THE COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE is proud of its contribution to the University, country and region and boasts some of the best teaching and research facilities on the continent. Researchers in the College lead many national and international teams, and support from government agencies and international foundations exceeds R200 million annually.

DURBAN – A SUBTROPICAL SEASIDE UNIVERSITY CITY

The University of KwaZulu-Natal is situated in the subtropical seaside city of Durban and in the Midlands city of Pietermaritzburg, capital of the province of KwaZulu-Natal, South Africa. With an inviting outdoor climate, KwaZulu-Natal’s two World Heritage sites lure the explorer. Surf, snorkel or scuba dive in the sea or hike the majestic Drakensberg mountain range only two hours’ away. Go wild game or bird viewing in the internationally renowned national parks, famous for the successful conservation of the Black and White Rhinos. Durban is a city whose local authority has received numerous awards for their management of the city. Pietermaritzburg is the seat of provincial government and is located in the centre of the scenic KwaZulu-Natal Midlands, close to numerous nature reserves and parks. The city has a rich architectural heritage, with many fine examples of Victorian and Edwardian buildings.

PIETERMARITZBURG – THE MIDLANDS CAPITAL OF KWAZULU-NATAL, A STONE’S THROW FROM THE DRAKENSBERG WORLD HERITAGE SITE
The University and the College of Agriculture, Engineering and Science is home to over 9,500 students and approximately 800 staff. The College is committed to equity and excellence and over 31 percent of the staff and 63 percent of the students are black Africans. Increasingly, women are excelling in the College and we are proud that 40 percent of our staff and students are women. In addition the College attracts students and staff from around the world. Over eight percent of our students come from 53 countries around the globe. Nearly 2,000 - 20 percent - of our students are in masters or doctoral studies.

The College operates on the Pietermaritzburg, Westville and Howard College campuses of the university and is led by a Deputy Vice-Chancellor and Head of College. It comprises five Schools, namely, the School of Agricultural, Earth and Environmental Sciences; the School of Chemistry and Physics; the School of Engineering; the School of Life Sciences; and the School of Mathematics, Statistics and Computer Science. The College is a complex operation delivering a full range of excellent undergraduate and postgraduate programmes.

We are extremely proud of the significant contribution the College has made to advancing underprivileged scientists and engineers in South Africa through its ground-breaking bridging programmes. The College’s Science and Engineering Access Programmes were among the first on the African continent and have been in operation for over 25 years. The Science Access Programme, which has served as a blueprint for several universities in South Africa, Namibia and Botswana, is designed to facilitate access to degree studies for students who have had a disadvantaged education that under-prepared them for university study. This programme is widely recognised as the premier bridging science programme. The Engineering Access programme (formerly known as UNITE), is a unique course of study specifically designed to prepare students for the rigorous demands of the engineering profession. This programme has a proud record and celebrated 29 years of its existence in 2017. Our Engineering students enjoy substantial support from collaborating industry sponsors.

The College of Agriculture, Engineering and Science houses a wide range of sophisticated equipment in its five schools, for example, the School of Life Science’s electron microscopy and microanalysis imaging units on the
Pietermaritzburg and Westville campuses, and the School of Chemistry and Physics’ specialist scientific glassblowing unit and electronics centre - placing the College at the cutting edge in respect of research and teaching equipment and tools. We also have a 400 hectare research and training farm located at Ukulinga, just seven kilometres from the Pietermaritzburg campus. Apart from some of the oldest ecological experiments on the continent, Ukulinga also boasts internationally recognised research facilities for poultry production.

The College has always maintained a direct link between teaching and research. Our staff and postgraduate students consistently produce close to 40 percent of the University’s research outputs, which drives our teaching strengths. We have several Research Centres, many of which are recognised internationally. Their specific achievements are detailed in this brochure. A number of them have combined the pursuit and development of knowledge with community-outreach goals. The African Centre for Food Security and the Farmer Support Group have achieved the Southern African Development Community Centre of Excellence status, as world leaders in the advancement of human development. Most disciplines across the College have field trips and projects that comprise considerable components of the curriculum, thereby ensuring that our students learn in real situations under full field conditions.

The College is proud of its contribution to the University, country and region. We boast some of the best teaching and research facilities on the continent. Our researchers lead many national and international teams, and support from government agencies and international foundations exceeds R200 million annually.

Our province provides an ideal environment to study Agriculture, Engineering and Science at one of the finest universities on the African continent. Our wide range of research and development skills and programmes prepare our students for the lucrative job market or as entrepreneurs!

I invite you to join us or work with us to be part of this exciting team.

PROFESSOR ALBERT MODI
GOAL ONE: EXCELLENCE IN TEACHING AND LEARNING

- Lecturers from within the College are consistent recipients of the University’s annual Distinguished Teacher Awards, with 12 individuals being honoured over the past ten years.

- The College runs one of the country’s leading access programmes and provides educational opportunities to students from under-prepared backgrounds.

- Teaching and learning within the College is significantly enhanced by a regular infusion of capital in new teaching facilities, state-of-the-art laboratories and improved equipment.

- The College regularly excels in graduating the highest number of PhD students. In 2017 this figure reached 128.

GOAL TWO: PRE-EMINENCE IN RESEARCH

- The College has the highest research output in the University and produces the most research publications. In 2015 it contributed close on 40% of the University’s productivity units, with 20 academic staff appearing amongst the top 30 UKZN researchers and six being listed by Thomson Reuters as the most cited internationally.

- The College boasts a high number of National Research Foundation rated researchers: 4 ‘A’ (leading international researcher), 23 ‘B’ (internationally acclaimed researcher), 100 ‘C’ (established researcher), and 22 ‘Y’ (young researcher with potential).

- Over the past ten years, the prestigious annual Vice-Chancellor’s Research Award has gone to a member of the College of Agriculture, Engineering and Science six times.

- A total of nine Department of Science & Technology and National Research Foundation National Research Chairs (SARChI Chairs) reside within the College.

- There are some 70 well-established research groups active within the College.

- To increase its research output, quality and global impact, the College has appointed 197 postdoctoral scholars across its five Schools from 2012 to date, at a cost of over R19 million.
The College runs a number of school outreach programmes aimed at learners. These include the School of Engineering’s annual Winter School and ‘Be a Scientist for a Week’. On an annual basis, 300 students attend National Science Week at the Science and Technology Education Centre on the Westville campus.

In 2012, over 150 Agricultural alumni attended the launch of the Friends of UKZN Agriculture Society. The main objective of the society is to form closer working relationships between UKZN agriculture and agribusiness stakeholders.

Maths4Stats is a training initiative for mathematics educators, aimed at improving mathematics teachers’ understanding of the content of High School Mathematics, thereby better preparing students for University Statistics.

The multi-million dollar uMgeni Resilience Project is reducing the vulnerability of low-income communities in the uMngungundlovu District Municipality to the impact of drought and climate change.

In 2012, the College structure was reconfigured to optimise efficient and streamlined support services for enhanced academic teaching and research.

Members of the College Management Committee have played an integral part in formulating policies, processes and systems that ensure efficiency and service-delivery within the University.

The leadership body of the College is in line with the University’s equity targets, being fully representative both in terms of gender and race.

Scholarships and bursaries attract students wanting to pursue studies in scarce-skilled areas, e.g. Agriculture and Engineering.

Most of the qualifications within the College are offered in Durban and Pietermaritzburg, providing students with a choice of campus.

The College has injected considerable capital into the creation of world-class physical infrastructure that promotes academic endeavour and attracts superior staff. The R40 million new home for the School of Engineering on the Howard College campus represents the cutting edge of architectural innovation.

College management rewards and acknowledges commitment, dedication and hard work.

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The Deans and Heads of the College’s five Schools are all active and respected academics in their own rights.

Many College staff are leading members on a range of University and national bodies.

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Many College staff are leading members on a range of University and national bodies.
Knowledge leaders are essential in the rapidly-changing and information-rich world of today. UKZN prides itself as being a research-led institution and for the past three years has been rated Number 1 in South Africa in terms of research output. Research underpins the College of Agriculture, Engineering and Science, which boasts the highest research output of the entire university. Research grants annually exceed R200 million.

The College has a high number of National Research Foundation rated researchers: 4 A (leading international researcher); 23 B (internationally acclaimed researcher); 100 C (established researcher); and 22 Y (young researcher with potential). Collectively, a huge volume of international and national peer reviewed and rated journal publications are produced annually. UKZN’s top published male and female researcher reside in the College, as do six of the world’s most cited international researchers.

Of UKZN’s 15 DST/NRF National Research Chairs (SARChI Chairs), nine are housed in the College, namely: Evolutionary Biology; Gravitational Systems; Quantum Information Processing and Communication; Fluidisation Research Group and Separation Technology; Land Use Planning and Management; Rural Agronomy and Development; Proteolysis in Homeostasis Health and Disease; Ecosystem Health and Biodiversity in KZN and the Eastern Cape; and Chemistry of Indigenous Medicinal Plants.

The College has formal links, exchange programmes and collaborative teaching and research initiatives with many other universities around the globe. It is actively growing its postgraduate study programme and consistently leads the university in the output of postgraduate students. Currently, 20 percent of its student body are engaged in postgraduate research at Honours, Masters and PhD level. For the dedicated and ambitious student, a number of internationally recognised postgraduate degree options are available.

The College hosts an annual Postgraduate Research and Innovation Day. This forum provides a challenging and competitive environment for postgraduate students to present their scholarly work, via posters and presentations, to an academic but supportive audience, while at the same time disseminating knowledge.

Research Centres, Units and Groups within UKZN’s College of Agriculture, Engineering and Science operate at the cutting edge of technology and enjoy support from external organisations and funders. Some of our world-renowned Research Centres and Units include:

- Aerospace Systems Research Group (ASRG)
- African Centre for Crop Improvement (ACCI)
- African Centre for Food Security
- African Energy, Food and Water Engineering Research Group
- Agricultural Policy Research Unit (APRU)
- Amarula Elephant Research Programme
- Applied Analysis and Differential Equations Group
- Applied Statistics Research Group
- Astrophysics and Cosmology Research Unit (ACRU)
- Atmospheric Research Group
- Bioeconomy Research Group
- Bioresources Engineering Research Group
- Biosciences Research Group
- Catalysis Research Group
- Centre for African Parrot Conservation
- Centre for Artificial Intelligence Research (CARI)
- Centre for Composite and Smart Materials and Structures
- Centre for Plant Growth and Development
- Centre for Quantum Technology
- Centre for Radio Access and Rural Technologies (CRART)
- Centre for Research in Environmental, Coastal and Hydrological Engineering (CRECHE)
- Centre for Water Resources Research
- Condensed Matter Group
- Discrete Mathematics and Graph Theory Group
- Eastern Centre Transport Development Group
- Energy and Materials Engineering Research Group (EMERG)
- Energy, Food and Water Engineering Research Group (EFAW)
- Fibre Processing Research Group
- Fluidisation Research Group
- Forrestry and Forest Products Research Centre
- Geomatics Research Group
- High Voltage Alternating Current (AC) Research Group
- High Voltage Direct Current (DC) Research Group
- Hub for the African City of the Future (AfriHub)
- Hydrology Research Group
- Inland Invertebrate Initiative
- Laser Users’ Group
- Marine Biology, Aquaculture, Conservation Education and Ecophysiology Lab (MAECE)
- Marine Research Initiative and Estuarine Research Programme
- Mathematical Biology Research Group
- Mathematics, Statistics and Computer Science Education Research Group
- Mechatronics and Robotics Research Group
- Microscopy and Microanalysis Unit (MMU)
- Mineral Processing Research Group
- Motion Control Group
- Nanotechnology Platform
- National Wetland Rehabilitation Research Programme
- Plant Germplasm Conservation Research Group
- Pollution Research Group (PRG)
- Positional Communication System Unit
- Power System Dynamics Group
- Satellite Applications and Hydrology Group
- Science and Technology Education Centre (STED@UKZN)
- Science and Technology Innovation Park (STIP)
- Signal and Image Processing Group
- Soil-Plant-Atmosphere Continuum Research Group (SPACRU)
- Solar Energy Research Group
- Space, Plasma and Atmospheric Research Group
- Superconductivity and Nanotechnology Group
- Sustainable Energy Research Group
- Sustainable Resources Research Unit
- Theoretical and Computational Physics Group
- Theoretical Fluid Mechanics and Numerical Analysis Group
- Thermodynamics Research Unit (TRU)
- Topology Research Group
- UKZN - NAOC Joint Centre for Computational Astrophysics
- Vibration and Research Testing Centre (VRTC)
The University of KwaZulu-Natal is ranked within the top 3% of the World’s Universities by the Academic Ranking of World Universities, the QS World University Rankings, and the Times Higher Education Ranking. It is ranked Number 1 in South Africa in terms of research output.

UKZN has a student population of over 45 000, 69% of whom are African and 58% of whom are female.

The College of Agriculture, Engineering and Science represents the largest group of scientists, engineers and technologists under one structure in Africa with over 800 employees, including academics, administrative staff, specialist technical support staff, tutors, demonstrators and research support staff.

The College has over 9 500 students, of whom approximately 20% are postgraduate, and eight percent international.

The College boasts the highest research output within the University and produces the most research publications. The College’s contribution to University productivity units in 2015 was some 40%, with 20 academic staff appearing amongst the Top 30 UKZN Researchers.

UKZN’s Top Published Male Researcher and Top Published Female Researcher consistently come from the College’s ranks, as does the awardee for the Vice-Chancellor’s Research Award.

Four of UKZN’s eight NRF A-rated researchers come from the College. As per NRF ratings, the College also has 23 B, 100 C and 22 Y rated researchers.

Of the 15 DST/NRF South African Research Chairs (SARChI Chairs) hosted by UKZN, nine reside within the College (Evolutionary Biology; Fluorine Process Engineering and Separation Technology; Quantum Information Processing and Communication; Gravitating Systems; Land Use Planning and Management; Rural Agronomy and Development; Proteolysis in Homeostasis Health and Disease; Ecosystem Health and Biodiversity in the Eastern Cape; and Chemistry of Medicinal Plants).

Women in the College have received, or been runners-up, for the DST’s Distinguished Women in Science Awards.

Lecturers from the College regularly appear in the successful nominations for the annual UKZN Distinguished Teacher Awards (12 individuals over the past ten years) and as recipients of UKZN Fellowship Awards (53% of all awards since 1989 have been in the College).

The College produces the highest number of PhD graduates in the University. This figure increased from 69 in 2011 to 128 in 2017.

To increase its research output, quality and global impact, the College has appointed 197 postdoctoral scholars across its five Schools at a cost of over R19 million since 2012.

UKZN possesses the widest range of Agricultural disciplines at one South African institution. Of the five areas identified as lacking critical skills by the National Education and Training Strategy for Agriculture, four are addressed by programmes within the College of Agriculture, Engineering and Science (Agricultural Production (plants and animals); Agricultural Economics; Agricultural Development; and Agricultural Engineering).

The College conferred its first crop of co-taught Bachelor of Agriculture (B Agric) degree certificates at its 2013 graduation ceremony. This practical degree is offered in conjunction with Cedara College of Agriculture, and in partnership with the KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development. It has been adapted as a model by other universities.

UKZN is the only university in South Africa to offer a degree in Agricultural (Bioresources) Engineering that is fully accredited by the Engineering Council of South Africa.

The African Centre for Food Security is the only facility in the world offering transdisciplinary training and named degrees in the field of Food Security. It has been
appointed by the African Union and the New Partnership for Africa’s Development (NEPAD) as the lead agency in the food security activities of the Comprehensive African Agricultural Development Programme. In addition, it is formally recognised as the Southern African Development Community (SADC) Regional Centre of Excellence in Vulnerability Assessment and Analysis.

- The African Centre for Crop Improvement (ACC) established in 2002, trains African plant breeders in sub-Saharan Africa in the applied breeding of African crops using conventional and biotechnological breeding tools. The Centre receives support from the Rockefeller and Bill & Melinda Gates Foundations.

- UKZN is a NEPAD and SADC-recognised Centre of Excellence in Water Research. UKZN is the country’s leading institution in terms of attracting funding for agricultural related water resources research and over the past five years has trained more students than any other institution on Water Research Commission projects. An Umgeni Water-sponsored Chair of Water Resources Management has been established for a period of ten years and contributes to the College’s water related teaching, training and research initiatives.

- According to a Thomson-Reuters ‘InCites’ survey, Mathematics at UKZN was rated Number 1 in South Africa in terms of research impact over a ten year period.

- Thomson-Reuters have ranked the School of Chemistry and Physics as the top research producer in both disciplines for the past five years, amongst South African universities.

- The Vibration and Research Testing Centre (VRTC), which conducts research, testing and investigations in the field of conductor mechanical oscillations, is one of only four such facilities in the world, and the only one in the southern hemisphere.

- The College’s Access Programme positions it as a natural leader in providing education opportunities to undergraduate students from under-prepared backgrounds.

- The Science and Technology Education Centre (STEC@UKZN) on the Westville campus showcases the University’s scientific achievements and promotes the public understanding of science, engineering and technology within the region. It also houses the university’s Geology Museum.

- The College has invested over R300 million in new teaching and research facilities, state-of-the-art laboratories and equipment. A R40 million infrastructure investment saw the birth of the multi-purpose, environmentally-friendly UNITE School of Engineering building – the heart and soul of Engineering at UKZN and the venue of choice for university, industry and community-related activities.
The School of Agricultural, Earth and Environmental Sciences is driven by its mission to excel in teaching and research and to engage critically with all levels of society.

Based on the Pietermaritzburg, Howard College and Westville campuses, the School provides quality training and education and engages in groundbreaking research. Its location on the eastern shores of southern Africa provides it with a strategic advantage in terms of solving major problems related to food security, environmental resource management and wealth creation in Africa.

Programmes offered by the School are founded in the pure sciences but possess an applied and practical base, ensuring that they are relevant and make an effective contribution to South African society. Qualifications are continually reviewed and revised so that they match market demand and the requirements of professional training.

Agricultural Sciences

The School comprises three broad streams. In the agricultural field, it boasts the widest range of agricultural disciplines at one South African institution. These include Agricultural Economics (including Agribusiness and Agricultural Management), Agricultural Extension and Rural Resources Management, Animal and Poultry Science, Crop Science, Dietetics and Human Nutrition, Food Security, Horticultural Science, Plant Breeding and Plant Pathology. Of the five areas listed by the National Education and Training Strategy for Agriculture as lacking critical skills, three are addressed by programmes in the School, namely Agricultural Production, Agricultural Economics and Agricultural Development (a fourth area, Agricultural Engineering, is addressed by the School of Engineering).

Earth Sciences

The second major discipline stream within the School is that of the earth sciences, in particular, Geology. The School has the second largest university-based geoscience unit in South Africa, and is the only academic unit in Africa to offer Environmental and Engineering Geology as a qualification at both undergraduate and postgraduate level.

Cognisant that Geology is an integral and essential part of the mainstream economy of South Africa and its neighbouring states, the School offers a comprehensive range of undergraduate and postgraduate modules covering all sub-disciplines of Geology. Although historically a male-dominated field, the discipline has seen a dramatic change in recent years. Currently more than half the student population is female, and it is also fully representative of all demographic groups within South Africa.

Graduates in Geology play an important role in the utilisation and management of the natural resources of the country and the region. They are sought after in sectors such as Mining and Mineral Exploration, Minerals Research, Engineering Geology, Geotechnical Engineering, Government and Academia.

Environmental Sciences

Environmental Sciences is the final discipline stream within the School. Specialisations within this stream include Agrometeorology, Environmental Hydrology, Geography, GIS and Earth Observation, and Soil Science. Research activities within this stream are both relevant and diverse, ranging from web-based systems for near real-time agrometeorological applications, to River Health Programmes, which use cellphone technology to enable school children to report, discuss and take action on issues affecting the health of local rivers.

Postgraduate training and research is a key area of strength in the School of Agricultural, Earth and Environmental Sciences. Twenty-five percent of current postgraduate students come from some
20 different African countries, which impacts considerably on capacity development in Africa. The School has one of the highest research outputs of the College, with topical and relevant projects undertaken in identified focus areas.

World Class Centres of Research

The School boasts several recognised world class centres of research. Established in 2002, the African Centre for Crop Improvement (ACCI) trains African plant breeders in sub-Saharan Africa in the applied breeding of African crops using conventional and biotechnological breeding tools, with the ultimate aim of alleviating hunger in Africa. The Centre receives support from the Rockefeller and Bill & Melinda Gates Foundations through the auspices of AGRA (A Green Revolution for Africa), and collaborates with a wide range of international organisations. It has been adopted by the World Bank as an education and training model and has won an AGRA award for outstanding contributions to food security in Africa.

The African Centre for Food Security contributes to building and sustaining the critical mass of African expertise required to alleviate hunger on the continent. Endorsed by the African Union and the New Partnership for Africa’s Development (NEPAD) as the lead agency in the food security activities of the Comprehensive African Agricultural Development Programme, the Centre offers undergraduate and postgraduate training programmes that draw on the expertise of over 30 scholars from a variety of disciplines. It possesses a thriving research culture and works closely with other universities and organisations to facilitate development and provide policy and programme support. It is formally recognised as the Southern African Development Community (SADC) Regional Centre of Excellence for Vulnerability Assessment and Analysis.

Ukulinga research farm, a 400 hectare farm situated near the Pietermaritzburg campus, provides an invaluable resource for disciplines within the School. It is used extensively as an “outdoor laboratory” for research and the training of students. It also includes a sustainable small-scale farming section.

The Centre for Water Resources Research undertakes research and postgraduate training that is focused on improving our understanding of the functioning of the hydrological cycle, its sensitivity to human influences and the development of tools through which this knowledge can be applied for effective water resources management and planning. Within this context, research is conducted within the following areas: hydrology process studies; agricultural water use and innovation in irrigation practices; water quantity and quality related aspects of global change, including the dynamics of land use change, climate change and forecasting; hydrological model and database design and development; and water resources management and governance. Development of tools and practices to assist in the implementation of South Africa’s National Water Act and the management of the country’s water resources is an outcome of these studies.

The Soil-Plant-Atmosphere Continuum Research Unit (SPACRU) conducts investigations into the energy and water balances between the soil, plants and atmosphere, and specialises in micrometeorology and agrometeorology. This internationally-recognised Research Unit has a major research thrust in the investigation of energy and water balances and emphasises the use and development of methods for the measurement of evaporation, sensible heat and, more recently, carbon dioxide fluxes above land surfaces. Most of this research is funded by the Water Research Commission.

The Agricultural Policy Research Unit (APRU) engages in applied research to produce highly relevant, evidence based discussion documents that constructively contribute to the debate on agricultural policy in South Africa. The initial focus of the APRU has been land reform and labour markets, but the Unit’s research activities span a number of disciplines and involve a range of academic faculty, honorary academic staff and postgraduate students.

Research within the geological sciences is aimed at enhancing our understanding of the way the earth works now and in the geological past. Research encompasses the fields of Environmental and Engineering Geology, Petrology, Geochemistry, Structural Geology, Marine and Coastal Geology, Ore and Mining Geology and Tectonics. A close association exists with the Marine Geoscience Unit of the Council for Geoscience, and offshore investigations are undertaken around the coast of southern Africa and further afield. In fact, research activities across the whole School reflect a strong partnership approach. School academics sit on various international and local scientific forums, committees and review panels, and staff members enjoy mutually beneficial links with a number of national and international institutions and with industry partners.

Alumni and Community Initiatives

The School values its Alumni and has a thriving Alumni arm. The Friends of UKZN Agriculture actively assist with the promotion of links between Alumni, Academia and Agribusiness.

Community initiatives form a central focus of the School of Agricultural, Earth and Environmental Sciences. Community engagement informs teaching and learning activities and provides students with ‘hands on’ training. For example, the Geology Museum, which forms part of the Science and Technology Education Centre on the Westville Campus engages in a number of activities aimed at educating the youth and instilling a love and passion for science. Further afield, the Farmer Support Group provides scientific knowledge and support to smallholder farmers in rural communities.
The School of Chemistry and Physics is a major international player in research and teaching, being ranked by Thomson-Reuters as the top South African research producer in both disciplines for the past five years.

With some 150 academic, technical and administrative staff, 600 undergraduate students and a postgraduate component of 320 who are engaged in Honours, Masters, PhD and Postdoctoral research, the School of Chemistry and Physics is now the largest research centre of its kind in sub-Saharan Africa. It is also one of the best resourced, with a new postgraduate laboratory and office building recently added on the Pietermaritzburg campus.

The School boasts leading-edge laboratories and research equipment. In terms of nuclear magnetic resonance (NMR), it has two high field (600 and 500 MHz) and two medium field (400 MHz) spectrometers, facilitating investigation into materials that are separated from plants, compounds synthesised in the laboratory and industrial substances. Alongside the NMR arsenal there are state-of-the-art mass spectrometry (LCMS and GCMS) and X-ray diffraction facilities that give the School an important technological advantage in research.

Integrated Teaching
UKZN’s School of Chemistry and Physics offers a three-year undergraduate course leading to the degree of Bachelor of Science (BSc). This may be achieved in two ways: through a general and flexible BSc or through a specific focused BSc in either Applied Chemistry or in Chemistry and Chemical Technology. This option has a more directed outcome, and Chemical Technology in Pietermaritzburg and Applied Chemistry in Westville receive substantial support from industrial partners and sponsors.

The two operating centres of the School complement each other. The much larger Westville centre feeds off the energy generated by the huge expansion of chemical-related business in the Durban area. The Pietermaritzburg centre accounts for about 30% of the School and operates on a quieter, more intimate, level. Both centres, however, adopt the same holistic approach to teaching and research. Caring and enthusiastic lecturers ensure that students emerge highly employable, with a rich university experience and a first-class degree in Chemistry or Physics to their name. Each centre runs a programme geared towards improving student understanding of the academic-industrial interface.

Quality Research
Postgraduate study and research is viewed as critical within the School. Staff regularly feature within the Top 30 published researchers at UKZN. Research focus areas in chemistry include Medicinal and Natural Product Chemistry, Nanomaterials Research, Green Chemistry, Catalysis and Analytical Chemistry and Environmental Science. Areas of specialisation in Physics include Space Physics, Astrophysics, Computational Physics, Particle Physics, Quantum Research and Biomedical and Molecular Optics. Teams of researchers ensure thriving research projects with a critical mass of expertise, acceptable levels of funding and a good nucleus of postgraduate students.

The Catalysis Research Group is at the forefront of research and development in the field of reactions catalyzed in both a homogenous and heterogenous medium. The Group has initiated research projects in a wide range of topics, from precious metal catalysis to zeolites and supported transition metal oxides, which are of ever increasing relevance to modern chemistry.

The Astrophysics and Cosmology Research Unit (ACRU), which is co-hosted by the School, runs a strong research programme that delves into issues such as the cosmic microwave background, the evolution of galaxies and galaxy clusters, large-scale structure, mathematical relativity and geometry, and relativistic astrophysics. ACRU is closely aligned to the Square Kilometre Array (SKA) radio telescope project.

In 2016, the National Astrophysics and Space Science Programme (NASSP) was launched at UKZN as a multi-institutional postgraduate programme training graduates in astronomy, astrophysics and space science. In the same year a Joint Centre for Computational Astrophysics was established with UKZN and the National Astronomical Observatory of China (NAOC).

The UKZN Nanotechnology Platform, initiated in 2014 with the objective of bringing together all nano-related researchers, is perfectly poised to contribute to the national nanotechnology agenda for addressing current challenges. Research focuses on nano-energy, nano-health, nano-materials and quantum science and technology.

The Centre for Quantum Technology, with its primary thrust in quantum computing and cryptography, has contributed to the development of the theory of open quantum systems, which is at the basis of recent quantum information technological applications.

Community Outreach
Community outreach programmes focus on utilising the School’s teaching and research expertise to inform, educate and uplift the broader community, especially school-going children. Fun Chemistry ‘Magic Shows’ bring learners onto campus. The School participates actively in the College’s flagship outreach programme, “Be a Scientist for a Week”. It also puts on an enthusiastic display at the College Open Days and at Career Expos. The School’s postgraduate student society assists with outreach activities as well as maths and science coaching for school pupils.

The School of Chemistry and Physics teaches its students to become highly employable problem solvers. To be a Chemist or Physicist one needs an enquiring mind, good powers of observation, mathematical skills, practical ability, the adaptability to learn new skills throughout one’s career, and the social skills necessary to share one’s ideas with colleagues.

The future of Chemistry and Physics lies in producing a top-class workforce for Industry, engaging and educating the community, collaborating internationally and generating quality research.
The School comprises nine disciplines and has an Engineering access programme for talented yet disadvantaged students. Each discipline provides students with the option of professional registration and access to numerous career opportunities in the fields of engineering, research and development, project management, production management, consulting and general management. The School is home to the first-in-Africa, ‘Hub for the African City of the Future’ – a trans-disciplinary centre for research into smart and sustainable cities.

**Agricultural (Bioresources) Engineering**

The School of Engineering is the only institution in South Africa to offer a degree in Agricultural (Bioresources) Engineering. Cognisant of the ever-increasing demand for engineers who care for and possess the skills and experience to work with our biological resources, teaching and research go well beyond farm boundaries; they include water resources management, forestry, mining rehabilitation, machinery design, food processing, transport, irrigation design and management, controlled environments and animal husbandry. Research conducted by staff and students is driven by industrial and agricultural challenges. It seeks to develop innovative tools and solutions for technological advancements and sustainable environmental management.

The Energy, Food and Water Engineering Research Group (EFWE) is the largest and most influential group of its kind on the continent. This group of Professors, Lecturers, Postdoctoral, PhD and Masters degree students contribute to research in energy and supply chains in biomass production and processing systems; irrigation, soil and water engineering and food process and postharvest engineering. The group combines the fundamental elements of engineering with a range of other disciplines such as Hydrology, Soil, Animal, Food and Crop Sciences.

The Centre for Water Resources Research, which houses the Umgeni Water Chair of Water Resources Management conducts research and postgraduate training in hydrology process studies; agricultural water use and innovation in irrigation practices; water quantity and quality related aspects of global change; climate change and forecasting; hydrological model and database design; and water resources management and governance. The centre is active in regional, continental and global initiatives.

**Chemical Engineering**

The School of Engineering boasts the largest group of Chemical Engineers in South Africa. The Chemical Engineering programme, which is not only accredited by ECSA but also internationally under the Washington Accord, is a dynamic four-year undergraduate programme that shifts progressively from fundamental science at the start, to applied science and engineering at the end. Final year students are exposed to reactor technology, distillation and biochemical engineering, as well as major laboratory and design projects.

Access to top-quality facilities where students gain hands-on experience is an essential component of the learning process. Facilities include a well-equipped workshop with excellent technicians, state-of-the-art laboratories for thermodynamics and instrumental analysis, and pilot plants for gasification, mineral processing, distillation, pyrolysis and reverse osmosis. A full range of analytical equipment complements these resources, providing critical tools for research and analysis.

Focused research groups with close industry ties reflect a commitment to sustainable development, environmental conservation and social responsibility. Formed in 1970, the Pollution Research Group applies process and biochemical engineering principles to industrial problems. This professional group undertakes contract research and supervises postgraduate students in a number of fields, including cleaner production, wastewater treatment and computational fluid dynamics. It is an active member of a number of noteworthy organisations and agencies and is closely aligned with the Bill & Melinda Gates Foundation in their quest to improve global sanitation, through the Reinvent the Toilet Project.

The Thermodynamics Research Unit is a SASOL Centre of Excellence in Chemical Thermodynamics. Director of the Unit, Professor Deresh Ramjugernath leads a large team of postgraduate students and researchers - arguably one of the leading research groups in its field globally - which undertakes breakthrough research contributing towards chemical process development and optimisation in South Africa and abroad. The group actively contributes to the Government’s Fluorochemical Expansion Initiative (FEI) by researching and developing South Africa’s fluorinated products. Its activities are integral to the development of a fluorochemicals industry in the country and directly linked to the South African Nuclear Energy Corporation (NECSA) and SASOL.
Working in close collaboration with the Sugar Milling Research Institute (SMRI), Chair of Biorefinery Research Professor Annegret Stark and her interdisciplinary Bioeconomy Research Group are investigating opportunities to convert local biomass to chemicals and materials, and implementing the biorefinery concept in industry. The group’s research takes a holistic approach, covering fundamental investigations of biomass composition and properties, resource and market analysis, chemical and catalytic conversion and separation, as well as process development.

**Civil Engineering**

Areas of expertise in the Civil Engineering Programme include structural engineering and design, geotechnical engineering, environmental engineering and environmental fluid dynamics. Water and environmental issues are an area of strength and form the predominant focus of the research conducted within the discipline. The

Centre for Research in Environmental, Coastal and Hydrological Engineering (CRECHE), is an active group that promotes sustainable practice and deals with the interaction between engineering and the natural environment. Current projects include the management of hazardous emissions; the dispersion of pollutants in the atmosphere and coastal waters; spatial rainfall modelling; estuary bio-hydrodynamics; climate change; control of greenhouse emissions and production of energy from renewable resources.

**Electrical, Electronic and Computer Engineering**

The disciplines of Electrical, Electronic and Computer Engineering are in a state of continuous and rapid growth. Recognising the challenge of teaching in such an environment, the central philosophy adopted is to ensure that students gain an enduring capacity for continuous and effective self-education throughout life. Electrical Engineering deals with the critical industry of power generation, transmission and power utilisation. Students are exposed to the theory and practices of this diverse field and work with anything from large power generation facilities to microcomputer based systems. Electronic Engineering is related to the vast discipline of electronic information processing and distribution. This discipline includes all aspects of telecommunications, the design of microcomputer systems, signal and image processing and electronic hardware design.

Computer Engineering involves the use of computer systems in the management, control and dissemination of information. Students specialise in the fields of networking, and hardware and software design for computer and embedded systems.

Research activities within the disciplines of Electrical, Electronic and Computer Engineering are grouped according to areas of specialisation and are driven by active and well established research groups. Some of these areas include: High Voltage Engineering, Power Systems, Machines and Drives, Control, Digital Systems, Communications, Signal and Image Processing and Materials Science.

The Centre for Radio Access and Rural Technologies is a significant research group whose particular focus is future wireless networks, which will see the merging of computing and communication in the true spirit of the information technology era. Topics under research include wireless sensor networks, high-speed digital communications, cooperative communication networks, network protocol design and radio propagation.

The Eskom Centre of Excellence in HVDC Engineering is a multidisciplinary research centre focusing on research in technology relating to HVDC, power systems and power electronics of alternating current (AC) systems. Its research supports the National Development Plan (NDP) of the South African Government. It is home to four state-of-the-art research laboratories: the HVDC laboratory, the HVAC laboratory, the SMART Grid research laboratory (the first of its kind in Africa for training, research development and integration of Smart Technologies) and the Vibration Research and Testing Centre (VRTC), which conducts much-needed research, testing and investigations in the field of conductor mechanical oscillations.

Research groups maintain close ties with industry and collaborate on issues of technological advancement and change. With the assistance of industry funding, high end research focused laboratories and equipment are maintained, calibrated and upgraded on a continuous basis. Industrial partners include Siemens, Telkom, Eskom, Alcatel-Lucent, Armscor, Hulamin, Umgeni Water, South African Breweries and Sappi, to name a few.
Mechanical Engineering

The discipline of Mechanical Engineering makes a significant contribution to industry and engineering science through its teaching programmes and its well-established research centres. Teaching focuses on fundamental engineering science principles and their practical applications. This is reinforced by innovative laboratory work and experiments. Computer-aided design and analytical tools are used in problem solving and engineering analysis.

The final year curriculum, which is design focused, requires students to address present day industrial problems culminating in a comprehensive engineering project that brings the School of Engineering international exposure and recognition. Africa’s first solar car was designed and manufactured by Mechanical Engineering students and staff in the Solar Energy Research Group, in an effort to draw attention to alternate transport technologies. In 2012 and 2014 the car was the most successful South African university entry in the annual SASOL Solar challenge; and in 2015 was the first team from Africa to enter the Bridgestone World Solar Challenge, successfully racing 3,022 km from Darwin to Adelaide in Australia.

The Mechatronics and Robotics Research Group provides a state-of-the-art research and education environment for senior undergraduate and postgraduate students interested in the development of mechatronics and robotics technologies. The Group collaborates with national and international academic institutions and provides practical solutions to local industry problems. Research includes the development of new theories and methods in Computer Integrated Manufacturing. Exciting research is also happening in the field of touch prosthetics.

In the Aerospace Systems Research Groups (ASRG), academics and postgraduates conduct applied research in rocket propulsion and associated technologies such as thermal management and launch systems. Their aim is to develop aerospace technologies and human skills in aerospace engineering.

The internationally recognised Centre for Composite and Smart Materials and Structures is at the forefront of innovation and technology. One of its inventions, the smart bolt, is an advanced way to measure the stresses and loads placed on a structure. This invention could benefit the mining industry by keeping more accurate logs on the structural integrity of mines. It is cost effective, simple to implement and has real potential to save lives.

Land Surveying and Construction Studies

The School of Engineering is one of only two in the country to offer a fully accredited four-year BSc degree in Land Surveying. Staff contribute significantly to the community by undertaking contract research work and consultancy. Tourism within the province has benefited considerably as a result of their projects. Some of these include the development of a GIS database of potential sites in the Cato Manor area, and the mapping of tour routes for proposed tours in the Durban metro area. A highly successful rock art mapping project involved the establishment of a web-based GIS spatial database of 3D geometric and colour images of the rock art paintings of the Ukhahlamba-Drakensberg Mountains World Heritage Park.

Falling under the discipline of Construction Studies the three-year BSc in Property Development provides students with the technical competence to understand the factors which influence the design form, procurement process and production of buildings and civil engineering structures. Students seeking to hone their skills and specialise in a specific area have the option of continuing with a one-year Honours degree, majoring in either Quantity Surveying or Construction Management. Both these programmes are accredited by The Royal Institution of Chartered Surveyors (RICS) and the South African Council of Quantity Surveyors (SACQS).

Engineering Access

By offering a specialised extended curriculum programme, Engineering Access (previously UNITE) caters for disadvantaged South Africans with unrealised potential for academic success. The Engineering Access programme develops students with ability into excellent engineering graduates.
The School of Life Sciences, which is located on the Pietermaritzburg and Westville campuses, has a staff complement of 150 academic and support staff, houses approximately 1,500 undergraduate students, and boasts a postgraduate component of 560 engaged in Honours, Masters, PhD and Postdoctoral research. This makes it one of the largest gatherings of life scientists in Africa.

Laboratories and research equipment within the School are world class. Enthusiastic and dedicated lecturers ensure that students absorb a well-rounded scientific education, emerge with a first-class degree in the life sciences, and can rest assured that they will be employable both within South Africa and abroad.

The field of study that the School of Life Sciences covers ranges from bacteria, protozoans and fungi, to plant and animal life, i.e. from microscopic organisms to elephants, and everything in-between.

Teaching Focus Areas

Four broad disciplines encapsulate the School’s teaching and research work: Biological Sciences, Biochemistry, Genetics, and Microbiology. Within these areas a wide range of curriculum options are available.

- Biological Sciences includes Botany, Cellular Biology, Ecology, Entomology, Environmental Biology, Grassland and Rangeland Science, Marine Biology, and Zoology.

- Biochemistry looks at the molecules that make up ‘life’ and studies the proteins, fats, carbohydrates, vitamins and DNA that make living cells and organisms work.

- Genetics seeks to understand the way in which the determinants of heredity are encoded and expressed. Understanding the nature of genetic variation permits one to combat disease in humans, plants and animals, and improve existing strains and breeds of plants and animals. It includes the specialisation of Plant Biotechnology.

- Microbiology teaches students how to apply new and advanced technologies to explore the make-up, diversity and functioning of micro-organisms, as well as their relationship with other organisms and the environment. Molecular Biology and Forensic Biology fall under this discipline.

- The School of Life Sciences offers a three-year undergraduate Bachelor of Science (BSc) degree which may be achieved in two ways: either through a general and flexible BSc (Life and Earth Sciences Stream) with a variety of major subject combinations; or through a specific focused BSc with a more directed outcome in either Biological Sciences, Industrial and Applied Biotechnology, or Marine Biology.

- Teaching and learning within the School is complemented by highly specialised labs and facilities. The Microscopy and Microanalysis Unit (MMU) is a service facility that offers sample preparation for microscopy, image capturing, X-ray microanalysis and image analysis on the Pietermaritzburg and Westville campuses, whilst at Westville the state-of-the-art Forensic Science laboratory houses a R2 million Applied Biosystems 3 500 Genetic Analyser, used not only for research but to train future forensic geneticists at Honours level.

Research Specialisations

Research in the School yields important insights and practical applications in all aspects of the life sciences. The School has a rich postgraduate and research ethos, enjoys substantial backing from a...
range of industrial partners and collaborates with leading scientists from all over the world. Annually, the School graduates a significant number of PhDs and produces the greatest number of research publications in the university. Both the leading male and leading female UKZN researchers have come from its ranks. The School houses three National South African Research (SARChI) Chairs: in Evolutionary Biology, in Proteolysis in Homeostasis Health and Disease, and in Ecosystem Health and Biodiversity in KZN and the Eastern Cape. It is home to a number of staff with National Research Foundation (NRF) A, B and C ratings. A notable number of academics within the School are recognised as world leaders and are highly cited internationally in their field.

The world-renowned Centre for Plant Growth and Development is situated on the Pietermaritzburg Campus and fosters high quality research and excellence in Tissue Culture, Plant Physiology, Plant Molecular Biology, Seed Germination and Ethnobotany. The driving vision of the centre is to extend postgraduate research and training at the MSc and PhD levels on an interactive basis between plant-based disciplines.

The Plant Germplasm Conservation Research Group focuses on understanding the basis of seed recalcitrance – most simply defined as desiccation sensitivity – and, based on this understanding, developing the means for long-term conservation of the germplasm (genetic resources) of species producing seeds which cannot be stored conventionally. The optimal way to conserve seeds of crop and wild plants is by cryopreservation, i.e. storage at ultra-low temperatures, in or above liquid nitrogen. Once successfully cryostored, plant germplasm would be available for scientific work, species reintroductions, habitat restoration and mitigation of the consequences of climate change.

The Amarula Elephant Research Programme (AERP) comprises a team of active researchers, PhD and MSc students as well as partners with Government agencies, private game reserves and ecologists, who, in partnership with Government agencies, generate elephant management plans and strategies for public and private game parks that are based on data collected through scientific research.

The Marine Biology, Aquaculture, Conservation Education and Ecophysiology (MACE) lab provides dynamic insights into the world of marine biology whilst the Research Centre for African Parrot Conservation studies the biology of and threats to African parrots and lovebirds, not only in South Africa, but also in Mozambique, Malawi, Zimbabwe, Zambia, Namibia and Uganda. In addition to field studies, laboratory research has addressed issues of eco-physiology, behaviour and systematics, leading to many scientific publications and conference presentations.

Community Education

The School of Life Sciences provides several facilities that enable the local community to engage in a rich scientific experience, including the three hectare University Botanical Garden, the Bews Herbarium and online collections (the largest herbarium collection in KZN with over 130 000 specimens), and the SF Bush Zoological Museum. In addition, School research projects such as surveys of endangered fauna and flora, and lion and elephant monitoring, often involve participation by local communities. One such example is the annual Cape Parrot Big Birding Day, which undertakes a count of these endangered birds under the auspices of Professor Colleen Downs and the Cape Parrot Working Group.

For many years, academics and postgraduate students in the School have played an important role in equipping communities in the upper uThukela catchment to monitor and rehabilitate their catchment system, as well as providing livelihoods for members of these communities.

The School actively participates in educational outreach projects to local high schools which are arranged by the College. It also facilitates an active public seminar series on both campuses through the Royal Society of South Africa, which encourages the dissemination of research findings and information amongst academics, students and the general public.
SCHOOL OF MATHEMATICS, STATISTICS AND COMPUTER SCIENCE

RATED NUMBER ONE

Mathematics is the language all scientists use for communication, while Statistics is the scientific tool used for rational decision-making in almost every facet of contemporary social and economic life, and Computer Science underpins the technological foundation of the modern era. The three disciplines are all national and international scarce skills, with many exciting opportunities for employment or further research endeavours for graduates.

UKZN’s School of Mathematics, Statistics and Computer Science is one of the largest in the country. In 2012 Mathematics at UKZN was rated by Thomson Reuters’ InCites’ analysis as Number 1 in South Africa in terms of relative research impact over the previous ten year period, and was compared favourably with similar universities internationally.

Located predominantly on the Pietermaritzburg and Westville campuses, with an Engineering service presence on Howard College, the School of Mathematics, Statistics and Computer Science has a staff complement of 72 academic, ten administrative and six technical services staff. It houses approximately 900 undergraduate students and boasts a postgraduate complement in excess of 290, engaged in Honours, Masters, PhD and Postdoctoral research. The School’s laboratories and research equipment are amongst the best on offer.

The School’s competent cohort of lecturers ensure that students emerge highly employable, with a rich university experience and a comprehensive, first class Bachelor of Science (BSc) degree to their name. This three-year undergraduate degree is achieved either through a general and flexible BSc (Mathematics Stream, or M-stream as it is known) with various possible major subject combinations (Applied Mathematics, Computer Science, Pure Mathematics, Statistics), or through a specific focused BSc, which has a more directed outcome in Computer Science and Information Technology.

Mathematics

Discrete Mathematics deals with a modern aspect of Mathematics that has a significant impact on applications in the fields of science and engineering, e.g. computer science, telecommunications, information security, and operations research. UKZN’s mathematicians have well established research links with prominent universities all over the world, including Carnegie Mellon University, Vanderbilt University, University of Montreal, Warwick University and the University of Birmingham.

Staff active in the Applied Analysis and Differential Equations Group investigate models emanating from mathematical biology (epidemiology and cancer), mathematical finance and engineering, using various methods. Several bilateral international agreements exist with organisations such as the National Research Foundation (NRF) - Royal Society and the NRF-Polish Academy of Science. The School is an institute partner of the Mathematical Biosciences Institute at Ohio State University and there is an active programme of collaboration resulting in staff and students making regular visits.
Statistics

Worldwide, the amount of data collected grows each year in quantity and complexity. Accordingly, Applied Statistics has become an essential tool in almost every area of business and industry, including banking, insurance, finance, health care, gaming and entertainment, sports, government and non-profit organisations. Skilled professionals, able to analyse and interpret data to facilitate and inform effective decision-making, are in great demand. Analysts with proper training are becoming sought after by employers who help make data-driven decisions. The most common role for a graduate with these skills is as an applied statistician, data analyst, or data scientist.

Well-developed undergraduate Statistics and Biometry programmes equip students for a competitive market place. Graduates in these fields have excellent employment opportunities and are snapped up by organisations in the business and banking sector, industry, research and academia.

Computer Science

The School’s Computer Science graduates are highly sought after by KwaZulu-Natal based companies and national employers. During their degree, students are sought after by KwaZulu-Natal based companies and have excellent employment opportunities and are competitive in the market place. Graduates in these fields have excellent employment opportunities and are snapped up by organisations in the business and banking sector, industry, research and academia.

The School’s Computer Science degree to make sense of Big Data.

Research Profile

UKZN’s School of Mathematics, Statistics and Computer Science has an outstanding research profile. Research in the School covers a variety of topics in Pure and Applied Mathematics, Statistics and Computer Science. Core research focus areas include Cosmology and Astrophysics, Mathematical Biology and Biostatistics, Financial Mathematics, and Artificial Intelligence. At postgraduate level strong fields of supervision exist in all of these areas.

Academics in the School are actively involved in professional bodies such as the Academy of Science of South Africa (ASSAf), the South African Mathematical Society and the African Institute of Mathematical Sciences (AIMS).

The Astrophysics and Cosmology Research Unit (ACRU) is the largest research unit in the School. Headed by Professor Sunil Maharaj, SARChI Chair of Gravitating Systems, it aims to promote research in astrophysics and cosmology. ACRU runs a strong research programme centred around academic staff, postdoctoral researchers, postgraduate students, affiliated researchers and visitors. Research focus areas include the evolution of galaxies and galaxy clusters, the cosmic microwave background, large-scale structure, mathematical relativity and geometry, and relativistic astrophysics. With South Africa’s successful bid to host the Square Kilometre Array (SKA) telescope project, ACRU is ideally placed to make a significant scientific contribution to mankind’s understanding of the universe and the diverse range of structures that it contains.

The Centre for Artificial Intelligence Research (CAIR) conducts foundational, directed and applied research into various aspects of Artificial Intelligence. Machine Learning and Optimisation, and Image Processing are other domains of artificial intelligence that are currently being researched by staff, postgraduate students and postdoctoral researchers in Computer Science.

Currently a growing area of research in the School is Theoretical Fluid Mechanics and Numerical Analysis. The aims of this group are two fold; firstly to derive new, efficient and robust algorithms for the solution of nonlinear equations that describe most phenomena in science and engineering; and secondly, to use these techniques to solve primarily fluid flow problems. The group is actively involved in heat and mass transfer as well as nanofluid flow research.

Research endeavours in the theoretical and applied areas of computer science are significantly strengthened through collaboration and partnerships with well-known organisations such as the KwaZulu Natal Sugar Industry, where simulation is used to model the supply chain system; ThoroughTec, who employ students to create real-time simulations of heavy equipment; and the National Defence Force.

Image processing and computer vision are vital components of modern security systems. Researchers in the School are involved in the construction of systems that track movement and detect threatening gestures. Genetic programming and neural networks are other areas of expertise where applications range from chemical process tuning to feature classification. A local Bioinformatics Node of the National Bioinformatics Network has been set up and runs on the Pietermaritzburg Life Sciences campus.

Community Capacity Building

Conscious that Mathematics, Statistics and Computer Science are scarce skills within South African society, the School is committed to capacity building within communities and high schools. The popularisation of these subjects is a key focus of the School’s outreach programmes and activities are geared towards upgrading the skills and knowledge base of learners and teachers within the KwaZulu-Natal region.

The School’s capacity building initiatives are firmly rooted in ongoing research being undertaken by its academics into the area of Mathematics, Statistics and Computer Science education, in particular through the running of upliftment courses for in-service teachers.

ACRU has an exciting and engaging astronomy outreach programme that targets schools, universities and the general public and offers a substantial bursary programme for aspiring young astronomers. The Siyanqoba extension programme, which is administered by the South African Mathematics Foundation (SAMF) and UKZN, is one of ten centres around the country which provides training to young people who exhibit unusual talent in mathematics. The programme has consistently produced top finalists in the South African Mathematics Olympiad.

Finally, through the School of Mathematics, Statistics and Computer Science, UKZN is part of the Sub-Saharan Africa Consortium for Advanced Biostatistics (SSACAB) training, which is a five year project funded in 2016 by the Welcome Trust of the United Kingdom working in partnership with the African Academy of Sciences. The project is aimed at developing leadership training and science in Africa under the theme: Accelerating Excellence in Science in Africa.
The College of Agriculture, Engineering and Science is extremely proud of the significant contribution it has made to advancing previously disadvantaged scientists and engineers in South Africa through its Access programmes. Twenty-five years ago these programmes were pioneering – today they are the benchmark against which other Universities compare their endeavours.

COLLEGE ACCESS PROGRAMMES

The Science and Engineering Access Programmes are the College’s key mechanism for redressing inequalities in the natural and physical sciences. The Access Programmes cater for students from disadvantaged schools who have the potential to succeed, but lack the necessary entry requirements and preparation to gain automatic admission into science-based degrees.

Operating for over 25 years, the College’s Access initiatives currently comprise two programmes that have long and distinguished histories of helping learners achieve their true potential: the Science Access Programme (SAP) and the Engineering Access Programme (EAP). In addition to academic subjects and skills, these programmes place particular emphasis on developing the communication and life skills of students, providing a solid foundation for their future studies.

Science Access Programme

The Science Access Programme is a four year degree programme where students do their level 1 modules over the first two years of the degree. After two full years in the Science Access Programme, a student can move straight into level 2 modules. By spreading degree requirements over four years students have a slightly lighter load and can spend more time on each module, thus assuring success. Level 1 modules are not semesterised but taken over an entire year to allow for absorption of core scientific principles. Students take Biology, Chemistry, Mathematics and Physics in Year 1.

The Science Access Programme not only provides opportunities for a generation of South Africans whose education might have ended at secondary school level, but also contributes to addressing key national needs in the sciences.

Engineering Access Programme

The University of KwaZulu-Natal’s access programme for Engineering students originated as a partnership between industry and the University to enhance the success of disadvantaged students. Formerly known as UNITE, the Engineering Access Programme addresses two key imperatives: advancing the University’s goal of promoting access to learning for historically disadvantaged members of South African society; and creating an enabling academic and professional platform by providing sound academic training in engineering and organisational life skills.

The five year Engineering Access Programme applies a dynamic and proactive methodology to teaching and learning. An initial specialised, two-year augmented academic curriculum provides a holistic and solid foundation in the engineering sciences in preparation for the mainstream syllabus (years 3 – 5). Students acquire full first year credits in Engineering Drawing and Mathematics, Physics, Technical Communication and Engineering Design and Materials. In addition to attending mainstream lectures, supplementary tuition is given in all the above subjects. Trained counsellors provide ongoing academic and personal support to Access students.
Engineering Access employs highly qualified and experienced staff who understand the learning needs of students. The curriculum is presented through mixed-mode delivery, consisting of formal lectures supplemented by intensive small group tutorials. Applied projects bridge the gap between theory and practice. Students enjoy close interaction with lecturers. Professional awareness is complemented by vacation site work and industry visits.

Community initiatives are a core focus of the programme. These activities range from on-campus career talks and applied projects, to outreach programmes at various schools in the KwaZulu-Natal region.

Engineering Access enjoys the support of large corporations and industries who recognise the need for engineers in South Africa. Thus many bursaries are made available to students with high academic potential. At UKZN, such students are transformed into excellent engineering graduates, who are able to contribute fully to South African society.