

# Annual Report 2023

**D**uring 2023 the College of Agriculture, Engineering and Science (CAES) continued to contribute significantly towards UKZN's goal of being the Premier University of African Scholarship as well as helping the Institution meet its strategic imperative of excellence in teaching and learning, research, community engagement and targeted internationalisation.

## STRATEGIC OBJECTIVES

In line with UKZN's ten-year Strategic Plan and the aligned, College-specific 2023-2027 Plan, CAES set out to achieve the following objectives in 2023:

- Enhance the undergraduate and postgraduate student experience
- Increase student registration and fundraising for student bursaries
- Advance technology-enhanced, blended teaching and learning with a strong contact core
- Entrench the First Year Experience Programme
- Provide academic monitoring and support to students in the College
- Rationalise programmes and modules as part of Project Renewal
- Increase interdisciplinary and cross disciplinary research in meaningful and topical areas that solves current problems
- Mentor, nurture and develop young and emerging researchers
- Increase third stream research income through industry and governmental partnerships and projects
- Position the College as a hub of science research in Africa through increased relations with other African countries and Universities
- Increase the international research footprint
- Improve and upgrade infrastructure, including the establishment of a Central Analytical Facility
- Stabilise staffing in line with transformation and equity, particularly at professorial level
- Unite and improve staff morale, with greater collaboration between disciplines, Schools and the College
- Prepare for 2024 ECSA accreditation in the School of Engineering
- Develop skills in STEM subjects in students in the community

## SIGNIFICANT ACHIEVEMENTS

In the Teaching and Learning sphere, the College developed a comprehensive five-year Teaching and Learning (TL) Strategic Plan, aligning with the broader UKZN's Strategic Plan 2023-2032 and focusing specifically on two primary goals: Excellent Teaching and Learning, and Excellent Student Experience. The CAES TL Plan encompasses six key strategies: (1) student epistemic access and success; (2) enhanced teaching and learning; (3) improved efficiencies; (4) staff and student capacitation; (5) TL adaptation for the fourth industrial revolution; and (6) nurturing excellence in teaching. The Plan is committed to supporting students holistically from their initial transition to the end of their academic journey. This support is achieved through the Academic Monitoring and Support (AMS) programme, which addresses both academic and psychosocial needs, creating a responsive and supportive educational environment.

In terms of curriculum transformation matters, Professor Anne Stark was a core member of the team in the Innovative Engineering Curriculum project, a significant initiative aimed at transforming engineering education. Hosted by the University of Pretoria and in collaboration with most South African universities, the project focused on framework development and strategies for feasible implementation. In the Environmental Sciences, Professor Jemma Finch conducted a research project on perceptions of undergraduate learners on bilingual English-isiZulu teaching materials. This project helped develop isiZulu as a language of teaching and learning by creating bilingual teaching materials for a Level 2 undergraduate module.

Student Support Services continued with offering students a choice of teletherapy or face to face therapy and psychosocial services for the 2023 academic year. Students in the College who were on negative term decisions completed "The Learning Enhancement Checklist", which is a computerized screening and self-reflective tool to help students identify obstacles to their academic success.

In terms of academic monitoring and support activities, CAES successfully hosted UKZN's 10th Annual Academic Monitoring and Support (AMS) Colloquium where AMS practitioners from both within and outside the University shared research and engaged in meaningful discussions on relevant topics of interest. The theme for the colloquium was "Supporting Digital Natives in the Era of Artificial Intelligence." The Supplemental Instruction (SI) support initiative drew on successful senior undergraduate and postgraduate students to act as role models for their fellow students and focused on active and collaborative learning. Some 100 SI leaders and 10 SI coordinators were allocated to 74 modules across the College. Academic Development Officers (ADOs) set up and managed hot-seat tutorials for selected modules that required this type of additional support. Writing Place tutors assisted students with long practical write-ups, mini-dissertations, thesis writing and power-point presentations. Academic advising sessions provided students with support regarding their curriculum, information, and development needs. Practical Allocation Software was also developed with the primary goal of helping CAES organise practicals and tutorials efficiently.

The PhD Teacher Training initiative equipped PhD students with the necessary skills for academic careers. Five Level 1 workshops and four Level 2 workshops were conducted for nominated students. Participants acquired skills in practical teaching and learning, including lecture delivery, classroom management, assessment, and the use of key technologies to enhance practices in the classroom. To address the needs of CAES First Year Entry Students (FTENs), the First Year Experience (FYE) programme employed 80 student mentors across the Pietermaritzburg, Westville and Howard College Campuses to guide new students through accessing the FYE website, which contains crucial information to aid their transition to University.

Within the Research field, the College bagged an impressive 18 of the 30 places in the Top 30 most published researchers in the University (based on papers published in the 2022 academic year). In terms of graduation numbers, CAES awarded 236 MSc and 143 PhD degrees, with a total graduation number of 1 777 over all qualifications offered. Some 115 degrees were awarded *cum laude* and 56 *summa cum laude* (undergraduate and postgraduate). The annual Postgraduate Research and Innovation Symposium (PRIS) was once again a resounding success as CAES continued to lead the University in showcasing innovative research at the Masters and PhD level.

Several prestigious awards were made to CAES staff and students during 2023. The Royal Society of South Africa (RSSAf) honoured Professor of inorganic chemistry and material science Vincent Nyamori with a Fellowship (FRSSAf) for his outstanding contribution to furthering science in South Africa. Professor Thomas Afullo and Professor Akshay Saha of the disciplines of Electronic and Electrical Engineering were inducted as Fellows of the South African Academy of Engineering (SAAE). Meanwhile in the discipline of Chemical Engineering, Academic Leader and Associate Professor David Lokhat was inducted as a new Affiliate of the African Academy of Sciences (AAS) and named among the 20 most influential researchers in chemical and engineering research in Europe, the Middle East, and Africa by the Industrial and Engineering Chemistry Research (I&EC Research) journal. Professor Colleen Downs, the South African Research Chair (SARChI) of Ecosystem Health and Biodiversity in KwaZulu-Natal and the Eastern Cape, received BirdLife South Africa's Gill Memorial Medal Award in recognition of her outstanding lifetime contributions to ornithology in southern Africa. Professor Steven Johnson, an A-rated Research Professor at UKZN whose expertise lies in the ecology, evolution and chemistry of plant-animal interactions was awarded the South African Association of Botanists (SAAB) Gold Medal, the association's premier acknowledgment for outstanding botanical research and contributions to the advancement of botany in South Africa. Professor Sunil Maharaj, Director of UKZN's Astrophysics Research Centre, won the esteemed annual Harry Oppenheimer Fellowship Award for his exceptional work in the field of gravitational processes within evolving stars, a pivotal area bridging science, mathematics and astronomy.

CAES won three of the prestigious National Science and Technology Forum (NSTF)-South32 Awards for the 2022-2023 cycle. Professor Onesimo Mutanga, DSI/NRF/Nedbank SARChI Chair in Land Use Planning and Management and Professor of Remote Sensing at UKZN, won one of two Engineering Research Capacity Development Awards. Professor of Marine Geology, Andrew Green, won the Special Annual Theme Award: Ocean Science for Sustainable Development. The Centre for Water Resources Research (CWRR) headed by Professor Jeff Smithers won the NSTF Water Research Commission Award in recognition for cutting edge applied and interdisciplinary research and postgraduate training in water resources-related research and capacity building. Professor Francesco Petruccione, Interim Director of the National Institute for Theoretical and Computational Sciences (NITheCS), holder of the DSI/NRF SARChI Chair in Quantum Information Processing and Communication, and a Fractional Professor in the School of Chemistry and Physics was a Lifetime Award finalist.

Cellular biologist Dr Dalene Vosloo joined the ranks of UKZN's Distinguished Teachers with the Award that was made to her at the May Graduation ceremonies, recognising the animal physiologist's excellence in and sustained contributions to teaching and learning in her 16 years at the University. Postdoctoral researcher in biochemistry Dr Alexandre Delpont was honoured with a L'Oréal-UNESCO For Women in Science (FWIS) South Africa National Young Talents Programme Award, whilst Lesotho national Ms Nthabeleng Hlapisi, a PhD candidate in the School of Chemistry and Physics, received a L'Oréal-UNESCO For Women in Science Young Talents Sub-Saharan Africa Award at the 2023 awards ceremony.

Honorary Professor Sushant Ghosh from the School of Mathematics, Statistics and Computer Science was listed amongst the World's Top 2% of Scientists, as ranked by Stanford University and Elsevier; as was Professor Amir Mohammadi from the School of Engineering.

The Centre for Transformative Agricultural and Food Systems' National Climate Change Indaba celebrated the successes of the uMngeni Resilience Project, one of South Africa's climate change adaptation flagship projects. The Indaba presented a moment to explore strengthening water and food security in the face of a changing climate, while protecting natural ecosystems and ecological infrastructure. And at UKZN's African Centre for Crop Improvement (ACCI), researchers together with colleagues from the Tanzania Agricultural Research Institute (TARI) released two new advanced sorghum pure lines (TARISOR1 and TARISOR2), which were posted on the Southern Africa Plant Breeders Association (SAPBA) Wall of Fame. The seeds of the two varieties are now under commercialisation in western Tanzania.

A R15 million grant from the National Research Foundation enabled the School of Chemistry and Physics to purchase a new Mass Spectrometer, housed on the Pietermaritzburg Campus. PolyPeptide signed a collaboration agreement with UKZN's Peptides Science Laboratory, where Professor Fernando Albericio and Professor Beatriz G. de la Torre will support one of PolyPeptide's innovation projects to improve the sustainability of peptide manufacturing.

In the Engineering sphere, a website - Woz'Olwandle - launched under the leadership of UKZN's Environmental Fluid Mechanics Lab Co-Director, Dr Justin Pringle, provides real-time guidance to beachgoers in Durban regarding the safety of water at popular beaches for swimming. Pringle also won the UKZN Inspiring Impact Challenge 2023 for his work with students on purpose-driven engineering. In the same School, the Aerospace Systems Research Institute (ASRI), formerly known as the Aerospace Systems Research Group (ASReG) was constituted with funding from the Department of Science and Innovation and is pursuing the development of suborbital sounding rockets (Phoenix) and orbital liquid rocket engine technology (SAFFIRE) under one integrated Space Propulsion Programme. During the year ASRI conducted a successful test launch of its Phoenix 1D hybrid rocket demonstrator and Phoenix 1C low-altitude rocket. UKZN is currently the only South African university pursuing an applied rocket propulsion programme, producing graduates with skills in advanced manufacturing, aerospace systems design, rocket launch operations and computational analysis.

The College remained committed to Community Engagement during the year. Academics and honorary staff members were sought-after for their scientific input on current events, especially record-high temperatures and the current El Niño, floods and infrastructure damage, and small-scale farmers' lives under climate change. The Farmer Support Group within the School of Agricultural, Earth and Environmental Sciences hosted its annual Food and Nutrition Fair at Othobothini (Emafusini) in the Msinga Local Municipality where it works to help 19 smallholder farmer groups to achieve food security.

STEC@UKZN – UKZN's Science and Technology Education Centre – reached a total of 12 600 school learners through its mobile science laboratory as well as science outreach programmes conducted at the Science Centre. The well-received "What Do Scientists Do?" monthly online public lecture series highlighting research conducted by various members of the faculty continued for the third year running owing to popular demand. In recognition of this successful outreach, the College won two Gold and two Silver awards at the South African Marketing and Advancement in Education (MACE) annual prizegiving. Led by Dr Cerene Rathilal, the STEM MentHER Programme bridged the gender gap in STEM by providing mentorship and support to exceptional young female learners. The programme will continue to empower and guide these high achievers through their ongoing educational and professional journey in STEM by connecting 12 learners with experienced and accomplished female academic mentors.

## **SIGNIFICANT CHALLENGES ENCOUNTERED AND ACTION TAKEN TO ADDRESS THEM**

The College recognised the challenge of declining enrolment owing to falling STEM marks amongst school leavers, implementing plans to remedy this trend through school outreach activities. CAES hosted two curriculum conversations with UKZN feeder schools titled 'Bridging the Gap', so as to engage meaningfully on decreasing the gap between mathematics and science competency levels amongst school leavers, and standards required to navigate a Bachelor of Science degree successfully. To promote the College Access programmes aimed specifically at learners from quintile 1-3 schools, rural areas such as Eshowe, Inanda, Umthatha, St Johns (both in Eastern cape) and Umbumbulu were visited. The CAES Grade 11 and 12 matric helpline initiative, started online in 2021 during COVID-19, was extended in 2023 to include free contact sessions as a way to help secondary school learners better prepare for final exams in the STEM subjects of Mathematics, Physical Science and Life Sciences. All classes were offered in both English and IsiZulu and any resources used during these sessions were made available through a dedicated website. CAES also partnered with the Department of Education in Pietermaritzburg for its Annual Spring School to assist with grade 12 learner exam preparation.

Staffing was a challenge during 2023 in both the academic and professional staff sectors due to the moratorium on advertising permanent positions during Project Renewal. This was addressed by the release of posts in academic disciplines, the employment of qualified ad-hoc lecturers, an increase in NGap and NESP candidates in line with the CAES transformation policy, and by the contracting of fixed term staff in the professional services. Infrastructure maintenance challenges that impacted on undergraduate and postgraduate programmes and research were addressed to some extent by the use of College and School funds. Keeping classes running during load shedding also proved problematic, with the purchase of generators and portable invertors assisting in this regard.

In the postgraduate sphere, foreign students experienced challenges with VISAs, which is an ongoing constraint. A decline in postgraduate numbers owing to a lack of funding opportunities was mitigated to a certain extent by the College awarding a limited number of bursaries to enable students to register. Postgraduate students without bursaries continue to support themselves by undertaking teaching commitments in laboratories and tutorials.

### PLANS TO ENSURE THE FUTURE FINANCIAL SUSTAINABILITY AND EFFICIENCY OF THE COLLEGE

College strategies to ensure future financial sustainability and efficiency include increasing third stream income through funded long-term research projects, such as national and international collaborations; research projects related to industry; and through publications on teaching and learning. Grant writing workshops for both staff and students are in the pipeline to encourage them to apply for national and international grants to support research. Plans are in place to centralize research equipment and undertake building essential renovations.

A College Business Plan and Risk Management strategy for overall College performance in terms of delivery of core business services and mitigation of negative financial impacts, has been developed in line with the 2023-2027 CAES Strategic Plan. Under the Project Renewal banner, rationalization of existing programmes and the five School structure within the College has begun, along with curriculum review and improvement for core degree offerings. Implementation and evaluation of the CAES strategy and implementation plan will be the major responsibility of the Deputy Vice-Chancellor, assisted by the Deans, Director of Professional Services and other managers across all Schools and divisions of the College. The Line of Sight performance management system will be used to achieve this goal and report to the University leadership.

### RECOGNITION AND GRATITUDE

As Acting Deputy Vice-Chancellor, I express my deep appreciation for the resilience displayed by all staff within the College of Agriculture, Engineering and Science. This team of professionals have contributed immensely to the institution, enabling UKZN to retain its place as an innovative leader in teaching, research and community advancement during the 2023 academic year. As an integral part of our truly African University, the College has endeavoured to contribute to South Africa and to the Africa-wide goals on sustainable development.

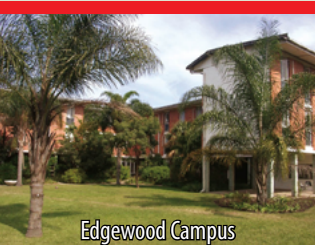
Staff in the College have worked tirelessly to achieve our strategic objectives to become a centre of excellence, advance opportunities for marginalised communities and participate impactfully in the global knowledge arena. We are so proud of these achievements and we commit to continued improvement in the coming years.

I would like to congratulate the team for making 2023 a year of success.



**Professor Fhatuwani Mudau**

*Deputy Vice-Chancellor and Head of College (Acting)*



Edgewood Campus



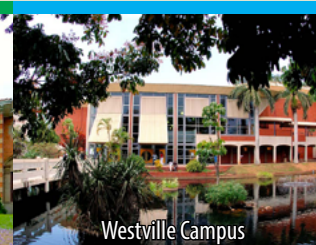
Howard College Campus



Nelson R.Mandela School of Medicine



Pietermaritzburg Campus



Westville Campus