



UNIVERSITY OF  
KWAZULU-NATAL™

INYUVESI  
YAKWAZULU-NATALI

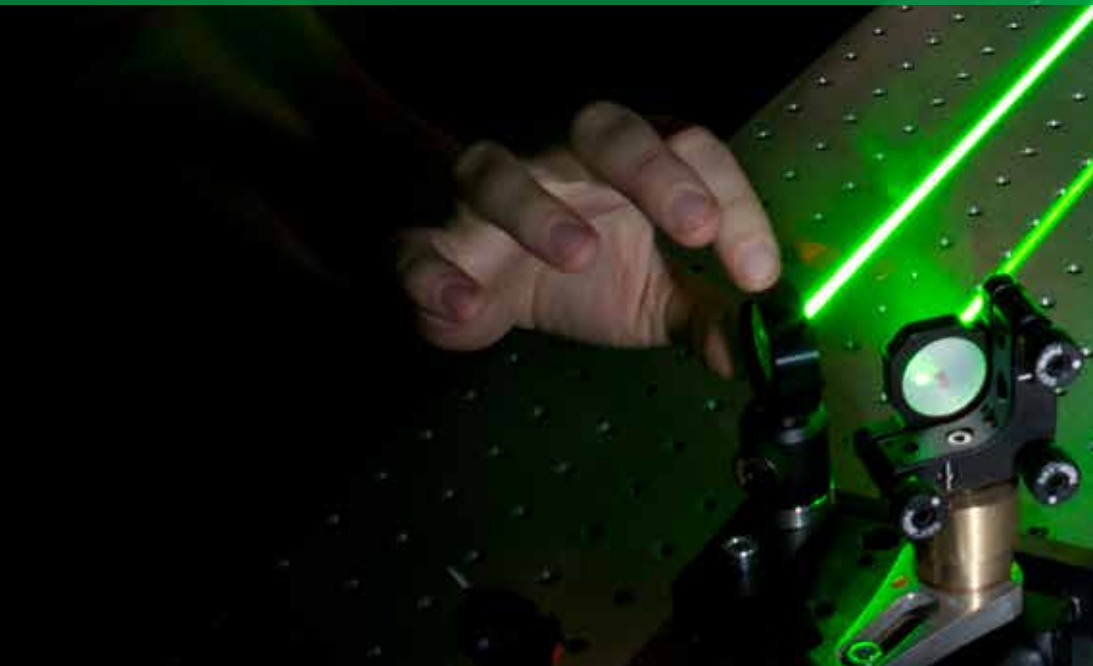
# School of Engineering

**College of Agriculture, Engineering  
and Science**

**INSPIRING GREATNESS**



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



The School of Engineering is one of five Schools that form UKZN's 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 nine disciplines and the Unite Programme, which is an alternate access programme.

Programmes offered by the School are fully accredited by the Engineering Council of South Africa (ECSA) 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**

The School offers nine areas of specialisation. 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.



## Agricultural Engineering

Life on earth needs a sustainable supply of food, water and energy in order to feed and sustain a growing population under variable and changing climate conditions.

Agricultural Engineers utilise technology to connect the living world of plants, soil, water and animals, with engineering (systems, structures and machines).

**As an Agricultural Engineer you may be involved in the following:**

- design, construct and manage technology for food, fiber and energy productions systems
- manage irrigation systems
- design and manage agricultural and rural water resource systems
- minimise pollution
- add value to raw products by preserving and processing food and animal feed
- design intensive animal and plant production structures to optimise food production through the use of technology
- develop and utilise sustainable sources of energy

## 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, Automation, Digital Signal Processing, Embedded Systems, Illumination and Data Communications and Telematics.

## 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.

## 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.

Geomatics is a new word (not found in the Oxford dictionary) and is derived from the word geo, meaning of the earth, and informatics, which is the science of disseminating information.

The recent 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.

## Construction Studies

The Bachelor of Science in Property Development is a three - year programme that can be followed by an Honours programme in either Quantity Surveying Management or Construction Management,

which is accredited by the Royal Institution of Chartered Surveyors (RICS) and the South African Council of Quality Surveyors (SACQS) respectively. Graduates are equipped for careers in a wide range of built environment related disciplines.

## DEGREES OFFERED

### Undergraduate Programmes

The primary qualification offered by the School of Engineering is the 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)
- BSc (Property Development)

## APPLICATION REQUIREMENTS

**In order to apply for the BSc Engineering programmes and BSc Land Surveying programme listed above, students must have achieved the following:**

- Achieve at least 33 Matric Points
- Pass Mathematics and Physical Sciences at Level 6 (70%) as a minimum
- Property Development requires Maths 5 and Physical Science 4.

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

For most programmes, the first year can be taken on either the Pietermaritzburg or Howard College campus.

All programmes with the exception of Agricultural Engineering, however, must be completed at the Howard College Campus.

## POSTGRADUATE STUDY

At the postgraduate level, students can specialise in their field by studying for a Master of Science (MSc) degree.

Generally, students will use this degree to expand on their undergraduate studies and develop a more in-depth knowledge and understanding of their chosen discipline.



UKZN also offers PhD degrees and the opportunity for post-doctoral research.

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](http://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.

- **Land Surveying, Construction and Property Development**

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, Property Development or Civil Engineering provides the training and development necessary to be at the forefront of this expansion.

- **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.

For example, a research team at UKZN's School of Engineering is developing robots that can search for and rescue victims of accidents in mine shafts.

- **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.

## CONTACT DETAILS

Engineering Admissions

**Tel:** 031 260 8038

**Fax:** 086 743 8950

**E-mail:** [engineering@ukzn.ac.za](mailto: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>

Designed by Corporate Relations

