



UNIVERSITY OF
KWAZULU-NATAL™
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INSPIRING GREATNESS

School of Engineering

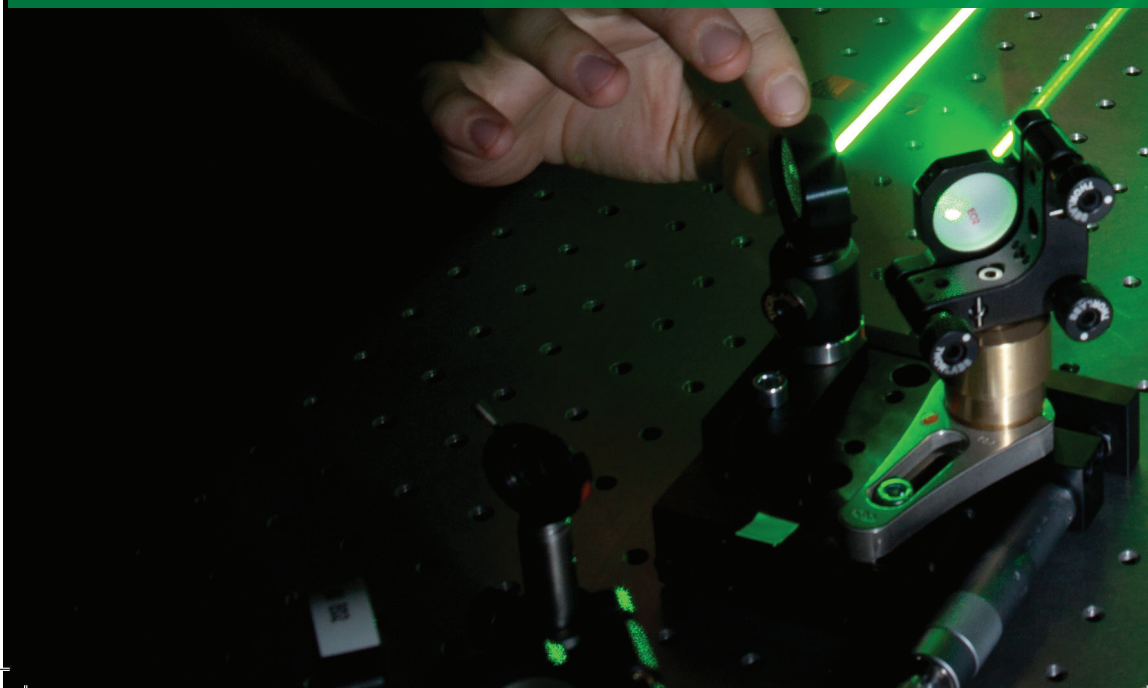
College of Agriculture, Engineering
and Science



INSPIRING GREATNESS



DON'T ACCEPT WHAT IS,
ALWAYS ASK WHAT IF.



The University of KwaZulu-Natal (UKZN) is ranked in the top 3% of the world's universities. UKZN has a worldwide reputation for academic excellence in teaching and research, and degrees offered have international standing. To choose to study at UKZN is the first step in securing your future.

UKZN's School of Engineering is one of two Schools that form the College of Agriculture, Engineering and Science. It is based on the Howard College campus in Durban with one of its disciplines, Agricultural Engineering, on the Pietermaritzburg campus. It comprises seven engineering specialist disciplines as well as land surveying and architecture.

Programmes offered by the School are fully accredited by the Engineering Council of South Africa (ECSA), the South African Geomatics Council (SAGC) and the South African Council for the Architectural Profession (SACAP) respectively, and conform to the highest international standards. The School offers a variety of degree options, ranging from undergraduate qualifications to doctoral degrees.

AREAS OF SPECIALISATION

Each discipline provides students with the option of professional registration and access to numerous career opportunities in the fields of architecture, land surveying, engineering, research and development, project management, production management, consulting and general management.



Agricultural Engineering

Agricultural Engineering is at the heart of sustainable development by ensuring reliable access to food, water and energy for growing populations while addressing climatic variability and environmental challenges.

Agricultural Engineers apply engineering principles to optimise agricultural systems and promote efficient and sustainable use of bio-resources. Agricultural Engineering is Engineering in and with the environment.

As an Agricultural Engineer, you may work as a project manager or engage in research and development in diverse areas, including:

- agricultural machinery: design, selection and management of equipment like tractors, combine harvesters, planters and spreaders to enhance productivity.
- agricultural structures and controlled environment: development of storage facilities, greenhouses and animal shelters to optimise space and environmental conditions.
- agro-processing systems: agro-processing plant layout, optimising supply chains, design and management of postharvest technologies and value addition on products.
- environmental protection systems: implementation of waste management solutions, such as biogas plants, composting units and development of pollution control technologies.
- irrigation and drainage systems: design and management of systems, such as sprinkler, pivot, drip, dams, river diversion and conveyance structures to ensure efficient water use.
- precision agriculture solutions: integration of GPS-guided equipment, variable rate technologies, GIS, remote sensing and use of drones to enhance decision-making and resource management.
- smart agriculture solutions: integration of artificial Intelligence (AI), the Internet of Things (IoT), robotics and automation into agricultural systems.
- soil and water conservation systems: development of systems for soil erosion control, water conservation and natural resources management.
- renewable energy: integration of energy sources that naturally replenish such as solar, wind, biogas and biofuels into agricultural systems.



Chemical Engineering

There are many opportunities for Chemical Engineers in South Africa, ranging from software development to being a patent attorney.

The increasing demand for the commodities which the country has to offer will require further large-scale development of our fuel, mineral and chemical industries. Chemical Engineers are required to “add value” to these materials, and to optimise our processes to make them competitive on a world scale.

Advancement is usually rapid and promotion to senior management is common.

As a Chemical Engineer, the following options become available:

- Research and development
- Project management
- Project evaluation and design
- Production management
- Consulting
- General Management

Civil Engineering

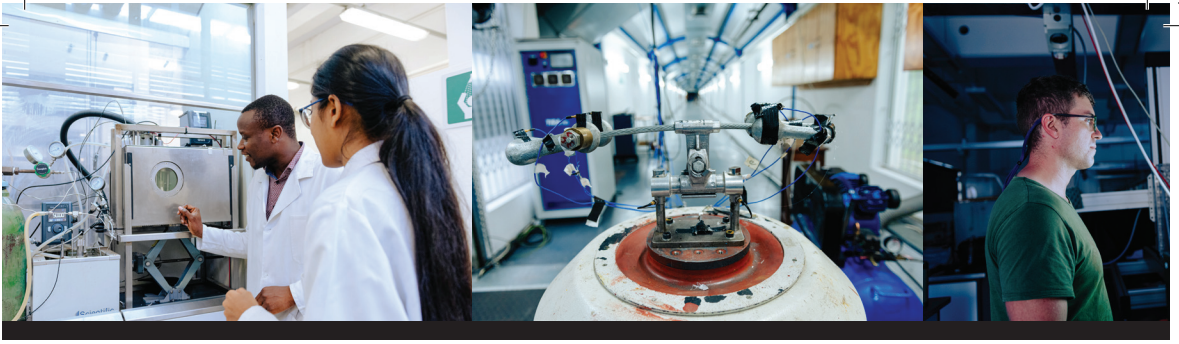
Civil Engineering is concerned with planning, designing, constructing and managing the physical infrastructure and facilities needed for the smooth functioning of contemporary society so that the optimal quality of life can be ensured for its people.

In order to provide these facilities the Civil Engineer needs to understand and integrate the natural environment with the requirements of people and engineering science in order to design and construct a solution that satisfies the needs of society within the constraints of nature, using the best available technology.

The ideal attributes of a Civil Engineer are a holistic, all embracing outlook, a creative and logical mind, and good communication skills.

Typical examples of Civil Engineering are:

- Structures, such as tower blocks (skyscrapers), bridges, power stations, sports stadiums and oil rigs.
- Transport Systems, for example roads, railways and airports.
- Water Supply Systems, including dams, reservoirs and water towers.
- Marine Works, such as seawalls, harbours and dry docks.



Computer Engineering

The Computer Engineering curriculum is designed to prepare students for a career in the fast-growing field of computer engineering where computer systems are applied to the management, control and dissemination of information and the control and management of systems of all forms.

The programme enables students to specialise in the fields of hardware and software design of computer and embedded systems. It also provides a solid background in Electronics, Control and Telecommunications.

The foundation subjects common to Computer, Electrical and Electronic Engineering Programmes, are offered during the first, second and part of the third year of study.

The specialisation subjects start in second year with a module on Data Structures and Algorithms, which complements the two standard Computer Methods programming modules taken by all three programmes.

In the third year of study, further specialist modules in Software Engineering, Advanced Programming and Discrete Mathematics are taken along with two Computer Engineering Design modules.

Students also attend a module on Engineering Management and Labour

Practices in preparation for the management role they will assume in Industry and an Environmental Engineering module to ensure sensitivity to this important aspect of any engineering.

The fourth year of study is where most specialisation takes place with prescribed modules in Advanced Computer Engineering, Embedded Systems, Operating Systems, and Real Time Computing, plus three optional modules taken from subjects such as Ecommerce Systems, Security and Encryption, Internet Engineering, Artificial Intelligence, and Image Processing.

Students at the fourth year undertake two Computer Engineering design projects; one of them (the second semester) is a major project.

Electrical Engineering

The Electrical Engineering curriculum is designed to prepare the student for the environment in which the generation, transmission and use of electrical power takes place.

This environment varies from large generators in a power station to the latest microprocessor used to control a process in a factory or the supply of electricity to a house.



We believe that the best way to accomplish this preparation is by a broad-based degree in which the third year includes modules such as Electromagnetic Theory, Electrical Machines, Power Systems, Electronics, Digital Systems, Power Electronics and Control Systems.

The study of electronics and the use of computers are integrated into the electrical engineer's training because they are vital tools. Students also attend a module on Engineering Management and Labour Practices in preparation for the management role they will assume in Industry.

Final year students take two compulsory modules in each semester including Engineering Business and Entrepreneurship.

The remaining module credits required are selected from a wide range of options to suit a student's specific interests and chosen career specialisation area. These options address issues likely to be experienced in practice and so familiarise the future graduate with problems that will be faced in Industry.

Options that may be offered include High Voltage Engineering, Power Systems, Power Electronics, Electrical Machines, Control Systems, and selected topics such as Renewal Energy and Smart Grid.

Electronic Engineering

The Electronic Engineering curriculum is designed to prepare students for a career in the extensive discipline of electronic information handling, which has become crucial to the promotion of efficiency and productivity in so many facets of both commercial and industrial life.

This includes all aspects of telecommunications, the design of computers and microcomputer systems, microwave engineering, electronic equipment manufacture, and many other similar activities.

We believe we achieve this by offering a degree with a strong emphasis on the principles of electronic communication, while at the same time permitting a wide range of different applications of electronics to be studied.

For example, in the third year, the curriculum includes such modules as Electronics, Digital Systems, Electromagnetic Theory, Physical Electronics, Communications, Control Systems and Power Electronics.

Approximately 15% of the total academic load is on engineering design in which students are involved in team and individual projects.



Students also cover detailed aspects of electronic engineering such as Digital Communications, Digital Processes, Electronics, Digital Signal Processing, Control Systems, and Embedded Systems. A number of optional modules are also offered.

These include Acoustics, Artificial Intelligence, Microwave Engineering, Superconductivity, Data Communications, Image Processing, Automation and Power Electronics.

Students attend modules on Engineering Management and Labour Practices, Engineering Business and Engineering Entrepreneurship, in preparation for their professional lives.

Mechanical Engineering

Mechanical Engineering is the broadest based engineering discipline with the opportunity to specialise in areas such as machine design, materials engineering, aerodynamics, power generation, mechatronics and dynamics to name a few.

Many fields of Mechanical Engineering come together when exciting projects like producing a winning Formula 1 Ferrari, or designing a hypersonic spacecraft are undertaken.

A mechanical engineer is someone with a natural curiosity about how things work and a creative desire to make things that work well.

Mechanical engineers combine sound knowledge of physical and engineering science with ingenuity to create the mechanical devices and systems that are essential in almost every industry and every phase of technology.

Their activities range from those leading to the production of a machine (research, design, development and manufacturing), to those ensuring the optimal performance of equipment, including management and consulting.

Engineering Access Programme

Each year, the College accepts 80 students into the Engineering Access Programme.

The purpose of the Engineering Access Programme is to provide access to higher education for high potential students from socio-economically deprived backgrounds, who attended schools without the proper resources and infrastructure to put them on a level playing field with students who attended better resourced schools.

The structure for the Engineering Access Programme involves an extension of the



standard four-year Engineering degree by one year (i.e. the Engineering Access Programme is a five-year degree). For the first two years, students are part of the Access Programme.

In year one, they study mathematics and physics, along with modules in engineering drawing and design and engineering materials, as well as technical communication, and receive academic and personal support from the College's student counsellors. In year two, students continue with mathematics and physics along with applied mathematics and chemistry.

Once a student has completed these two years, he or she moves directly into level two of the Engineering discipline chosen, having completed the level one prerequisites and electives.

The strength of the Access Programmes derives not only from a specialised academic curriculum which provides solid grounding on engineering fundamentals, but also from developing the communication and life skills of students thereby providing a solid foundation for their future.

Land Surveying

The Bachelor of Science in Land Surveying is a four-year professional degree that

is tailored towards registration as a professional land surveyor.

It also covers closely related areas such as geographical information systems (GIS), land information systems (LIS), and global positioning systems (GPS). These subjects are part of the growing science of geomatics.

The word "Geomatics" is derived from the word geo, meaning of the earth, and informatics, which is the science of disseminating information.

The introduction of geomatics is because of the "digital revolution" which has revolutionised the traditional instruments and also our methods of presenting and transmitting that information.

Our graduates are sought after by both private firms of land surveyors and government departments. Many work overseas and in other African countries.

Future graduates could be involved in land development and management, geographic information systems, engineering surveys, applied computing and hydrographic surveys.

The Bachelor of Science in Land Surveying is only offered by two universities in South Africa. At the University of KwaZulu-Natal it is a vibrant programme which offers its students the advantages of close contact



with their lecturers and fellow students in a small group.

In addition to the academic requirements, during our annual survey camps for first, second and third year of study, students are involved in practical work to support development of our national nature reserves throughout the province of KwaZulu-Natal.

Architecture

Architecture is a field related to the design of buildings and human spaces. The responsibility of architects includes the supervision of the construction of the buildings they design.

Architecture at UKZN is appropriately placed to work with both national and local governments in promoting the synergistic relationship between the built environment and social, economic, cultural, political and environmental development.

The Discipline of Architecture offers a professional programme and boasts an experienced, balanced and high calibre group of academic staff who are experts in their field and committed to their students. It can be studied at the undergraduate and/or postgraduate level.

The three-year Bachelor of Architectural Studies undergraduate course is a professional degree programme that can

lead to registration as an architect. Critical outcomes of the degree include proficiency in architectural computations; effective oral and graphic communication of architectural projects; competent application of technological systems in design and the theoretical application and development thereof; knowledge and application of the statutory regulations; the ability to design appropriate buildings from the simple to the complex within variable contexts; and the ability to research the requirements and processes of buildings effectively.

The Bachelor of Architectural Studies degree provides a strong academic and practical foundation for students in both their yearlong internship in an architectural firm and their Honours and Masters in Architecture degrees that are to follow thereafter.

DEGREES OFFERED

Undergraduate Programmes

The primary qualification offered by the School of Engineering is the four year BSc Engineering degree. There are several areas of specialisation that prospective students can choose from, each with its own programmed degree.

These include:

- BSc Engineering (Agricultural Engineering)
- BSc Engineering (Chemical Engineering)



- BSc Engineering (Civil Engineering)
- BSc Engineering (Computer Engineering)
- BSc Engineering (Electrical Engineering)
- BSc Engineering (Electronic Engineering)
- BSc Engineering (Mechanical Engineering)
- BSc (Land Surveying)
- B Architectural Studies

APPLICATION REQUIREMENTS

In order to apply for the BSc Engineering programmes and BSc Land Surveying programme, students must have achieved at least 33 Matric Points and pass Core Mathematics and Physical Sciences at Level 5 (65%) as a minimum.

The BSc Engineering degree is four years in duration, as is the Land Surveying degree.

Programme Name	CAO Code	Entry Requirements	APS Range	Duration
B Sc Eng: Agricultural	KN-P-BEA	NSC-Deg with Maths & Physics (65%), Engl & LO 4 and three other subjects with at least two from the designated list	48-33	4 yrs
B Sc Eng: Chemical	KN-H-BEC		48-33	4 yrs
B Sc Eng: Civil	KN-H-BEV KN-P-BEV		48-33	4 yrs
B Sc Eng: Computer	KN-H-BEK KN-P-BEK		48-33	4 yrs
B Sc Eng: Electrical	KN-H-BEE KN-P-BEE		48-33	4 yrs
B Sc Eng: Electronic	KN-H-BEF KN-P-BEF		48-33	4 yrs
B Sc Eng: Mechanical	KN-H-BEM KN-P-BEM		48-33	4 yrs
B Sc Land Surveying	KN-H-BSL		48-33	4 yrs
B Architectural Studies	KN-H-BAR	NSC-Deg with Maths 5. Architectural Studies applicants who meet the minimum requirements will be requested to submit a portfolio of original creative work.	48-30	3 yrs
BSc Engineering Access Programme	KN-H-UNT	NSC-Deg with Engl, LO 4, Maths and Phys Sci 4	N/A	5 yrs



For Agricultural Engineering, students study first year on Pietermaritzburg Campus, second year at Howard College, and the remaining two years back at Pietermaritzburg. Chemical Engineering and Land Surveying are offered on Howard College Campus only. For all other Engineering degrees, students have the choice to study first year on either campus before completing their degree at Howard College.

For the Engineering Access programme, applicants should be from Quintile 1-3 schools and achieve at least Level 4 (50%) for English, Life Orientation, Core Maths and Physics. The minimum matric point score is waived.

For Architectural Studies, a National Senior Certificate for degree studies (NSC-DEG) with an APS of 30 or above is required, as well as Core Mathematics at Level 5 or above. In addition, applicants will be required to submit a portfolio of creative work, write an essay and complete a questionnaire.

Maths Literacy is not accepted as a substitute for Core Maths, for any degree offered by the School of Engineering.

POSTGRADUATE STUDY

At the postgraduate level, students expand on their undergraduate studies and

develop a more in-depth knowledge and understanding of their chosen discipline.

The Honours degree in Architecture aligns with the competencies required for the professional category of senior architectural technologist and enables individuals to continue to a master's degree in related fields such as landscape architecture, interior architecture, architectural restoration, planning, housing, and property management. The programme therefore focuses on research-led and project-based learning within an interdisciplinary curriculum mode to develop graduate attributes to contribute meaningfully to the built environment industry and society.

The Master of Architecture is the apex degree of a succession of qualifications leading towards professional registration as a candidate architect in South Africa. It is also one of the degrees required for admission to post-professional design or research specialisations. The Masters' programme is offered either by research or coursework. The Masters' in research focuses primarily on an independent, original investigation culminating in a thesis, ideal for those pursuing academia or further specialisation. In contrast, a Master's degree in coursework emphasises structured learning through lectures, studios and assessments, often integrating practical and professional skills.



Engineering students can move straight into a Master of Science in Engineering (MScEng) degree as their four year BSc Engineering degree is equivalent to an Honours qualification. At Masters level, students specialise in their specific discipline of choice, and work on a research dissertation under the guidance of an appointed academic supervisor. A Master's degree takes a minimum of one year.

UKZN also offers PhD degrees by research under an appointed supervisor, and the opportunity for post-doctoral research.

Fee remission is provided for one year for Masters degrees, and three years for PhD degrees. Applications are open throughout the year.

For postgraduate queries, you will need to get in contact with the discipline concerned.

CAREER OPPORTUNITIES

Engineering in South Africa is a growing field and one that requires scarce skills. A degree from UKZN's School of Engineering will provide you with the knowledge and skills necessary to be a highly marketable employee.

Several opportunities exist for people with a BSc Engineering degree.

These include:

- **Professional Engineer**

Becoming a Professional Engineer

The Engineering Council of South Africa (www.ecsa.co.za) has accredited the BScEng degree at the University of KwaZulu-Natal as being consistent with its requirements for undergraduate training. With an ECSA accredited engineering degree, graduates have to have approximately three years of practical work experience before they can apply to be registered as a Professional Engineer.

- **Research and Development**

In today's knowledge-driven economy, companies and countries continuously strive to gain and maintain a competitive advantage.

This is often done through harnessing appropriate technology, and creating innovative solutions to problems.

Engineers often conduct research and development (R & D) as part of their role as professionals in an organisation.

They could also serve on R & D teams that explore new technological advancements at universities or pure research organisations.



- **Project Management**

The specialised knowledge and skills that a qualified Engineer possesses can be applied to a wide variety of projects.

Large corporations ranging from manufacturing to financial services find these attributes to be particularly useful, and often hire Engineers in this capacity.

The nature of project management means that work is non-routine, and designed to achieve a specific purpose.

This could include the construction of a new housing estate or even the streamlining of financial operations at a private company.

- **Production Management**

Engineers are involved in production processes in a variety of industries. From securing and sourcing raw materials to improving production methodology and quality management, Engineers are involved in the design, implementation, monitoring and evaluation of production management.

- **Consulting**

Apart from consulting on their specific area of specialisation, Engineers are often recruited by some of the largest and most successful corporate companies.

The analytical and critical thinking skills that are gained as part of a BSc Engineering degree are highly sought after. The methodical and logical means employed by Engineers to solve complex problems see them actively recruited by leading companies.

- **General Management**

Many organisations in today's competitive economy seek professionals with the ability to problem solve, think critically, monitor and evaluate operations and take corrective action where necessary.

In addition, general managers must have good people skills, and be able to work independently as well as within larger teams.

The BSc Engineering degree at UKZN equips students with these skills throughout their studies, producing competent professionals that can be groomed for general or even executive management.

- **Land Surveying**

South Africa is a country bustling with new development and a growing economy and population.

As a result, available land needs to be used appropriately as construction and infrastructure expand steadily.



A degree in Land Surveying provides the training and development necessary to be at the forefront of this expansion.

To become a registered surveyor with SAGC you must pass various specified exams, pay council fees and have performed work experience tasks.

- **Architecture**

Architecture can be practiced in one of four categories of registered person, namely Professional Architect, Professional Senior Architectural Technologist, Professional Technologist or Professional Draughtsperson.

To become a Professional Architect, graduates with a Bachelor of Architectural Studies will need to do in-service training under the supervision of a registered architect. Once this theoretical learning and practical training is completed, they write a

professional practice entrance exam. All graduates are required to register as architects with the South African Council for the Architectural Profession. The Master of Architecture is the apex degree for a Professional Architect in South Africa.

UNDERGRADUATE APPLICATION PROCESS

All undergraduate applications to study for a degree in UKZN's School of Engineering are done through the CENTRAL APPLICATIONS OFFICE (CAO). Visit the CAO website at cao.ac.za, and follow the process.

Applications open on the 1 April and close on 30 September of the year preceding entry.

CONTACT DETAILS

Engineering, Land Surveying and Architecture Admissions

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E-mail: engineering@ukzn.ac.za

Website: <http://engineering.ukzn.ac.za>

Handbook:

For full course codes and information see the
College of Agriculture, Engineering and Science handbook at
<http://caes.ukzn.ac.za>