Christian Beck at Queen Mary University of London.

This integrated approach to energy research positions the Department as a valuable contributor to South Africa's transition to a low-carbon energy future.

Research Output

80

Subsidised
Journal Articles

88

International
Proceedings

2

Chapters
in Books

16

Doctorates

50

Master's
Degrees

Research Themes

Robotics

In the Electronic Systems Laboratory (ESL), research, development and projects concentrate mainly on the control of autonomous vehicles and robots. The autonomous vehicles include satellites (e.g. CubeSats), manned and unmanned aerial vehicles (UAVs), autonomous underwater vehicles (AUVs), and unmanned ground vehicles (UGVs). The robots include two- and four-legged robots, hexapods, and humanoid robots. As most of the research is part of a larger system, students gain first-hand experience of the full breadth of the management and technical activities required in complex system development.

Electromagnetics

Current activities focus on the following projects: RF and microwave antennas for communications and radar systems, FEM, FDTD and MoM modelling of antennas and wave propagation in complex electromagnetic environments, development of numerical methods and software for simulation of electromagnetic fields, free-space and near-field measurement techniques, optimising complex antennas and microwave components, the Karoo Array Telescope (KAT) and the Square Kilometre Array (SKA). Other activities involve superconducting elements, nanosensors, electromagnetic compatibility, microwave filters and non-linear circuits. An antenna and microwave laboratory, supported by sophisticated instrumentation and powerful computing facilities, provides the infrastructure for research work.

Electrical Energy

This division covers research on electrical energy in terms of conversion, distribution, control and management, and renewable energy. Specifically, attention is given to multilevel power electronic converters, electrical machine design and drive systems, energy efficiency, and the measurement and management of electrical energy. Renewable energy focuses on photovoltaic solar energy, wind generator systems, system identification and grid integration. Our facilities include world-class laboratories and instrumentation for prototype testing and measurement. The Department has the only high-voltage laboratory in the Western Cape for advanced insulator tests and research.

Telecommunications and Informatics

This division works in a variety of areas that involve the manipulation of information-bearing signals. The work comprises the extraction and embedment of information in the signal (digital signal processing), the transmission of such signals over large distances (telecommunication) and through complex networks (communication networks), and automatic learning and the recognition of the signal content (machine learning and deep learning) with particular focus on speech and image signals, and specialised sensor signals.

Chair

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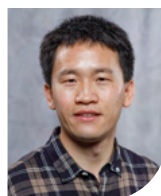
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DEPARTMENT OF INDUSTRIAL ENGINEERING

Advances in technology that enable new methods for generating and sharing information are ushering in the Fourth Industrial Revolution. The Department of Industrial Engineering is training a new generation of engineers with the computational skills that businesses need to remain competitive.

At the ACOSCM 2025 conference, discussions centred on how Africa can leverage logistics and supply chains to foster economic growth, sustainability and resilience. Pictured above are the scientific committee alongside the executive and organising committee: Ms Jorida Gjergji (left), Prof Leila Goedhals-Gerber (third from the left), Dr Lester Brian Shawa (middle) and Prof Joubert Van Eeden (conference chair, front left).



Prof Imke de Kock (first from the left) at the NiTIM 2025 doctoral summer school in Valencia, Spain. Several of her students attended, including Prudence Madiba, who won Best PhD Presentation.

Global partnership prepares future-fit engineers

Collaboration between institutions is crucial to research, as exemplified by the partnership between Stellenbosch University (SU) and Reutlingen University in Germany. This alliance has led to the Digital Industrial Management and Engineering (DIME) programme, an international master's programme in which students can earn a double degree – a master's degree from Reutlingen and an MEng from SU. The programme focuses on topics such as smart factories, Industry 4.0 and sustainable production, aligning with the goal of developing globally competitive engineers.

The 15th Conference on Learning Factories (CLF 2025) was held from 25–28 March 2025 and hosted by the Department of Industrial Engineering, with Prof Louis Louw serving as chair and Prof Imke de Kock as co-chair. The event also welcomed the IALF General Assembly, presided over by Prof Vera Hummel, President of the International Association on Learning Factories (IALF) and Professor at Reutlingen University. The conference brought together leading academics and researchers to share their latest research findings and promote excellence in teaching and research in learning factories.

Industrial companies strive to deliver unique products and services while adapting to challenges such as digitalisation, intelligent systems and sustainability. Success in these transitions depends on competent staff, including well-prepared students and engineers, and requires learning systems tailored to the practical needs of future production processes.

Learning factories provide hands-on experience

that enhances students' understanding of product development, manufacturing systems and quality management.

Double-degree programmes and conferences like these enable SU engineering students to collaborate with colleagues at the cutting edge of innovation, enriching the educational experience of the next generation of engineers and problem solvers.

Certification and competition success strengthen project management skills

Industrial Engineering is giving final-year BEng students a stronger bridge between academic learning and professional practice through internationally benchmarked project management training, certification opportunities and a national competition.

The Project Management 412 (PM412) module offers the Faculty's engineering students a valuable opportunity to take the International Project Management Association South Africa (IPMA-SA) Foundation Certification Exam, which is based on the globally recognised IPMA Individual Competence Baseline (ICB 4.0).

Prof Corné Schutte, the module coordinator, explained that the certification was piloted in 2024 and, following strong uptake and performance, has now been formally integrated into the module as an optional extension. Stellenbosch University is the only university in South Africa offering this opportunity.

The quality of the PM412 module was reflected when Stellenbosch Engineering teams secured first and second place at the inaugural IPMA-

SA Project Management Championship, held alongside the IPMA-SA HOPE Summit. Competing against the University of Cape Town, the teams had three hours to create a project plan based on a complex City of Cape Town case study and present a compelling pitch to an expert judging panel. The winning Mechanical and Mechatronic Engineering team, Risky Business, and the Civil Engineering runners-up, Solid Ground Projectors, impressed judges with their strategic thinking and teamwork.

Prof Taryn Bond-Barnard, coordinator of the structured master's in Engineering Management (MEM) programme, served on the judging panel alongside senior project managers from the City of Cape Town. Her involvement underscored the close alignment between industry expectations and the academic preparation offered by the Faculty of Engineering.

The championship also gave students access to industry professionals, mentorship opportunities and networking beyond the classroom. For many participants, it offered a practical bridge between project management theory and professional application.

Industrial Engineering celebrates a year of academic excellence

In a significant display of academic excellence, several colleagues achieved important career milestones or received recognition from prestigious organisations, while emerging scholars excelled on international platforms.

Four colleagues achieved career milestones. Established researchers Prof Natasha Sacks and Prof James Bekker were awarded C-ratings by the National Research Foundation (NRF), recognising the quality, coherence and sustained productivity of their research. Prof James Bekker was also promoted to full professor. Dr Eldon Burger completed his PhD titled *The Removal of False Signals from Convolutional Neural Networks* under the supervision of Prof Andries Engelbrecht.

Three colleagues were honoured at SU's Research and Inno-



Profs Grobbelaar, Van Vuuren and Engelbrecht

vation Excellence Awards 2025 ceremony. Prof Sara Grobbelaar received two awards: a Women in Engineering Award and a Postgraduate Supervision Award. Prof Jan van Vuuren also received a Postgraduate Supervision Award, and Prof Andries Engelbrecht received an Established Researcher Award.

In a proud moment for South Africa, Prudence Madiba won Best PhD Presentation at NiTIM 2025, an annual international doctoral summer school attended by Prof Imke de Kock and several of her doctoral students. This distinctive forum fosters in-depth discussions, hands-on workshops, and global networking among researchers, academics and industry experts.

Demonstrating our growing academic leadership in Africa, the Department hosted the 7th African Conference on Operations and Supply Chain Management (ACOSCM), sponsored by the Kühne Foundation's LEARN Logistics under the theme Shaping Logistics for the Future: Enhancing Sustainable Logistics and Supply Chain Systems.

Another highlight was the hosting of the 2025 Automotive IT Colloquium. At this annual five-day event, BMW's leadership and key innovators delivered presentations on the overall IT environment in automotive manufacturing and students from various universities worked in groups to develop AI-driven solutions to help internal teams enhance efficiency in the ZA Hub.

These accomplishments and initiatives highlight the Department's ongoing dedication to academic leadership and our impactful contribution to the global research community.



At the 2025 Automotive IT Colloquium, students from various universities worked in groups to develop AI-driven solutions for the BMW IT Hub. Above, BMW's CIO, Alexander Buresch, presents a certificate to a deserving group.

Electric Mobility Lab wins two prestigious Africa Supply Chain Excellence Awards



Transportation has a daily impact on millions of people, and its contribution to climate change and environmental pollution is substantial. Consequently, initiatives to mitigate this impact are highly regarded.

Two such projects, spearheaded by the Electric Mobility Lab in the Faculty of Engineering and developed through collaboration between the Departments of Industrial and Electrical and Electronic Engineering, were honoured at the 2025 Africa Supply Chain Excellence Awards (ASCEA). The remarkable Nairobi-to-Stellenbosch solar-powered electric motorbike expedition was named the winner in the Training and Talent Management category, while the pioneering diesel-to-electric bus conversion project received an outstanding achievement certificate in the Transport category.

The first award celebrates a 6 000 km journey from Nairobi, Kenya, to Stellenbosch on a solar-powered electric motorbike.

The Roam Air electric motorbike, developed by Nairobi-based Roam Electric, was paired with a mobile solar charging solution designed by Stellenbosch University as part of the LEAP-RE research project. Built for Africa's rugged transport landscape, these custom solutions enabled the team to travel through six countries in seventeen

days without grid electricity or fuel, relying solely on portable solar power and African ingenuity.

Along the way, they engaged with communities and universities, promoting sustainable transport and showcasing how African supply chains can deliver resilient, low-carbon mobility solutions. The expedition attracted global attention, including coverage by the international news company CNN.

In a first for South Africa and a breakthrough for the continent, SU partnered with Rham Equipment, Golden Arrow Bus Services and the South African National Energy Development Institute to convert a 2005 diesel commuter bus into a fully electric vehicle.

The project replaced costly imports with locally sourced and assembled components, extending the bus's operational life and dramatically reducing emissions. The retrofit, carried out entirely in South Africa, trained local technicians and proved that high-impact transport innovation can be achieved within African supply chains. It is now being piloted on the streets of Cape Town.

"This project is a blueprint for inclusive, African-led innovation that empowers communities while tackling climate change," says Prof Thinus Booysen, director of the Electric Mobility Lab.

Research Output

174

Subsidised
Journal Articles

62

International
& National
Proceedings

1

Chapters
in Books

18

Doctorates

170

Master's
Degrees

Research Themes

Engineering Management

Our research aims to improve value creation in technology-based enterprises by focussing on the following:

- *Enterprise Engineering*: Analysing enterprise design, implementation and operation to improve knowledge, innovation, financial and technology management.
- *Sustainable Systems*: Enabling the transition to sustainability by enhancing systems and technology evaluation, development, planning, design and management.
- *Health Systems Engineering*: Finding engineering solutions for challenges facing the healthcare sector.
- *Innovation for Inclusive Development*: Analysing, developing and evaluating inclusive innovations and systems.
- *Industrial Policy and Beneficiation*: Enabling mineral-rich countries to achieve sustainable development.
- *Innovation*: Management of technological innovation, innovation strategy, dynamics of technological change and the impact of emerging technologies.

Manufacturing

Our research covers the development of resource-efficient process chains for the sustainable and smart manufacturing of products through digital, economically-sound process chains that minimise negative environmental impacts while conserving energy and natural resources.

Additive and subtractive manufacturing; reverse engineering, materials design and development; prototyping, ergonomics (human factors); commercial readiness; micro-manufacturing; novel biocompatible alloy development.

Operations Management

Operations and supply chain management focus on process excellence within and between organisations in the following areas:

- *Asset Management*: Improving the coordinated activities of an organisation to realise value from assets.
- *Supply Chain Management*: Leveraging the impact of 4IR technologies to improve operations and supply chains through digitalisation.
- *Sustainable Freight Transport*: Facilitating decarbonisation of freight transport activities by focussing on modal shift

and vehicle technology.

- *Logistics*: Ensuring the right product reaches the right place at the right time efficiently and cost-effectively.

Systems Modelling, Operations Research and Decision Support

This theme covers the development of mathematical models and their incorporation into computerised systems to support effective decisions in the industry. These models draw from applied mathematics, statistics, industrial engineering and computer science and apply to complex problems with many trade-off solutions. Examples include routing and scheduling decisions for delivery vehicle fleets, employee duty roster/timetabling construction, optimal production facility layout; simulation; spatio-temporal modelling using machine learning; and sentiment analysis.

Data Science

Research produces novel, efficient and robust data science technologies by developing machine learning and optimisation techniques. Data science techniques are applied to data sets to reveal patterns, trends and associations. Examples include:

- Forecasting customer demand from millions of retail transactions to understand demand patterns.
- Determining optimal segmentation of customers to customise service delivery and develop targeted marketing strategies.
- Using machine learning to predict order delivery times in a distribution scenario.
- Analysing imaging data for real-time inventory decision making.

Fourth Industrial Revolution and the Internet of Things

This theme focuses on automating industry and society using large-scale machine-to-machine communications, sensors, actuators, and other connected devices (the "Internet of Things"). Automation enables autonomous interaction between machines and humans. Examples include smart systems in transport and agriculture; intelligent management of energy and water in education and health sectors; real-time digital modelling of devices and industrial processes, using this "digital twin" for monitoring, diagnostics and prediction.

Chair

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DEPARTMENT OF MECHANICAL AND MECHATRONIC ENGINEERING

Providing quality engineering education in South Africa since 1944, the Department was the first to offer a degree programme in Mechatronics. This led to our name change to the Department of Mechanical and Mechatronic Engineering in 2006. Our newly refurbished research and teaching environment, featuring a dedicated Mechatronics Laboratory, offers state-of-the-art facilities that equip graduates to tackle modern engineering challenges. At the Solar Thermal Energy Research Group's Open Day exhibit above, students Roesang Lekholoane and Robert Cheesman-Hooper explain how solar radiation is converted into heat energy through concentrated reflection, using a concentrating solar power plant model that includes a central receiver, an evacuated tube and a parabolic trough solar collector.

Curriculum innovation heightens relevance and interest

We continued to prioritise student-centred teaching and curriculum innovation while managing rising student numbers and operational pressures stemming from ongoing laboratory refurbishment projects. Despite these challenges, the Department maintained strong academic delivery.

The Department hosted several informal gatherings for students and staff to strengthen relationships within the Department and foster a stronger sense of belonging among students. One of these initiatives specifically encouraged final-year undergraduate students to consider postgraduate studies and future research opportunities in mechanical and mechatronic engineering.

Undergraduate curriculum innovation led to the introduction of a new final-year module, Experimental Techniques, which provides students with hands-on experience directly linked to theoretical concepts taught earlier in the curriculum. Likewise, a redesigned practical assignment, introduced alongside the theoretical coursework for the final-year elective module, Finite Element Method, enhanced the learning experience and contributed to increased enrolments.

The Department introduced a new method for evaluating vacation training experiences. Instead of written reports, students had to submit video presentations reflecting on their exposure to industry and their workplace learning. This method not only strengthened communication skills but also fostered critical engagement with practical engineering environments.

As artificial intelligence continues to shape higher education globally, the Department explored AI's role in teaching and assessment.



Prof Annie Bekker

In the third-year Modelling module, lecturers evaluated the use of AI tools in assignments as part of broader discussions on assessment design, academic integrity and the responsible integration of emerging technologies into engineering education.

Collaboration with the Department of Electrical and Electronic Engineering continued through shared final-year mechatronics projects and postgraduate research initiatives. These opportunities encouraged greater postgraduate participation and interdisciplinary research between the two departments.

The year under review saw the Department successfully manage more than 1 000 undergraduate students and supervise over 220 undergraduate research projects, underscoring its continued commitment to academic excellence and student development at scale.

New strategic partnerships expand our research capability

The Department made significant strides in enhancing its research capabilities and fostering collaboration across scientific and engineering disciplines.

The appointment of Prof Annie Bekker as the DSI/NRF-SAIMI SARCHI Research Chair in Naval Architecture and Design has strengthened the Department's research in ship design, maritime systems

and broader naval architecture. Prof Bekker also continued to serve on international naval architecture committees, further strengthening collaboration between the local and international maritime engineering sectors.

The inaugural BONES Workshop marked an important step towards interdisciplinary collaboration, bringing together experts to explore innovative applications in bone growth and material science. Led by Dr Andie de Villiers from

Applied Mathematics, Dr Rudolph Venter from the Institute for Biomedical Engineering and Prof Martin Venter from the Department, the workshop explored applications spanning clinical practice, engineering and computational modelling.

A notable achievement was the establishment of Africa's first fireball network in partnership with the Purple Mountain Observatory of the Chinese Academy of Sciences. The project uses the European Allsky7+ meteor detection camera system to detect and analyse atmospheric entry events of meteors and comprises five monitoring nodes across the Western Cape.

A research contract with Frencken Mechatronics in Eindhoven is set to develop a laser forming technique for thin stainless-steel components used in the high-tech semiconductor industry. Master's student Kevin Crnkovic is working on this project under the supervision of Profs Gerhard Venter and Kristiaan Schreve.

The Department also launched a two-year project with Hansen Industrial Transmissions, Bearing Man Group and Sumitomo Drive Technologies to investigate gearbox behaviour and improve resilience, lifespan and operational reliability.

The completion of the first phase of the laboratory refurbishment project, together with the acquisition of a HotDisk TP 1000 instrument, has expanded the Department's research capabilities and positioned it for continued growth in teaching and research excellence.

Appointments drive impactful research

Building capacity in strategic focus areas fostered a vibrant research culture, enabling staff and students to thrive.

The Department welcomed Dr Clint Steed, who specialises in virtual prototyping, human-centric manufacturing and assembly systems, together with four junior lecturers pursuing doctorates, namely Mr Chaz Fenner, Mr Philip Ligthart, Mr Sa'eed Fataar and Ms Lindi Grobler, who strengthen the Department's expertise in thermofluid systems, biomechanics, Industry 5.0 and biomedical engineering.

Academic staff were recognised for excellence in teaching and research. Prof Ryno Laubscher delivered his inaugural lecture on harnessing deep

learning for thermal-fluid systems, while Prof Craig McGregor received a Teaching Excellence Award. Prof Josua Meyer again earned an A-rating from the National Research Foundation for his work in thermal sciences. Prof Debby Blaine completed Stellenbosch

University's Teaching Fellowship programme.

Two PhD candidates received best presentation awards. Ellen Letsogile Thipe was recognised at the 6th International Conference on Agriculture, Food Security and Safety in Kuala Lumpur for her research on greenhouse thermal modelling and climate resilience in semi-arid Southern Africa. Gerhard Durandt received the award at the 14th South African Conference on Computational and Applied Mechanics for his paper on virtual strain measurement of industrial structures using accelerometers.

Master's student Amohetsoe Shale earned regional recognition by winning the Research Commercialisation category at the Western Cape Entrepreneurship Development in

Higher Education (EDHE) Intervarsity Competition. Her biomedical engineering research, conducted through her start-up, NAVU, focuses on developing an affordable, passive prosthetic knee to improve mobility for underserved communities.



Amohetsoe Shale

International student engagement further developed intercultural and research skills through collaboration with Ohm University Nürnberg in Germany. The project, Testing the Properties of Sausages, brought together undergraduate students from both institutions to explore mechanical properties, manufacturing methods and cultural preferences in food production.



Prof Ryno Laubscher

ACWA Research Chair envisions **reliable, renewable solar power**



At the launch of the new ACWA Research Chair, Prof Wikus van Niekerk, Dean of the Faculty of Engineering, with Prof Sam Tshela, acting Deputy Vice-Chancellor: Strategy, Global and Corporate Affairs (representing the Rector and Vice-Chancellor); Prof Craig McGregor (incumbent); Mr Nandu Bhula, ACWA Power's Country General Manager; and Prof Sibusiso Moyo, Deputy Vice-Chancellor: Research, Innovation and Postgraduate Studies.

In a major step towards South Africa's renewable energy ambitions, Prof Craig McGregor, a professor in the Department of Mechanical and Mechatronic Engineering, has been appointed as the first ACWA Chair in Concentrating Solar Power (CSP). He leads the Solar Thermal Energy Research Group (STERG) and has helped position Stellenbosch University as a global contributor to solar thermal innovation, achieving significant research and collaboration milestones.

The prestigious Chair was established in partnership with ACWA, a leading Saudi Arabian developer, investor and operator of power generation and desalination plants. ACWA has significant CSP operations in South Africa, including the operational Bokpoort plant and the recently commissioned Redstone facility in the Northern Cape.

The Chair was officially launched on 21 August 2025. The event featured speeches by university officials and ACWA's Country General Manager

for South Africa. The appointment recognises Prof McGregor's leadership in solar thermal energy and his track record of combining academic excellence with industry innovation. He said, "I am excited to work with ACWA Power to build on their operational experience in the Northern Cape."

The ACWA Chair will receive annual funding for impactful research, including bursaries for undergraduate and postgraduate students. The Chair will focus

on CSP plant modelling and optimisation, high-temperature thermal storage, dry-air cooling, medium-scale industrial systems, and capacity building, particularly in the Northern Cape. The Chair will also provide advisory support to the Northern Cape Government on energy policy and economic development.

The Chair strengthens South Africa's capacity in CSP, which, owing to its energy storage capabilities, is crucial to meeting the country's energy needs. This initiative will also drive innovation and economic growth in the region, positioning CSP as key to South Africa's sustainable energy future, according to Prof Wikus van Niekerk, Dean of the Faculty of Engineering. He added, "Prof McGregor has been instrumental in aligning our research with the needs of South Africa's energy sector. Through this Chair, we hope to sustain and expand our contributions to the success of local CSP projects."

Research **Output**

77

Subsidised
Journal Articles

20

International
Proceedings

4

Doctorates

36

Master's
Degrees
(incl. 6 IBEs)

Research **Themes**

Energy and the Environment

In close collaboration with the Centre for Renewable and Sustainable Energy Studies, the Department contributes to fundamental research into a wide range of energy generation technologies. Addressing transport needs, the group investigates the performance and impact of biofuels and blends in compression-ignition and spark-ignition engines. Finding uniquely South African solutions for concentrating solar thermal power and energy storage systems, the group's world-leading research in air-cooled heat exchangers and cooling towers is well known. Excellent experimental capabilities and strong computational expertise enable the group to develop custom-made fans, compressors and turbines for ocean current, wind and solar energy exploitation, and air-cooled and hybrid (dry/wet) cooling systems. Research covering the energy-efficient design of ship propulsion, ship hulls and various turbomachinery is supported by the only 90 m long towing tank in southern Africa. The Department boasts the largest fan test facility (7 m diameter) in South Africa.

Mechanics and Dynamics

The group's activities consist of fundamental research on materials, the behaviour of structures and failure mechanisms and criteria. The materials research focuses on powder metal processing and products, material property extraction using digital image and volume correlation, characterisation of granular materials, and qualification of additive manufactured parts. The structures research looks for a fundamental understanding of the behaviour of structures under static and dynamic conditions and, in the case of vehicles, aircraft or ships, their impact on humans. Failure mechanisms and criteria cover composite materials and fracture and creep deformation of steels.

Mechatronics, Automation and Design

Diverse mechatronic systems such as reconfigurable manufacturing systems, machine vision applications, cyber-physical systems and digital twins, augmented/virtual reality and human-system integration. These systems are applied in diverse contexts, including manufacturing, mining, health care, renewable energy systems, motor vehicles production, facilities management and maintenance management.

Computational Modelling

The group's expertise in optimisation theory and algorithm development, finite element methods (FEM), computational fluid dynamics (CFD), discrete element methods (DEM) and continuum methods is world-renowned. The DEM work is applied to, among other things, mining and earthmoving equipment, particle dampers and conveyors. We often link optimisation methods with the FEM and CFD work in applications related to fluid-structure interaction, turbomachinery, combustion and various renewable energy technology applications. The group also has expertise in the modelling and simulation of metal casting processes, emphasising solidification analysis and segregation.

Biomedical Engineering

Technologies such as 3D printing, microcomputers and artificial intelligence are opening up new opportunities for engineering in the biomedical field. This group develops innovative minimally invasive devices to collect healthcare information, mechatronic devices for telemedicine, customised solutions for treating specific diseases, and develops and tests medical sensors for in vivo testing of the human knee's biomechanical properties.

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Outreach Programmes

Open Day

The annual online and on-campus Open Day offers learners, parents, and the general public an exciting opportunity to explore engineering as a field of study and a career path. The Open Day highlights how engineers solve real-world challenges, drive innovation, and contribute to society. It offers a glimpse into the diverse career opportunities in engineering and how the field can shape a rewarding future.

Enquiries: Ms Tanya Ficker
+27 21 808 9403 | tanya@sun.ac.za

Engineering Winter Week

During the annual Winter Week, Grade 11 and 12 learners gain a comprehensive understanding of the engineering profession. This event includes presentations by lecturers and engineers, as well as visits to industries and laboratories, providing students with a clear picture of an engineer's work.

Enquiries: Ms Ainsley Truter
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Women in Engineering

During the annual Women in Engineering event, Grade 11 female learners who excel in Mathematics and Physical Sciences are introduced

to the possibilities of a career in engineering. The event features women engineers from various industries, along with lecturers and students, who share their insights and experiences.

Top Achiever Sessions

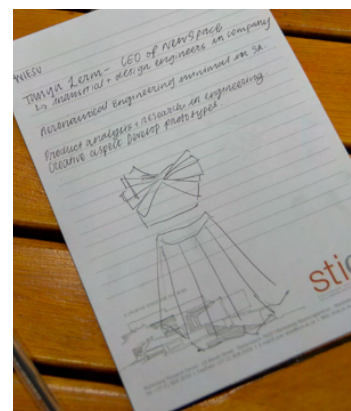
Top achievers in Grade 11 and 12, along with their parents, are invited to sessions held in Stellenbosch and major cities across South Africa and Namibia. These sessions provide information about engineering careers and the Faculty's degree programmes. Local alumni from industry are invited to share their experiences. Additionally, some departments conduct programme-specific webinars to further promote their engineering degrees and boost registrations.

First Generation Experience

Universities can be pretty daunting if you have no experience in academic or tertiary institutions. In 2018, the Faculty launched this outreach for Grade 11 and 12 top achievers whose parents have not had the opportunity to attend university. During a day visit, they experience the exciting vibe of campus, learn about the Faculty's degree programmes and other SET fields of study and meet the Dean.



At the Women in Engineering event, Grade 11 learners proudly model newspaper dresses they designed and constructed in only 15 minutes as part of a creative engineering challenge.



Attendees at the Top Achievers function were welcomed by the Dean of Engineering, Prof Wikus van Nierkerk.

Engineering Telethon Outreach Programme

This outreach initiative aims to increase the registration rates of black African-language-speaking students who receive provisional offers to study engineering at Stellenbosch University. The Telethon initiative engages prospective students from nine vernacular language backgrounds (excluding English and Afrikaans). Senior Matie students from similar language groups connect with these learners in their mother tongue, sharing their experiences and addressing questions or concerns about studying engineering at Stellenbosch University.

This peer-to-peer engagement helps create a sense of belonging and supports informed decision-making during the registration process.

Enquiries for these programmes, please contact:

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Our Open Day guides welcoming future engineers (top). During Winter Week, a scholar and a mentor showcase a project integrating engineering concepts (bottom).

The Faculty of Engineering honours the life and legacy of

Prof Paul Johan Erens (1945–2025)

a distinguished scholar, mentor and industry leader. Through his expertise in thermodynamics, fluid mechanics and heat transfer, he shaped both academia and industry, leaving a lasting impact on engineering education and research.

Prof Erens earned his BSc (Eng) in 1967 and, while lecturing, his MSc (Eng) in 1972 at the University of Pretoria. Thereafter, he joined the Council for Scientific and Industrial Research, where he conducted research on pulverised coal combustion.

In 1973, he worked in bioengineering at Groote Schuur Hospital in Cape Town. He joined Stellenbosch University in 1974 as a senior lecturer and pursued a PhD (Eng), which he completed in 1982 under the supervision of Prof Detlev Kröger. His groundbreaking research on liquid-metal condensation established him as a leading expert in heat transfer.

His academic career spanned more than four decades. He was promoted to professor in 1983 and served as chair of the Department of Mechanical and Mechatronic Engineering for 11 years, shaping the education of generations of engineers.

Prof Erens was known for his strict standards and rigorous teaching, particularly in Thermodynamics B, where punctuality and discipline were non-negotiable. Despite his high expectations, he was deeply invested in his students' success. Many credit him with their academic and professional growth, including a former student who pursued a PhD at the Delft University of Technology thanks to his encouragement.



He mentored numerous postgraduate students, including two PhD candidates and five master's students. His mentorship extended beyond research, offering hands-on experience in his laboratory and guiding students towards industry success.

Prof Erens played a key role in bridging academia and industry, particularly through a strong partnership with Industrial Water Cooling (IWC). His expertise in heat exchangers and cooling tower technologies earned international recognition, resulting in innovative computational models that continue to influence the field. He later moved to a full-time role at IWC, where he continued to drive technological advances in cooling systems.

Beyond his professional achievements, Prof Erens was a mentor and friend who shaped the careers of many engineers across South Africa and beyond.

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