

2025

# Undergraduate Faculty Brochure



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA

## Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en  
Inligtingtegnologie / Lefapha la Boetšenere,  
Tikologo ya Kago le Theknolotši ya Tshedimošo

The closing date for programmes  
in this Faculty is **30 June**.

**Make today matter**

[www.up.ac.za](http://www.up.ac.za)

## Message from the Dean

Finding innovative solutions that lead to real-world change is at the heart of the University of Pretoria's Faculty of Engineering, Built Environment and Information Technology (EBIT). We are home to a generation of leaders and innovators who are dedicated to making a difference.

**Prof Wynand JvdM Steyn**  
Dean: Faculty of Engineering, Built Environment and Information Technology



Our students and researchers strive to contribute to society at large by focusing on topics that will solve global challenges and change the world for the better. The Faculty therefore supports its students and researchers to positively impact the lives of their families, their country and the world. We focus on becoming the change we want to see in the world through innovative and cutting-edge research, and collaborative community engagement.

From your first year of study until you graduate and enter the world of work or enrol for postgraduate studies, you will be encouraged to do more than qualify for a given profession. We urge our students to recognise that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability.

Our graduates are therefore nurtured to become engineers who solve engineering challenges for future generations; built environment practitioners who create sustainable solutions for society; and information technology (IT) specialists who use the disruptive technologies of the Fourth Industrial Revolution to the utmost benefit of the human race.

Our students and researchers are increasingly concerned about the future of humanity, particularly in terms of global challenges such as energy security, food security, infrastructure security and data security. We seek solutions that extend beyond traditional disciplinary boundaries. Therefore, by enrolling for a programme in EBIT, you are not limited to a career in a traditional discipline, but can transcend the boundaries and make a difference to the bigger picture. This includes contributions to fields like health sciences, natural and agricultural sciences, social sciences, and economic and management sciences.

Your degree from the University of Pretoria will turn you into an engineer who can design things to support life beyond traditional engineering concepts, such as enhancing water security by improving the country's dams and sewerage works, and designing sensors to determine water quality. You will become a built environment practitioner who can design and plan locations to support life, such as clinics and schools that are easily accessible to people in rural areas, houses close to job opportunities and infrastructure that provides efficient transportation. You will become an IT specialist who focuses on data to support life, ensuring access to data, the security of data, and information and communication technologies that support health, education and food security, including the application of elements such as Big Data and Artificial Intelligence (AI).

Our strategic vision is to pursue innovation, while maintaining relevance for the present challenges. At the same time, we embrace digital transformation to ensure that its impact on individuals and organisations will improve the well-being of both our people and the planet. Our slogan, **"innovate our tomorrow"**, ensures that the difference we make will be felt not only today, but by all the generations to come.

We look forward to receiving your application to join one of our degree programmes, and welcoming you in 2025. We are positive that you will find your journey at the University of Pretoria to be an enriching and rewarding one.

**Tel** +27 (0)12 420 5318  
**Email** linda.king@up.ac.za  
**Website** www.up.ac.za/ebit

### EBIT IS ORGANISED INTO FOUR SCHOOLS

School of Engineering

School for the Built Environment

School of Information Technology

Graduate School of Technology Management

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VISIT OUR WEBSITE FOR MORE INFORMATION  
FOLLOW US ON SOCIAL MEDIA!

## ABOUT THE FACULTY

### TOP 284

in the world for **engineering and technology** (featuring in the top 550 in **FIVE** different engineering and technology subject areas)



Minerals & Mining Engineering



Chemical Engineering



Mechanical & Aeronautical Engineering



Electrical & Electronic Engineering



Computer Science & Information Systems



### TOP 240

in the world for **architecture and built environment**

### LOCAL RANKINGS

Study at the top South African university in the following fields:

- #1** in South Africa for electrical and electronic engineering (four years running)
- #1** in South Africa for materials science and metallurgical engineering
- #1** in South Africa for mechanical engineering

*Rankings based on 2023 QS Rankings, US News and World Report, 2022 Shanghai Rankings and the Minerals Education Trust Fund.*

## WE HAVE WHAT YOU ARE LOOKING FOR



Undergraduate programmes



Honours programmes



Master's programmes



Doctoral programmes



Academic laboratories

### Why #ChooseUP?

As one of the country's oldest and most prestigious universities, the University of Pretoria produces sought-after graduates, who become well-rounded, socially responsible citizens. The Faculty of Engineering, Built Environment and Information Technology (EBIT) is the largest of the University's nine faculties, and produces some **28%** of South Africa's graduate engineers. The University strives to instill in its students, graduates and staff a realisation that every action in the present shapes the future, and encourages them to **make today matter**.

Produced by the Department of Enrolment and Student Administration in December 2023. Comments and queries may be directed to [ssc@up.ac.za](mailto:ssc@up.ac.za) or tel: +27 (0)12 420 3111.

**Disclaimer:** This publication contains information about regulations, policies, tuition fees, curricula and programmes of the University of Pretoria applicable at the time of printing. Amendments to or updating of the information in this publication may be affected from time to time without prior notification. The accuracy, correctness or validity of the information contained in this publication is therefore not guaranteed by the University at any given time and is always subject to verification. The user is kindly requested to verify the correctness of the published information with the University at all times. Failure to do so will not give rise to any claim or action of any nature against the University by any party whatsoever.

FACULTY WEBSITE:



POSTGRADUATE WEBSITE:



# Online application process for studies in 2025

Please read through all the steps below to determine which actions are relevant for your application to study at the University of Pretoria in 2025. Citizens from countries other than South Africa (i.e. applicants who are not South African citizens) should also take note of the steps below with specific reference to the important information above the tables in the brochure: Undergraduate prospectus 2025: Applicants with a National Senior Certificate (NSC) or Independent Examinations Board (IEB) Certificate, available at [www.up.ac.za/programmes](http://www.up.ac.za/programmes) > **Undergraduate** > **Admission information**.

## 1

### Choose a programme

**Read about all the undergraduate programmes offered at UP in the brochure:**

Undergraduate prospectus 2025: Applicants with a National Senior Certificate (NSC) or Independent Examinations Board (IEB) Certificate available at [www.up.ac.za/programmes](http://www.up.ac.za/programmes) > **Undergraduate** > **Admission information**.

- It is important to indicate a first- as well as a second-choice programme on your Online Application. The Online Application Form only makes provision for two study choices. If you want to add a third choice, or if you want to change your study choice after you have already submitted your online application, please forward your request to [ssc@up.ac.za](mailto:ssc@up.ac.za).
- Ensure that your first- and second-choice programmes meet the minimum admission requirements, as well as the faculty's selection guidelines.
- Please note that certain programmes will not be considered if indicated as your second choice. Refer to the faculty tables in the abovementioned brochure available at [www.up.ac.za/programmes](http://www.up.ac.za/programmes) > **Undergraduate** > **Admission information**.
- Your application will be considered for all study programmes that you applied for and you will be notified via the UP Student Portal on your application status.
- For study advice, make an appointment with a Student Advisor via Ms Carol Bosch at [carol.bosch@up.ac.za](mailto:carol.bosch@up.ac.za).

More information is available at [www.up.ac.za/programmes](http://www.up.ac.za/programmes) > **Undergraduate** > **Admission information**.

## 2

### Tuition and residence fees

For more information on tuition and residence fees, go to [www.up.ac.za/article/2749200/fees-and-funding](http://www.up.ac.za/article/2749200/fees-and-funding).

- Fee quotation:** Please go to [www.up.ac.za/student-fees](http://www.up.ac.za/student-fees) to get an estimation of the study fees for the programme/s that you are interested in.
- Family discount:** When two or more dependent children of the same family are registered simultaneously at the University of Pretoria, they may apply for a rebate on tuition fees.
- The 2.5% discount:** If the student account is paid in full (i.e. 100%) by 30 April, a 2.5% discount is applicable.
- Initial payment:** This payment is not an additional amount payable, but the first payment towards the tuition fees.
- Residence reservation fee:** This fee will be payable within 30 days after placement in a UP residence. For residence room fees, go to [www.up.ac.za/accommodation](http://www.up.ac.za/accommodation).
- Fees paid by bursaries:** Students must submit written proof from the sponsor of the bursary awarded to them prior to registration, otherwise they will be responsible for the initial payment. The final decision regarding the acceptance of a bursary letter rests with the University.
- How and where to pay:** We encourage you to make EFT or credit card payments. Please allow at least five working days for the payment to reflect on your student account.
- UP banking details:** Refer to [www.up.ac.za/student-fees/article/2735940/up-bank-details](http://www.up.ac.za/student-fees/article/2735940/up-bank-details).

More information is available at [www.up.ac.za/student-fees](http://www.up.ac.za/student-fees).

## 3

### Apply to study at UP in 2025

Apply ONLINE at [www.up.ac.za/apply](http://www.up.ac.za/apply) from 1 April in the year preceding studies.

- Applications open on **1 April**. All study programmes at the University of Pretoria are number-limited. You are encouraged to submit your application as soon as possible after 1 April.
- The closing date for applications for all UP study programmes is **30 June**. This excludes the programmes in the Faculty of Veterinary Science, which close on **31 May**.
- Before you start to complete the Online Application, please watch an online application demonstration at [www.up.ac.za/juniortukkie](http://www.up.ac.za/juniortukkie) > **Study at UP**.
- Ensure that the email address that you indicate on your Online Application is correct as your temporary password and T-number will be sent to this email address.
- You will receive your student number within 10 working days after you have submitted your Online Application.
- On receipt of your student number, you will be able to track your application status on the UP Student Portal. Refer to Step 6 for instructions on how to gain access to your UP Student Portal.

## 4

### Apply for residence placement

The Online Application has a section to be completed if you are interested in residence placement. More information is available at [www.up.ac.za/accommodation](http://www.up.ac.za/accommodation).

- The demand for accommodation by far exceeds the available spaces. Applications open on **1 April**. The earlier you apply, the better your chances.
- A student who is admitted to a University of Pretoria residence for the first time must pay a reservation levy within the prescribed period. This amount is communicated in the placement letter.

## Online application process for studies in 2025

### 5

#### Apply for bursaries and loans

Visit the relevant website for closing dates.

##### UP bursaries and loans

- Applications must be submitted via the UP Student Portal or [www.up.ac.za/fees-and-funding](http://www.up.ac.za/fees-and-funding). No late applications will be accepted.
- UP sports bursaries: [www.up.ac.za/sport](http://www.up.ac.za/sport).

##### National Student Financial Aid Scheme (NSFAS)

- For applications and comprehensive information, visit [www.nsfas.org.za](http://www.nsfas.org.za).

##### Fundi (previously known as Eduloan)

- As a registered credit provider, Fundi covers a wide range of student-related necessities such as books, accessories, laptops, university and private accommodation, as well as study tuition with a fixed monthly instalment. Anyone can apply for a loan (students, parents or guardians), provided that the applicant is in full-time employment or has a registered business. For more information, visit [www.fundi.co.za](http://www.fundi.co.za).

##### Other bursary options

- Bursaries according to field of study: [www.gostudy.mobi](http://www.gostudy.mobi).
- The Bursary Register: Contact [rlevin@mweb.co.za](mailto:rlevin@mweb.co.za) or +27 (0)11 672 6559.

### 6

#### How to access the UP Student Portal

Go to [www.up.ac.za](http://www.up.ac.za) and click on My UP Login.

**Note:** A T-number is a temporary number and NOT a student number. This T-number is issued to the applicant at the beginning of the Online Application process. An applicant will receive a UP student number within 10 working days after the application has been submitted successfully. Applicants will only be able to access the UP Student Portal once they have received a UP student number, eg u25123456.

Please watch a video demonstration on: "How to access the UP Student Portal" at <https://youtu.be/Yd4pWr8lvNk>. Go to [www1.up.ac.za](http://www1.up.ac.za) and click on the "New user" link.

##### Instructions:

- Type in your username (u followed by your student number) and your national ID or passport number. Click the "Proceed" button.

- Set up your new password and confirm the password in the second block. Click the "Proceed" button.
- A message is displayed to inform the user that the password was set successfully. Click the "OK" button.
- A list of challenge questions appears. Select any three of these challenge questions and then click the "Submit" button. Enter your answer on the three challenge questions you chose and click the "Save" button.
- A message will be displayed to inform you that your challenge questions have been set up. Click the "OK" button.
- You are now ready to access the UP Student Portal.
- Sign in again with your username and password.

### 7

#### UP student contract

Before a student will be able to register, a contract needs to be concluded between the student and the University of Pretoria.

- Students must access the contract online on the UP Student Portal at [www.up.ac.za](http://www.up.ac.za) > My UP Login.
- The contract should be completed online, and then printed and signed.
- Hand your original, signed UP student contract in at the Student Service Centre, Hatfield Campus. You can also post your contract to the Student Service Centre, University of Pretoria, Private Bag X20, Hatfield, 0028; or you can courier

your contract to University of Pretoria (Contracts), University Road entrance, Hatfield, Pretoria, 0083.

- The University of Pretoria does not accept faxed, scanned or emailed contracts.
- Before you start to complete the UP student contract, please watch a video demonstration on: "How to complete the UP student contract" at <https://www.youtube.com/watch?v=BycC1rjLDsc>.

### 8

#### Orientation and registration for new first-year students

- The Orientation Programme will be available on [www.up.ac.za/orientation](http://www.up.ac.za/orientation) by the end of December.
- Online registration information will be available on [www.up.ac.za/online-registration](http://www.up.ac.za/online-registration) by the end of December.

### 9

#### Fly@UP Assist First-Year Awards

More information is available at [www.up.ac.za/student-funding](http://www.up.ac.za/student-funding) > Fly@UP Assist 1st Year Awards.

- First-year students who register for studies at UP directly after their final school-year (NSC Grade 12 or equivalent qualification), who meet the award criteria, will be considered.
- Students do not apply for these awards.
- Terms and conditions apply.

## Undergraduate programmes

### General admission regulations that apply to all prospective students

- The admission requirements and general information provided in this Faculty brochure are applicable to students who apply for admission to the University of Pretoria with a National Senior Certificate (NSC) or an Independent Examination Board (IEB) qualification.
- The following persons will be considered for admission to a first bachelor's degree at the University of Pretoria:
  - Candidates who have a certificate that is deemed by the University to be equivalent to the required National Senior Certificate (NSC) with bachelor's degree endorsement;
  - Candidates who are graduates from another tertiary institution or have been granted the status of a graduate of such an institution; and
  - Candidates who are graduates of another faculty at the University of Pretoria.
- Grade 11 results are used for the conditional admission of prospective students, but final admission will depend on the NSC (or equivalent) qualification and results.
- Candidates must also comply with the specific subject and achievement level requirements and the minimum Admission Point Score (APS) for their chosen degree programmes.
- The APS calculation is done by using the NSC 1 to 7 scale of achievement. It is based on a candidate's achievement in six recognised 20-credit subjects. The highest APS that can be achieved is 42. Life Orientation is a 10-credit subject and is excluded from the calculation when determining the APS. The following subject rating scores are used for calculating the APS for NSC/IEB:

#### Admission Point Score (APS) Conversion

Rating code	Rating	Marks %
7	Outstanding achievement	80–100%
6	Meritorious achievement	70–79%
5	Substantial achievement	60–69%
4	Adequate achievement	50–59%
3	Moderate achievement	40–49%
2	Elementary achievement	30–39%
1	Not achieved	0–29%

NSC – National Senior Certificate (completed Grade 12 in or after 2008)

IEB – Independent Examination Board

- Except in cases where modules or programmes require the use of a language other than English, all modules will be presented in English, which is the University's official language of tuition, communication and correspondence.
- Minimum requirements for admission to the relevant programmes are set out in the minimum admission requirements table in this brochure.
- Meeting the minimum admission requirements does not guarantee admission into a programme.
- Applicants with qualifications other than NSC and IEB should refer to the following publications:
  - The *International undergraduate prospectus 2025: Applicants with a school leaving certificate not issued by Umalusi\** (South Africa), available at [www.up.ac.za/programmes](http://www.up.ac.za/programmes) > Undergraduate > Admission information.
  - The *Newcomer's Guide 2024 of the International Cooperation Division*, available at [www.up.ac.za/programmes](http://www.up.ac.za/programmes) > Undergraduate > Admission information.
- School of Tomorrow (SOT) and Accelerated Christian Education (ACE):** The University of Pretoria no longer accepts qualifications awarded by these institutions.
- General Education Development (GED):** South African GED graduates who graduated up to 2019 may be considered for admission, provided they qualify for an exemption certificate issued by USAf and comply with both University admission and Faculty subject requirements. South African GED graduates who graduated after 2019 cannot be considered for admission to UP as the diploma is not accredited by USAf and will not be considered for exemption. Applicants from the USA who completed the GED may apply for a Foreign Conditional Exemption Certificate issued by USAf and accompanied by their SAT/TOEFL/IELTS results.
- National Certificate (Vocational) (NCV) Level 4:** The University of Pretoria may consider NCV candidates, provided they meet the exemption for bachelor's status criteria and the programme requirements.



\* **Umalusi** accredits South African private providers of education and training as well as private assessment bodies to offer tuition and/or assessment for qualification(s) on the General and Further Education and Training Qualifications Sub-Framework (GFETQSF). Contact Umalusi at [info@umalusi.org.za](mailto:info@umalusi.org.za) or +27 (0)12 349 1510.

**Note:** Refer to the General Academic Regulations and Student Rules at [www.up.ac.za/yearbooks/home](http://www.up.ac.za/yearbooks/home), click on 'General Rules and Regulations'.

#### APPLICATION AND CLOSING DATES:

- Applications open on 1 April. All study programmes at the University of Pretoria are number-limited. You are encouraged to submit your application as soon as possible after 1 April.
- The closing date for applications for all UP study programmes is 30 June. This excludes the programmes in the Faculty of Veterinary Science which close on 31 May.

#### APPLICATION STATUS:

- Apply with your final Grade 11 (or equivalent) results.
- Please note that meeting the minimum academic requirements does not guarantee admission.
- Applicants can expect feedback by September at the latest.
- Please check your application status regularly on the UP Student Portal at [www1.up.ac.za](http://www1.up.ac.za).
- Final admission will be based on the applicant's final school-year NSC or equivalent results.

# Undergraduate programmes

## Faculty-specific admission regulations

- Conditional admission to a four-year programme in the School of Engineering is considered only if a prospective student complies with ALL the requirements as indicated in the undergraduate minimum admission requirements table.
- Admission to the 5-year Bachelor of Engineering programme [previously called ENGAGE] in the School of Engineering will be determined by the NSC results, achievement level of 5 for English, 65% for Mathematics and 65% for Physical Sciences, and an APS of 33.
- Students may apply directly to be considered for the 5-year Bachelor of Engineering programme for all the Engineering disciplines.
- **Second-choice programme:** Should the Admission Point Score (APS) of a prospective student meet the entrance requirements for a programme, and the prospective student is not accepted for the first-choice programme, then an alternative programme should be considered as a second-choice programme.
- **Accreditation:** The various programmes in the School of Engineering are accredited by the Engineering Council of South Africa (ECSA), and the degrees meet the requirements for professional engineers in South Africa. All the programmes in the School for the Built Environment are internationally recognised and accredited by their respective statutory councils, allowing students to register as members of their chosen professions. All the degree offerings in the School of Information Technology (SIT) are highly sought after in the IT industry with a focus on industry-related trends. The curriculum conforms to the highest international standards. We are very proud to be a member of the iSchools Organisation. We are the only IT School in South Africa with Accreditation Board for Engineering & Technology (ABET) rating.

University of Pretoria website [www.up.ac.za/ebit](http://www.up.ac.za/ebit)

## Minimum admission requirements

- The closing date for applications for programmes in this faculty is 30 June.
- Meeting the minimum admission requirements does not guarantee admission into a programme.

## University of Pretoria programme qualification verification

The higher education sector has undergone an extensive alignment to the Higher Education Qualification Sub-Framework (HEQSF) across all institutions in South Africa. In order to comply with the HEQSF, all institutions are legally required to participate in a national initiative led by regulatory bodies such as the Department of Higher Education and Training (DHET), the Council on Higher Education (CHE), and the South African Qualifications Authority (SAQA). The University of Pretoria is presently engaged in an ongoing effort to align its qualifications and programmes with the HEQSF criteria. Current and prospective students should take note that changes to UP qualification and programme names may occur as a result of the HEQSF initiative. Students are advised to contact their faculties if they have any questions.

## SCHOOL OF ENGINEERING

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Engineering in Chemical Engineering</b> [4 years]	5	6	6	35
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Chemistry</i> , Bachelor of Science <i>Mathematics</i> and Bachelor of Science <i>Physics</i>				
<b>Careers:</b> Chemical engineers are involved in industrial processes that convert raw materials to products with a higher economic value. This is achieved using physical, thermal, chemical, biochemical and mechanical changes and processes. Chemical engineers apply their specialised knowledge in the petroleum, food, minerals processing, power generation and the paper and pulp industries, water and effluent treatment, and environmental engineering activities, including air pollution control. Like those in other engineering disciplines, chemical engineers are involved in research and development, techno-economic evaluation, equipment and plant design, process control and optimisation, construction, commissioning, operation and management, and the marketing and distribution of the final products.				
<b>Bachelor of Engineering in Civil Engineering</b> [4 years]	5	6	6	35
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Chemistry</i> , Bachelor of Science <i>Mathematics</i> , Bachelor of Science <i>Physics</i> , Bachelor of Science <i>Construction Management</i> and Bachelor of Science <i>Quantity Surveying</i>				
<b>Careers:</b> Civil engineers design, build and maintain constructions such as tower blocks and skyscrapers, dams, canals and pipelines, roads, bridges, tunnels, railways, airports, power stations, towers, waterworks and outfall installations. They are involved in financial modelling, feasibility studies and the management and rehabilitation of large asset portfolios.				
<b>Bachelor of Engineering in Computer Engineering</b> [4 years]	5	6	6	35
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Chemistry</i> , Bachelor of Science <i>Mathematics</i> and Bachelor of Science <i>Physics</i>				
<b>Careers:</b> Computer engineers are active in all fields of the information superhighway and the information and communication technology (ICT) world, which include computer systems, software engineering, computer and communications networks, wireless sensor networks, embedded software, electronics, smart control systems and automation, data security, e-commerce, pattern recognition (face and speech recognition) and artificial intelligence. They specialise in combining hardware, software and communication technologies to optimise system performance.				
<b>Bachelor of Engineering in Electrical Engineering</b> [4 years]	5	6	6	35
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Chemistry</i> , Bachelor of Science <i>Mathematics</i> and Bachelor of Science <i>Physics</i>				
<b>Careers:</b> Electrical engineers are active in the generation, storage, transmission, distribution and utilisation of electrical energy. There is a bright future in renewable energy. Electrical engineers design, supervise the construction, oversee the optimal operation and assure perfect and timely maintenance of all electrical installations for municipalities, residential areas, commercial buildings, factories, mines and industries. Rail transport, water pumping, electrical grids, telecommunications, energy management and smart lighting all fall within the scope of electrical engineering.				

\*Please apply for your second-choice programme if your APS and subject requirements of your first-choice programme are not obtained.

## Undergraduate programmes

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Engineering in Electronic Engineering</b> [4 years]	5	6	6	35
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Chemistry</i> , Bachelor of Science <i>Mathematics</i> and Bachelor of Science <i>Physics</i>				
<b>Careers:</b> Electronic engineers are active in various fields, such as telecommunications (fixed networks, wireless, satellite, television, radar and radio frequency networks), entertainment and medicine (magnetic resonance imaging, X-rays, cardiopulmonary resuscitation, infrared tomography, electroencephalograms (EEGs), electrocardiograms (ECGs), rehabilitation engineering and biokinetics), integrated circuit design, bioengineering, military equipment design (vehicle electronics, smart bombs, night vision, laser systems), transport (e-tags, speed measuring, railway signalling, global positioning system (GPS) and mapping), 'smart' dust, safety and security systems (face and speech recognition), banking (ATMs), commerce, robotics, education, environmental management, tourism and many more.				
<b>Bachelor of Engineering in Industrial Engineering</b> [4 years]	5	6	6	35
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Chemistry</i> , Bachelor of Science <i>Mathematics</i> and Bachelor of Science <i>Physics</i>				
<b>Careers:</b> Industrial engineers design, test, implement and manage a wide range of man/machine systems for production and the delivery of services. Organisational matters that require optimisation include site selection and layout of facilities, manufacturing, inventory control, materials handling, supply chain management, quality management, cost control, financial services, maintenance, reliability, computer simulation, information systems, human resources and business law.				
<b>Bachelor of Engineering in Mechanical Engineering</b> [4 years]	5	6	6	35
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Chemistry</i> , Bachelor of Science <i>Mathematics</i> and Bachelor of Science <i>Physics</i>				
<b>Careers:</b> Mechanical and aeronautical engineers are concerned with power-generating machines and systems such as vehicles, ships, air-conditioners, pebble-bed nuclear reactors, aeroplanes, engines and turbines, robots and biomedical systems. Areas of specialisation include product design and manufacturing (such as the design, testing and improvement of mechanical, electrical, pneumatic and hydraulic systems), marine engineering and naval architecture, biomedical engineering, air-conditioning and refrigeration, aerospace systems and aircraft/missile engineering, vehicle engineering, maintenance engineering and energy management (gas and steam turbines, nuclear power reactors, petrol engines, cooling towers and renewable energy systems).				
<b>Bachelor of Engineering in Metallurgical Engineering</b> [4 years]	5	6	6	35
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Chemistry</i> , Bachelor of Science <i>Mathematics</i> and Bachelor of Science <i>Physics</i>				
<b>Careers:</b> Metallurgical engineers unlock the riches of deposits of metal ores and minerals and optimise the manufacture and performance of metallic components. You'll find metallurgical engineers where valuable minerals are recovered from ore, where metals are produced from the minerals and where the metals are converted into useful materials as well as into high-performance products. Areas of specialisation include minerals processing, extractive metallurgy, materials engineering and performance, advanced manufacturing processes, including laser-assisted additive manufacturing and welding, as well as failure analysis and forensic engineering.				
<b>Bachelor of Engineering in Mining Engineering</b> [4 years]	5	6	6	35
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Chemistry</i> , Bachelor of Science <i>Mathematics</i> and Bachelor of Science <i>Physics</i>				
<b>Careers:</b> Mining engineers have a wide range of opportunities, namely mining (mine management, technical management of ventilation, rock mechanics, rock breaking, mineral resources), financial evaluation and management (mine design, financial evaluation of mines, mine feasibility studies, mine environmental impact studies), mining and drilling contracting (mining, tunnelling, shaft sinking, mine development, ore evaluation), mining research, mining equipment design and manufacture, mining marketing and mining administration at national, provincial and international levels.				
<b>Bachelor of Engineering</b> [5 years] This is a 5-year programme for all Engineering disciplines. <i>Previously called ENGAGE</i>	5	65%	65%	33
For advice on a second-choice programme, please consult a Student Advisor. To make an appointment, send an email to carol.bosch@up.ac.za.				
<b>Note:</b> The admission requirements above are relevant to prospective students who will commence their studies in 2025. Admission to the 5-year programme in the School of Engineering will be determined by the NSC results.				

## SCHOOL FOR THE BUILT ENVIRONMENT

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Science <i>Architecture</i></b> [3 years]	5	4	4	27
Will only be considered as first study choice. Selection programme: Selection includes an interview.				
<b>Careers:</b> The Bachelor of Science <i>Architecture</i> degree programme enables graduates to register with the South African Council for the Architectural Profession (SACAP) as candidate architectural technologists. The qualification is the first step to future registration as a candidate senior architectural technologist or a candidate architect.				
<b>Bachelor of Science <i>Construction Management</i></b> [3 years]	5	5	or Accounting 4	30
<b>Suggested second-choice programme*:</b> Bachelor of Science <i>Real Estate</i>				
<b>Careers:</b> After completing the three-year undergraduate degree programme, graduates could enter careers in, among others, construction site management or subcontracting. On completion of the ensuing one-year honours programme, graduates can register as candidate professional construction managers or candidate professional construction project managers and opportunities become much wider, including property development, portfolio management, commercial marketing and managerial positions in the corporate environment.				

\*Please apply for your second-choice programme if your APS and subject requirements of your first-choice programme are not obtained.

## Undergraduate programmes

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Science <i>Real Estate</i></b> [3 years]	5	5	or Accounting 4	30
<b>Suggested second-choice programme*:</b> Bachelor of Commerce <i>Investment Management</i>				
<b>Careers:</b> Apart from a future in areas such as property investment, property finance and facilities, and property management, further studies to obtain an honours degree in real estate can lead to registration as professional property valuers. Career opportunities encompass the entire spectrum of the property sector, whether as entrepreneurs in the private sector or as employees in the private, government or semi-government sectors.				
<b>Bachelor of Science <i>Quantity Surveying</i></b> [3 years]	5	5	or Accounting 4	30
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Construction Management</i> and Bachelor of Science <i>Real Estate</i>				
<b>Careers:</b> Quantity surveying is the science that delivers specialised financial and contractual services and advice to clients in the built environment, as well as related industries. The three-year undergraduate degree is the first step towards registration as quantity surveyors. The ensuing one-year honours programme leads to registration as candidate professional quantity surveyors. Career opportunities, apart from those in the private, government or semi-government sectors, also exist in the property, banking, insurance, mining and manufacturing industries.				
<b>Bachelor of Town and Regional Planning</b> [4 years]	5	4	-	27
For advice on a second-choice programme, please consult a Student Advisor. To make an appointment, send an email to carol.bosch@up.ac.za.				
<b>Careers:</b> Town and regional planners, development practitioners, urban managers, real estate analysts and researchers. While many town and regional planners act as private consultants to the public and private sectors, the majority are employed by government, research agencies (such as the Council for Scientific and Industrial Research (CSIR) and the Human Sciences Research Council (HSRC)), non-governmental organisations, community-based organisations, major financial institutions and property development groups. The qualification will enable graduates to register as professional town and regional planners with the South African Council for Planners.				

## SCHOOL OF INFORMATION TECHNOLOGY

Programmes	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
	English Home Language or English First Additional Language	Mathematics	
<b>Bachelor of Commerce <i>Informatics</i></b> [3 years]	5	5	30
This programme is administered by the Faculty of Economic and Management Sciences.			
<b>Careers:</b> Data scientist, IT auditor, IT entrepreneur, IT tax specialist, e-business consultant, programmer, business analyst, project manager, CIO, CTO and knowledge manager			
<b>Bachelor of Information Science</b> [3 years]	4	-	28
<b>Suggested second-choice programmes*:</b> Bachelor of Information Science <i>Publishing</i> , Bachelor of Commerce <i>Informatics</i> and Bachelor of Arts			
If informatics is selected as a subject at the first-year level, an achievement level of 5 is required in Mathematics.			
<b>Careers:</b> Information and knowledge managers (manage information and knowledge resources), information or e-commerce specialists (organise, retrieve and add value to information), consultants on information products (services and systems), information brokers (act as infopreneurs and buy and sell information products and services), and system specialists/analysts/technologists (develop information systems).			
<b>Bachelor of Information Science <i>Publishing</i></b> [3 years]	5	-	28
<b>Suggested second-choice programmes*:</b> Bachelor of Information Science, Bachelor of Arts <i>Languages</i> and Bachelor of Arts			
<b>Careers:</b> Entry-level job opportunities include assisting specific role-players in the publishing value chain (such as MDs of publishing houses, commissioning editors, editors and production or marketing managers), market or picture research, copyright negotiations, copy-editing and proofreading, marketing and promotion, distribution and delivery.			
<b>Bachelor of Information Science <i>Multimedia</i></b> [3 years]	4	5	30
<b>Suggested second-choice programmes*:</b> Bachelor of Information Science, Bachelor of Information Science <i>Publishing</i> , Bachelor of Science <i>Information and Knowledge Systems</i> and Bachelor of Commerce <i>Informatics</i>			
<b>Careers:</b> Programmers, web designers, animation specialists, video editors and electronic artists. The programme prepares candidates for positions at any of the following content producers: paper publications, television, radio, phone technologies and the web. Graduates can become coders and work for programming companies. They can develop skills in their particular areas of interest, such as digital music or video programming, or graphic, games or web development.			
<b>Bachelor of Information Technology in Information Systems</b> [3 years]	5	5	30
<b>Suggested second-choice programme*:</b> Bachelor of Information Science			
<b>Careers:</b> Data scientist, IT auditor, IT entrepreneur, IT tax specialist, e-business consultant, programmer, business analyst, project manager, CIO, CTO and knowledge manager			
<b>Bachelor of Science <i>Computer Science</i></b> [3 years]	5	6	30
<b>Suggested second-choice programmes*:</b> Bachelor of Science <i>Information and Knowledge Systems</i> and Bachelor of Commerce <i>Informatics</i>			
<b>Careers:</b> Programmers, systems analysts, systems architects, consultants, database administrators, network analysts and researchers			
<b>Bachelor of Science <i>Information and Knowledge Systems</i></b> [3 years]	4	6	30
<b>Suggested second-choice programme*:</b> Bachelor of Science <i>Computer Science</i>			
<b>Careers:</b> Graduates will differentiate themselves in an application environment by choosing one of the following options: data science, genetics, geographical information systems, IT and enterprises, IT and law, IT and music or software development.			

\*Please apply for your second-choice programme if your APS and subject requirements of your first-choice programme are not obtained.

## Taking teaching and learning to the next level

**The Faculty of Engineering, Built Environment and Information Technology (EBIT) at the University of Pretoria attracts students who want to make the world a better place. These are individuals who want to contribute to global challenges by developing solutions that support life in every conceivable discipline. They are focused on the bigger picture: contributing to the world economy and job creation, food security, energy security and sustainable development.**

The University's approach to teaching and learning embraces **inquiry-based learning, hybrid learning and community-based learning**. In adherence to this, the Faculty has established a progressive teaching and learning strategy to address several key priorities.

These priorities include increasing overall module pass rates, and ensuring that students are enabled to excel and complete their degrees in the minimum prescribed time. This strategy is entrenched in a culture of excellence, and is focused on bringing about transformation through the curriculum.

It also guides the Faculty's implementation of the University's hybrid model of teaching and learning, and contributes to EBIT's international ranking through its teaching and learning practices.

Lecturers are encouraged to develop creative approaches to transferring knowledge. Their focus is on achieving improved academic performance and preparing students for the Future of Work. In this way, the Faculty ensures that its graduates are not just exceptionally qualified professionals, but people who can make a meaningful contribution in the workplaces they enter by being equipped with empathy and people skills.

An important focus of teaching and learning in the Faculty is to embrace innovative teaching methodologies so as to produce work-ready graduates.

This prompted the Faculty to adopt the concept of immersive learning as an innovative approach to provide students with a deep experience of reality. This exposes them to real-world projects, where they can test multiple solutions in a fail-safe environment, preparing them for the world of work.

It also keeps abreast of the latest technological developments that may affect students' performance, such as Chat GPT. In addition to making students aware of the inherent risks associated with this technology, it is investigating ways in which this platform can be used to support learning by enhancing comprehension and fostering critical thinking skills.

It believes that innovating our tomorrow starts with adopting innovation today.

## LOOK OUT FOR OUR **TEAM** AT EXPOS, EXHIBITS, CAREER DAYS AND SCHOOL VISITS.



## Immersive learning prepares learners for the future

**In the Faculty of Engineering, Built Environment and Information Technology (EBIT) at the University of Pretoria, we believe that preparing our learners for the future entails more than just ensuring that the course content is up to date and in touch with the latest developments in industry. It means preparing our students for the classroom of the future.**



We have embraced the concept of **immersive learning** as an innovative teaching approach to provide learners with a deep experience of reality. Through virtual reality (VR) tools, we immerse learners in the learning experience in a way that allows them to influence the outcomes.

This approach enables learners to learn about the work they will be doing when they enter industry in a fail-safe, virtual environment before they even encounter it in the real world. This takes experiential learning to the next level. In this way, we can take the classroom to

a remote and unsafe environment such as an underground mine, or expose students to equipment and instruments in virtual reality before they work with them in the laboratory. This not only reduces the chance of accidents, but increases accessibility.

Exposing our students to emerging teaching technologies such as VR tools allow them to make the mindshift towards a future in which their unique talents and experiences will further the development and growth of sustainable communities.

## JOIN US FOR EBIT WEEK

**Do you want to experience first-hand what it is like to be a student in the Faculty of Engineering, Built Environment and Information Technology (EBIT) at the University of Pretoria? Attending EBIT Week gives you the perfect opportunity.**

EBIT Week is a four-day holiday programme presented twice a year to learners in Grade 9, 10 and 11. It provides prospective students with a hands-on opportunity to gain information about all the disciplines offered in the School of Engineering, the School for the Built Environment and the School of Information Technology.

Learners are introduced to both the practical and theoretical aspects of the programmes in these schools to help them make sound career choices. They also obtain industry exposure on-site or off-campus.



The School of Engineering presents the following programmes during the first and second EBIT Week:

- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Electronic Engineering
- Industrial Engineering
- Mechanical Engineering
- Metallurgical Engineering
- Mining Engineering



**Prospective students are invited to visit our website for more information on EBIT Week.**

The School for the Built Environment presents the following programmes during the first EBIT Week:

- Architecture
- Construction Management
- Real Estate
- Quantity Surveying
- Town and Regional Planning

The School of Information Technology presents the following programmes during the second EBIT Week:

- Computer Science
- Publishing
- Information and Knowledge Systems
- Information Science
- Information Systems
- Informatics
- Multimedia

## Student support and student life

**The Faculty of Engineering, Built Environment and Information Technology (EBIT) at the University of Pretoria emphasises the importance of solid student support systems to ensure that students can complete their qualifications in the minimum prescribed time. Through effective academic support, students have a firm foundation from which to launch their future careers. At the same time, they become aware of the importance of contributing their time and skills to communities that do not have the same advantages they do.**

### STUDENT LIFE

While the Faculty expects total commitment from its students with regard to individual and group work, it also encourages them to actively participate in student life. This supports the development of well-rounded future leaders.

The University hosts a wide range of student life activities through campus organisations like the Student Representative Council (SRC), Student Culture (STUKU), the Student Sport Committee (SSC) and RAG.

The Faculty's students automatically become part of EBIT House, a student structure that forms part of the SRC sub-structure. EBIT House represents students and acts as a communication channel between the Faculty and its students. EBIT House offers academic, professional and personal development opportunities.

Within EBIT House, students can find a variety of discipline-specific subhouses through which they can become involved in more specialised student activities.



### STUDENT SUPPORT

The Faculty has several support structures from which students can benefit. These include a foundation programme and a five-year Bachelor of Engineering programme in all Engineering disciplines that enable students to adjust to university life and cope with academic demands. Faculty student advisors are also on hand to provide ongoing academic support

#### The Foundation Programme

The University's Foundation Programme focuses on providing educational pathways into science, technology, engineering and mathematics (STEM) fields. Presented on the Mamelodi Campus, qualifying students complete their first year through this programme before entering a mainstream programme.

#### Bachelor of Engineering [5-year programme]

This is a carefully structured five-year curriculum that is offered in all engineering disciplines. The volume of work is gradually increased over a period of three years. The students work in parallel with the mainstream students, but in smaller groups. They join the mainstream programme from their second academic year of study.

#### Faculty student advisors

EBIT's faculty student advisors provide assistance with study and examination skills, time management, and support with other co-curricular issues. The qualified faculty student advisors

teach students life skills through holistic development interventions so that they can become well-rounded individuals, employers or employees, and responsible citizens. The advisors are all professional counsellors, who can identify issues that may require additional professional support.

**Read more:** <https://bit.ly/46QoSjQ>

### COMMUNITY ENGAGEMENT

The ability of EBIT's students to operate in a complex and multicultural environment is strengthened by the Faculty's focus on community engagement. The **Community-based Project module (JCP)** is an essential part of the curriculum of all the Faculty's undergraduate programmes. It accommodates the need for community service and service-learning projects in a higher education environment. Students are required to dedicate 40 hours of their time to the planning and execution of a community engagement project.

Through this module, students engage with a section of society that is different from their own social background. The goal is for students to develop an awareness of personal, social and cultural values, as well as multidisciplinary and life skills, like communication, interpersonal and leadership skills.

**Read more:** [www.up.ac.za/community-project-module](http://www.up.ac.za/community-project-module)

# School of Engineering

**The School of Engineering presents programmes in all the major engineering disciplines, with many specialisations offered at postgraduate level. It is ranked 284<sup>TH</sup> out of more than 10 000 engineering schools in the field of engineering and technology.**

The Engineering Council of South Africa (ECSA) has granted accreditation to all programmes offered by the School of Engineering at the University of Pretoria. The School is one of the largest of its kind in the country in terms of student numbers, graduates and research contributions.

Through the relevant, cutting-edge research undertaken in the engineering departments, we provide our students with the necessary training to enable them to make a considerable contribution to engineering in South Africa and abroad.

The School maintains close ties with industry through several research chairs in all its departments. It also pursues innovation in its research centres and institutes.

## MAKE AN IMPACT

EBIT focuses its research on impacting global challenges. As the only faculty at a South African higher education institution to house a unique combination of schools related to engineering, the built environment, information technology and technology management, EBIT is in the ideal position to pursue research that provides integrated solutions. The School of Engineering actively contributes to research in the following Sustainable Development Goals (SDGs) of the United Nations:

- **SDG 7:** Affordable and Clean Energy
- **SDG 9:** Industry, Innovation and Infrastructure
- **SDG 12:** Responsible Consumption and Production
- **SDG 13:** Climate Action



DISCOVER THE CAREER BENEFITS OF  
A POSTGRADUATE QUALIFICATION:  
FIND SPECIALISATIONS

## SCHOOL OF ENGINEERING DEPARTMENTS

- **Department of Chemical Engineering.....11**
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- **Department of Electrical, Electronic and Computer Engineering.....15**
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- **Department of Mining Engineering .....27**

# School of Engineering

## Department of Chemical Engineering



### Bachelor of Engineering in Chemical Engineering

#### What does the programme entail?



##### What is chemical engineering?

A chemical engineer, **also known as a process engineer**, finds ways to convert cheap raw materials into more valuable products. Theoretical knowledge of chemistry is required, but the field mostly focuses on the application of intense mathematics to make processes as efficient as possible.

The programme provides students with the necessary foundation to ensure that once they have graduated, they will be able to make creative contributions to the world's ever-increasing needs by:

- Converting natural resources into efficient and useable forms of energy
- Developing more durable, lighter and renewable materials
- Designing more efficient, environmentally friendly processing plants
- Applying biotechnology to convert raw materials into products in a sustainable way
- Designing processes to ensure that limited natural resources, such as water, can be reused
- Leaving a clean and sustainable environment behind for future generations

A solid foundation in chemistry, physics, mathematics and biology is combined with the principles of the conservation of mass, energy and momentum, followed by the application of the economic tenets when designing equipment so as to ensure lucrative processes that will contribute to economic and industrial growth. The programme is aimed at producing graduates who can develop new and innovative processes, ensuring continued growth to satisfy the abovementioned needs.

#### Who are the ideal candidates?



The ideal candidate should:

- Have a passion for mathematics
- Enjoy problem solving
- Enjoy challenges
- Be hard-working
- Be creative and an independent thinker
- Have drive and ambition
- Be a team player

This discipline is exceptionally suited to women and the number of females in our student complement is continuously growing. In the past three years 40% of the Department's graduates were female.

#### Career opportunities



Chemical engineers are involved in industrial processes that convert raw materials to products with a higher economic value. This is achieved by using physical, thermal, chemical, biochemical and mechanical changes and processes.

Chemical engineers apply their specialised knowledge in the petroleum, food, mineral processing, power generation and paper and pulp industries, water and effluent treatment, and environmental engineering activities, which include air pollution control.

Like those in other engineering disciplines, chemical engineers are involved in research and development, techno-economic evaluation, equipment and plant design, process control and optimisation, construction, commissioning, operation and management, and the marketing and distribution of the final products.



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Petroleum/  
petrochemical industry

Food and pharmaceutical  
industry

Sustainable/  
environmental  
engineering activities

#### Where are chemical engineers employed?

Mineral/material  
processing

Power  
generation

Paper and pulp  
industries

Water treatment  
and valorisation

# School of Engineering

## Bachelor of Engineering in Chemical Engineering *(continued)*



### Which companies employ our graduates?



#### Companies where Chemical Engineers are employed in South Africa include:

Sasol, Golder and Associates, Veolia Water, APT, Hoechst SA, Afrox, Bayer, Surochem, Shell Chemicals, BASF, Engen Petroleum, Silicate & Chemical Industries, ICI, Rohm and Haas, Omnia, Chemsolve, Fine Chemicals Corp (SA Druggists), Noriscl, Henkel, Revertex, CH Chemicals, Chempro, Carbon Trust, McKinsey and Co. and Kimberley Clark.

### Postgraduate studies



At the postgraduate level, the Department of Chemical Engineering focuses on the following research themes:

- Sustainable environment and water utilisation processes
- Sustainable and efficient energy processes
- Advanced and applied materials
- Process modelling, control and optimisation ([www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate))

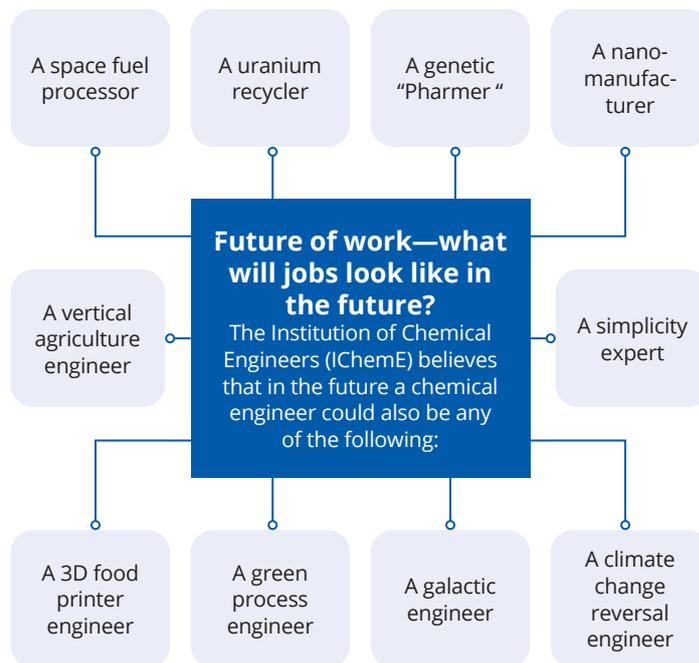
### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
SCHOOL OF ENGINEERING	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Engineering in Chemical Engineering [4 years]	5	6	6	35

The suggested second-choice programmes for Bachelor of Engineering in Chemical Engineering are Bachelor of Science *Chemistry*, Bachelor of Science *Mathematics* and Bachelor of Science *Physics* if your APS and subject requirements of your first-choice programme are not obtained.

**Contact information** Tel +27 (0)12 420 3011 | Email [chemeng@up.ac.za](mailto:chemeng@up.ac.za)

**Websites** [www.up.ac.za/chemical-engineering](http://www.up.ac.za/chemical-engineering) | [www.up.ac.za/school-of-engineering](http://www.up.ac.za/school-of-engineering) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)



# School of Engineering

## Department of Civil Engineering



### Bachelor of Engineering in Civil Engineering

#### What does the programme entail?



Civil engineers create facilities that improve the quality of people's lives and environments. This process entails research into the proposed facility, followed by the planning, design and construction of the facility and its continued maintenance. Civil engineers design, build and maintain constructions such as tower blocks and skyscrapers, dams, canals and pipelines, roads, bridges, tunnels, railway lines, airports, power stations, towers, waterworks and outfall installations.

Since these facilities have a long lifespan and a direct impact on the community and environment, civil engineers are trained to not only deal with the analytical aspects of design, but to also liaise and consult directly with communities and individuals to design, build and maintain such facilities cost-effectively and to the benefit of humankind.

The development of information technology and computer software that make continuous data collection, mathematical modelling and designs more effective has drastically changed the nature of civil engineering in that it enables civil engineers to concentrate on the more fundamental aspects of developmental work and design.

Information technology and environmental engineering and management increasingly form a greater part of the training, so that a civil engineer can still be provided with a broad-based qualification that offers challenging, fulfilling and highly adjustable career opportunities throughout a career lifespan of between 40 and 50 years.

In 2020, the Department inaugurated its new Engineering 4.0 facility, which includes state-of-the-art laboratories and training facilities to support the training and education of the engineers of the future.

#### What makes this programme unique?



Our programmes in the School of Engineering are accredited by the Engineering Council of South Africa (ECSA), and our degrees meet the requirements for professional engineers in South Africa.



LEARN  
MORE

#### Who are the ideal candidates?



The ideal candidate needs:

- A passion for continuous learning
- People-management skills
- Good planning skills
- Problem-solving skills

#### Future of work/careers in the future



In order to work towards smart cities, there is a need to develop researchers with advanced skills in robotics, artificial intelligence, the internet of things and satellite technology.

The civil engineer of the future will need to internalise the fundamentals of materials science, engineering mechanics and dynamics. This knowledge should be combined with an appreciation of the environment and its effects on materials, as well as a sound appreciation of the internet of things (IoT) and Big Data analysis. Another essential skill is the ability to integrate internalised knowledge with searchable information and data, combined with the development of models to describe the interaction between materials, traffic and the environment.

The expected effects of the 4IR on the life of the pavement engineer, for instance, may include changes in pavement structures due to the wandering patterns of autonomous vehicles, changes in materials due to developments in nanotechnology, changes in traffic loading due to vehicle technology developments, the availability of traditional materials such as bitumen, and the need to develop novel road pavement surfacing options.

For more information visit [www.up.ac.za/eng4](http://www.up.ac.za/eng4).

#### Which companies employ our graduates?



Any company involved in development, design, construction and management of infrastructure and related services.

For more information visit

[www.careerexplorer.com/careers/civil-engineer](http://www.careerexplorer.com/careers/civil-engineer).

Government departments, provincial administrations and municipalities

Self-employment as a consultant, with the necessary experience and initiative

Research institutions, state owned enterprises, and infrastructure developers

#### Where are civil engineers employed?

Engineering or architectural firms

Universities of technology and universities

Construction companies

# School of Engineering

## Bachelor of Engineering in Civil Engineering *(continued)*



UP Engineering 4.0's 'smart avos' hold the key to determining the impact of transportation conditions on agricultural products.

[READ THE FULL STORY](#)



### Home of the Smart Alternative Transport Platform

The research done at the **Engineering 4.0 Complex** is a testimony to EBIT's thought leadership and frontline position on the global stage for smart alternative transport platforms. One of our innovations is **SmWoef**, which can transport sensors into high-risk environments that are not safe for or accessible to humans, for the collection of useful data. This is an excellent example of how robots and humans can co-exist and work together to innovate our tomorrow. Researchers in the Faculty's Department of Civil Engineering are currently training SmWoef to assist with multiple research projects at Engineering 4.0.



[LEARN MORE ABOUT ENGINEERING 4.0](#)



### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
<b>SCHOOL OF ENGINEERING</b>	<b>English Home Language or English First Additional Language</b>	<b>Mathematics</b>	<b>Physical Sciences</b>	
<b>Bachelor of Engineering in Civil Engineering</b> [4 years]	5	6	6	35

The suggested second-choice programmes for Bachelor of Engineering in Civil Engineering are Bachelor of Science *Chemistry*, Bachelor of Science *Mathematics*, Bachelor of Science *Physics*, Bachelor of Science *Construction Management* and Bachelor of Science *Quantity Surveying* if your APS and subject requirements of your first-choice programme are not obtained.

**Contact information** Prof Hannes Grabe (Head of Department) | **Tel** +27 (0)12 420 2925 | **Email** hayley.boks@up.ac.za  
**Websites** [www.up.ac.za/civil-engineering](http://www.up.ac.za/civil-engineering) | [www.up.ac.za/school-of-engineering](http://www.up.ac.za/school-of-engineering) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)

# School of Engineering

## Department of Electrical, Electronic and Computer Engineering



### Bachelor of Engineering in Electrical Engineering

#### What does the programme entail?



Electrical engineering is one of the three internationally accepted and closely related subdisciplines in the traditional field of electrical engineering (electrical engineering, electronic engineering and computer engineering). This programme covers the vast and continuously expanding field of energy generation, distribution and utilisation. Practically all technological systems in the world rely on electrical power as a source of energy. An electrical engineer is someone with a talent for introducing alternative and renewable sources of electrical energy into everyday life.

Enormous challenges exist for utilising and storing electrical energy derived from such sources as the sun (solar energy), wind, biomass and water (hydro-energy), and even nuclear energy. In South Africa, pumped storage systems are extensively used, and new systems are being developed. The most cost-effective way of saving electrical energy is to spend a great deal of research and development time and money on sustainable energy-efficient equipment, from electrical machines to geysers and lighting.

There is a shortage of qualified electrical engineers all over the world. An electrical engineer has a thorough understanding of the basic sciences and a good education in the theoretical and practical aspects (including design, installation and maintenance methodology) of electrical engineering.

#### Who are the ideal candidates?



An electrical engineer needs to be innovative and has to keep abreast of new developments in the field of technology. Many electrical engineers move into management positions very quickly and use analytical, synthesis, managerial and leadership skills to reach the highest levels of corporate management.

#### What skills do I need?

- Critical thinking
- Complex problem-solving
- Innovative thinking
- Technological knowledge
- Analytical skills

#### What makes this programme unique?



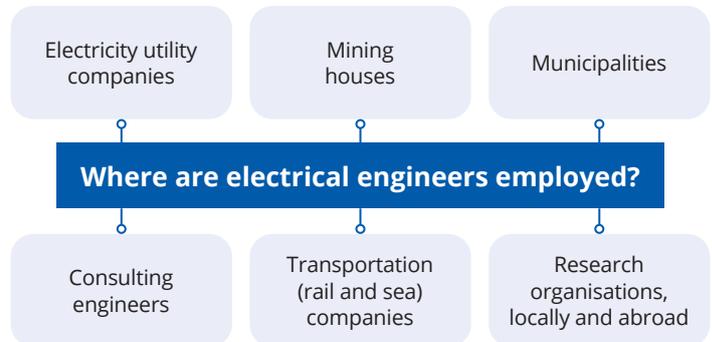
Our programmes are internationally accredited by the Engineering Council of South Africa (ECSA).

#### Which companies employ our graduates?



Electrical engineering graduates have access to a wide range of job opportunities. The advances in electrical energy generation and distribution create tremendous opportunities for entrepreneurs in South Africa and in the rest of the world.

Research and development opportunities are available locally at institutions such as Denel, Eskom, the Council for Scientific and Industrial Research (CSIR) and Transnet.



**Due to the current worldwide energy crisis, there is an urgent need for environmentally friendly ways to generate power and energy. There is a bright future in renewable energy.**



LEARN MORE

## School of Engineering

### Bachelor of Engineering in Electrical Engineering *(continued)*

#### Career opportunities



Electrical engineering is prevalent in almost all application fields and technologies where electrical energy is consumed. Every known piece of equipment requires a source of energy—powered by mains, batteries or photovoltaic (PV) cells—and needs the skill of an electrical engineer.

The transport and manufacturing industries are excellent examples of industries in which electrical engineers use their superior skills to design, develop and maintain electrical machines (motors and generators) with control systems for optimal performance. Most ships and trains are electrically powered.

Other applications of electrical engineering include power reticulation in cities, townships, shopping malls and factories. The lighting of indoor and outdoor areas forms the basis of our daily activities. It includes lighting at:

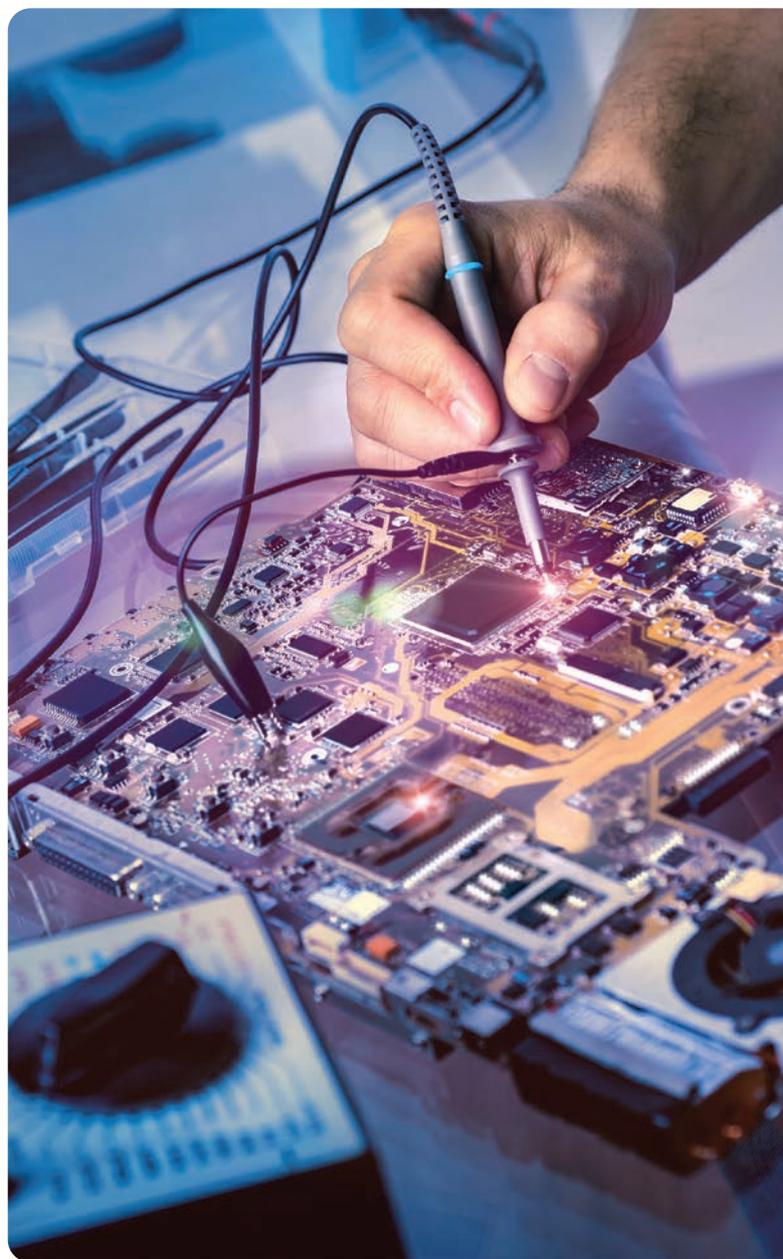
- Sports stadiums
- Street lighting
- Safety and security lighting
- Task and ambient lighting
- Lighting for offices, entertainment and many other specialist applications

Regardless of whether it is medicine, the military, entertainment, sports, education or any other field of technology, electrical engineers will be there to provide the energy and control required.

Electrical engineering aims to change the world by discovering ways to generate, transmit, distribute and utilise electrical energy in an environmentally friendly and sustainable way.

Typical subsystems that may form part of larger electrical systems are:

- Electrical machines of all sizes and shapes
- Power electronics
- Control systems
- Power system components
- Power quality and network stability
- Lamps and lighting
- Power supplies
- Photovoltaic (PV) cells
- Solar geysers
- Space systems
- Robotics and energy management systems



#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
SCHOOL OF ENGINEERING	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Engineering in Electrical Engineering</b> [4 years]	5	6	6	35

The suggested second-choice programmes for Bachelor of Engineering in Electrical Engineering are Bachelor of Science *Chemistry*, Bachelor of Science *Mathematics* and Bachelor of Science *Physics* if your APS and subject requirements of your first-choice programme are not obtained.

**Contact information** Prof Herman Myburgh (Function Head: Marketing) | **Tel** +27 (0)12 420 4540 | **Email** eerc@up.ac.za  
**Websites** www.ee.up.ac.za | www.up.ac.za/school-of-engineering | www.up.ac.za/ebit-postgraduate

## School of Engineering

### Department of Electrical, Electronic and Computer Engineering



## Bachelor of Engineering in Electronic Engineering

### What does the programme entail?



Electronic engineering is one of the three internationally accepted and closely related subdisciplines in the traditional field of electrical engineering (electrical engineering, electronic engineering and computer engineering).

Electronic engineering entails the vast and continuously expanding field of the 'electronic world and era.' There is hardly a technological system in the world that does not rely on electronics and electronic engineering. An electronic engineer is someone with a talent for introducing new and upgrading old technologies.

An electronic engineer has a good understanding of the basic sciences and a sound education in the theoretical and practical aspects (including design methodology) of electronics and electronic engineering systems. The drastic increase in the development of new electronic systems globally makes it essential for electronic engineers to be well prepared for the workforce.

Our electronic engineering degree programme was developed over many years to provide exactly what the industry requires. This is an exciting world, and since the 'half-life' of microelectronics and

photonics is only approximately two-and-a-half years, there are constant improvements and developments.

Electronic engineering aims to do things faster, cheaper, in smaller sizes and with much more control. Typical subsystems that form part of larger electronic systems are:

- Amplifiers
- Transmitters and receivers
- Control and sensor systems
- Antennas
- Power supplies
- Radio frequency (RF) subsystems
- Micro and nanoelectronics and microprocessors
- Digital signal processors (DSPs)

### What makes this programme unique?



The academic programme at the University of Pretoria prepares students to become leaders in the field of electronic engineering—with excellent financial rewards and professional satisfaction. This programme is internationally accredited.



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# School of Engineering

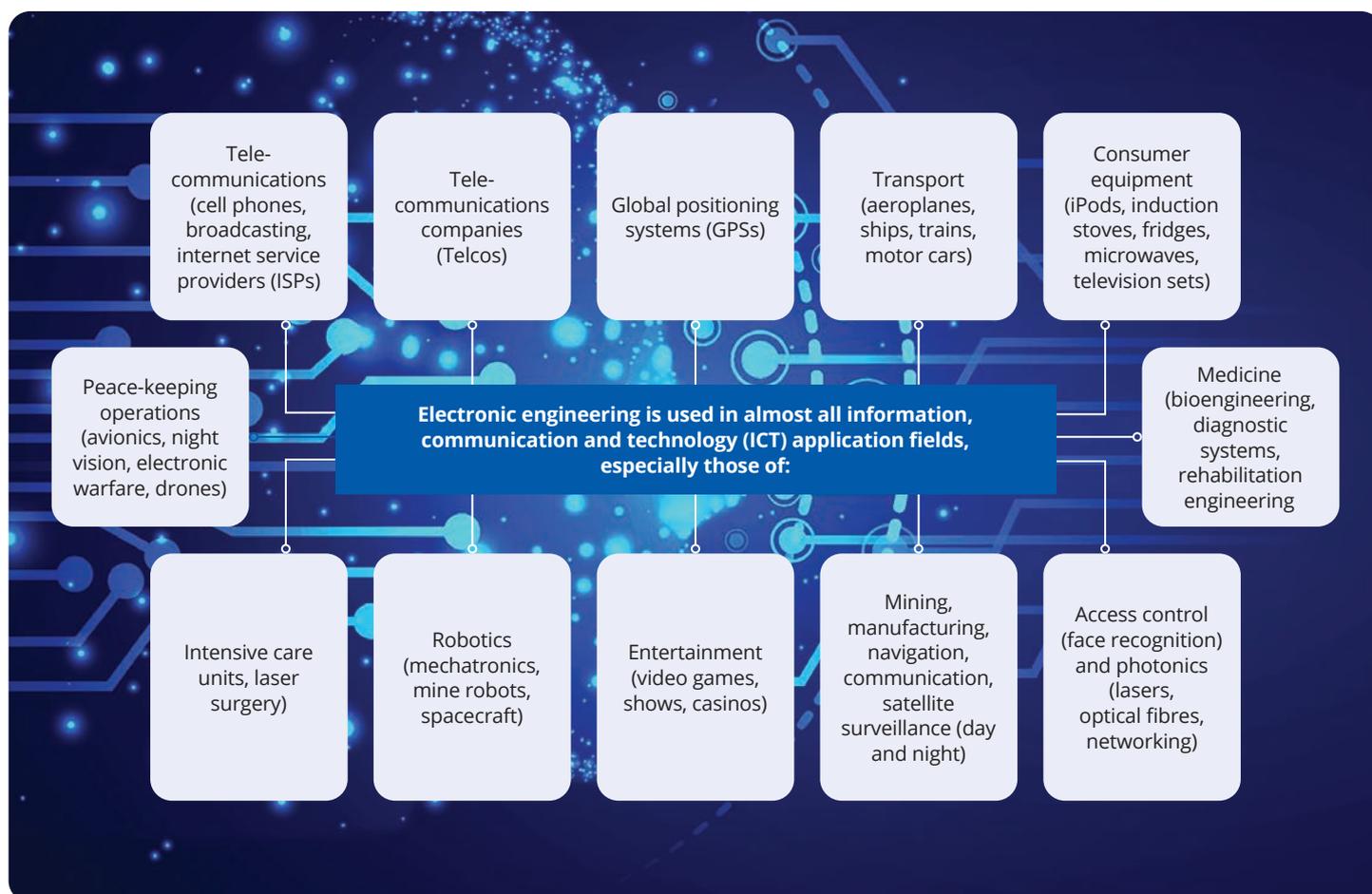
## Bachelor of Engineering in Electronic Engineering *(continued)*

### Career opportunities



Electronic engineering graduates have access to a wide range of job opportunities, which include working for companies (large or small) anywhere in the world as employees, or being entrepreneurs or self-employed. Research and development opportunities are available at South African electronics and microelectronics companies and research institutes (such as the CSIR), and at universities all over the world. Graduates in electronic engineering have the opportunity to be innovative, ie to identify real-life problems and to come up with solutions, which they might be able to patent.

Electronic engineers are active in various fields, such as telecommunications (fixed networks, wireless, satellite, television, radar and radio frequency networks), entertainment and medicine (magnetic resonance imaging, X-rays, cardiopulmonary resuscitation, infrared tomography, electroencephalograms (EEGs), electrocardiograms (ECGs), rehabilitation engineering and biokinetics), integrated circuit design, bioengineering, military equipment design (vehicle electronics, smart bombs, night vision, laser systems), transport (e-tags, speed measuring, railway signalling, global positioning system (GPS) and mapping), 'smart' dust, safety and security systems (face and speech recognition), banking (ATMs), commerce, robotics, education, environmental management, tourism and many more.

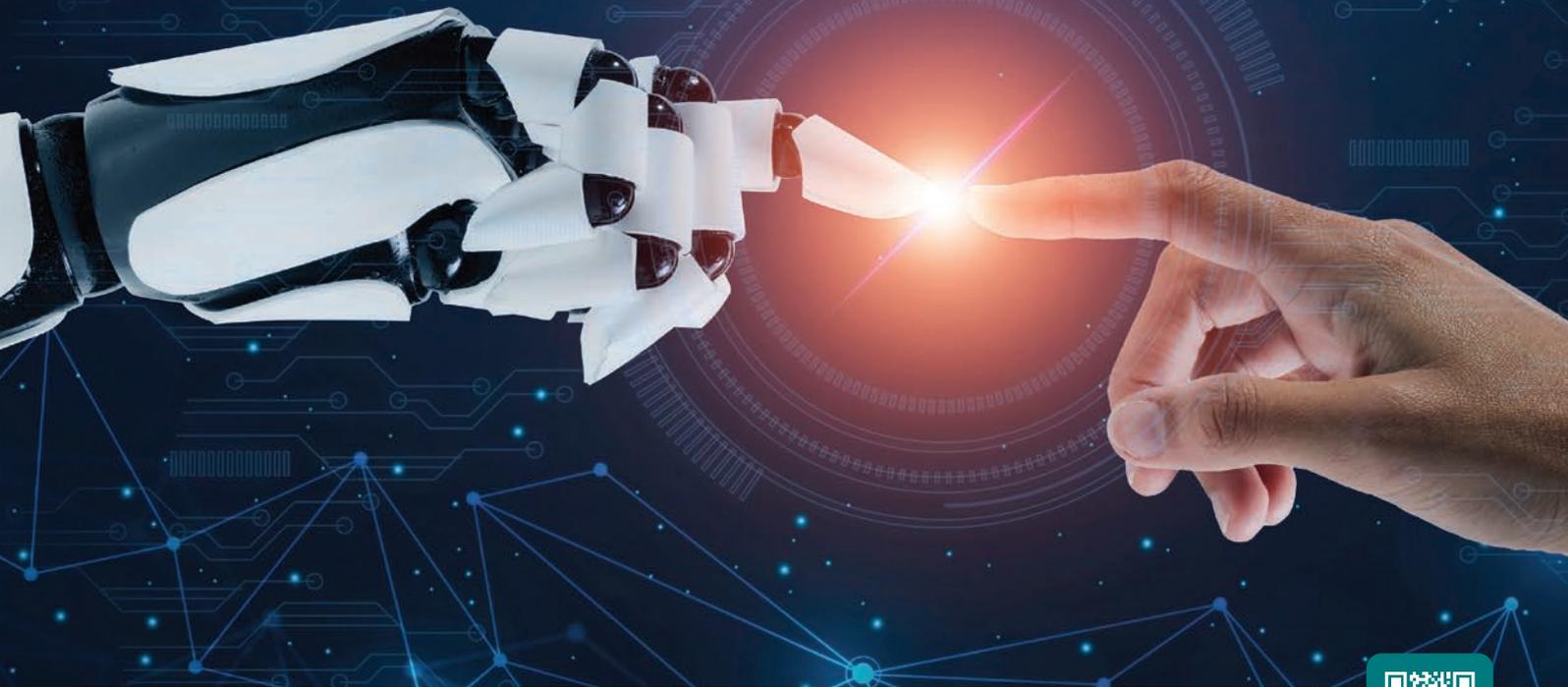


### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
SCHOOL OF ENGINEERING	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Engineering in Electronic Engineering</b> [4 years]	5	6	6	35

The suggested second-choice programmes for Bachelor of Engineering in Electronic Engineering are Bachelor of Science *Chemistry*, Bachelor of Science *Mathematics* and Bachelor of Science *Physics* if your APS and subject requirements of your first-choice programme are not obtained.

# School of Engineering



## Department of Electrical, Electronic and Computer Engineering



### Bachelor of Engineering in Computer Engineering

#### What does the programme entail?



Computer engineering is one of the three internationally accepted and closely related subdisciplines of the traditional field of electrical engineering (electrical engineering, electronic engineering and computer engineering). Computer engineering is the most dynamic and rapidly growing engineering discipline in the vast and constantly expanding field of information and communication technology (ICT), and almost every technological system in the world relies on it. It involves a combination of electronics, computer systems (hardware and software) and communication systems. A computer engineer is someone with a talent for optimising electronic systems by introducing dedicated computing systems and control software. This includes computer and communication networks of all sizes—from a couple of microcontrollers to the worldwide web. It is essential to know what this career entails before enrolling for the programme.

A computer engineer has a thorough understanding of the basic sciences and a sound education in the theoretical and practical aspects (including design methodology) of electronics, digital systems, computer systems and control software. Due to the dramatic increase in computing and storage capabilities, as well as a decrease in size and cost, most technological systems include components of computer engineering.

The computer engineering degree offered by the University of Pretoria was developed in 1998 to deliver graduates who are able to deal with the most demanding challenges of the ICT world in all its forms. Examples of computer engineering include cell phone technology, car-control computers for engine management, entertainment systems, security systems, air-conditioning systems, active suspension and anti-lock braking systems (ABSs), which all use the principles of sensing, computing and actuation under optimised software control. This is the fastest-growing new discipline in engineering, and job opportunities for graduates exist all over the world.

#### Career opportunities



Computer engineering is used in the following fields in particular:

- Telecommunications
- Computer networking
- Cell phone operations
- Computer system companies, military technologies (avionics, night vision, electronic warfare, drones)
- Transport technologies
- Internet banking
- Security systems
- Consumer equipment
- Modems, hand-held scanners
- Voting
- Medical systems (portable and remote diagnostic recorders)
- Robotics
- Entertainment equipment
- Global positioning system (GPS)
- Navigation
- Measurement and control software
- Fibre-optic (self-healing) networks

Computer engineering graduates have access to a wide range of job opportunities, which include working for a company (large or small) anywhere in the world as an employee, being an entrepreneur or being self-employed.

Research and development opportunities are available in the fields of communication, computer systems, networking and peace-keeping operations, and in medical, transportation, software and electronics companies in South Africa and all over the world. This provides opportunities for innovation: thinking of a problem to be solved and coming up with a solution and even possibly patenting the idea. The academic programme at the University of Pretoria prepares students to become leaders in the field of computer engineering—with excellent financial rewards and professional satisfaction.

## School of Engineering

### Bachelor of Engineering in Computer Engineering *(continued)*

#### Who are the ideal candidates?



The ideal candidate needs the following skills:

- A sound understanding of basic sciences
- A talent for optimising electronic systems and control software
- A problem-solving mind.

Research and development

Computer systems industry

Software and electronics industry

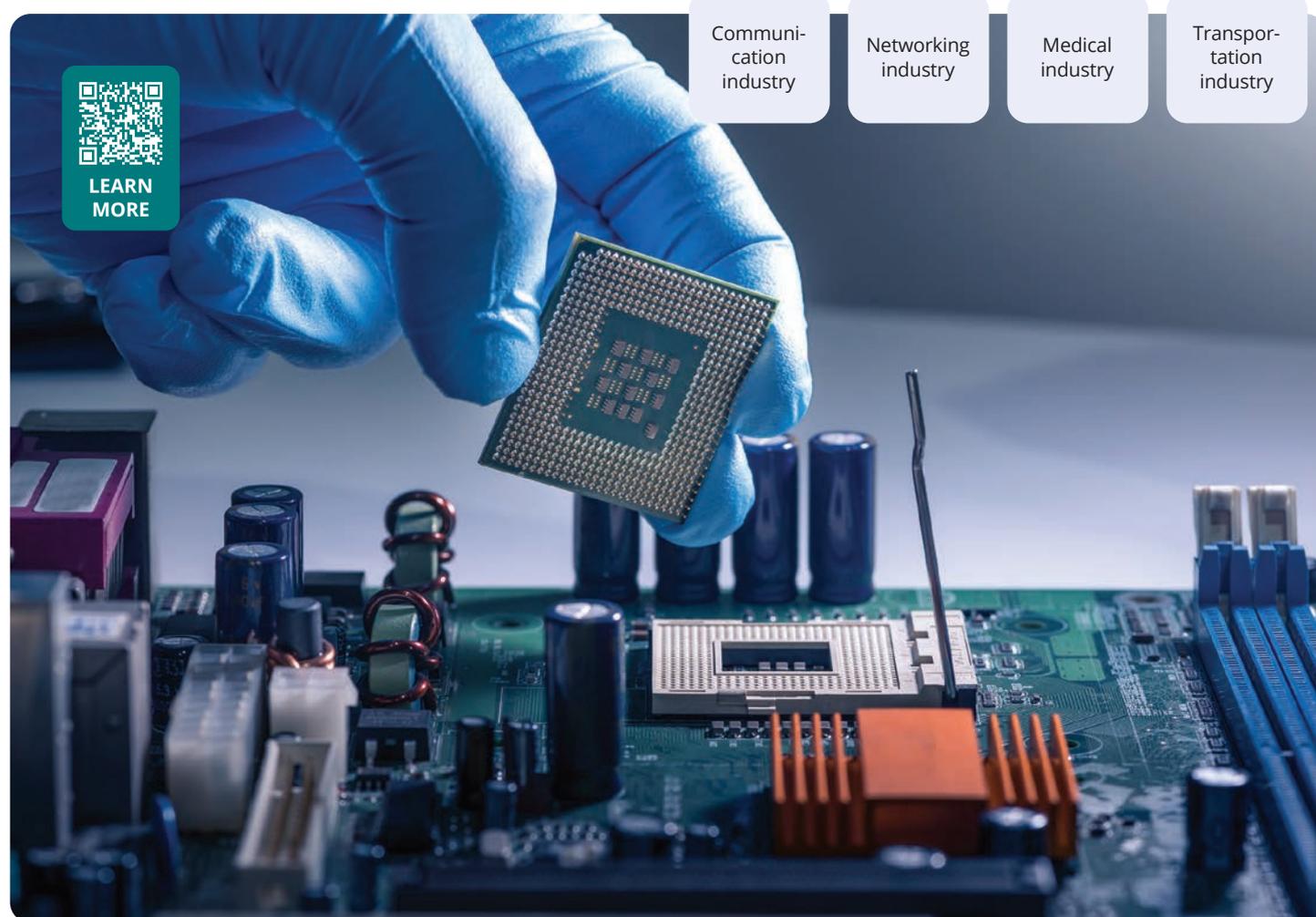
#### Where are computer engineers employed?

Communication industry

Networking industry

Medical industry

Transportation industry



#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
<b>SCHOOL OF ENGINEERING</b>	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Engineering in Computer Engineering</b> [4 years]	5	6	6	35

The suggested second-choice programmes for Bachelor of Engineering in Computer Engineering are Bachelor of Science *Chemistry*, Bachelor of Science *Mathematics* and Bachelor of Science *Physics* if your APS and subject requirements of your first-choice programme are not obtained.

**Contact information** Prof Herman Myburgh (Function Head: Marketing) | **Tel** +27 (0)12 420 4540 | **Email** eerc@up.ac.za  
**Websites** www.ee.up.ac.za | www.up.ac.za/school-of-engineering | www.up.ac.za/ebit-postgraduate

# School of Engineering

## Department of Industrial and Systems Engineering



### Bachelor of Engineering in Industrial Engineering

#### What makes this programme unique?



Industrial engineers are generally responsible for analysing, designing, testing, planning, implementing, operating, managing and maintaining integrated systems. These systems consist of people, capital, materials, equipment, information and energy, and are aimed at increasing productivity. Industrial engineers integrate the contributions of all the other engineering disciplines into a final, functional and marketable product or service.

#### Elements that require optimisation include the following:

- Site selection and the layout of facilities
- Manufacturing
- Inventory control
- Materials handling
- Supply chain management
- Quality management
- Cost control
- Financial services
- Maintenance
- Reliability
- Computer simulation
- Information systems
- Human resources
- Business law

#### Typical activities of an industrial engineer are:

- Designing, implementing and managing production processes and equipment
- Designing and improving plant layout
- Designing and improving business processes
- Functional design and implementation of information systems
- Developing and implementing performance criteria and standards
- Providing support with decision making
- Scheduling activities
- Analysing systems with the aid of mathematical and simulation models
- Undertaking economic evaluations of alternatives
- Integrating new systems in an existing environment

#### Who are the ideal candidates?



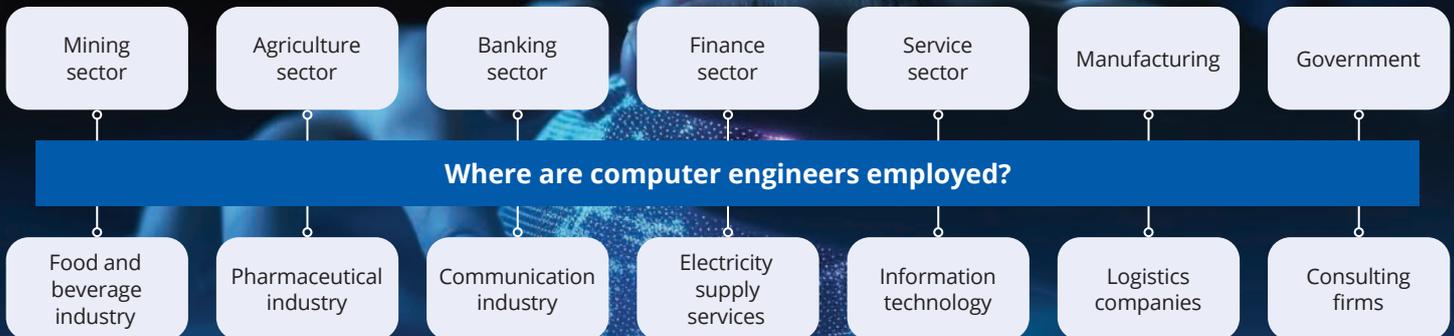
The ideal candidate needs:

- Problem-solving skills
- Critical thinking skills
- Project management skills
- Communication and organisation skills

#### Are these the types of questions you want to get the answers to?



- How do we get products to the customer **faster** and **cheaper**?
- How do we get passengers to their destination **safely** and **on time**?
- What data do we need for **effective** decision making, and how can we source it?
- How do we turn this data into actionable information that helps us make **tough decisions**?
- How should we manage inventory levels of products in a warehouse or store to **minimise cost**?
- What is the **best** factory layout and handling system for the movement of parts in a factory?
- How can we best route vehicles through a city to **minimise** travel time?



LEARN ABOUT OUR FINAL-YEAR PROJECTS



LEARN ABOUT OUR VACATION WORK

# School of Engineering

## Bachelor of Engineering in Industrial Engineering *(continued)*

### It's all about efficiency

Balancing man,  
money and machine

#### What makes this programme unique?



The programmes in the School of Engineering are accredited by the Engineering Council of South Africa (ECSA), and our degrees meet the requirements for professional engineers in South Africa.

#### Examples of the academic modules you will encounter in your studies:

- General Engineering (e.g. Manufacturing and Design, Statistics, Mechanics)
- Industrial Engineering (e.g. Simulation Modelling, Logistics, Information Systems Design, Facilities Planning)
- Mathematics (e.g. Calculus, Linear Algebra, Numerical Methods)
- Sciences (e.g. Physics, Chemistry, Social Sciences)
- Programming
- Financial Management and Management Accounting
- Labour Relations and Business Law
- Workshop Practice and Practical Training

#### Why choose the University of Pretoria



- The Department of Industrial and Systems Engineering is the first and still the **largest** industrial engineering school in South Africa.
- The School of Engineering has been ranked **#1 in Africa** by the US News and World Report.
- The University was ranked in the top **285 universities worldwide** for engineering and technology in the QS World University Rankings.

#### Interesting facts



Our academic staff are specialists in their respective fields. Alumni of the Department of Industrial and Systems Engineering have made major contributions in several spheres of society. They also occupy important positions in organisations throughout South Africa and across the globe. The demand for industrial engineers currently exceeds the supply, and young graduates are virtually assured of employment.

#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
SCHOOL OF ENGINEERING	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Engineering in Industrial Engineering [4 years]	5	6	6	35

The suggested second-choice programmes for Bachelor of Engineering in Industrial Engineering are Bachelor of Science *Chemistry*, Bachelor of Science *Mathematics* and Bachelor of Science *Physics* if your APS and subject requirements of your first-choice programme are not obtained.

**Contact information** Prof Sarma Yadavalli (Head of Department) | **Tel** +27 (0)12 420 2979 | **Email** sarma.yadavalli@up.ac.za  
**Websites** [www.up.ac.za/industrial-and-systems-engineering](http://www.up.ac.za/industrial-and-systems-engineering) | [www.up.ac.za/school-of-engineering](http://www.up.ac.za/school-of-engineering) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)

## School of Engineering

### Department of Materials Science and Metallurgical Engineering



## Bachelor of Engineering in Metallurgical Engineering

### What does the programme entail?



South Africa is not only blessed with the world's largest deposits of gold, chromium, platinum, vanadium and manganese but also has extensive reserves of iron, lead, zinc, copper, nickel, coal and diamonds. The minerals industry contributes 50% of South Africa's exports and is one of the largest employers in the country. Metallurgical engineers play a key role in the production of minerals and metals and help to process metals into final products with added value. In this way, the maximum income is generated in local and international markets. Components made from metals and other materials are designed to perform optimally in all aspects of modern life.

### Career opportunities



Metallurgical engineers unlock the riches of deposits of metal ores and minerals and optimise the manufacture and performance of metallic components. You'll find metallurgical engineers where valuable minerals are recovered from ore, where metals are produced from the minerals and where the metals are converted into useful materials as well as into high-performance products. Areas of specialisation include minerals processing, extractive metallurgy, materials engineering and performance, advanced manufacturing processes, including laser-assisted additive manufacturing and welding, as well as failure analysis and forensic engineering.

Careers include production engineers, plant managers, consultants, forensic engineers and researchers.

### What makes this programme unique?



As the leading metallurgical engineering department in South Africa, the Department of Materials Science and Metallurgical Engineering currently plays a prominent role in the education of metallurgical engineers for the South African metallurgical and mining industries, and its graduate students are in high demand. Many graduate engineers from other disciplines take postgraduate programmes in the Department to enhance their skills in the rich minerals industry in South Africa and abroad.

Unconditional accreditation by the Engineering Council of South Africa (ECSA) is a confirmation of the quality of undergraduate teaching in the Department, and the degree currently enjoys international recognition. Staff members consult with and conduct research for industry and maintain close contact with local metallurgical industries to ensure that teaching and research are in line with industry needs. Sophisticated research equipment is available in the Department, as well as in the Industrial Metals and Minerals Institute (IMMRI), which is situated in the Department. Bursaries for metallurgical engineering students are available from various industry partners (see the website for additional information: [www.up.ac.za/metal](http://www.up.ac.za/metal)).

Students are supported in several ways by the Department. To help them to overcome problems, a member of staff is appointed as a mentor for each student year group. For first-year students, in particular, there is an intensive mentorship programme. The normal programme runs over four years, but we also offer a five-year Bachelor of Engineering programme in all Engineering disciplines [previously called ENGAGE] for students who require additional support and mentoring.

The Metallurgical Student Association is elected by the student body and organises social and sports functions.



**Minerals processing**  
Processing the ore to release and concentrate the valuable minerals contained in it.



**Extractive metallurgy**  
The processing of mineral concentrates to metals through pyrometallurgy (including smelting) or hydrometallurgy (including leaching) as refining steps.

### The three main fields of specialisation in metallurgical engineering



#### Materials production, performance and integrity

This field entails the development of new alloys, the production of useful materials and products from raw metals, including forming through casting, 3D printing using lasers and joining through welding. The forensic investigation of failures is also of great importance.



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## School of Engineering

### Bachelor of Engineering in Metallurgical Engineering *(continued)*



### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
SCHOOL OF ENGINEERING	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Engineering in Metallurgical Engineering</b> [4 years]	5	6	6	35

The suggested second-choice programmes for Bachelor of Engineering in Metallurgical Engineering are Bachelor of Science *Chemistry*, Bachelor of Science *Mathematics* and Bachelor of Science *Physics* if your APS and subject requirements of your first-choice programme are not obtained.

**Contact information** Prof Roelf J Mostert (Head of Department) | **Tel** +27 (0)12 420 3182/4551 | **Email** gabi.ngema@up.ac.za  
**Websites** [www.up.ac.za/materials-science-and-metallurgical-engineering](http://www.up.ac.za/materials-science-and-metallurgical-engineering) | [www.up.ac.za/school-of-engineering](http://www.up.ac.za/school-of-engineering) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)

# School of Engineering

## Department of Mechanical and Aeronautical Engineering



### Bachelor of Engineering in Mechanical Engineering

#### What does the programme entail?



The undergraduate programme focuses on the establishment of a broad knowledge of engineering, and includes topics such as dynamics, strength of materials, thermodynamics, fluid mechanics and design. Mechanical and aeronautical expertise is required for designing and manufacturing products and services, such as the provision of electricity and water, transport (road, rail and air), mining activities, mechatronics and air conditioning.

Heat exchangers, refrigerators, ventilation systems

Manufacturing technologies that include the use of lasers, precision machinery

**What is mechanical engineering?**  
Mechanical engineering is concerned with the **design, manufacture and operation** of components, devices or systems such as:

Automobiles, aeroplanes and other vehicles

Robotics, mechatronics and electronic control of machinery

Digitisation of physical assets through sensing, computing and data science

#### Why choose the University of Pretoria



The programmes of our School of Engineering are all accredited by the Engineering Council of South Africa (ECSA), and the School has been ranked **#1 in Africa** by the US News and World Report. Our mechanical engineering programme has been ranked **#1 in South Africa** in the Shanghai Rankings.

The Department of Mechanical and Aeronautical Engineering offers a unique learning environment for engineering students with opportunities for practical application of theoretical knowledge in activities like the Tuks Baja team and the AREND project. We also host the only off-road vehicle dynamics group in the country.

#### International collaboration

The University of Pretoria is always looking for opportunities to collaborate with other innovative institutions around the world. One such an initiative is our third-year exchange programme with Massachusetts Institute of Technology (MIT) in the USA (2023–2028). The exchange programme makes it possible for students from the Department to study at MIT for a year, and for MIT students to study at the University of Pretoria for a year.

#### Who are the ideal candidates?



The ideal candidate should be resilient to work pressure, and flourish when confronted with new problems that need to be solved effectively and efficiently. The following skills are required to achieve this:

- Creativity
- Critical thinking
- Fundamental understanding
- Mathematical rigour
- Teamwork
- Adaptivity

Oral, verbal and graphical communication abilities are essential for a technically diverse team of individuals.

#### Career opportunities



Mechanical engineers are employed in almost all sectors of the economy, for example in the chemical industry, mining, manufacturing, processing, vehicle/aircraft manufacturing and design, defence and in the aeronautics industry. Possible careers are:

- Aerospace engineer
- Automotive engineer
- Maintenance engineer
- Design engineer
- Mathematical and computational modeling engineer
- Data science engineer

Our graduates find work in private industry, semi-government services and corporations, consulting engineering firms and tertiary education institutions as researchers. Non-traditional employment such as banking, finance and health insurance is also an option. In addition, many of our graduates with an entrepreneurial mindset go on to start their own businesses. The University of Pretoria supports research-based start-ups through various initiatives, including its business incubator, TuksNovation.

#### TuksNovation



TuksNovation acts as a catalyst for the development of business technology clusters to positively impact on the South African economy. Innovations arising from research can lead to new product development.

TuksNovation provides technology development and entrepreneurship support, from the prototype to the commercialisation growth stages, to ensure that the technology is fully developed, and addresses a relevant market need. A virtual incubation programme focuses on technology and techno-entrepreneurship skills, while an acceleration programme focuses on commercialisation and business growth.

## School of Engineering

### Bachelor of Engineering in Mechanical Engineering *(continued)*

#### Department in a nutshell



We are the largest producer of mechanical engineering graduates in the country.

**200+** graduates annually since 2017

**18%** female final-year research project students

Alumni of the Department have made valuable contributions in several spheres of society and occupy important positions in organisations throughout South Africa. Others are employed overseas.



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#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
SCHOOL OF ENGINEERING	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Engineering in Mechanical Engineering [4 years]	5	6	6	35

The suggested second-choice programmes for Bachelor of Engineering in Mechanical Engineering are Bachelor of Science *Chemistry*, Bachelor of Science *Mathematics* and Bachelor of Science *Physics* if your APS and subject requirements of your first-choice programme are not obtained.

**Contact information** Prof Schalk Kok | **Tel** +27 (0)12 420 3104 | **Email** mecheng@up.ac.za

**Websites** [www.up.ac.za/mechanical-and-aeronautical-engineering](http://www.up.ac.za/mechanical-and-aeronautical-engineering) | [www.up.ac.za/school-of-engineering](http://www.up.ac.za/school-of-engineering) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)

# School of Engineering



## Department of Mining Engineering



## Bachelor of Engineering in Mining Engineering

### What does the programme entail?



As a profession, mining engineering encompasses a broad spectrum of engineering work—from mine evaluation to industrial control. For instance, mining engineers may assess a new mining project as soon as the geological confirmation of a newly discovered mineral deposit has been completed. If such a mineral deposit is found to be viable, mining engineers will design the mine to exploit the mineral deposit. Where the mineral deposit is close to the surface, an opencast mine is preferred, but for deeper deposits, an underground mine will be planned. Mining engineers will coordinate the construction of such a mine and bring it to the stage where it starts producing.

A typical mine has a lifespan of 15 to perhaps 100 years. The design of the mining excavations, with their equipment and services, the planning of all the activities and the management of the operation at all levels is the responsibility of the mining engineer. This professional will also provide expert advice on rock breaking, blasting, materials transport systems, mine planning and scheduling, mechanical tunnel development, mine climate control, rock mechanics, support of excavations, devising mining methods, as well as the design and development of equipment.

### What makes this programme unique?



#### The Mining Engineering Leadership Academy

Our students have a sound academic foundation. To that, we add skills such as self-awareness, communication skills and the ability to work in multi-disciplinary settings and groups.

The philosophy of the Leadership Academy programme is to expose final-year students to experiential situations, which teaches them intrapersonal and interpersonal skills. Psychometric assessments and real-life case studies hone well-rounded leadership habits.

#### The University of Pretoria provides excellent facilities to our Mining Engineering students and these include access to the:

- Kumba Mine Design Laboratory
- Kumba Virtual Reality 3D360 cylinder
- Kumba Virtual Reality 3D theatre
- ARM Laboratory
- Virtual Blasting Wall
- The Metallurgical, civil and mechanical engineering laboratories on the Hatfield Campus

### Who are the ideal candidates?



The aptitudes and skills of successful engineers include the following:

- Be able to visualise objects in three dimensions
- Have good health and stamina
- Have mathematical and scientific ability
- Be curious
- Be disciplined
- Be passionate about mining
- Have creativity and initiative
- Be responsible
- Have self-confidence
- Have organisational skills
- Command respect
- Maintain a cool head and take charge of a situation
- Have listening, speech and writing skills

### Career opportunities



The mining industry is one of the largest industries in South Africa, producing more than **60 different minerals in over 1 000 mines and quarries**. Mining amounts to one eighth of the gross national product.

Mining engineers are employed at a wide range of companies, both locally and internationally. They are responsible for the effective, safe and profitable operation of mining undertakings.

Mining engineering careers include that of rock engineer; mine ventilation engineer; explosives engineer; rock breaking engineer; drill and blast engineer; project engineer; mine planner and environmental engineer to mention but a few.

- Mining engineers are mining experts and they are engineers, who have a background in geology as well as in civil, mechanical and electrical engineering.
- Mining engineers research mining-related topics in order to improve safety and find better ways to extract minerals.
- Mining engineers also work in the banking sector and at the Stock Exchange, where they specialise in risk analysis and investment.
- Mining engineers are also needed for sales and marketing as well as business development of mining companies or supporting industries.

There is a shift in mining as it progresses towards mechanisation and automation through robotics. Mechanisation requires in-depth engineering skills to support and operate mobile mechanised equipment.

# School of Engineering

## Bachelor of Engineering in Mining Engineering *(continued)*

**The rewarding profession of being a mining engineer**

Mining Engineering is the study and application of technological methods to effectively and safely operate a mining operation.

Mining engineers conduct mine evaluations as soon as geological confirmation of a mineral deposit, are confirmed.

Mining engineers will design the mine itself. If the mineral deposit is close to the surface, an opencast mine will be preferred, but for deeper deposits, an underground mine will be required.

Mining engineers coordinate the construction of such a mine, from the planning phase to full production phase.

Mining engineers design mining excavations; manage operations at all levels; provide expert advice on rock breaking, blasting materials, transport systems and scheduling; mechanical tunnel development, mine ventilation, rock mechanics, support of excavations, mining methods, as well as the design and development of equipment.

Mining engineers do mine planning and design. They also oversee mining projects. As consultants, they provide crucial information to decision-makers.

### Educating and leading mining engineers to become imagineers

### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
SCHOOL OF ENGINEERING	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Engineering in Mining Engineering</b> [4 years]	5	6	6	35

The suggested second-choice programmes for Bachelor of Engineering in Mining Engineering are Bachelor of Science *Chemistry*, Bachelor of Science *Mathematics* and Bachelor of Science *Physics*.

# School of Engineering

## Bachelor of Engineering

5-year programme for all Engineering disciplines [previously called ENGAGE]

### What does the programme entail?



An engineering degree is very demanding. The workload is high, the pace is fast and the modules are academically challenging. Many students also face challenges regarding background knowledge in mathematics and physical sciences, academic literacy and information technology. They may not have the study skills to cope with the mainstream four-year programme.

Furthermore, many students – even some of those who attended high-performing schools – struggle with the transition to university life due to the very large first-year classes, freedom from strict discipline and many social activities.

For this reason, the School of Engineering offers a five-year programme [previously called ENGAGE] which is available in all the engineering disciplines. It provides a carefully structured curriculum that helps students adjust to university life and cope with the academic demands of engineering studies.

In the 5-year programme, the volume of work is gradually increased while the support provided is decreased over a period of three years. However, the workload – the time students must spend on their studies – is high from the very beginning. Therefore this programme is not for students who do not want to work!

### What makes this programme unique?



Parallel support is offered through additional modules in the first and second years of the 5-year Bachelor of Engineering programme.

### Who are the ideal candidates?



Students may apply for the Bachelor of Engineering [5-year programme] if:

- their marks in the National Senior Certificate meet the minimum admission requirements for the 5-year programme; or
- their marks in the National Senior Certificate meet the minimum admission requirements for the four-year programme, but they would like more support.

### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
SCHOOL OF ENGINEERING	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Engineering</b> [5 years] This is a 5-year programme for all Engineering disciplines. <i>Previously called ENGAGE</i>	5	65%	65%	33

For advice on a second-choice programme, please consult a Student Advisor. To make an appointment, send an email to carol.bosch@up.ac.za.

**Note:** The admission requirements above are relevant to prospective students who will commence their studies in 2025. Admission to the 5-year programme in the School of Engineering will be determined by the NSC results.

### Structure of the programme



In the 5-year Bachelor of Engineering programme, students take the same first-year modules and attend the same classes as the four-year degree programme students, but the modules are spread out over two years.

In addition, for every 16-credit 100-level (first-year) module, students also take an 8-credit augmented additional module. For example, in the first year, students take the same mathematics modules (16 credits) as the four-year degree programme students, as well as some additional mathematics modules (8 credits).

In the additional modules, students are divided into groups of approximately 50 members to work on strengthening their problem-solving and other cognitive skills, developing conceptual understanding and acquiring the background knowledge needed for both the additional module and the corresponding four-year module.

In the first year of study, students take the basic sciences modules that form the foundation of engineering, namely chemistry, physics and mathematics. However, computer engineering students take mechanics instead of chemistry. Students in the 5-year Bachelor of Engineering programme also take Professional Orientation, which provides an introduction to information technology skills and practice, and develops their academic and communication skills. Furthermore, first-year engineering students are required to take a module in humanities and social sciences – the HAS module.

In the second year, students take all the introductory (100-level) engineering modules, as well as a compulsory additional module for each. They also take one 200-level mathematics module per semester. In the third year, they take the remaining 200-level modules, but since they have already completed two 200-level mathematics modules, their workload is slightly lighter than that of the four-year degree programme students.

For the last two years of their studies, students in the 5-year Bachelor of Engineering programme follow exactly the same programme as the four-year degree programme students. All the prescribed components of the 5-year programme are compulsory, as is attendance of all lectures and discussion classes in the modules.



## I AM EBIT

### Empowering healthcare through industrial engineering

**Cayla Janse van Rensburg, EBIT industrial engineering graduate, was accepted to specialise in health data science at the University of Cambridge in England. She aims to develop models to capture the dynamic movement and spread of infectious diseases in populations. "These models are valuable, as they allow us to "test" different interventions without actually implementing them. In this way, we can determine which intervention will be the most effective and only implement that solution".**

#### WHAT MAKES INDUSTRIAL ENGINEERING CAPTIVATING

In high school, Cayla had a wide range of interests and found it difficult to decide on one specific career. "Although I seriously considered studying medicine, I was a bit concerned that it would not be analytical enough. I enjoyed mathematics during my school years and was quite disappointed that the MBChB course did not include any maths modules. Consequently, I decided to pursue a more analytically oriented course like engineering". She decided to pursue industrial engineering, which offers a broader scope and higher degree of versatility, and enabled her to decide what she wanted to specialise in after better understanding her passion and specific interests.

#### BE PREPARED FOR SUCCESS

Studying engineering is a challenging journey, and Cayla emphasises that the test weeks at UP have been instrumental in preparing her to manage substantial workloads. She has been able to refine her time



management skills and understand the importance of effective study approaches that are tailored to individual preferences. "I think some of the most valuable skills I've learnt during my studies are perseverance and resilience. Throughout all four years of study, but particularly during my final year, I had to deal with significant workloads that often felt overwhelming. As a result, I quickly learnt the importance of breaking down the workload into smaller, more manageable chunks. I discovered that small, consistent efforts make it possible to overcome these substantial amounts of work."

#### CAMARADERIE

Reflecting on her time at the University of Pretoria, Cayla is grateful for the exceptional expertise of lecturers who inspired her to do her best, as well as a special sense of camaraderie among her friends and colleagues from the UP Symphony Orchestra. "I was fortunate to meet incredible people and formed a close group of supportive friends. When I look back on the past four years, some of my favourite moments include having lunch on the lawn in front of the Aula, late-night study sessions in the study centre and celebrating after test weeks and major submissions."

#### ADVICE FOR ASPIRING ENGINEERS

Cayla recommends getting involved in the University's sports and cultural clubs and societies, as they present a great opportunity to meet like-minded people and engage in activities beyond studying. She also shares that one of the most valuable lessons she has learned is not to link one's identity and self-worth to one's academic performance. "I realised how easy it is to tie our self-worth to good grades and perceive ourselves as failures when we encounter academic setbacks, when, in actual fact, everyone experiences a bad test or exam at some stage, and it does not at all reflect our true worth as individuals."

Her advice for future engineers is to "dream big". Engineering skills can be combined with other passions and hobbies. She encourages new students to think outside the box, be creative and make the most of the diverse opportunities available at the University of Pretoria.

#### DREAM BIG

Cayla's journey is a testament to the power of following one's passion and combining it with the versatility of engineering disciplines. To all high school students exploring their potential paths, remember Cayla's story and pursue your dreams with determination, creativity and an eagerness to create a positive impact in the world.

**The future is yours to shape!**

## I AM EBIT: Community engagement

### UP engineering students prepare learners for STEM careers

**As part of EBIT's community engagement initiatives, through the Joint Community Projects (JCP) module, students have been teaching and mentoring learners from underprivileged township and rural schools in science, technology, engineering and mathematics (STEM) careers. This programme was expanded to include a new flagship programme, Tuks Robot School, where robotics, computer programming and sensor technology prepare and inspire these learners for the future world of work.**

A curriculum that targets Grades 8 to 11 learners was designed around a low-cost robot platform. Several senior students from the Department of Electrical, Electronic and Computer Engineering (EECE) were given the chance to participate in the development of the platform and curriculum content. Many learners come from rural and remote townships such as Winterveld, Atteridgeville, Mamelodi, Hammanskraal, as well as some schools in Pretoria North.

"We started this initiative because we found that many learners in the remote areas of our communities do not think about studying engineering," said Prof Tania Hanekom, EECE Function Head of Undergraduate Studies. "They look at it as a career for learners who come from privileged schools. We created this platform to say, 'No, let us show you that you can not only touch one of these robots – you can also create one!' There is no reason why they cannot study this. We inspire learners to think about engineering as a career because we have a lot of



potential in South Africa that we are not using, which is sad. We need all those learners to study towards careers in STEM disciplines and help develop South Africa to its full potential."

Prof Hanekom added that it was concerning that some developed countries have one in 200 or one in 300 engineers in their populations, while South Africa has only one in 3 100. The Tuks Robot School programme engages learners in STEM activities in the hope that the experience will inspire some of them to become future students in the EBIT Faculty.

UP has partnered with the non-profit organisation KTG (Keep That Gold Shining), which aims to expose high school learners to introductory robotics and computing principles. KTG works in schools in underprivileged communities and brings learners from these schools to UP over weekends to attend the Tuks Robot School and the Drone and Sensor Schools, which followed after the initial success of the Robot School.

"We select learners who show a keen interest in learning further and place them into a more continuous and more advanced robotics programme,"

said Matthew Beekman, KTG Chief Information Officer and UP computer engineering student. This is where UP's Robot School, UP's Sensor School, and UP's Drone School, come into play. We hope to introduce learners to the possibilities in the industry and to spark interest in as many of them as we can. Within the context of the Fourth Industrial Revolution, information and communications technology and robotics are careers that offer good job security. The skills we share are becoming more of a necessity than a privilege – yet these learners still lack these opportunities.

Grade 9 learners Lesego Mahladi (15) of Thulaganyo Secondary School in Winterveld and Thato Mathou (14) of Makgetse Secondary School in Hammanskraal said the programme created in them an interest and curiosity about engineering as they learned about coding and robots, as well as how AC and DC motors are used.

"For eight weeks I learned about how engineers create things and I witnessed how coding, architecture and technology create very useful things," Mathou said. "This programme has definitely made me want to study computer engineering. I cannot wait!"

## I AM EBIT: Student fun

### Annual Robot Car Race Day

**The annual Robot Race of the Faculty of Engineering, Built Environment and Information Technology (EBIT) was initiated by Prof Tania Hanekom in 2013 in an attempt to create an engaging, enjoyable practical project for the third-year Microcontrollers module as students were really struggling with the module.**

The intent was to generate excitement in the students about the learning material by creating a formal opportunity to play and explore. Inviting spectators to attend the Robot Race, which was initially no more than the final practical assessment in the Microcontrollers module, provided the opportunity for other students and members of the public to see what the students were doing in class.

Students had to work together in small groups to design and build a microcontroller-based autonomous robotic vehicle. The outcome of the project was for the autonomous vehicle to navigate a coloured line laid out to purposefully cross over other coloured lines and not veer off course, in the shortest time possible.

The project has been extended to other modules within the Department, enabling the horizontal and vertical integration of learning content in the respective programmes.

The Robot Race is also the inspiration behind a Robot School community engagement project, launched in 2021. This involves second-year and final-year students in the Department, who need to complete a period of work-integrated learning. The Robot School curriculum is targeted at Grade 8 to Grade 11 learners, and is presented free of charge between April and October each year.



# School for the Built Environment

**The School for the Built Environment offers the entire spectrum of programmes in this field, and prioritises close ties and alignment with the building industry. The School places a particular emphasis on the equitable and sustainable development of people.**

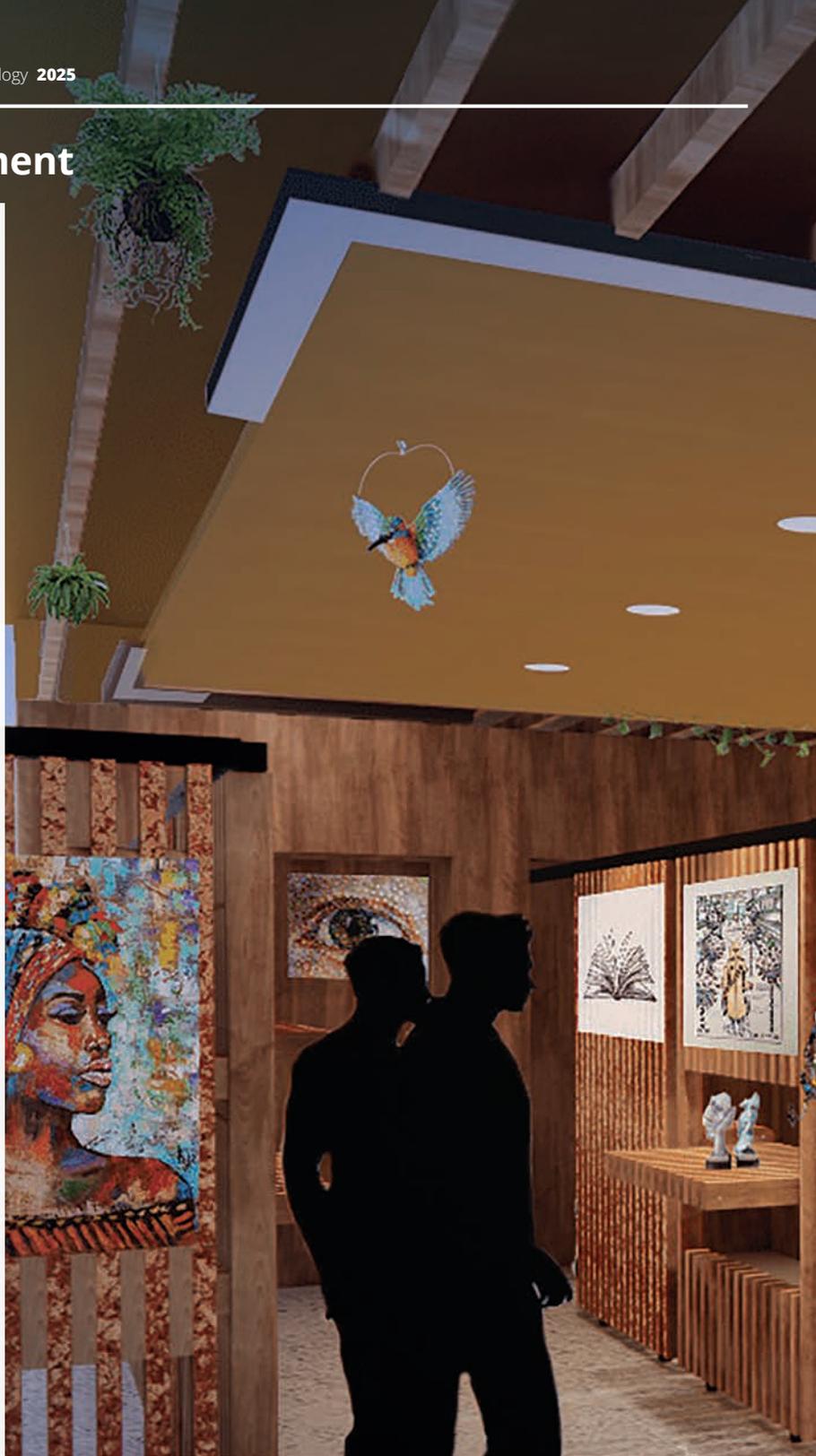
The School offers professional degree programmes in architecture, quantity surveying, construction management, real estate and town and regional planning. All these programmes are internationally recognised and accredited by their respective statutory councils, allowing students to register as members of their chosen professions. We also encourage our students to participate in community development and service during their studies, as well as after they graduate.

Our close relationships with industry and government expose students to regular engagements with practitioners and real-life projects; and ensure curricula that are relevant to current and future challenges. These relationships also open doors to exciting research opportunities at postgraduate levels in fields such as environment behaviour studies, climate change adaptation, urban resilience, urban citizenship, green building, regenerative design and development, heritage and cultural landscapes, safe and sustainable housing and urban spaces, strategic development planning, construction cost databases, escalation and indices, and contracts and property law.

## MAKE AN IMPACT

EBIT focuses its research on impacting global challenges. As the only faculty at a South African higher education institution to house a unique combination of schools related to engineering, the built environment, information technology and technology management, EBIT is in the ideal position to pursue research that provides integrated solutions. The School for the Built Environment actively contributes to research in the following Sustainable Development Goals (SDGs) of the United Nations:

- **SDG 9:** Industry, Innovation and Infrastructure
- **SDG 11:** Sustainable Cities and Communities
- **SDG 12:** Responsible Consumption and Production
- **SDG 13:** Climate Action



## SCHOOL FOR THE BUILT ENVIRONMENT

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DISCOVER THE CAREER BENEFITS OF A POSTGRADUATE QUALIFICATION: FIND SPECIALISATIONS

## I AM EBIT

### Quantity Surveying students recognised by industry bodies



Celebrating Women's Month in August, the Green Building Council of South Africa (GBCSA) initiated the annual IFC Women in Green Building Competition, a testament to the growing recognition of women's pivotal role in the property and construction sectors. The competition, introduced in 2022, was conceived with the aim of empowering and enhancing the skills of female professionals within these industries through specialised training in EDGE Expert green building practices.

**Amber Freestone**, a BSc Quantity Surveying (Hons) student, was selected as one of the ten finalists in this competition. Her motivation for participating in this competition stems from her Quantity Surveying Honours research. As cost consultants, quantity surveyors are uniquely positioned professional consultants and influence the trajectory of a construction project throughout its various phases. It is, however, increasingly evident that financial considerations are not the only bottom line. The decisions a quantity surveyor needs to make within the built environment industry have substantial consequences for the environment. With almost every move our industry makes, it inadvertently releases carbon into the atmosphere and produces detrimental by-products. To reshape this industry and, by extension, our future urban landscapes, a fundamental paradigm shift in our consulting approach as built environment professionals is imperative.

Amber firmly believes that programs like EDGE, in conjunction with the sustainability assessment tools provided by the GBCSA, are setting the course for this transformation within South Africa. Consequently, she is motivated to embark on her professional journey from a sustainability-oriented perspective. By integrating these tools and frameworks into our consulting practices, quantity surveyors can actively contribute to the reduction of the environmental impact of our cities, thereby ensuring a more sustainable legacy for future generations.



The Association of South African Quantity Surveyors (ASAQS) recognises the outstanding academic achievements of quantity surveying students nationally. The ASAQS Gold Medal Award is presented annually to a student whose academic achievements are of outstanding merit and whose personal qualities promise to positively contribute to the profession.

The 2022 gold medal was awarded to **McKayla McMaster**, who completed her BSc Quantity Surveying (Hons) degree with distinction. This milestone achievement is not surprising as McKayla has received no less than 15 top academic awards during her four years of study. McKayla refers to herself as an ambitious quantity surveyor with a great passion for the profession.



The ASAQS and Turner & Townsend Great Outcomes Award for outstanding academic achievement in the first two years of undergraduate study went to **Tyla Mundie**, who completed her Bachelor of Science *Quantity Surveying* degree with distinction. Tyla has a bent for numbers, enjoys solving problems and thinking out of the box!

# School for the Built Environment

## Department of Architecture



### Bachelor of Science *Architecture*

#### About the Department

The Department of Architecture presents an undergraduate programme in architecture that explores the design of meaningful environments across varying scales, from intimate interior spaces to more significant interventions in landscapes. Specialised programmes in architecture, interior architecture and landscape architecture are introduced at the postgraduate level.

Our vision is to provide a learning environment that fosters critical and independent thinking, encourages social-ecological accountability and inspires responsive and responsible problem-solving that contributes to the improvement of society and its environment. We engage with spatial design with academic rigour that is theoretically grounded and technologically informed, and our academic programmes are locally and internationally accredited.



#### What does the programme entail?

The curriculum for the Bachelor of Science *Architecture* programme integrates knowledge from the humanities and the natural sciences to develop students' spatial design skills, and aims to instil a culture of lifelong learning in graduates.

##### Design and Applied Theory

Architecture students attain half of the credits for every year of study in the significant module of design, which is presented in tandem with architectural theory to equip students with a pertinent vocabulary and theoretical underpinning.

Design is a studio-based module in which projects over a range of scales and complexities are undertaken to encourage students to develop critical and independent design thinking, the ability to evaluate design within a social, cultural and ecological framework, and to explore imaginative and appropriate solutions.

In the studio, design discernment is fostered through ongoing discussion, peer learning, and formal and informal assessment. The Department promotes design that is responsive and evidence-based rather than stylistically or iconically driven, and students are encouraged to appreciate the universal (global), while engaging with the particular (local).



##### History of the Environment

History of the Environment prepares students to define their role in society and find meaning in history through the study of the self and the cultures of others. It investigates the context and meaning of cultural artefacts, including space and place, to relate form and order to the environmental, political and philosophical conditions that influenced their making. It culminates in a reading of southern Africa in the third year of study.



##### Earth Studies

Earth Studies introduce students to ecosystemic accountability and systems thinking to guide them towards designing for well-being in the built environment from social, cultural and environmental points of view. It includes ecological themes that extend to approaches that underpin and inform inclusive, ecological, passive and responsive design.



Students attend classes in the following subject streams:

##### Community and Practice

Students participate in collaborative community projects that are directed by our research and initiatives in urban citizenship, as well as the Faculty's community engagement module. In the third year of study, the focus turns to the management of a professional practice and the legal context of construction contract law.



##### Construction

The study of construction theory, materials and methods is presented as an extension of design to enable the designer to give tangible expression to built form and realisation of an architectural concept.



##### Design Communication

Design Communication offers students the opportunity to develop skills in harnessing especially the digital tools that are essential to designers in the twenty-first century. It deals with visual communication, digital visualisation and representation, and the management of document and building information.



##### Theory of Structures

Theory of Structures equips students with the theoretical knowledge and practical understanding required to analyse, plan and design critical structural components such as beams, columns and trusses from a structural engineering perspective, using timber, steel, concrete and other materials.



# School for the Built Environment

## Bachelor of Science *Architecture* (continued)

### Career opportunities



The Bachelor of Science *Architecture* degree is accredited by the South African Council for the Architectural Professions and allows graduates to enter professional practice as technologists. To be able to register as a candidate architect, landscape architect or interior architect, they need to complete two additional professional postgraduate programmes. Note that the Department recommends at least one year of work or travel before postgraduate studies are undertaken. Through a commitment to innovation and internationally recognised programmes, the Department maintains professional qualifications of a high standard. The graduates of the Department are highly regarded both locally and abroad, in academia as well as in practice.

Architects design spaces and buildings to satisfy our daily needs and improve the environment in which we live. They need abilities and skills that range from the practical to the artistic, and from the technical to the theoretical. As professionals, they conceptualise, design and document building projects and oversee quality control during construction. Architects are ethically and legally bound through institutes and a government-controlled council, which protects the interests of the public. Architects may manage their own practices or work for other – often multidisciplinary – firms, or can make contributions to the government sector and education.

The majority of our graduates work in professional practice, often in multidisciplinary firms. Still, there is a wide range of other possibilities that branch out from the spatial design disciplines: from furniture to urban design, ecological planning to entrepreneurship, as well as in research and advisory positions in the public and private sector.

### Admission by selection

A limited number of students are admitted to the Department annually. Admission is determined by a four-part selection process explicitly developed to level the playing field between students coming from different educational and cultural backgrounds.

Please refer to [www.up.ac.za/architecture](http://www.up.ac.za/architecture) for information on the selection requirements and process.

### Important dates



Applications open on **1 April** and close on **30 June**.

Undergraduate	Minimum duration	Outcome (SACAP registration)
Bachelor of Science <i>Architecture</i>	Three years (full-time, studio-based)	Candidate Architectural Technologist
At least one year of work or travel recommended before postgraduate studies are undertaken.		
Professional Postgraduate	Minimum duration	Outcome
Bachelor of Architecture Honours	One year (full-time, studio-based)	Candidate Senior Architectural Technologist
Bachelor of Landscape Architecture Honours	One year (full-time, studio-based)	Candidate Senior Landscape Architectural Technologist
Bachelor of Interior Architecture Honours	One year (full-time, studio-based)	Candidate Senior Interior Designer
Master of Architecture	One year (full-time, studio-based)	Candidate Architect
Master of Landscape Architecture	One year (full-time, studio-based)	Candidate Landscape Architect
Master of Interior Architecture	One year (full-time, studio-based)	Candidate Interior Architect

### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
SCHOOL FOR THE BUILT ENVIRONMENT	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science <i>Architecture</i> [3 years]	5	4	4	27

Will only be considered as first study choice. Selection programme: Selection includes an interview.

**Contact information** Dr Nico Botes (Coordinator: Undergraduate Programme in Architecture) | **Tel** +27 (0)12 420 4600 | **Email** arch@up.ac.za

**Websites** [www.up.ac.za/architecture](http://www.up.ac.za/architecture) | [www.up.ac.za/school-for-the-built-environment](http://www.up.ac.za/school-for-the-built-environment) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)

**Academic enquiries: Prospective students** | **Email** arch@up.ac.za | **Website** [www.up.ac.za/architecture](http://www.up.ac.za/architecture)

# School for the Built Environment

## Department of Construction Economics



### Bachelor of Science *Construction Management*

#### What does the programme entail?



Construction management is the management of the physical construction process within the built environment and includes the coordination, administration and management of resources. The construction manager takes full responsibility in this process and can work either as a construction manager or a construction project manager.

#### Who are the ideal candidates?



The ideal candidate should have the following skills:

- Communication
- Risk management
- Financial management
- Organisation
- Openness to feedback

#### What makes this programme unique?



The Bachelor of Science *Construction Management* and BScHons (Construction Management) programmes are accredited nationally by the SACPCMP and internationally by the Chartered Institute of Building (CIOB) in the UK. The CIOB has a worldwide footprint and provides our degrees in construction management with international recognition.

The Department also offers master's and doctoral degrees, which can be obtained by submitting a thesis and passing an oral examination.

#### Career opportunities



Various job opportunities exist in the construction industry. On successful completion of the three-year programme, students can enter a career in construction management, or undertake subcontract and main contract work. On successful completion of the one-year honours degree, opportunities become far wider. The one-year honours degree focuses on further training in aspects such as financial, project and strategic management.

After registration with the South African Council for the Project and Construction Management Professions (SACPCMP), students will be able to become professional construction managers and construction project managers.



## School for the Built Environment

### Bachelor of Science *Construction Management* (continued)

#### Duration of the programme



#### Bachelor of Science *Construction Management*

The three-year programme will qualify Bachelor of Science *Construction Management* graduates to support professionals in the construction industry with all types of construction work.

#### BScHons (Construction Management)

The one-year BScHons (Construction Management) programme qualifies graduates to start a professional construction management

career or professional construction project management career in the construction and related industries. After submitting proof of prescribed professional practical experience and the successful completion of an assessment of professional competence, graduates may register with the South African Council for the Project and Construction Management Profession (SACPCMP).

The honours degree requires students to work part-time at construction companies or firms or other relevant establishments for at least 240 hours to supplement their theoretical studies with hands-on practical experience. Students will be required to keep and submit a logbook on the prescribed template.



#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
<b>SCHOOL FOR THE BUILT ENVIRONMENT</b>	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
<b>Bachelor of Science <i>Construction Management</i></b> [3 years]	5	5	or Accounting 4	30

The suggested second-choice programme for Bachelor of Science *Construction Management* is Bachelor of Science *Real Estate*.

**Contact information** Mr Derick Booyens | Tel +27 (0)12 420 4433 | Email [derick.booyens@up.ac.za](mailto:derick.booyens@up.ac.za)

**Websites** [www.up.ac.za/construction-economics](http://www.up.ac.za/construction-economics) | [www.up.ac.za/school-for-the-built-environment](http://www.up.ac.za/school-for-the-built-environment) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)

# School for the Built Environment

## Department of Construction Economics



### Bachelor of Science *Quantity Surveying*

#### What does the programme entail?



Quantity surveyors are independent, professional consultants who are responsible for the financial management of construction projects. They provide specialised financial and contractual services, as well as advice to clients in the construction industry. They act in collaboration with, among others, architects, consulting engineers and contractors to promote the interests of the building client.

#### What will I do?

- Quantify construction drawings to prepare budgets and tender documents
- Protect the interests of the client and contractors
- Consult with developers, architects, engineers and building contractors

#### Who are the ideal candidates?



The ideal candidate should have:

- Strong numeracy skills
- Attention to detail
- Negotiation skills
- Organisational skills
- Discipline
- Interpersonal skills

#### What makes this programme unique?



The three-year Bachelor of Science *Quantity Surveying* and BScHons (Quantity Surveying) programmes are accredited nationally by the SACQSP and internationally by the Royal Institution of Chartered Surveyors (RICS).

The RICS has a worldwide footprint, which provides our degrees in quantity surveying with international recognition. The Department also offers master's and doctoral degrees, which can be obtained by submitting a thesis and passing an oral examination.

#### Career opportunities



Various job opportunities exist in the construction industry. The majority of quantity surveyors are employed in quantity surveying practices in the private sector.

After registration with the South African Council for the Quantity Surveying Profession (SACQSP), quantity surveyors may become partners or directors, or they could start their own professional practices. Quantity surveyors also act as project managers and valuers, provided that they are registered with the relevant councils.



LEARN  
MORE



## School for the Built Environment

### Bachelor of Science *Quantity Surveying* (continued)

#### Duration of the programme



#### Bachelor of Science *Quantity Surveying*

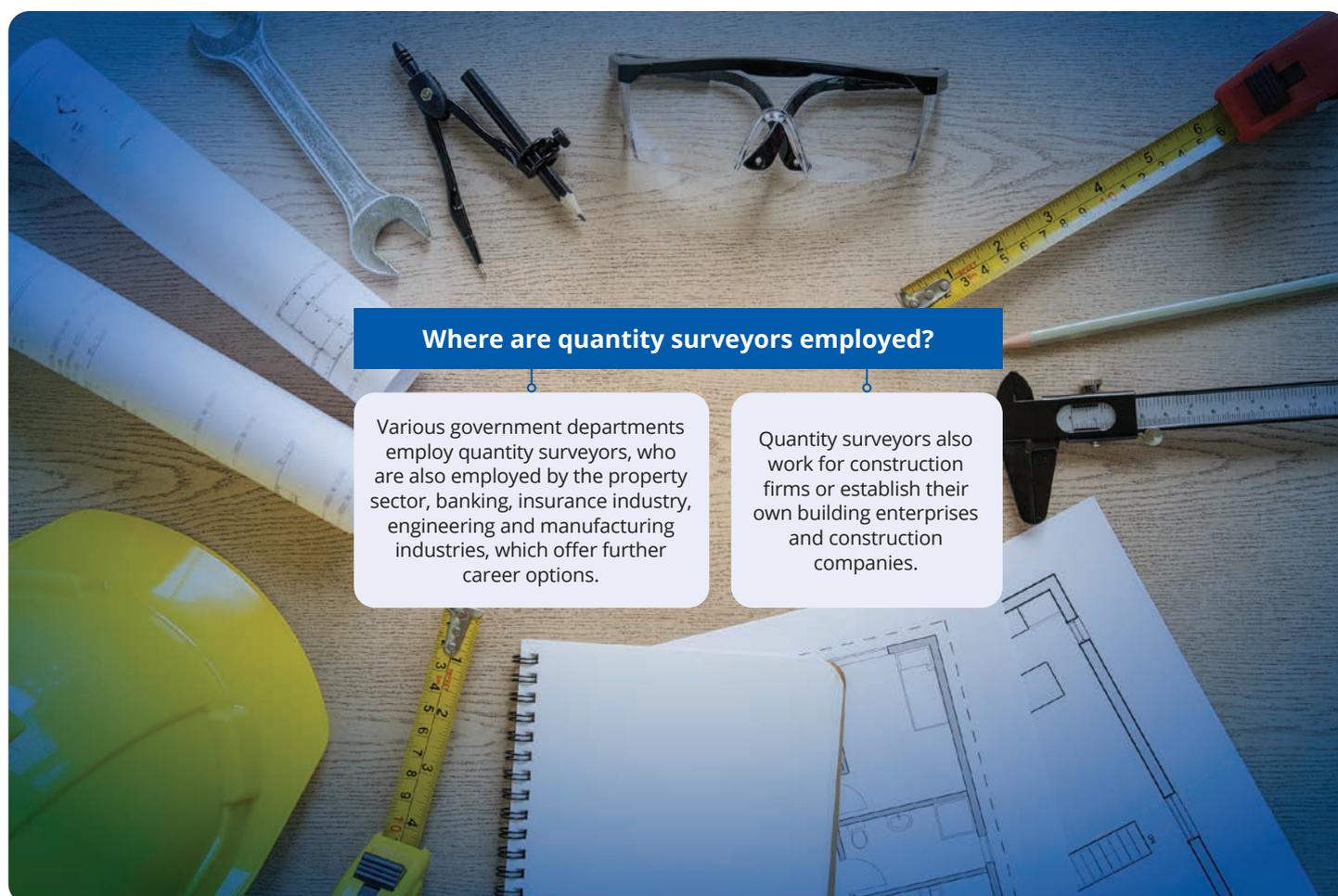
This three-year programme qualifies Bachelor of Science *Quantity Surveying* graduates to support professional quantity surveyors with all types of construction work, particularly buildings and infrastructure.

#### BScHons (Quantity Surveying)

The one-year BScHons (Quantity Surveying) programme qualifies graduates to start a professional quantity surveying career in

construction and related industries. After submitting proof of the prescribed professional practical experience and the successful completion of an assessment of professional competence, graduates may register with the South African Council for the Quantity Surveying Profession (SACQSP).

The honours degree requires students to work part-time at quantity surveying firms, or other relevant establishments for at least 240 hours to supplement their theoretical studies with hands-on practical experience. Students will be expected to keep and submit a logbook on the prescribed template.



#### Where are quantity surveyors employed?

Various government departments employ quantity surveyors, who are also employed by the property sector, banking, insurance industry, engineering and manufacturing industries, which offer further career options.

Quantity surveyors also work for construction firms or establish their own building enterprises and construction companies.

#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
<b>SCHOOL FOR THE BUILT ENVIRONMENT</b>	<b>English Home Language or English First Additional Language</b>	<b>Mathematics</b>	<b>Physical Sciences</b>	
<b>Bachelor of Science <i>Quantity Surveying</i></b> [3 years]	5	5	or Accounting 4	30

The suggested second-choice programmes for Bachelor of Science *Quantity Surveying* are Bachelor of Science *Construction Management* and Bachelor of Science *Real Estate*.

**Contact information** Mr Danie Hoffman (Programme Leader: Quantity Surveying) | **Tel** +27 (0)12 420 2551 | **Email** danie.hoffman@up.ac.za  
**Websites** [www.up.ac.za/construction-economics](http://www.up.ac.za/construction-economics) | [www.up.ac.za/school-for-the-built-environment](http://www.up.ac.za/school-for-the-built-environment) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)

# School for the Built Environment

## Department of Construction Economics



### Bachelor of Science *Real Estate*

#### What does the programme entail?



The study of real estate (also known as the science of property) covers all aspects relating to land and buildings, including the development of land, the management of buildings (including shopping centres), the valuation of land and buildings and decision making regarding the financing of, and investment in land and buildings. Real estate/Property practitioners are professional people who work in all spheres of the property industry—also as professional property valuers.

#### What makes this programme unique?



The Bachelor of Science *Real Estate* and BScHons (Real Estate) programmes are accredited nationally by the SACPV and, apart from qualifying students to work in all spheres of the property industry, enable them to become professional property valuers.

The Department also offers an MSc (Real Estate) coursework degree, as well as master's and doctoral degrees, which can be obtained by submitting a thesis and passing an oral examination.

Internationally, the MSc RE coursework degree is accredited by the Royal Institution of Chartered Surveyors (RICS). The worldwide footprint of the RICS provides our real estate degrees with international recognition.

#### Who are the ideal candidates?



- The ideal candidate should have:
- A keen interest in the greater built environment
  - Strong project and management skills
  - Strong creative and communication skills
  - Strong entrepreneurial skills

#### Career opportunities



Real estate (or property) studies has developed into a specialised field requiring unique expertise in areas where the property sector represents a significant part of the South African economy. Property/real estate comprises between 40% and 50% of the world's total assets.

Apart from a future in areas such as property investment, property finance and facilities management, further studies to obtain an honours degree in real estate can lead to registration as a professional property valuer.

Career opportunities exist in the entire spectrum of the property sector, and individuals with a qualification in real estate can work as entrepreneurs in the private sector, or as employees in the private, government or semi-governmental sectors.

Where are real estate graduates employed?

- Growthpoint
- Atterbury
- DDP Valuers
- Investec
- Resilient
- Redefine
- Abland

## School for the Built Environment

### Bachelor of Science *Real Estate* (continued)

#### Duration of the programme



##### Bachelor of Science *Real Estate*

This is a three-year programme that will qualify graduates to work in the various spheres of the property industry, including management, development and marketing.

##### BSchHons (Real Estate)

Students who complete this one-year programme will be qualified to start a professional career in the property industry.

After submitting proof of having gained the prescribed professional practical experience, and the successful completion of a professional examination, graduates may register with the South African Council for the Property Valuers Profession (SACPVP).

The honours degree requires students to work part-time at approved property companies or related businesses for at least 240 hours to supplement their theoretical studies with hands-on practical experience. They will be expected to keep and submit a logbook on the prescribed template.



#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
<b>SCHOOL FOR THE BUILT ENVIRONMENT</b>	<b>English Home Language or English First Additional Language</b>	<b>Mathematics</b>	<b>Physical Sciences</b>	
<b>Bachelor of Science <i>Real Estate</i></b> [3 years]	5	5	or Accounting 4	30

The suggested second-choice programme for Bachelor of Science *Real Estate* is Bachelor of Commerce *Investment Management*.

**Contact information** Ms Vita Wilkens (Programme Leader: Real Estate) | **Tel** +27 (0)12 420 3599 | **Email** vita.wilkens@up.ac.za  
**Websites** www.up.ac.za/construction-economics | www.up.ac.za/school-for-the-built-environment | www.up.ac.za/ebit-postgraduate

# School for the Built Environment

## Department of Town and Regional Planning



### Bachelor of Town and Regional Planning

#### What does the programme entail?



This programme prepares students for a profession in which they will promote and manage societal transformation and progressive change through the planning, design, implementation and management of interventions in the development and use of land.

These interventions, which range from site level to supranational level, are aimed at widening choice, promoting equity, ensuring sustainable human settlements and improving people's quality of life.

The guiding motive of the profession is the pursuit of innovative, inclusive, sustainable and affordable alternatives to existing settlement types. At the current juncture in South Africa's history, town and regional planning as a profession plays a crucial role in the correction of the many spatial and other imbalances in both urban and rural areas, as well as the improvement of inefficient, unjust and underperforming human settlements.

The challenge for planning is the fact that stakeholders, role players and participants have different interests and different expectations for the future, which are often contradictory and conflict ridden.

#### What makes this programme unique?



One of the characteristics of the Department is its desire to take on new challenges and develop innovative ways of contributing to the reconstruction and development of the country. We are actively immersed and involved in, and committed to inclusive and transformative community development in South Africa, mainly through research and contract work for a range of clients in all three spheres of government.

The professional four-year BTRP qualification enables graduates to register as professional town and regional planners with the South African Council for Planners (SACPLAN), which is an official body established in terms of an act of Parliament. The degree is internationally recognised.

#### Who are the ideal candidates?



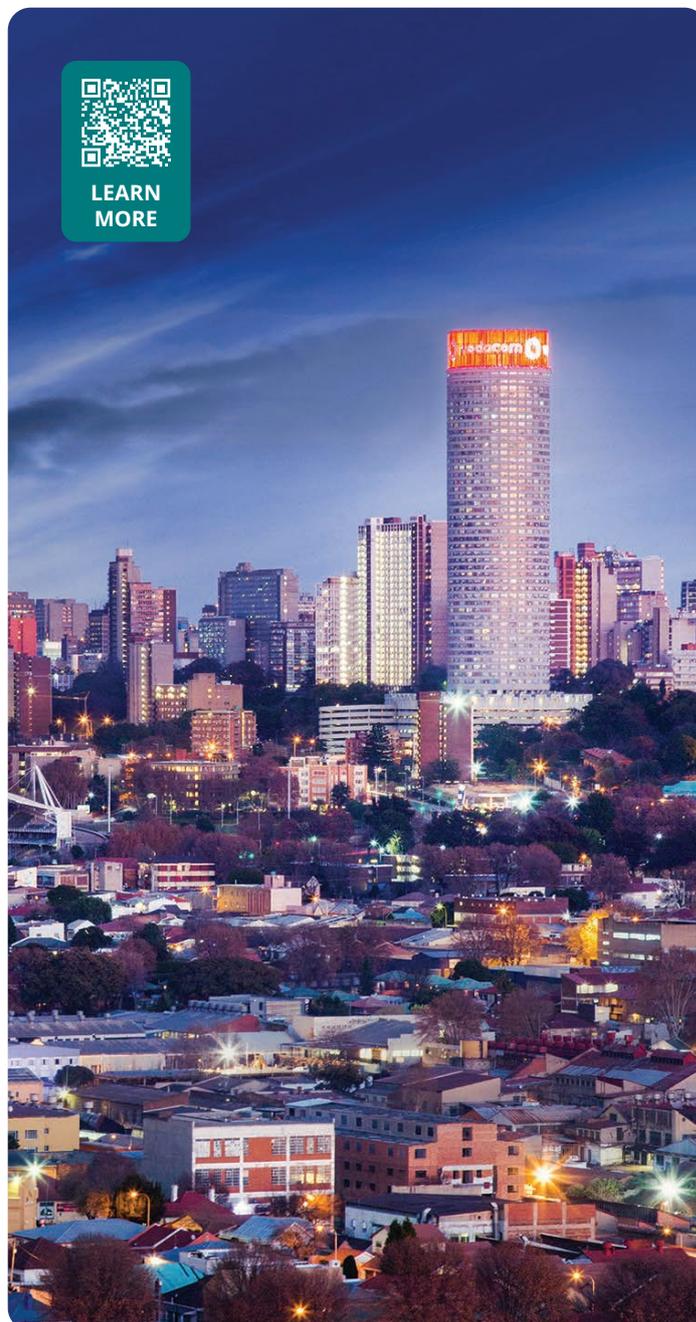
A professional approach that combines sensitivity, empathy and care, and strong analytical and strategic skills are required to manage the various political, social, environmental and economic issues at stake. The ideal town and regional planners are creative, can suggest innovative solutions to complex problems and, as mediators, can reconcile diverse points of view. They are strategic thinkers and good managers, and are passionate about working with people.

Given the enormous backlogs in the areas of housing and social services and the deep levels of poverty, marginalisation and despair in the country, planners also need a strongly developed sense of social and environmental justice. They should be committed to human and community development.

#### Career opportunities



While most town and regional planners are employed in the three spheres of government, or act as private consultants to the public and private sectors, they are also employed by research agencies such as the Council for Scientific and Industrial Research (CSIR) and the Human Sciences Research Council (HSRC), non-governmental and development organisations, community-based organisations, major financial institutions and property development groups.



# School for the Built Environment

## Bachelor of Town and Regional Planning *(continued)*

### Structure of programme



- The minimum period of study is four years' full-time study.
- Only a limited number of candidates can be accommodated and admission is subject to selection.

Practice and theory are integrated into the programme. Lectures, practical projects and studio work focus on stimulating critical thinking, engaging students in discussion and using practical problem-solving exercises by applying theory to real-world situations. Instruction is student centred and the progress of each student is carefully monitored.

The Town and Regional Planning programme equips planners with the knowledge and skills needed to present interventions to deal with many problems on properties and in settlements and regions by focusing on the following themes: planning theory and history; land-use management and land development; settlement planning and design; strategic and integrated development planning; urban and rural regeneration; public policy preparation and review; and planning methods and techniques.

Several modules in related fields are also prescribed to ensure that students acquire a multidisciplinary perspective and the knowledge base that is necessary to provide innovative, inclusive, affordable and appropriate solutions to complex urban and rural problems.



LEARN MORE ABOUT THE PROGRAMME'S MODULES



### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			APS
	Achievement level			
SCHOOL FOR THE BUILT ENVIRONMENT	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Town and Regional Planning [4 years]	5	4	-	27

For advice on a second-choice programme, please consult a Student Advisor. To make an appointment, send an email to [carol.bosch@up.ac.za](mailto:carol.bosch@up.ac.za).

**Contact information** Prof Karina Landman (Head of Department) | **Tel** +27 (0)12 420 6379 | **Email** [karina.landman@up.ac.za](mailto:karina.landman@up.ac.za)  
**Websites** [www.up.ac.za/townplanning](http://www.up.ac.za/townplanning) | [www.up.ac.za/school-for-the-built-environment](http://www.up.ac.za/school-for-the-built-environment) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)

# School of Information Technology

**The School of Information Technology is a forerunner in the South African IT environment. With its unique combination of the fields of computer science, informatics and information science, students benefit from an integrated approach, supported by modern laboratories.**

All the degree offerings in the School are highly sought after in the IT industry with a focus on industry-related trends. We also collaborate with industry and academic partners from the African continent and the rest of the world on a variety of research projects in exciting new technology fields.

The curricula conform to the highest international standards and provide breadth and depth in computing skills; equipping students with problem-solving abilities, and giving them a foundation for continued learning in an IT career. As a testimony to our commitment to top-quality education, the School of IT is a proud member of the iSchools Organization. Learn more from [ischools.org](https://www.ischools.org)

## MAKE AN IMPACT

EBIT focuses its research on impacting global challenges. As the only faculty at a South African higher education institution to house a unique combination of schools related to engineering, the built environment, information technology and technology management, EBIT is in the ideal position to pursue research that provides integrated solutions. The School of Information Technology actively contributes to research in the following Sustainable Development Goals (SDGs) of the United Nations:

- **SDG 4:** Quality Education
- **SDG 9:** Industry, Innovation and Infrastructure
- **SDG 17:** Partnerships for the Goals

## SCHOOL OF INFORMATION TECHNOLOGY

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DISCOVER THE CAREER BENEFITS OF  
A POSTGRADUATE QUALIFICATION:  
FIND SPECIALISATIONS

## I AM EBIT

### Addressing global challenges through machine learning

**Research conducted in the Department of Computer Science is not only making Artificial Intelligence (AI) more accessible, but can also be applied to areas that are relevant to the United Nations' Sustainable Development Goals (SDGs), especially in the fields of disease diagnosis, spam detection and sentiment analysis. Under the supervision of Prof Nelishia Pillay, master's degree student Mia Gerber investigated automating the design of the deep neural network pipeline to address problems related to the Fourth Industrial Revolution using AI.**



Deep neural networks are machine learning (ML) techniques that mimic the way the brain works. When applying these networks to a new application, the design pipeline involves several tasks, such as determining the most suitable neural network architecture. However, this is time consuming and requires expert knowledge.

According to Gerber, deep neural networks have been shown to be very effective for image and text processing. More and more non-experts are starting to make use of deep neural networks in their daily lives, but do not have the expertise to construct optimal deep neural network pipelines. In her study, Gerber therefore used a single-point hyper-heuristic (SPHH) to automate the design of the deep neural network pipeline.

The SPHH methodology can construct a deep neural network pipeline design by selecting techniques to use in the various stages of the pipeline. "This work

also investigated transfer learning by using a design that was created for one dataset as a starting point for the design process for a different dataset," says Gerber. She furthermore evaluated its effect and tested the reusability of the designs themselves.

The SPHH designed pipelines for both image and text processing. Image processing covered the detection of maize diseases and oral lesions, while text processing focused on sentiment analysis and spam detection. Multiple datasets were used for these tasks. The pipeline designs that were created by means of automated design were then compared to manually derived pipelines from the literature for the given datasets.

Gerber conducted three experiments to test the objectives of her study. Her findings revealed, firstly, that the automated design of a deep neural network pipeline using a selection perturbative hyper-heuristic is effective for both image and text processing. Secondly, transfer learning was found to produce results comparable to or better than the results achieved when using the SPHH without transfer learning. However, transfer learning is

only effective when the correct target and source are chosen. For some target datasets, negative transfer occurs when using certain deep neural network pipeline designs as the transfer learning source. Negative transfer occurs when the accuracy of the designed deep neural network pipeline decreases, while positive transfer occurs when the accuracy of the design deep neural network pipeline increases or the SPHH converges on an equally well-performing design at an earlier iteration. In the third experiment, which sought to determine whether the designs produced by the SPHH are disposable or reusable, she found that reusing designs do not perform as well as creating a design specifically for a particular dataset. The designs are therefore not reusable for either image or text processing, and deep neural network pipelines must be designed for each dataset individually to achieve acceptable results.

Future work in this field will include applying the automated design approach to more domains, and making the designs reusable. The transfer learning process will also be automated in future work to make sure that positive transfer occurs.

# School of Information Technology



## Department of Computer Science



### Bachelor of Science *Computer Science*

#### What does the programme entail?



A Bachelor of Science *Computer Science* degree from the University of Pretoria provides breadth and depth in computing skills. It equips students with problem-solving abilities and ensures that they have a solid foundation for continued learning and producing high-quality software in an IT career.

#### What makes this programme unique?



The curriculum conforms to the highest international standards and will give students a foundation in all the important areas of computer science. Students will study a wide variety of computer science modules that emphasise the most up-to-date ways of developing software for use in the IT industry.

#### Career opportunities



Graduates follow careers in programming, system analysis, system architecture, consulting, database administration and network analysis. They can also be employed as researchers.

#### Who are the ideal candidates?



Bachelor of Science *Computer Science* is the ideal programme for students who are curious about how computers work, enjoy building things carefully and systematically, have logical minds, are good at step-by-step reasoning, enjoy designing things that others can use, can pay attention to detail, can recognise good style and are able to keep working at a task until they succeed.

The ideal candidate should have:

- Attention to detail
- The ability to work with others in a team
- Analytical skills
- Creativity
- A logical mind



#### Structure of programme



The minimum time required for completing a Bachelor of Science *Computer Science* degree is three years. This programme includes a significant number of mathematics and natural sciences modules to strengthen the kind of thinking needed for the development of software and the enhancement of problem-solving abilities. It also provides a basis for research in computer science, which often relies on a certain level of mathematical skill and maturity.

#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
SCHOOL OF INFORMATION TECHNOLOGY	English Home Language or English First Additional Language	Mathematics	
<b>Bachelor of Science <i>Computer Science</i></b> [3 years]	5	6	30

The suggested second-choice programmes for Bachelor of Science *Computer Science* are Bachelor of Science *Information and Knowledge Systems* and Bachelor of Commerce *Informatics*.

# School of Information Technology

## Department of Computer Science



### Bachelor of Science *Information and Knowledge Systems*

#### What does the programme entail?



Bachelor of Science *Information and Knowledge Systems* is the ideal programme for students who are interested in computer science, and specifically in one of the following areas of specialisation:

- Data science
- Genetics
- Geographical information systems
- IT and enterprises
- Law
- Music
- Software development

The minimum period for the completion of the Bachelor of Science *Information and Knowledge Systems* programme, which aims to prepare students for careers in the IT industry, is three years.

#### What makes this programme unique?



Computer science has a multidisciplinary application domain and the purpose of the programme is reflected in the composition of the curriculum, which combines computer science with other fields of study. The possibility of taking a second major other than computer science broadens the scope of the curriculum for students.

#### Who are the ideal candidates?



The ideal candidate should have:

- Attention to detail
- The ability to work with others in a team
- Analytical skills
- Creativity



#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
SCHOOL OF INFORMATION TECHNOLOGY	English Home Language or English First Additional Language	Mathematics	
<b>Bachelor of Science <i>Information and Knowledge Systems</i></b> [3 years]	4	6	30

The suggested second-choice programme for Bachelor of Science *Information and Knowledge Systems* is Bachelor of Science *Computer Science*.

**Contact information** Dr Linda Marshall (Programme Coordinator) | **Tel** +27 (0)12 420 2361 | **Email** compsci@up.ac.za  
**Websites** www.cs.up.ac.za | www.up.ac.za/school-of-information-technology | www.up.ac.za/ebit-postgraduate

# School of Information Technology

## Department of Informatics



## Bachelor of Information Technology in Information Systems

### What does the programme entail?



Students who enrol for this programme study the application and use of computer and information systems in organisations. The use of information technology by organisations is growing exponentially and new, more complex and challenging applications are being explored and developed all the time.

Informatics specialists are trained to analyse business problems experienced by organisations and to improve the efficiency, effectiveness and control of business processes for commercial organisations, government, government departments, non-profit organisations or any other organisation where information is crucial. They therefore not only analyse the business needs, but also address them by designing and implementing information systems.

Nowadays the term information systems is used to refer to computer-based systems (including mobile applications) that store and manipulate data so that people can understand and interpret information and use it for decision-making.

### What makes this programme unique?



What makes the Informatics degree at the University of Pretoria unique is the Capstone Project, which is a working software solution for a real-life client. Implementing this software solution exposes students to the industry's need for graduates with both soft skills and technical skills.

### Who are the ideal candidates?



The ideal candidate should have:

- analytical skills;
- excellent research skills;
- problem-solving skills;
- communication skills; and
- the ability to work in a team.

### Career opportunities



The work environment of the informatics specialist is particularly interesting and well-qualified informatics specialists can choose between many excellent job opportunities, for example:

- Business analyst
- System analyst
- Data scientist
- Knowledge manager
- Quality assurance tester
- User experience designer
- Project manager
- Developer (front end, back end or full stack)
- IT auditor
- IT entrepreneur
- IT tax specialist
- e-business consultant

### Structure of programme

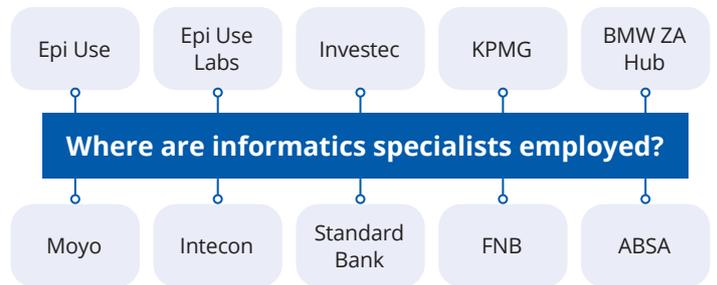


The Bachelor of Information Technology in Information Systems programme takes a minimum of three years to complete.

#### Core modules

- Critical thinking and problem solving
- Programming
- Systems analysis and design
- Database design and development
- Team skills development

Elective modules are dependent on the chosen stream.



### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
<b>SCHOOL OF INFORMATION TECHNOLOGY</b>	English Home Language or English First Additional Language	Mathematics	
<b>Bachelor of Information Technology in Information Systems</b> [3 years]	5	5	30

The suggested second-choice programme for Bachelor of Information Technology in Information Systems is Bachelor of Information Science.

# School of Information Technology

## Department of Informatics



### Bachelor of Commerce *Informatics*

#### What does the programme entail?



The Bachelor of Commerce *Informatics* entails the study of the application and use of computer and information systems in organisations. The superiority of students in this field lies in their broad background in the field of economic and management sciences, which implies familiarity with the world of business.

The use of information technology by organisations is growing exponentially, and new, more complex and challenging applications are being continuously explored and developed. In addition to the fact that their work environment is particularly interesting, many job opportunities are available to well-qualified informatics specialists.

Informatics specialists are trained to analyse the information needs of businesses, government departments, non-profit organisations or any other organisation where information is crucial. They not only analyse the needs but also address those needs by designing and implementing information systems. The term information systems is used nowadays to refer to computer-based systems (including

mobile applications) that store and manipulate data so that people can understand, interpret information and use it for decision making.

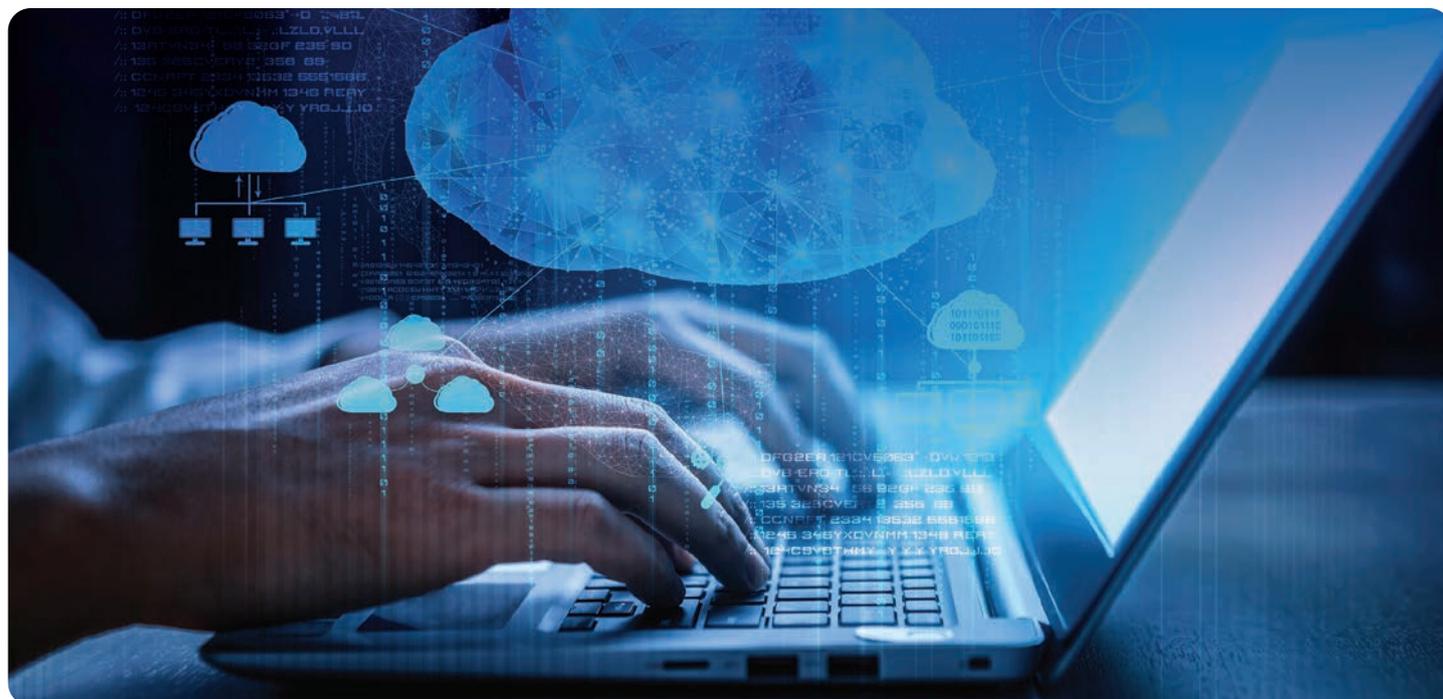
The Bachelor of Commerce *Informatics* degree offered by the University of Pretoria is the only degree in Africa that is internationally accredited by the Accreditation Board for Engineering and Technology (ABET) of the USA.

#### Career opportunities



Job opportunities for well-qualified informatics specialists can include:

- Data scientist
- IT auditor
- IT entrepreneur
- IT tax specialist
- e-business consultant
- Programmer
- Business analyst
- Project manager
- CIO
- CTO
- Knowledge manager



#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
SCHOOL OF INFORMATION TECHNOLOGY	English Home Language or English First Additional Language	Mathematics	
<b>Bachelor of Commerce <i>Informatics</i></b> [3 years]	5	5	30

This programme is administered by the Faculty of Economic and Management Sciences.

# School of Information Technology

## Department of Information Science

### Bachelor of Information Science *Multimedia*

#### What does the programme entail?



Modern information technology offers the possibility of information products being designed and created comprising various types of media over and above the traditional text medium. Information technology, therefore, results in the convergence of various previously separate traditional media. There is not a single discipline that handles the combination of information products.

The Multimedia qualification in the Department of Information Science addresses this shortcoming. Institutions in any economic sphere, including government, may profit from a multimedia approach to information design, organisation and retrieval. Multimedia documents include text, graphics, sound, video and animation. This qualification aims to enable students to understand the necessary concepts to build multimedia products and maintain the products. This programme is, therefore, a combination of theory and practice. The explosion of the web and the exponential growth and power of information technology require the introduction of this degree following international trends.

#### Which companies employ our graduates?



Institutions in any economic sphere can profit from a multimedia approach to information. For example, our graduates work at:

- RetroRabbit
- Gendac
- Epi Use Labs
- Derivco
- bizAR Reality
- 5DT

#### What makes this programme unique?



A student with this degree will work in a team of developers and designers and communicate easily with both groups. They will also have the skills to move between these two types of roles within a company.

They will also be able to further their understanding of design, animation, and game design and development and then work in those fields.

#### Who are the ideal candidates?



The ideal candidate should be:

- Passionate about computing and technological advancements
- Happy to spend many hours in front of a computer
- Interested in creating and maintaining websites (both front- and back-end)
- Interested in learning about animation, image, sound and video editing
- Interested in the intersection between technical aspects (programming) and design aspects (user experience, visual design)
- Interested in understanding how people interact with computing systems and how to design them based on this knowledge (user experience and interaction design)



# School of Information Technology

## Bachelor of Information Science *Multimedia* (continued)

### Structure of programme



#### Core modules

- Theory of information science
- Mark-up languages
- Multimedia theory and trends
- Multimedia authoring tools
- Human-computer interaction
- Programming and program design
- Computer science theory
- Visual design

#### Elective modules (3rd year computer science only)

- Software engineering
- Artificial intelligence
- Computer networks
- Programming languages
- Compiler construction
- Computer security
- Database systems
- Computer graphics



### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
<b>SCHOOL OF INFORMATION TECHNOLOGY</b>	English Home Language or English First Additional Language	Mathematics	
<b>Bachelor of Information Science <i>Multimedia</i></b> [3 years]	4	5	

The suggested second-choice programmes for Bachelor of Information Science *Multimedia* are Bachelor of Information Science, Bachelor of Information Science *Publishing*, Bachelor of Science *Information and Knowledge Systems* and Bachelor of Commerce *Informatics*.

**Contact information** Ms Anniq Smith | **Email** annique.smith@up.ac.za | **Website** [www.up.ac.za/information-science](http://www.up.ac.za/information-science) > multimedia  
**Websites** [www.up.ac.za/school-of-information-technology](http://www.up.ac.za/school-of-information-technology) | [www.up.ac.za/ebit-postgraduate](http://www.up.ac.za/ebit-postgraduate)

# School of Information Technology

## Department of Information Science



### Bachelor of Information Science

#### What does the programme entail?



The high prevalence of information and technology in the modern world implies that graduates are needed with specific competencies and skills related to the interaction between humans and information technologies. This is especially relevant concerning the technologies associated with the Fourth Industrial Revolution (and any further similar innovations).

This programme focuses on the use of information technology and the processing of information products. It is designed to train students in the management, retrieval and organisation of information and teach them to package, distribute and add value to information.

Students will also have the opportunity to develop their knowledge and skills in managing information and knowledge, which are the most critical resources of enterprises—information and knowledge. This will include knowledge management, competitive intelligence and also digitisation and digital repositories.

#### Who are the ideal candidates?



The type of student for whom this qualification is ideal is interested in engaging with information and creating and sharing new knowledge across platforms, primarily digitally and in analogue formats. This qualification will enable graduates to discover, organise, manage and utilise information, practice knowledge management and competitive intelligence in an ethical manner. Graduates with skills in this field are highly sought after to help information-intensive industries to meet their visions and missions and become globally competitive.

#### Which companies employ our graduates?



Banks, telecommunication companies, consultancy agencies and information-intensive industries.



#### Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
<b>SCHOOL OF INFORMATION TECHNOLOGY</b>	English Home Language or English First Additional Language	Mathematics	
<b>Bachelor of Information Science</b> [3 years]	4	-	28

The suggested second-choice programmes for Bachelor of Information Science are Bachelor of Information Science *Publishing*, Bachelor of Commerce *Informatics* and Bachelor of Arts.

# School of Information Technology

## Department of Information Science



### Bachelor of Information Science *Publishing*

#### What does the programme entail?



The Bachelor of Information Science *Publishing* programme teaches publishing theory and skills by selecting and developing content based on the needs of the user and appropriately packaging this content through a process of adding value. Publishing can happen in both paper-based and electronic format and includes a range of products, such as books for the trade market and publications for educational, academic and corporate readers. Publishing processes are also used in the production of mass media products, such as newspapers and magazines.

This programme aims to:

- provide students with knowledge of the publishing process and role-players, as well as trends and initiatives in the local and international publishing industry;
- provide students with relevant and current skills, including editing, design and production;
- enable students to work with a variety of information formats, from print to digital; and
- make students aware of the social, ethical and legal responsibilities involved in the publishing process.

#### What makes this programme unique?



This programme is unique in South Africa and offers students access to the full publishing value chain. It is benchmarked against international programmes and students can continue with their studies in other countries.

#### Who are the ideal candidates?



The ideal candidate should have:

- excellent language and communication skills, both written and verbal;
- project management and the ability to work towards goals and deadlines;
- computer skills and an aptitude for learning new skills;
- critical reading and reasoning; and
- good business sense.

#### Career opportunities



Graduates can work in a wide variety of publishing, communication and media functions. Various career opportunities are available in the publishing industry, book retail and corporate communications. Content production for media houses, magazines and other content creators is also possible.

Some career opportunities include the following:

- Editorial functions
- Layout, design and typesetting
- Digital production
- Copyright permissions and negotiations
- Marketing and promotion
- Self-publishing and consultancy



#### Which companies employ our graduates?



Our graduates can be found at all the major local publishers (Pan Macmillan, Jonathan Ball, NB, Oxford University Press, Van Schaik and Juta), as well as at companies as diverse as legal firms, medical aid schemes and car manufacturers. Some are also entrepreneurs and start new businesses, for example BK Publishing and Blackbird Books.

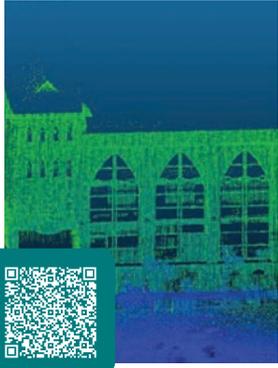


#### Minimum admission requirements

Programmes	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
<b>SCHOOL OF INFORMATION TECHNOLOGY</b>	English Home Language or English First Additional Language	Mathematics	
<b>Bachelor of Information Science <i>Publishing</i></b> [3 years]	5	-	28

The suggested second-choice programmes for Bachelor of Information Science *Publishing* are Bachelor of Information Science, Bachelor of Arts *Languages* and Bachelor of Arts.

## Flagship research projects



### Smart cities for the future

The term **'Smart Cities'** might conjure up ideas of robots, flying cars and buildings that know what you want to do

before you do. But, according to UP researchers, Smart Cities are cities where there are jobs and food for everyone, where different parts of the city work together to create a better place to live, and where these improvements are driven by gathering and using data in the best way possible.

EBIT believes that, by harnessing the power of the Fourth Industrial Revolution, we can solve Africa's urban challenges like food security, inequality and energy vulnerability. That is what really makes a city smart.

The Department of Architecture is on a quest to gauge the future of smart cities in developing economies. Its research helps one understand the pitfalls and opportunities of future smart cities in Africa.

In addition to envisioning a world where people are kinder to each other, and tolerance is the order of the day, African smart cities will have to thrive on collaboration rather

than competition. For this to happen, different entities and individuals will have to collaborate by using artificial intelligence from different sets of data to solve Africa's problems.

The Department of Architecture is also the driver of the University of Pretoria's **Hatfield Digital Twin City** initiative. The Digital Twin environment is a collaborative data-driven platform that allows for a multitude of research and experimentation opportunities to occur. It provides opportunities for transdisciplinary work, and acts as a testbed for the development of smart applications that support improved service delivery, more efficient use of resources and building urban resilience.



### Revolutionising travel by taking inspiration from nature

EBIT researchers are finding ways to make air travel cheaper, cleaner and faster. In

their quest to develop an aircraft that automatically adapts its flight behaviour as it encounters unpredictable weather, they are studying the behaviour

of the albatross, one of the most energy-efficient travellers in the animal kingdom.

In the process, technology and transdisciplinary collaboration are allowing nature to inspire design.

The research findings will have various implications for the aerospace industry, where aerodynamics plays a vital role in the design of next-generation aircraft.

Other applications of the impact of a technique that simulates the albatross's efficiency could be its use in unmanned aerial vehicles in remote, inaccessible locations that need to be constantly airborne to receive radio or telemetry signals. Sending robots into high-risk environments that are not safe for humans to collect useful data is an excellent example of how robots and humans can co-exist and work together to innovate our tomorrow.



### Healing the world by fighting diseases

An invention that originated in the University's Institute of Applied Materials

reduces the evaporation of expensive insect repellents, making them last longer. The flagship application is a hiking sock that has been treated with a long-lasting insect repellent.

The technology behind this development is finding additional applications, particularly in the field of

malaria control. Malaria is one of the leading causes of illness and fatalities around the world. Although the disease is mostly confined to tropical areas, it results in approximately 250 million clinical cases of malaria and nearly half a million deaths annually.

The World Health Organisation recommends the spraying of insecticides indoors and the use of bed nets treated with long-lasting insecticides as a preventative measure, particularly in sub-Saharan Africa, as the mosquito net distribution programme is much cheaper and simpler to manage for resource-limited

governments. However, insecticide resistance is now considered a major threat to malaria control in Africa.

To solve this problem, manufacturers of mosquito nets have included the use of piperonyl butoxide (PBO) on the mosquito net fibres alongside pyrethroids. PBO is a non-toxic chemical that suppresses the mosquito's ability to resist pyrethroids. Research and development conducted by EBIT researchers have involved trialling a novel insecticide active for use in long-lasting insecticide-treated nets to tackle the problem of insecticide resistance.

## Flagship research projects

### Bioengineering that changes lives

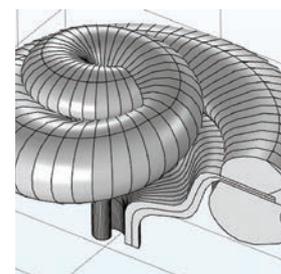
Bioengineering is a specialist field that includes medical or biomedical engineering and biological engineering, built on a foundation of electronic engineering. At EBIT, the core work of researchers in this area is in the field of sensory prostheses, with a primary focus on auditory neuroscience and cochlear implants for the deaf.

A cochlear implant is probably the most successful bioengineering product ever conceived. It is a device that electrically stimulates the auditory system of profoundly deaf individuals to elicit a sensation of sound. Tens of thousands

of profoundly deaf people worldwide have regained some hearing by using cochlear implants. These are people who could not benefit from hearing aids, but have now regained the ability to use a cell phone.

The work that is being conducted in the Faculty focuses on understanding human sensory processing and solving problems related to neural prostheses. It targets three research questions in particular. The first is the design of the electrode and the nerve fibres targeted by it. The second is understanding the relationship between stimulus and

perception. This is done by making use of signal processing in both the normal auditory system and the electrically stimulated auditory system. The third is creating acoustic models that enable people with normal hearing to listen to the sounds that cochlear implantees hear to improve speech processing algorithms.



### Energy sources through moonlight

Researchers in the Department of Mechanical and Aeronautical Engineering are making use of the moon to help improve solar energy. An outcome of this research is the development of a small-scale hybrid concentrating power system that uses concentrated solar power to generate electricity and process heat for commercial use.

Concentrating solar power systems generate electricity by concentrating the sun's rays onto a small solar receiver, which can then be used to heat air to generate electricity through electric turbines, or for the direct

heating of spaces and processes. The system that was developed makes use of a unique approach by substituting the sun's rays for those of the moon, which, because they are much dimmer, allow a normal camera to be used to photograph the concentrated moon rays on the solar collector. The moon's rays have many properties in common with those of the sun, as they are made up of a similar spectrum as the sun, and approach the earth with almost the same angular diameter, which is critical for approximating the sun.

The tests showed that, even when individual dishes are misaligned, up to

88% of the light on the dish was focused into the receiver.

These results have shown promise for further development, which would yield cost-effective, high-performance optical systems for concentrated solar applications, with a larger dish already being developed for commercial operation.



### Building a bridge between languages

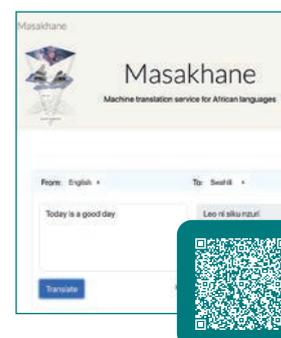
A natural language processing (NLP) machine translation system for low-resourced languages developed in the Faculty has been making great strides. It is using machine learning to develop an electronic translation application for languages that are not catered for by systems developed in North America and Europe. The application is similar to the popular Google Translate, but focuses specifically on the African languages for which accommodation is not made in existing machine translation tools.

Despite the fact that 2 000 of the world's languages are African, African

languages are barely represented in technology, despite the fact that language plays a very big role in the Fourth Industrial Revolution. Since recent advances in NLP have largely benefitted well-represented languages, research into lesser-known global languages has been identified as a necessity.

The research that formed part of the development of this machine translation tool for African languages aimed to fundamentally change the approach to "low-resourced languages" in Africa. Its novel approach to machine learning illustrates how the challenges these

languages face to join the web can be overcome. It entails new approaches in modelling, data collection and community building to create the perfect environment for creativity, innovation and archiving across South African languages and beyond. The solution to these challenges is not merely an academic exercise, but will benefit society as a whole.



2025



The Faculty of Engineering, Built Environment and IT (EBIT) is home to a generation of leaders and innovators who are dedicated to improving their lives, the lives of their families, their country, and the world.

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