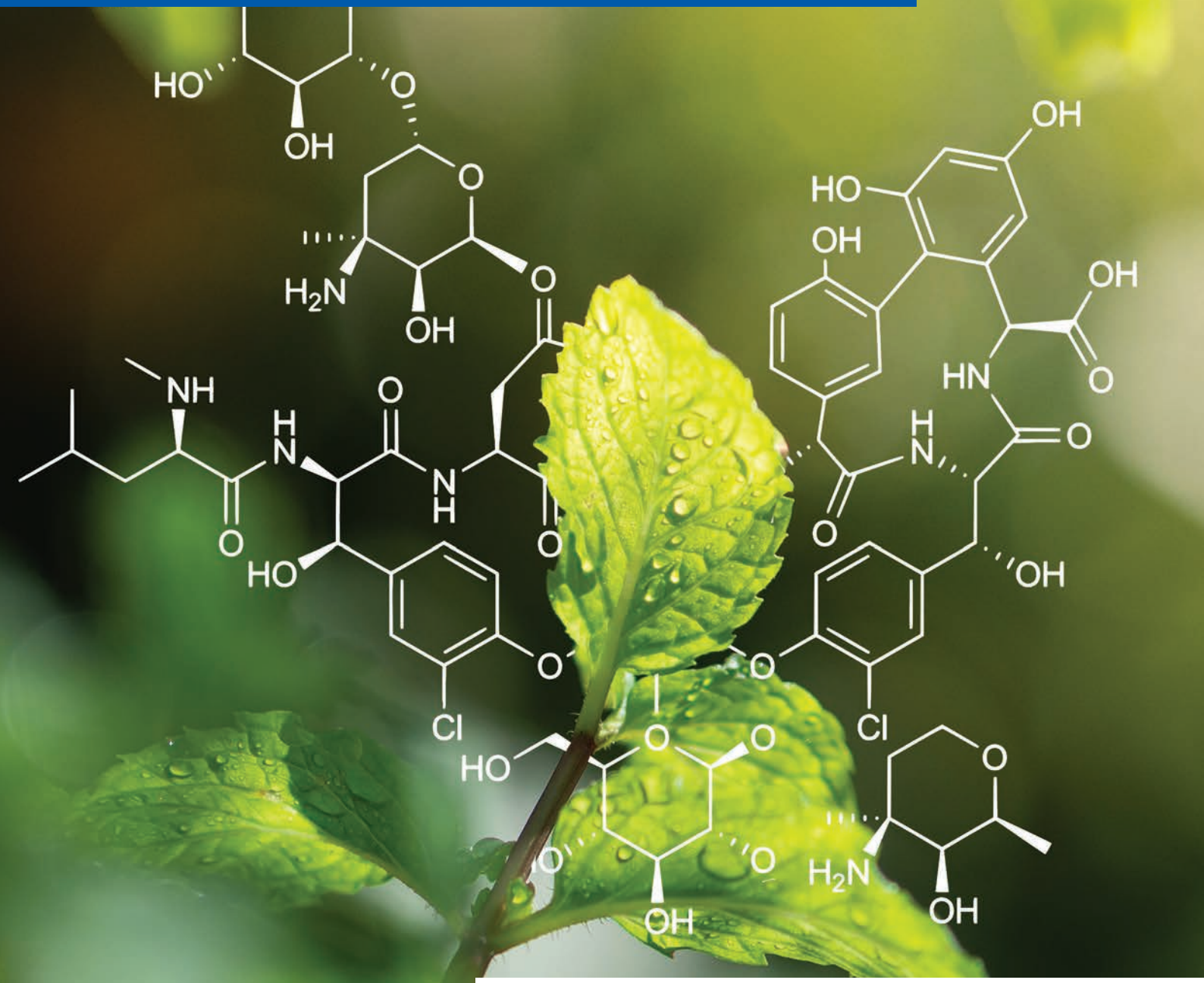
Undergraduate Faculty Brochure

2025



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Natural and Agricultural Sciences

Fakulteit Natuur- en Landbouwetenskappe
Lefapha la Disaense tša Tlhago le Temo

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

Make today matter

www.up.ac.za

Message from the Dean

‘What does a South African university know about changing the world? Well…more than most. We believe that within every moment of every day lies the potential to change the world… and the good we do today, can positively impact our futures. It is a single idea that holds everything together’.*

Prof Barend Erasmus
Dean: Faculty of Natural and Agricultural Sciences

Universities don’t operate in isolation, and the University of Pretoria is no exception. The world food security crisis, the domestic energy and water crisis, the global inflationary environment, geopolitics and climate change, to name but a few, challenges us to re-imagine what a university should look like and how it should conduct its core business of research, teaching and learning, and community engagement.

In the Faculty of Natural and Agricultural Sciences, we take this challenge very seriously: we continuously assess, reflect and improve how we work, to ensure that our graduates get the skills to thrive and lead in these uncertain times. We value quality education, campus safety, employability, international competitiveness and research impact.

Our high-quality, purposefully designed on-campus activities provide opportunities for our students and graduates to develop into well-rounded, locally rooted and internationally relevant citizens.

The diverse academic programmes of UP and of the Faculty of Natural and Agricultural Sciences (NAS), our industry connections, the quality of our research and our meaningful community engagement projects all contribute to your education to launch you on a pathway to a fulfilling career that will have an impact on the world. NAS is a faculty known for its diversity in respect of people and disciplines, and how we view the world. This diversity, which helps us look at old problems from new perspectives, plays a crucial role in ensuring our excellence in teaching and research. It also provides an ideal template for cross-cutting research, where diverse disciplines combine forces to solve the societal problems of the day. Our excellence in teaching and research is also recognised by our large number of partners outside of academia. We collaborate with several companies, non-profit organisations, industry bodies and government departments, which means that the qualification you receive from NAS gives you a unique edge for employment.

The excellent research and teaching you are exposed to during your training, combined with valuable real-world experience, will make you a sought-after candidate for employment.

*‘We never stop questioning, pushing, discovering, yearning in our pursuit of knowledge. This is why learning matters.’**

As a student in NAS, you will be mentored by leading scientists and trained in the use of state-of-the-art equipment. Here you will be at the forefront of scientific research, and you will be inspired to think innovatively. In NAS we have a deep appreciation of humanity’s connection to the living world and explore new opportunities for investigating how it shapes our livelihoods.

We are known for our expertise in forestry and agriculture, the life sciences and mathematical and statistical sciences—all supported by genuine scholarship and excellence in the basic sciences. We offer some unique degrees (in meteorology and nutrition, for example), and even though there may be similar offerings elsewhere, we also offer attractive double major options and even a unique triple major in Human Physiology, Genetics and Psychology. Food and water security in Africa are two of our many focus areas and our research in this regard can be approached from many angles, which include climate change, biotechnology, crop development, breeding, data science, agricultural economics, insurance risk, financial mathematics, consumer behaviour, indigenous crops, pests and diseases, carbon cycling and environmental change.

I look forward to joining you on an exciting journey within the Faculty of Natural and Agricultural Sciences.

Email nas.undergradhelp@up.ac.za

*UP Make Today Matter Manifesto.

Content

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

FACULTY WEBSITE:

POSTGRADUATE WEBSITE:

NAS at a glance

The Faculty of Natural and Agricultural Sciences is the most diverse faculty of its kind in Africa.

All degree programmes are designed to develop problem-solving individuals who can easily adapt to changing circumstances and take the lead in their chosen fields of specialisation. Our world-class qualifications provide access to numerous career opportunities for dynamic and creative people. Some of the Faculty's degree programmes are unique to the University of Pretoria, while others are also offered at other institutions.

STUDENT PROFILE

3 891
Undergraduate students

1 997
Postgraduate students

553
Students from countries other than South Africa*

ACADEMIC OFFERINGS

33
Undergraduate degree programmes

118
Postgraduate degree programmes**

6
Research centres

4
Research institutes

**27 honours, 50 master's, and 41 PhD programmes in 13 departments

UNIQUE DEGREES

Bachelor of Science *Meteorology* is the only degree of its kind offered in sub-Saharan Africa.

Bachelor of Science in Food Management [Option: Culinary Science] is the only degree of its kind in Africa.

*Applicants who are not South African citizens

The Faculty presents undergraduate degrees in the following fields:

Biological Sciences

Bachelor of Science:
- *Biochemistry*
- *Biotechnology*
- *Ecology*
- *Entomology*
- *Genetics*
- *Human Genetics*
- *Human Physiology*
- *Human Physiology, Genetics and Psychology*
- *Medical Sciences*
- *Microbiology*
- *Plant Science*
- *Zoology*

Agricultural and Food Sciences

Bachelor of Science:
- in Food Management [Options: 1. Nutrition 2. Culinary Science]
- *Food science*

Bachelor of Science in Agriculture in:
- Agricultural Economics in Agribusiness Management
- Animal Science
- Applied Plant and Soil Sciences
- Plant Pathology

Bachelor of Consumer Science:
- *Clothing Retail Management*
- *Food Retail Managment*
- *Hospitality Management*

Physical Sciences

Bachelor of Science:
- *Chemistry*
- *Environmental and Engineering Geology*
- *Geography [Option: Geography and Environmental Science]*
- *Geoinformatics*
- *Geology*
- *Meteorology*
- *Physics*

Mathematical Sciences

Bachelor of Science:
- *Actuarial and Financial Mathematics*
- *Applied Mathematics*
- *Mathematical Statistics*
- *Mathematics*

Undergraduate programmes

General admission regulations that apply to all prospective students

1. 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.
2. 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.
3. 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.
4. Candidates must also comply with the specific subject and achievement level requirements and the minimum Admission Point Score (APS) for their chosen degree programmes.
5. 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

6. 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.
7. Minimum requirements for admission to the relevant programmes are set out in the minimum admission requirements table in this brochure.
8. Meeting the minimum admission requirements does not guarantee admission into a programme.
9. 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 > Undergraduate > Admission information.
   - The *Newcomer's Guide 2024 of the International Cooperation Division*, available at www.up.ac.za/programmes > Undergraduate > Admission information.
10. **School of Tomorrow** (SOT) and **Accelerated Christian Education** (ACE): The University of Pretoria no longer accepts qualifications awarded by these institutions.
11. **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.
12. **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 or +27 (0)12 349 1510.

Note: Refer to the General Academic Regulations and Student Rules at 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.
- Final admission will be based on the applicant's final school-year NSC or equivalent results.

Undergraduate programmes

Faculty-specific admission regulations

1. **Mid-year selection cancelled:**
   The mid-year selection for the Bachelor of Medicine and Surgery [also referred to as MBChB] and Bachelor of Dental Surgery [also referred to as BChD] degrees in the Faculty of Health Sciences will be discontinued in 2025. Similarly, the Faculty of Natural and Agricultural Sciences will discontinue the BSc *Biological Sciences* registration option in 2025. Applicants may select a relevant Bachelor of Science degree in the field of biological sciences or another programme offered in the Faculty of Health Sciences as a second-choice option. For information on programmes offered by these faculties, refer to www.up.ac.za/programmes > Undergraduate > faculty brochures.
2. **Bachelor of Veterinary Science and Bachelor of Veterinary Nursing:**
   Students who intend to apply for admission to the Bachelor of Veterinary Science may register for Bachelor of Science biological sciences degrees' modules including Medical Terminology (MTL 180). Students should contact the Faculty of Veterinary Science for their selection criteria (www.up.ac.za/faculty-of-veterinary-science).
3. **BSc extended programmes:**
   A limited number of Bachelor of Science and Bachelor of Science in Agriculture specialisations may be offered over an extended period of time, with students being granted four years and five years, respectively, to complete the qualifications. Once external approval has been granted by the Department of Higher Education and Training (DHET), the Faculty will communicate the processes to all stakeholders.

University of Pretoria website www.up.ac.za/nas

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.

Physical Science: Students in the Cambridge system must have completed both **Physics** and **Chemistry** with an achievement level equal to that of NSC Physical Sciences as specified in the table on the next page.

Undergraduate programmes

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
BIOLOGICAL SCIENCES	**English Home Language or English First Additional Language**	**Mathematics**	**Physical Sciences**	
Bachelor of Science *Biochemistry* [3 years]	5	5	5	**32**
Careers: Biochemistry offers many opportunities for exciting and challenging careers in the food and pharmaceutical, fine chemicals and waste-processing industries. Careers at research councils, such as the Medical Research Council (MRC), the Agricultural Research Council (ARC), the Cancer Association of South Africa (CANSA) and the Water Research Commission (WRC) are possibilities, as are academic institutions, the Council for Scientific and Industrial Research (CSIR) and forensic as well as pathology laboratories. Possible careers include that of researcher, teacher, lecturer and medical representative. Graduates are comfortable in work environments such as universities, research institutes, pharmaceutical companies, biotechnology companies and related industries.				
Bachelor of Science *Biotechnology* [3 years]	5	5	5	**32**
Careers: Graduates mostly find work as laboratory-based researchers or bio-entrepreneurs using medical, animal, plant or microbe-based technologies to develop products and services. If students combine biotechnology with additional qualifications such as law, they will be equipped for success in careers such as patent law, pharmaceutical sales and marketing, project management, computer programming (natural computation) and science journalism. Please note that the level of training and qualification plays a vital role in determining the type of work a qualified biotechnologist can pursue.				
Bachelor of Science *Ecology* [3 years]	5	5	5	**32**
Careers: Graduates will be at the forefront of conserving natural ecosystems in a changing world. They find work in local and international environmentally based government and private conservation organisations (e.g., WWF, IUCN), companies involved in the direct or indirect use of natural resources (e.g., agriculture, mining), environmental consultancies, environmental education initiatives, academic and training institutions, and research.				
Bachelor of Science *Zoology* [3 years]	5	5	5	**32**
Careers: Our graduates will play pivotal roles in managing the conflict between a growing human population and the conservation of our unique biodiversity in Africa. They could be employed by public and private nature conservancies, environmental consultancies and conservation agencies, medical and veterinary research institutions, in biochemical and biotechnology industries, at educational institutions, in scientific data management, and the corporate sector. These jobs usually involve a stimulating combination of problem-solving, analytical work, and fieldwork.				
Bachelor of Science *Entomology* [3 years]	5	5	5	**32**
Careers: Graduates with expertise in entomology are highly sought after in the agricultural sector as insect management specialists or researchers. They are also employed at nature reserves, environmental consultancies, conservation planning agencies, medical and veterinary research institutions, educational institutions and museums, organisations involved in the management of invasive species and pests, quarantine and inspection services, in the biochemical and biotechnology industries, in IT-related fields, and in the corporate sector. There are also opportunities to start your own business to farms insects that benefit humans such as biological control agents or pollinators like bees and flies, or can be used as feed for animals and food for humans.				
Bachelor of Science *Genetics* **Bachelor of Science *Human Genetics*** [3 years]	5	5	5	**32**
Careers: Graduates generally choose to work as molecular biologists, medical or clinical geneticists, cytogeneticists, biotechnologists, agricultural scientists, molecular ecologists, forensic scientists, genetic counsellors, bioinformaticists and computational analysts, veterinary scientists, teachers or lecturers at various institutions, and in bioscience-related industries. If students combine genetics with additional qualifications such as law, they will be equipped for successful careers in, for example, patent law, pharmaceutical sales and marketing, project management, computer programming (natural computation) and science journalism. Note that the level of training and qualification plays an important role in determining the type of work in which a qualified geneticist can become involved.				
Bachelor of Science *Human Physiology* **Bachelor of Science *Human Physiology, Genetics and Psychology*** [3 years]	5	5	5	**32**
Careers: Many of the career options for graduates in Bachelor of Science *Human Physiology* and Bachelor of Science *Human Physiology, Genetics and Psychology* are research-orientated. Research is performed in cooperation with medical teams in private and government research laboratories, pharmaceutical firms, universities, veterinary and industrial institutions. Graduates of these degrees also contribute to education (teachers, lecturers and instructors), sport physiology, biostatistics, bioengineering, biotechnology, microbiology, virology, industrial hygiene, scientific journalism, medical technology, and sales representatives of pharmaceutical firms. Further studying also opens the opportunity to become genetic counsellors and psychologists.				
Bachelor of Science *Medical Sciences* [3 years]	5	5	5	**32**
Careers: Postgraduate studies are highly recommended. Honours, master's and doctoral degrees can be obtained in any of the subdisciplines of anatomy: neuro-anatomy, clinical anatomy, cell biology, physical and forensic anthropology, histology and embryology. Students who obtain this degree can also continue with their studies to obtain postgraduate degrees in physiology, genetics and pharmacology. Career opportunities include research in any of the subdisciplines of anatomy, in academia, in forensic science and in the health science industry. Other careers that can be considered are in the sports sciences, virology, chemical pathology, immunology, health administration or ergonomics. Technical careers are also possible, for example, in the Anatomy or Physiology departments at universities.				
Bachelor of Science *Microbiology* [3 years]	5	5	5	**32**
Careers: Microbiologists can pursue a variety of careers involving activities ranging from practical application to basic research. Career opportunities are available in the food, dairy, beer, wine, baker's yeast and fermentation industries, and at mines where they will be involved in corrosion control. Graduates can also follow careers in medical or veterinary microbiology, microbial genomics and, ecology or as researchers at organisations such as the CSIR, MRC or ARC, or lecturers and researchers at academic institutions.				
Bachelor of Science *Plant Science* [3 years]	5	5	5	**32**
Careers: Careers range from working in a laboratory to studying plants in their natural environments. Graduates could be employed at biotechnology and pharmaceutical firms, South African National Parks (SANParks), private ecological companies and research institutions such as the CSIR, ARC and the South African National Biodiversity Institute (SANBI).				

Undergraduate programmes

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
AGRICULTURAL AND FOOD SCIENCES	**English Home Language or English First Additional Language**	**Mathematics**	**Physical Sciences**	
Bachelor of Science in Food Management [Option: Culinary Science] [4 years]	5	5	5	**32**
Careers: Graduates can be employed as culinary scientists, culinologists, sensory analysts, food researchers, food product developers, food safety and quality assurance managers, and food service managers.				
Bachelor of Science in Food Management [Option: Nutrition] [4 years]	5	5	5	**32**
Bachelor of Science in Food Management [Option: Nutrition] is an interfaculty degree programme, presented jointly by Consumer and Food Sciences (Faculty of Natural and Agricultural Sciences) and Human Nutrition (Faculty of Health Sciences). **Careers:** The need for graduates with training in nutrition is driven by the worldwide recognition of the fact that food does not only meet basic nutritional needs but also plays a key role in the promotion and maintenance of long-term good health. Career opportunities exist in food or related industries (such as pharmaceutical and food manufacturing companies), government departments, international organisations (such as the United Nations Food and Agricultural Organisation (FAO) and the World Health Organisation (WHO)), NGOs, research organisations and as project managers and advisors in the food, health and consumer sectors.				
Bachelor of Science *Food Science* [3 years]	5	5	5	**32**
Careers: Food scientists with highly marketable training and professional skills work as food risk investigators, quality and safety assurance managers, food chemists, food microbiologists and biotechnologists, packaging and shelf-life specialists, safety auditors, product and process development managers, technical sales and marketing advisors, sensory scientists or food bio-scientists (for example brewers or flavourists) in the food, agro-processing and related industries. The work environments of food scientists include laboratories, food production sites, business premises (retail and wholesale), training areas, government institutions and research organisations. Food scientists also work in industries and companies that manufacture and supply materials (for example packaging and food additives, such as colourants and flavourants) to the food industry, or have secondary involvement in food production and sales.				
Bachelor of Science in Agriculture in Agricultural Economics in Agribusiness Management [4 years]	5	5	5	**32**
Careers: The Bachelor of Science in Agriculture in Agricultural Economics in Agribusiness Management degree is ideal for students who are passionate about and have competencies in both science and business subjects. The degree programme cultivates problem solvers with unique skill sets to help feed and clothe the world. Agricultural economists are involved in many different areas of the economy. Their roles in the economy include: analysing and understanding consumer behaviour in terms of people's wants, needs and willingness to pay for food and clothing; conducting research in environmental economics to assist governments and businesses in ensuring the sustainable use of scarce resources such as water; training of smallholder farmers by providing extension services; trading of financial instruments and agricultural commodities on global and local stock markets; advising clients in the agricultural sector on how to manage their finances and risks; advising government on how to ensure that there will be enough food for all South Africans; and conducting research to ensure the sustainable and profitable supply of food and clothing across the various supply chains. Employment opportunities for agricultural economists include employment in the government, commercial banks, multinational agribusiness companies, farmer cooperatives, commodity trading houses, food processors and manufacturers, and research councils.				
Bachelor of Science in Agriculture in Animal Science [4 years]	5	5	5	**32**
Careers: Animal science is focused on the application of the scientific aspects of animal production and the quality control of products to ensure consumer satisfaction. Careers in this field make an essential contribution to food (protein) production in South Africa. Based on the most recent research and the needs of both animals and humans, animal science focuses on the entire livestock production value chain, from conception to consumption. There are numerous career opportunities for animal scientists in research, commercial farming and the public sector, and for in the livestock and feed industry. Animal scientists can work on different levels in these sectors, eg as researchers or consultants on animal nutrition or breeding, technical representatives, managers of intensive and extensive animal production systems and policymakers. The Bachelor of Science in Agriculture in Animal Science degree is acknowledged as a professional qualification by SACNSP in terms of Act 106 of 1993. It is internationally recognised, which means that graduates can register as professional animal scientists.				

Undergraduate programmes

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
AGRICULTURAL AND FOOD SCIENCES	**English Home Language or English First Additional Language**	**Mathematics**	**Physical Sciences**	
Bachelor of Science in Agriculture in Plant Pathology [4 years]	5	5	5	**32**
Careers: Graduates could be employed in: ▪ **Education and training:** Graduates can work at universities, colleges and schools. ▪ **Plant pathologists:** Graduates are in demand in various industries. Careers range from researchers to practitioners who work in laboratories, on commercial farms (which includes fieldwork) or in the food trade industry. ▪ **Research and management:** Graduates are also hired at research institutes, government departments, seed, fertiliser and agrochemical companies, municipalities and in the mining industry. ▪ **Extension services for technology transfer:** Employers of graduates include grower associations, national and provincial Departments of Agriculture, Land Reform and Rural Development (DALRRD), Environment, Forestry and Fisheries (DEFF), Tourism (DT), Mineral Resources and Energy (DMRE) and Water and Sanitation (DWS). ▪ **Entrepreneurial:** Graduates can work as consultants or in production.				
Bachelor of Science in Agriculture in Applied Plant and Soil Sciences [4 years]	5	5	5	**32**
Careers: Graduates could be employed as teachers and lecturers at schools and academic institutions, as well as researchers and managers at various public and private institutions: ▪ **Public sector:** The ARC, DWS, DEFF, DT, DALLRD, DMRE, the CSIR, provincial agriculture and nature conservation departments, SANBI, municipalities, SANParks, national farming and food production agencies ▪ **Private sector:** Companies involved in seed, fertiliser and plant protection research and development, environmental planning and management, nurseries, vegetable, fruit and ornamental cut-flower production and irrigation ▪ **Extension services involving knowledge transfer:** Nature conservation, national and provincial departments of agriculture and the environment, environmental management and rehabilitation, nurseries, crop, turfgrass and weed management, private companies servicing field crops, vegetables, medicinal and aromatic plants, fruit, ornamental and cut-flower production ▪ **Entrepreneurial:** Consultants in crop, pasture, vegetable, medicinal and aromatic plants, ornamental and cut-flower production systems and landscaping enterprises, managing own farms and nurseries for extensive (field) or intensive (tunnel/greenhouse) production systems involving various crops, and managing companies specialising in irrigation, reclamation and soil conservation			

Programmes	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
CONSUMER SCIENCE	**English Home Language or English First Additional Language**	**Mathematics**	
Bachelor of Consumer Science *Clothing Retail Management* [4 years]	5	4	**28**
Careers: Graduates can be employed in retail management as brand managers, clothing buyers and planners, fashion designers, fashion marketers, fashion product developers, quality controllers and assurance managers, store managers, image consultants, textile technologists, visual merchandisers and pattern technologists, or can become entrepreneurs.			
Bachelor of Consumer Science *Food Retail Management* [4 years]	5	4	**28**
Careers: Graduates can be employed as brand managers, sales managers or store managers, food and beverage buyers and planners, food stylists, food journalists, food product marketers, visual merchandisers and consumer consultants, or can become entrepreneurs.			
Bachelor of Consumer Science *Hospitality Management* [4 years]	5	4	**28**
Careers: Graduates can be employed as food and beverage managers, food service managers, culinary specialists, events coordinators, entrepreneurs, food product and menu developers, food journalists, food safety and quality assurance managers, and food stylists.			

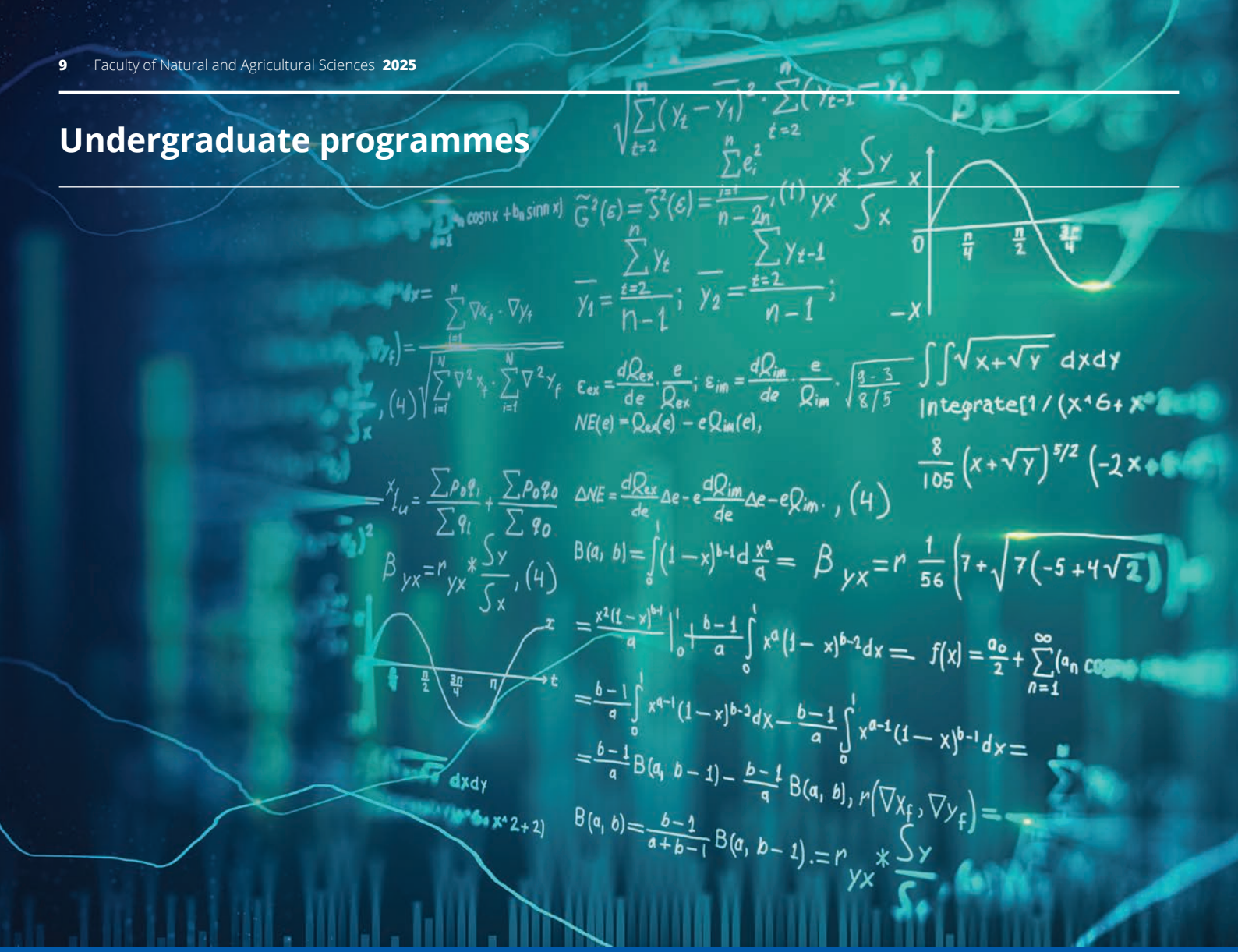
Undergraduate programmes

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
PHYSICAL SCIENCES	**English Home Language or English First Additional Language**	**Mathematics**	**Physical Sciences**	
Bachelor of Science *Chemistry* [3 years]	5	5	5	**34**
Careers: Graduates are employed in most technology-based institutions and work in laboratory environments that form part of industrial, research or academic institutions. A chemist must be able to participate in teamwork in a multidisciplinary environment and a wide variety of enterprises in both the private and public sectors. It is important to note that the type of work available to a graduate in chemistry depends on the level of the qualification obtained. Advanced qualifications will eventually lead to positions in research and/or production management and require management and financial planning skills. Many career opportunities exist in the fields of education, research, journalism, environmental protection, food and beverages, energy, water, health, sports, pharmaceutics and cosmetics, geology, mining and law enforcement. These include the well-known professions of synthetic chemist, materials scientist, chemical pathologist, forensic chemist, analytical chemist, drug analyst, patent lawyer, environmental chemist, geochemist, food chemist, polymer chemist and soil chemist.				
Bachelor of Science *Physics* [3 years]	5	5	5	**34**
Careers: Graduates could be employed as university academics, whose duties include lecturing, research and the supervision of postgraduate students, researchers in national laboratories such as the Nuclear Energy Corporation of South Africa (NECSA), the South African Astronomical Observatory or iThemba LABS (Laboratory for Accelerator-based Sciences), researchers in industry, for example at the CSIR or Element Six, science advisors for non-governmental organisations, industry or government, radiation scientists, medical scientists and biophysicists, atmospheric scientists and climatologists, developers of renewable energy sources, geophysicists, innovators and entrepreneurs, and computational scientists. International collaboration also takes place with experts from abroad.				
Bachelor of Science *Geography* **[Option: Geography and Environmental Science]** [3 years]	5	5	5	**34**
Careers: This degree offers a range of career paths, including teaching, research (for a variety of bodies) and the application of geographical knowledge and skills in practice. Graduates can focus on environmental management; urban issues such as informal settlements; regional and rural development; and environmental health or environmental issues, including pollution, climate change and the understanding and addressing of negative impacts on biodiversity/ecosystem services through activities such as mining, agriculture and tourism. Environmental specialists act as consultants in the fields of environmental analysis and management, environmental law, environmental standards, environmental management systems and environmental auditing. They are needed by, among others, professionals in private sector institutions involved with environmental issues, for example, transport and civil engineers, town and regional planners and landscape architects. In the private sector, graduates are generally employed by real estate, planning, architectural and engineering firms, and by banks, tourism organisations, environmental conservation bodies and industry. Government departments such as the Departments of Forestry, Fisheries and the Environment (DFFE), Agriculture, Land Reform and Rural Development (DALRRD), Water and Sanitation (DWS), Tourism (DT), Basic Education (DBE) and Higher Education and Training (DHET), and Statistics South Africa (Stats SA), the South African National Antarctic Programme (SANAP), and the Environmental Management Inspectorate (EMI) - Green Scorpions also employ these graduates, as do parastatal organisations such as the South African Bureau of Standards (SABS), the South African Biodiversity Institute (SANBI) and the Council for Scientific and Industrial Research (CSIR). Many graduates are also self-employed, working mainly in areas such as marketing, planning, development, tourism, cartography, remote sensing, environmental analysis, social impact assessments and environmental auditing.				

Undergraduate programmes

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			
PHYSICAL SCIENCES	**English Home Language or English First Additional Language**	**Mathematics**	**Physical Sciences**	**APS**
Bachelor of Science *Geoinformatics* [3 years]	5	5	5	**34**
Careers: Graduates with a Bachelor of Science *Geoinformatics* readily find work at organisations such as Geographic Information System (GIS) vendors (ESRI or Intergraph), the CSIR, GIS consultants (AfriGIS, GeoTerralmage, GISCOE), planning consultants (e.g., Cadreplan or Plan Practice), environmental consultants (e.g. Golder or Pegasys), civil engineering consultants (Aurecon, SSI), the South African National Space Agency (SANSA), National Geospatial Information (NGI), or any municipality in the country. Many government departments (eg DEFF, DSI, Stats SA, DALRRD and DWS) also employ GISc professionals. The South African Geomatics Council has accredited the Bachelor of Science *Geoinformatics* and BScHons *Geoinformatics* programmes. Bachelor of Science *Geoinformatics* graduates can register as candidate Geomatics Technologists in GISc (GTg GISc), and BScHons *Geoinformatics* graduates can register as candidate Geomatics Professionals in GISc (GPr GISc).				
Bachelor of Science *Geology* [3 years]	5	5	5	**34**
Careers: Large international mining companies are significant employers of geologists and other geoscientists in research, exploration and mining projects. However, employment is increasingly to be found in smaller, entrepreneurial firms ('juniors'). The Council also offers exciting careers for Geosciences, the CSIR, and the Council for Mineral Technology (MINTEK), DWS, and at museums, engineering firms and consulting companies. Graduates may even operate as self-employed consultants in their own firms. Laboratory specialists, for example, mineralogists, identify and examine minerals using sophisticated instruments and analytical equipment. Environmental and engineering geologists study the interaction between human activities and the geological environment, such as the pollution of soil and groundwater. They investigate geological structures and soil, and rock properties at construction sites, for example, dams, tunnels and mines, to provide valuable information before construction. They also locate and evaluate suitable construction materials. The task of the hydrogeologist is to look for groundwater and monitor the responsible exploitation of that water.				
Bachelor of Science *Meteorology* [3 years]	5	5	5	**34**
Careers: UP graduates in meteorology work as weather forecasters, researchers, climatologists, and lecturers and institutions. Meteorologists are employed by institutions involved in the study, interpretation, and prediction of weather, atmospheric science, and phenomena relating to the climate. The South African Weather Service (SAWS), the Council for Scientific and Industrial Research (CSIR), some universities, agricultural institutions, municipalities, consultants, and industries employ meteorologists who mainly practice as specialists. The BScHons *Meteorology* degree, which is required to become a professional meteorologist, conforms to all the requirements for a meteorologist according to the definition of the World Meteorological Organization (WMO) Technical Regulations.				
Bachelor of Science *Environmental and Engineering Geology* [3 years]	5	5	5	**34**
Careers: Engineering and environmental geologists study the interaction between human activities and the geological environment, such as the pollution of soil and groundwater. They investigate geological structures and soil and rock properties at construction sites, for example, dams, tunnels and mines, to provide valuable information before construction. They also locate and evaluate suitable construction materials. The task of the hydrogeologist is to search for groundwater and monitor the responsible exploitation of that water.				

Undergraduate programmes



Programmes	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
MATHEMATICAL SCIENCES	**English Home Language or English First Additional Language**	**Mathematics**	
Bachelor of Science *Actuarial and Financial Mathematics* [3 years]	5	7	**36**
Careers: Actuarial and financial mathematics is a popular field, with career opportunities in the business market and at investment institutions such as banks and insurance companies. Mathematical skills are essential in portfolio management and the modelling of financial risk. This programme prepares students for professional careers as actuaries or financial engineers. The activities of actuaries or actuarial technicians include long-term capital projects, designing the benefits of medical schemes, pension fund management, the determination of contributions and financial management on a sound long-term basis, the evaluation of investments in shares, property and other transactions, and the determination of the premiums and reserves for insurers' outstanding claims. Financial engineers can be employed by banks and financial institutions, brokerage firms and investment institutions. The mathematical skills of financial engineers are essential in portfolio and risk management. Activities include asset management (trading in bonds, futures and derivative instruments such as options), designing new financial products and devising strategies to control credit risk.			
Bachelor of Science *Mathematics* **Bachelor of Science *Applied Mathematics*** [3 years]	5	6	**34**
Careers: Graduates in mathematics and applied mathematics are employed by research institutions, educational bodies (universities and schools), the public sector (government and medical institutions) and the private sector (engineering companies, financial institutions and the computer industry). These graduates' training in abstract, analytical and computational thinking provides them with the background required to easily adjust to changing circumstances in the professional environment and to construct mathematical models of natural, technological and financial phenomena. Mathematicians and applied mathematicians apply, evaluate and adapt existing problem-solving techniques, or develop new techniques to solve problems.			
Bachelor of Science *Mathematical Statistics* [3 years]	5	6	**34**
Careers: By completing this programme you will therefore be positioned at the forefront of analytical thinking and application in the statistical, computational and interdisciplinary environments of the future. What career opportunities exist for you as a graduate? Many professions amongst others: Data scientist, data analyst, financial risk analyst, financial analyst, geospatial information analyst, biostatistician, statistical software engineer. Some examples of career opportunities are: ▪ Google Analytics use statistics to track internet users to generate leads for their recommended engines. ▪ Movement information captured by cell phones is used by statistical predictive models to predict traffic congestion and suggest faster routes. ▪ Statisticians make use of statistical methodologies to detect fraud, assist with credit-related portfolios and forecast financial-economic trends. ▪ Retail companies study customer satisfaction and customer experience by using statistical models. ▪ Statisticians are prominent in the modelling of climate change, crime hotspots, rhino-poaching, diseases, etc. ▪ Statisticians advise animal scientists on factors affecting animal nutrition and genetic breeding plans. ▪ Government employs statisticians to understand population demographics, health risks and other factors that influence sustainable development programmes.			

Single, double and triple major degree programmes

Although programmes are more generic during the first year to provide sound foundations, students who progress to the second year are advised to carefully consider the combinations that may be possible in their second and third years, which strongly relate to each other concerning prerequisites. Explanatory infographics can be seen on the NAS Faculty web page and detailed information is provided in the yearbook at www.up.ac.za/yearbooks/home.

The Bachelor of Consumer Science and Bachelor of Science in Agriculture degrees have relatively fixed curricula, but most of these programmes are multidisciplinary. The other NAS programmes offer a variety of combinations. There are 12 biological sciences programmes, which represent more than 50 possibilities for single or double majors, and even one triple major degree programme. Single major degrees can be obtained in most disciplines, but they all offer double major combinations to make it possible for graduates to choose either one of their majors for postgraduate study. In the physical sciences, there are six programmes, but more than 20 combinations.

There are several single major degrees (eg Environmental and Engineering Geology), but chemistry, geology and physics offer double majors. The mathematical sciences offer similar possibilities, with two streams in the professional programme in Actuarial and Financial Mathematics, and double major options in the Applied Mathematics, Mathematics and Mathematical Statistics programmes.

Open Day 2024

NAS OPEN DAY

Save the date: 16 March 2024

Become a Scientist – change the world!

We are excited to announce our first open day of the Faculty of Natural and Agricultural Sciences for Grade 11 and 12 learners with English (HL/L1 or FAL), Mathematics and Physical Sciences as subjects.
(The invitation will follow on 1 February 2024, and registration for the event will open on 1 February 2024.)

- Biological Sciences
- Agricultural and Food Sciences
- Mathematical Sciences
- Physical Sciences
- Information Sessions
- Meet the Faculty
- Meet the Industry
- Facility and Campus Tours

Biological Sciences

Anatomy

Bachelor of Science *Medical Sciences*

The Department of Anatomy is part of the School of Medicine in the Faculty of Health Sciences and offers a Bachelor of Science *Medical Sciences* degree in the Faculty of Natural and Agricultural Sciences. Students are trained in the basic medical sciences, which include clinical anatomy, physical and forensic anthropology, histology, cell biology and embryology. These subjects can be combined with elective modules from physiology, pharmacology and genetics. Ideally, students who register for this degree should have a keen interest in research related to anatomy and the basic medical sciences.

What makes this programme unique?

Students are trained in the basic medical sciences, including clinical anatomy, physical anthropology and cell biology. During the course of their studies they work with human material, including human skeletal material, and do cadaver dissection.

Career opportunities

Career opportunities exist in the field of research in any of the subdisciplines of anatomy, in academia, in forensic science and in the health science industry.

Other careers that may be considered are in sports science, virology, chemical pathology, immunology, health administration or ergonomics. Technical careers, for example in the Departments of Anatomy or Physiology at universities, are another possibility.

Which companies employ our graduates?

Graduates are sought after by institutes in the academic, government and private sectors, where they are employed as lecturers, researchers, medical and forensic scientists, and sales representatives in the medical and pharmacological industries. Several of our postgraduate students are currently studying at research facilities in North America and Europe.

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Medical Sciences* [3 years]	5	5	5	32

www.up.ac.za/anatomy/article/37643/undergraduate

Biological Sciences

Biochemistry, Genetics and Microbiology

Bachelor of Science *Biochemistry*

Life at the cellular and molecular levels depends on the specific interaction and cooperation of many individual biomolecules. To understand life at a fundamental level, biochemists study the role of individual biomolecules and relate this function to its unique structure and its interactions with other molecules.

Challenges of global relevance, such as COVID-19, HIV/AIDS, malaria, tuberculosis, antimicrobial drug resistance and other human or animal diseases are addressed by using flow cytometry, biophysical analysis, protein crystallography, genome analysis, selective gene expression and metabolic profiles.

Biochemists can work in medicine, veterinary science, the food and pharmaceutical industries, agricultural research and many other fields.

First-year students are exposed to a range of biological, physical and mathematical science subjects to provide them with a firm scientific basis. In the second and third years, they delve deeper into biochemistry, combining theoretical lectures with appropriate practical studies to learn the principles and methodology of best biochemical practice. In the third year, the genome, transcriptome, proteome and metabolome of a living cell is studied and proteome analysis, crystallography, cell structure and function, enzymology and immunology are applied to understand the molecular basis of disease.

Ideally, biochemistry is combined with chemistry, genetics, human physiology, microbiology, plant science and zoology, which all include both theoretical and practical aspects. Students may choose elective modules related to their studies.

Who is the ideal candidate?

A candidate for the Bachelor of Science *Biochemistry* programme should be motivated, innovative, persistent, meticulous and curious about life.

What makes this programme unique?

This degree falls under the Department of Biochemistry, Genetics and Microbiology and provides a firm basis for a career in the life sciences.

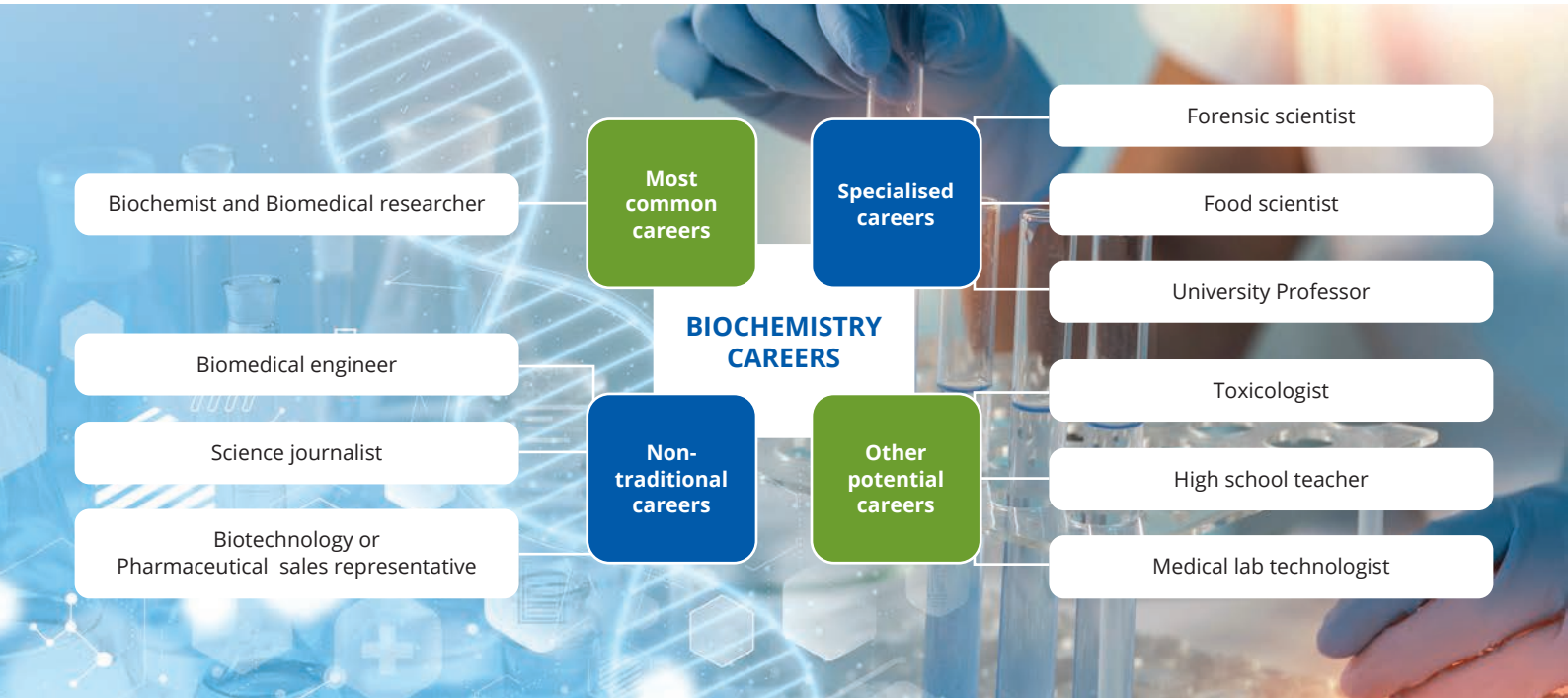
First-year students are exposed to a range of biological and physical science subjects to ensure a firm scientific basis. In the second and third years, they delve deeper into biochemistry, combining theoretical lectures with appropriate practical studies to learn the principles and methodology of research.

Ideally, biochemistry is combined with chemistry, microbiology, genetics, human physiology, plant science, zoology and/or food science.

Transferable skills gained while studying biochemistry include critical observation and analysis, project planning, report writing, time management, problem solving, logical thinking and computer literacy.

Career opportunities

Biochemistry offers many opportunities for exciting and challenging careers in medical research and in the food and pharmaceutical, fine chemicals and waste processing industries. Possible employers are academic institutions, research councils such as the Medical Research Council (MRC), the Agricultural Research Council (ARC), the Cancer Association of South Africa (CANSA) and the Water Research Commission (WRC), and applied research agencies such as the Council for Scientific and Industrial Research (CSIR) and forensic and pathology laboratories. Career opportunities include those of researcher, lecturer, teacher and medical representative. Graduates are comfortable in work environments such as universities, research institutes, pharmaceutical and biotechnology companies and related industries.



Biological Sciences

Biochemistry, Genetics and Microbiology

Which companies employ our graduates?

- Academic institutions
- Agribusiness companies
- Biomedical engineering environments
- Biotech-nological companies
- Cosmetic companies
- Food product development
- Forensic research
- Government
- Hospital laboratories
- Pharmaceutical companies
- Publishing companies
- Regulation companies
- Research institutions
- Sales and marketing firms

'I am fascinated by nature and science and could not have asked for a better degree. This incredible three-year degree gave me insight into how science and nature combine to produce something amazing.

I have also learnt how to recognise, understand and interpret key concepts, especially in the fields of biochemistry, genetics and microbiology. The skills and abilities acquired throughout the course have ensured that I will have access to career opportunities in industry and academia.

I am currently enrolled for postgraduate studies at UP and am involved in researching new ways to combat malaria.'

Henrico Langeveld – MSc *Biochemistry*

'The theoretical and practical aspects of this degree contributed to my intellectual development. What I enjoyed most about the course was the endless opportunities it offered to gain more knowledge by attending research seminars and annual symposiums. Using the knowledge of botany gained during my studies, I have started my own nursery at home.

I have also been able to put my knowledge of chemistry and biochemistry to good use and have started a chemicals company where household chemicals are produced. We are currently in the process of obtaining SABS approval for our products. My future plans include collaborating with other graduates to open our own pharmacy.

The broad scope of this degree provides the basis for a wide range of entrepreneurial ventures, but also qualifies graduates for good employment opportunities in companies that require the scarce skills developed by the programme.'

Meshack Kekana – MSc *Biochemistry*

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Biochemistry* [3 years]	5	5	5	**32**

Biological Sciences

Biochemistry, Genetics and Microbiology

Bachelor of Science *Genetics*, Bachelor of Science *Human Genetics* and Bachelor of Science *Biotechnology*

The Division of Genetics offers internationally recognised undergraduate and postgraduate degrees. Genetics is at the core of the biological, agricultural, veterinary and medical sciences and has become essential in fields as diverse as virology and epidemiology, biodiversity conservation and sustainable agriculture.

Single- and double-major options are offered in both the Bachelor of Science *Genetics* and Bachelor of Science *Human Genetics* programmes. Students can therefore choose to either specialise in genetics as a single major, or combine their genetics subjects with a second major, such as biochemistry, microbiology, plant science or zoology in the Bachelor of Science *Genetics* programme, or with human physiology in the Bachelor of Science *Human Genetics* programme.

The interdepartmental Bachelor of Science *Biotechnology* programme places particular emphasis on molecular biology and is aimed at empowering students to pursue their interest in biotechnology. Undergraduate training includes exposure to aspects of biochemistry, genetics and microbiology, in addition to the other subjects chosen by the student.

Our degrees are research-oriented and place a strong emphasis on understanding underlying concepts and principles, as well as on developing the necessary problem-solving and analytical skills. Students are encouraged to decide on their postgraduate research direction during their undergraduate studies and to choose their electives accordingly.

What makes this programme unique?

At the undergraduate level, students are provided with a thorough background in the principles of genetics, as well as the application of those principles in fields as diverse as genomics, plant and animal biotechnology, diagnostics and risk determination, bioethics, conservation ecology and population, and behavioural and evolutionary studies. Graduates acquire skills in analytical and critical thinking, as well as creativity in problem solving and data handling, which equip them for success in both scientific and non-scientific careers.

Which companies employ our graduates?

Genetics graduates are employed by institutes such as the CSIR, NHLS, ARC, NRF, SANBI and NICD. Some of the fields in which graduates have been employed are:

- academia;
- plant and crop breeding;
- animal health;
- microbiology;
- virology;
- agriculture and wildlife;
- medical and pharmaceutical;
- computational biology and bioinformatics;
- biomedical science communication;
- corporate business and sales; and
- human and medical genetics.

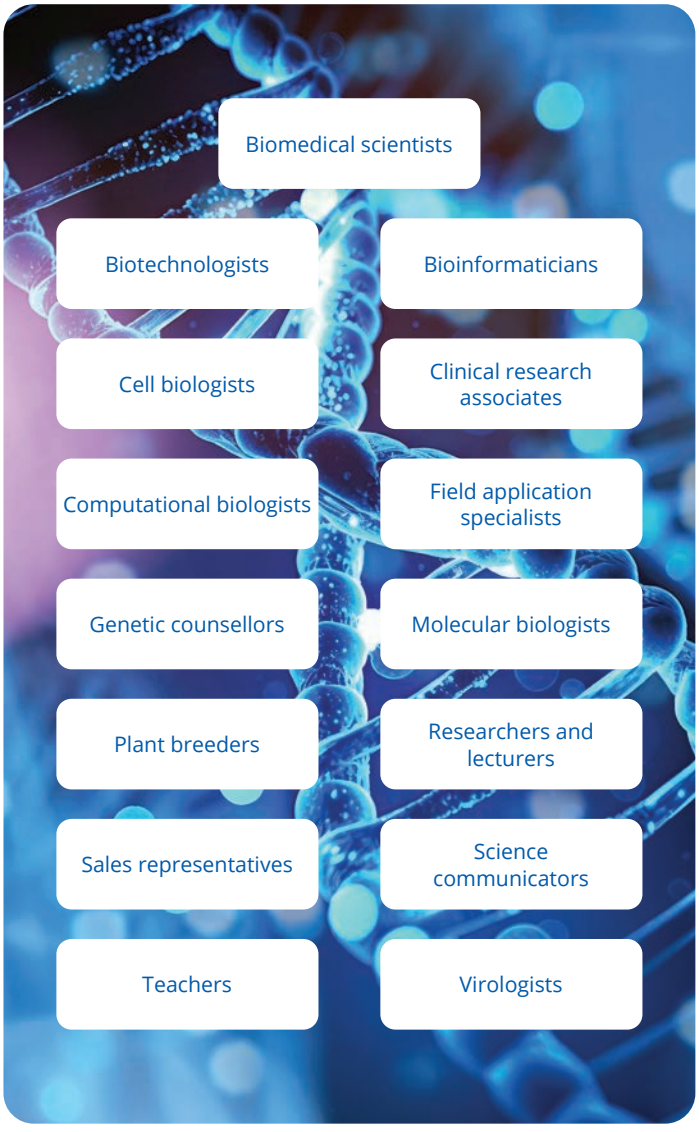
Who is the ideal candidate?

Effective science is increasingly becoming transdisciplinary and involves multifaceted research teams and expertise.

Individuals seeking to enrol in programmes such as Genetics should be innovative and creative thinkers with curious minds who exhibit inquiry-driven tenacity, display a passion for life-science-related topics and have a fair understanding of mathematics.

Career opportunities

Employment opportunities are available in various fields and graduates may be employed as:



Biological Sciences

Biochemistry, Genetics and Microbiology

Minimum admission requirements

Programmes	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Genetics* **Bachelor of Science *Human Genetics*** [3 years]	5	5	5	**32**
Bachelor of Science *Biotechnology* [3 years]	5	5	5	**32**

Bachelor of Science *Genetics*
Students complete all five of the final year **Genetics** modules together with three modules chosen from either Biochemistry, Plant Science, Zoology or Microbiology.

Single Major

Double Major — **Genetics** modules can be combined with an equivalent number of modules from either **Biochemistry, Plant Science, Microbiology, Zoology** or **Entomology**.

Bachelor of Science *Human Genetics*
Final year **Genetics** modules can be taken together with a selection of modules from Human Physiology, Biochemistry, Pharmacology or Microbiology.

Single Major

Double Major — **Genetics** modules can be combined with an equivalent number of modules from **Human Physiology**.

Bachelor of Science *Biotechnology*

Elective modules may be chosen from either **Genetics, Biochemistry, Plant Science** or **Microbiology**. The choice of modules determine a student's postgraduate outcomes.

Bachelor of Science *Medical Sciences*

Double Major — **Genetics** modules can be combined with an equivalent number of modules from **Human Anatomy**.

Bachelor of Science *Human Physiology, Genetics and Psychology*

Triple Major — Modules from all three fields are taken at final year level. Students may continue with postgraduate studies in **Genetics** by adding one additional final year Genetics module.

Postgraduate study options

Additional postgraduate study options available in other Departments and programmes depending on the student's choice of modules at final year level.

Biological Sciences

Biochemistry, Genetics and Microbiology

Bachelor of Science *Microbiology*

Microbiology is the study of organisms that cannot be seen with the naked eye, such as bacteria, fungi, algae and viruses. Essentially, the microbiology study programme, with its focus on the structure, function and classification of microbial species, is the gateway to the fascinating microbial world.

Students enrolled for this degree will be exposed to a wealth of tools and theoretical information, which can be applied to exploit and control microbial activities for improving industrial and agricultural processes, as well as for improving the lives of animals, humans and plants in the ecosystem.

Who is the ideal candidate?

Aspiring microbiologists should have a solid background in science and are expected to demonstrate curiosity about how biological systems function in their environments. Microbiology overlaps with areas such as botany, chemistry, zoology, physiology, genetics, medicine, nutrition and environmental sciences.

Candidates recognise that the field of microbiology has evolved, and continues to evolve, to cut across scientific disciplines, and understand that microbes impact every aspect of life on earth.

What makes this programme unique?

In microbiology, students learn about the different types of microbes which, even though invisible to the naked eye, represent the most abundant life forms on earth. It is believed that many microbes have not yet been discovered, and others are well adapted to survive in extreme conditions (eg in hydrothermal vents) that resemble conditions believed to have been prevalent when life began on earth billions of years ago. Microbiology is also one of only a few degree programmes that unites a diverse group of individuals (eg immunologists, geneticists, bioinformaticians, computational biologists, environmental scientists, etc) under one umbrella.

Career opportunities

Since the field of microbiology has many branches, graduates can follow various careers in industry or in academia, where they can contribute to increasing scientific knowledge, or they can establish their own businesses.

Which companies employ our graduates?

Graduates with microbiology degrees are employed by leading research institutes in South Africa, including the CSIR, ARC, FABI, NICD, SASRI, MRC and NRF, and by biotech industries such as Inqaba Biotech, CapeBio, Akili Labs and BioTech Africa. Generally they are employed as:

- Managers (eg Land remediation/Laboratory manager)
- Food technologists
- Laboratory technicians
- Quality assurance specialists
- Plant pathologists
- Medical/Clinical microbiologists
- Biomedical scientists
- Bioinformaticians
- Agricultural scientists
- Scientific writers

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Microbiology* [3 years]	5	5	5	**32**

Biological Sciences

Human Physiology

Bachelor of Science *Human Physiology*

During the first year of study for this degree, students are exposed to a generic range of subjects from the biological and agricultural sciences. In the second year they study physiological systems, which include the neurophysiological, haematological, cardiovascular, pulmonary, renal, nutritional and digestive, endocrinological and reproductive systems), with biochemistry as a compulsory subject.

The study programme for the third and final year includes a selection of integrated physiology modules, such as exercise and nutrition physiology, cellular and developmental physiology, applied and pathophysiology, higher neurological function and industrial physiology. At the third-year level, students have an opportunity to select elective modules in the programme. The Bachelor of Science *Human Physiology* programme will appeal to scientifically minded students who are inquisitive by nature.

What makes this programme unique?

Physiologists study the mechanisms by which the body functions from the molecular and cellular levels through progressive differentiation to tissue, organs and systems, and eventually the integrated interactions and control of body functions. This core knowledge is applied in research undertaken to investigate normal and abnormal life processes.

'I decided to study Bachelor of Science *Human Physiology* as I was highly intrigued about how the human body functioned, on a molecular and cellular level. The opportunity to study the degree had exposed me to a great number of experts in physiology and led me to have a greater understanding in the process associated with mundane things such as thinking, breathing and digestion. The road of studying the degree has let me pursue my passion in research. I am currently studying a MSc in the neuro track of physiology and I am highly interested in how ultrasound can be used as a tool in a neuro-surgical setting. My dream is to obtain my PhD and pursue health research further that will one day benefit the neurophysiology and neurosurgical field, which will hopefully lead to a greater understanding of the human brain.'

Muhammad J Bassa – Bachelor of Science *Human Physiology*

Career opportunities

Research is undertaken in cooperation with medical teams in private and government research laboratories at, for example, the Council for Scientific and Industrial Research (CSIR), the Medical Research Council (MRC), the South African Bureau of Standards (SABS), pharmaceutical firms, universities, veterinary and industrial institutions, state departments (for example the Department of Health) and health firms. Physiologists also make contributions in the fields of education (as teachers, lecturers and instructors), sports physiology, biostatistics, bioengineering, industrial hygiene, journalism, medical technology and, in the industry, as representatives of pharmaceutical firms.

Which companies employ our graduates?

Our graduates are employed by:

- Academia
- State departments (eg the Department of Health)
- Medical and pharmaceutical companies
- Private and government research laboratories (CSIR, MRC, NHLS, ARC, NRF, SANBI and NICD)
- Computational biology and bioinformatics companies
- Biomedical science communication companies
- Corporate and sales businesses
- Wellness companies

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Human Physiology* [3 years]	5	5	5	**32**

Biological Sciences

Human Physiology

Bachelor of Science *Human Physiology, Genetics and Psychology*

During the first two years of study, students are exposed to fundamental core scientific and biology-related modules. Final-year studies include modules from all three disciplines (Physiology, Genetics and Psychology), thus creating opportunities to continue with postgraduate studies in any of the three disciplines. The Bachelor of Science *Human Physiology, Genetics and Psychology* programme is recommended for individuals with a passion for biological and related sciences who wish to gain core knowledge in these fields.

What makes this programme unique?

The structuring of the programme, which allows students to choose any one of three majors for postgraduate studies, is quite unique. Another notable feature is the transdisciplinary inclusion of Psychology as a humanities module, which offers additional opportunities.

Which companies employ our graduates?

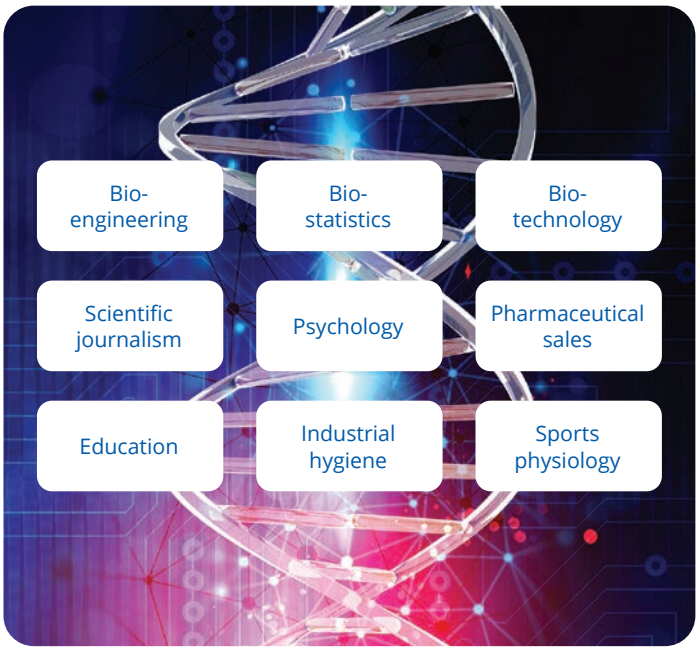
Our graduates are employed by:

- Academia
- State departments (eg the Department of Health)
- Medical and pharmaceutical companies
- Private and government research laboratories (CSIR, MRC, NHLS, ARC, NRF, SANBI and NICD)
- Veterinary and industrial institutions
- Computational biology and bioinformatics companies
- Biomedical science communication companies
- Corporate and sales businesses
- Wellness companies
- Human and medical genetics laboratories

Career opportunities

Many of the career options are research oriented. Research is conducted in cooperation with medical teams at private and government research laboratories, pharmaceutical firms, universities, veterinary and industrial institutions. Further study can lead to careers in genetic counselling and psychology.

Graduates who have obtained this degree are also employed in the fields of:



Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Human Physiology, Genetics and Psychology* [3 years]	5	5	5	**32**

Biological Sciences

Plant and Soil Sciences

Bachelor of Science *Plant Science*

Although plants are amazing organisms, we actually know very little about their potential uses. It is, however, well known that plants are the best factories for synthesising valuable natural products.

A degree in plant sciences is a three-year degree that broadly covers all relevant aspects of plant sciences. Further studies allow students to specialise in medicinal plant science, plant biotechnology or ecology and biodiversity.

In medicinal plant sciences, students learn about the discovery and use of plant medicines and phytotherapeutically important molecules obtained from plants. Students studying Plant Biotechnology learn about molecular tools and the use of model plants to study plant physiology. In the study of plant diversity and ecology, students learn about South Africa's rich and diverse vegetation and its origin, and how to facilitate conservation and management strategies for future generations.

Who is the ideal candidate?

The ideal candidate is someone who is inquisitive, has a broad interest in plants and the environment, conservation and in improving wellness and quality of life.

What makes this programme unique?

The Department is dynamic, innovative, modern and relevant. Staff members undertake world-class research and 70% have received NRF ratings.

Much of the research (including soil science) is of an applied nature and contributes to the improvement of agricultural crops and methods, knowledge of plant diseases, the use of plant-derived compounds, biodiversity (including evolutionary systematics and ecology) and plant biotechnology.

Which companies employ our graduates?

Our graduates are employed at:
- Medical Research Council (MRC)
- The Council for Scientific and Industrial Research (CSIR)
- The South African National Biodiversity Institute (SANBI)
- Pharmaceutical industries
- Tertiary institutions
- Government departments

Career opportunities

- Academic/ teacher
- Agricultural specialist
- Climate change biologist
- Conservationist
- Ecological consultant
- Pharmaceutical researcher
- Plant biotechnologist
- Plant systematist

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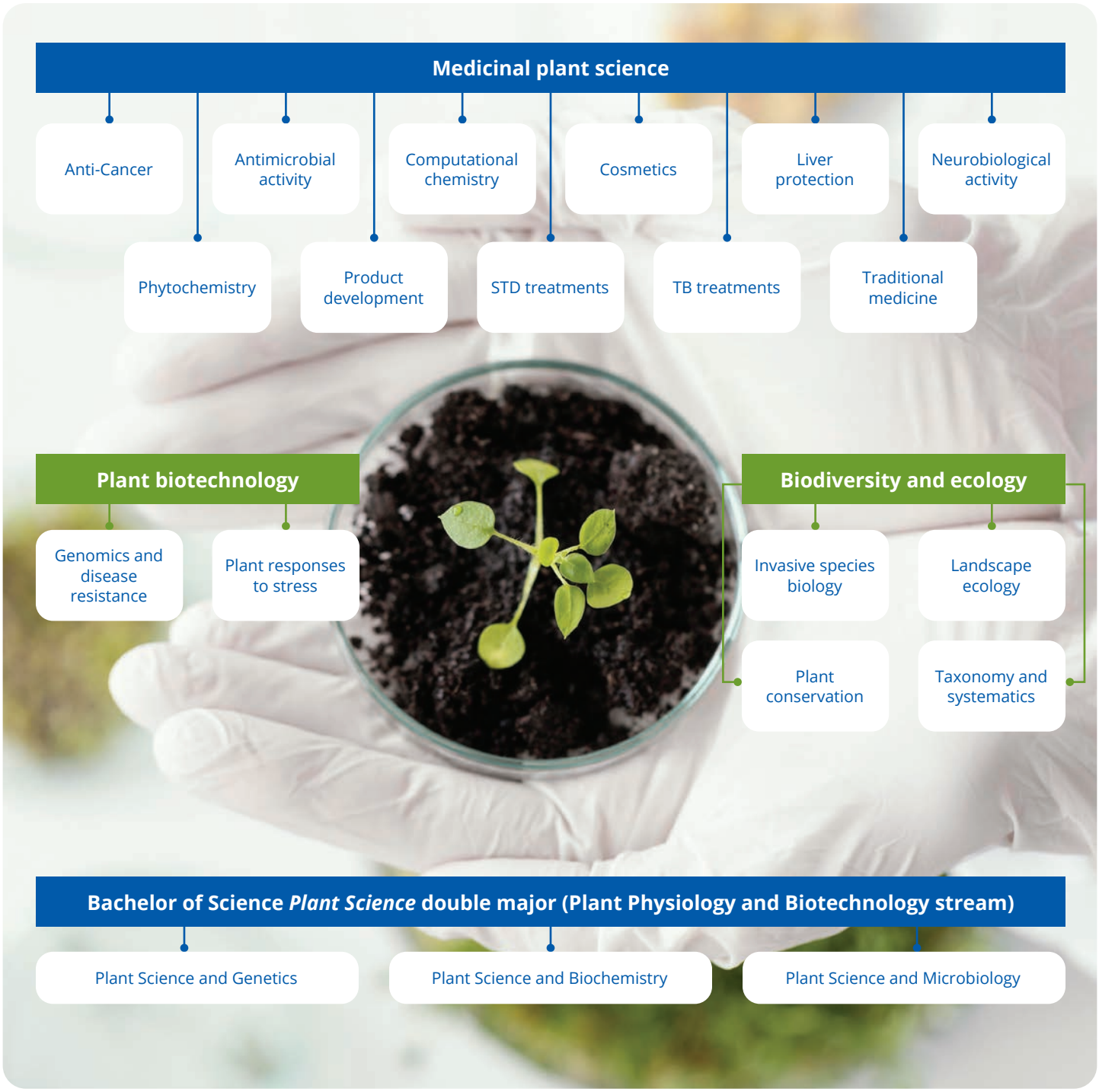
Biological Sciences

Plant and Soil Sciences

Bachelor of Science *Plant Science* (continued)



Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Plant Science* [3 years]	5	5	5	**32**

Biological Sciences

Zoology and Entomology

Bachelor of Science *Ecology*

The Bachelor of Science *Ecology* programme explores how animals and plants interact with each other and the natural environment. It will allow you to contribute to their conservation and solve the challenges threatening life on Earth.

If you want to pursue a career in biodiversity conservation, environmental consultancy, land rehabilitation or wildlife management, this programme is for you.

What makes this programme unique?

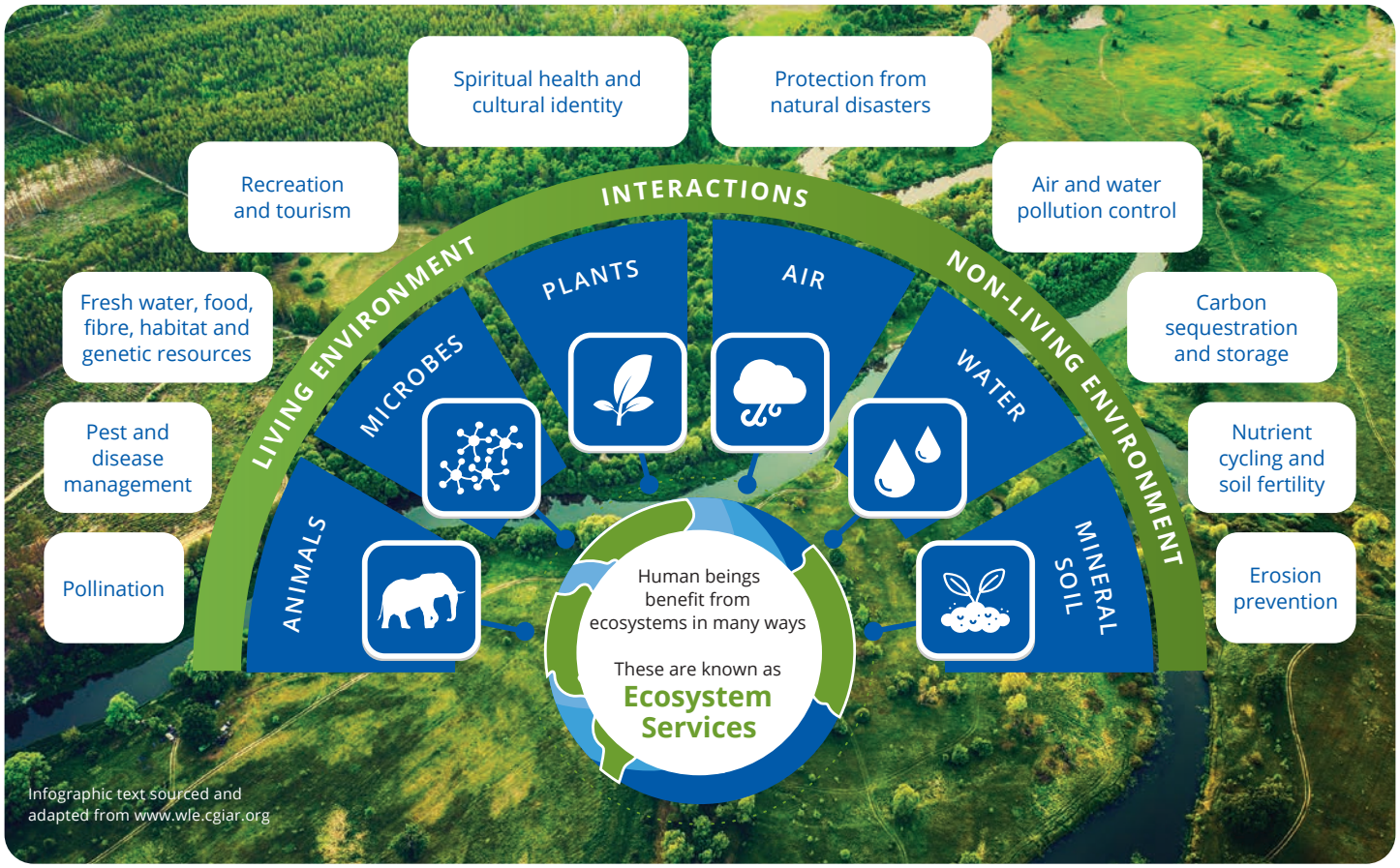
Bachelor of Science *Ecology* is the only programme of its kind offered in South Africa and teaching is focused on animals and plants, ecology, geographic information systems and quantitative statistics.

Career opportunities

As a graduate you can find employment as a conservation officer or manager, environmental consultant or manager, game ranger, research scientist, data manager and more.

Which companies employ our graduates?

You can find employment at government agencies concerned with the environment, conservation organisations, state or private game reserves, environmental consultancies and education initiatives, academic and training institutions and many more.



Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Ecology* [3 years]	5	5	5	**32**

Biological Sciences

Zoology and Entomology

Bachelor of Science *Entomology*

The Bachelor of Science *Entomology* programme gives exciting insights into insect diversity, conservation, ecology and physiology. As a graduate you can help to protect our crops, livestock, human health and the environment. This programme is right for you if you want a career in forensics, environmental affairs, or plant, animal or public health.

Which companies employ our graduates?

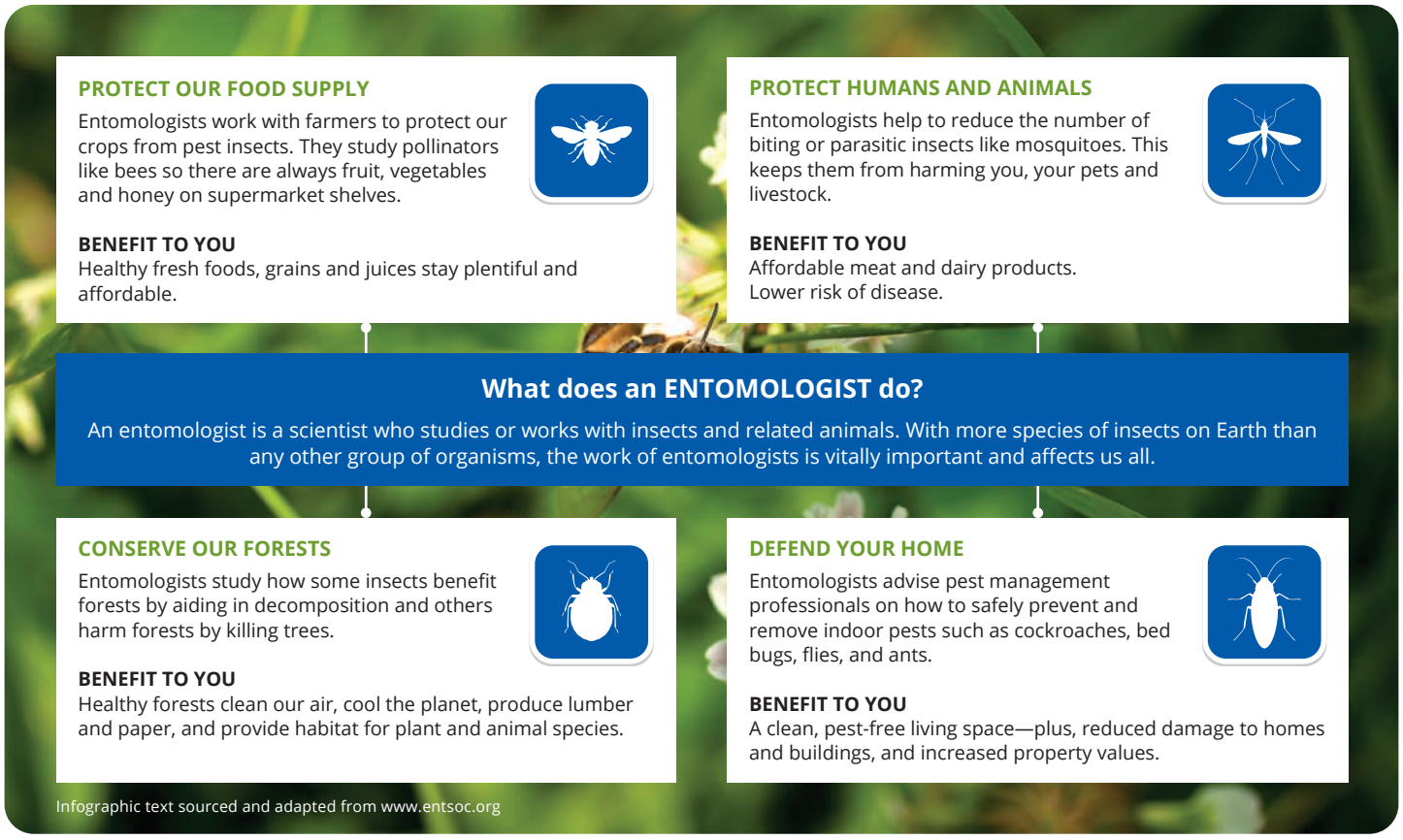
Graduates are employed by various government and international agencies, agricultural industries and research institutes, environmental consultancies, nature conservation agencies, museums, the South African Police Service, and public health research and policy institutes. You could even set up your own business in the growing industries of insect production for biological control, feed for animals or food for humans.

What makes this programme unique?

All of our lecturers are leaders in their fields. They have strong ties to governments, local and international organisations, and industries. This unlocks employment and postgraduate opportunities.

Career opportunities

Graduates find employment as researchers in biological control, curators for entomological collections, environmental consultants and managers, forensic entomologists, specialists in insect pest management, insect-rearing and laboratory technicians, quarantine officers, public health practitioners, and many more.



PROTECT OUR FOOD SUPPLY

Entomologists work with farmers to protect our crops from pest insects. They study pollinators like bees so there are always fruit, vegetables and honey on supermarket shelves.

BENEFIT TO YOU
Healthy fresh foods, grains and juices stay plentiful and affordable.

PROTECT HUMANS AND ANIMALS

Entomologists help to reduce the number of biting or parasitic insects like mosquitoes. This keeps them from harming you, your pets and livestock.

BENEFIT TO YOU
Affordable meat and dairy products.
Lower risk of disease.

What does an ENTOMOLOGIST do?

An entomologist is a scientist who studies or works with insects and related animals. With more species of insects on Earth than any other group of organisms, the work of entomologists is vitally important and affects us all.

CONSERVE OUR FORESTS

Entomologists study how some insects benefit forests by aiding in decomposition and others harm forests by killing trees.

BENEFIT TO YOU
Healthy forests clean our air, cool the planet, produce lumber and paper, and provide habitat for plant and animal species.

DEFEND YOUR HOME

Entomologists advise pest management professionals on how to safely prevent and remove indoor pests such as cockroaches, bed bugs, flies, and ants.

BENEFIT TO YOU
A clean, pest-free living space—plus, reduced damage to homes and buildings, and increased property values.

Infographic text sourced and adapted from www.entsoc.org

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Entomology* [3 years]	5	5	5	**32**

Biological Sciences

Zoology and Entomology

Bachelor of Science *Zoology*

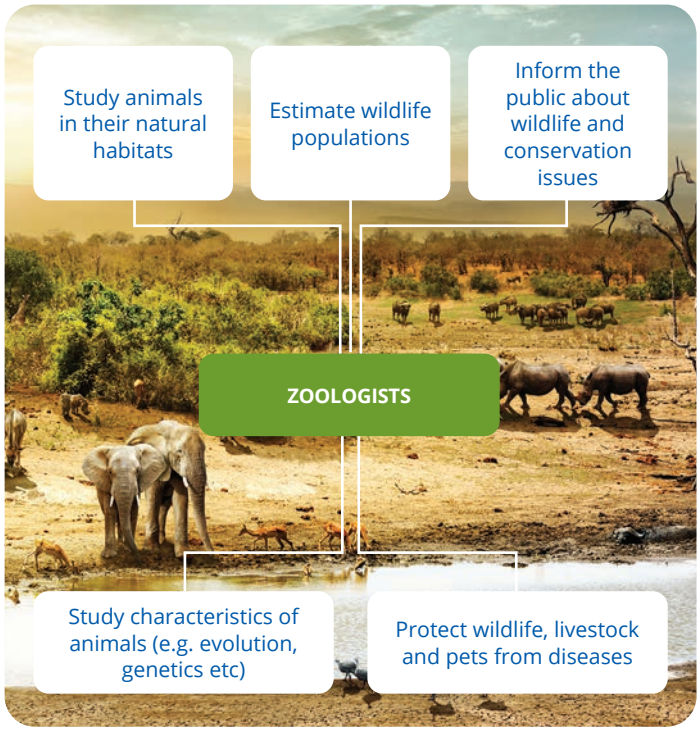
Zoology is the scientific study of animal life. In the Bachelor of Science *Zoology* programme you will gain the knowledge and skills needed to understand, protect and manage the diversity of wild African animals. This will involve training in animal evolution and diversity, physiology, behaviour and ecology, as well as related scientific fields.

Who is the ideal candidate?

Bachelor of Science *Zoology* is the ideal programme if you want to know how animals interact with each other, sense and respond to their surroundings, can be harvested sustainably and can be protected against human induced threats.

What makes this programme unique?

The University of Pretoria is the top-ranked institution in Africa for the subject of Zoology and is home to the internationally reknowned Mammal Research Institute.



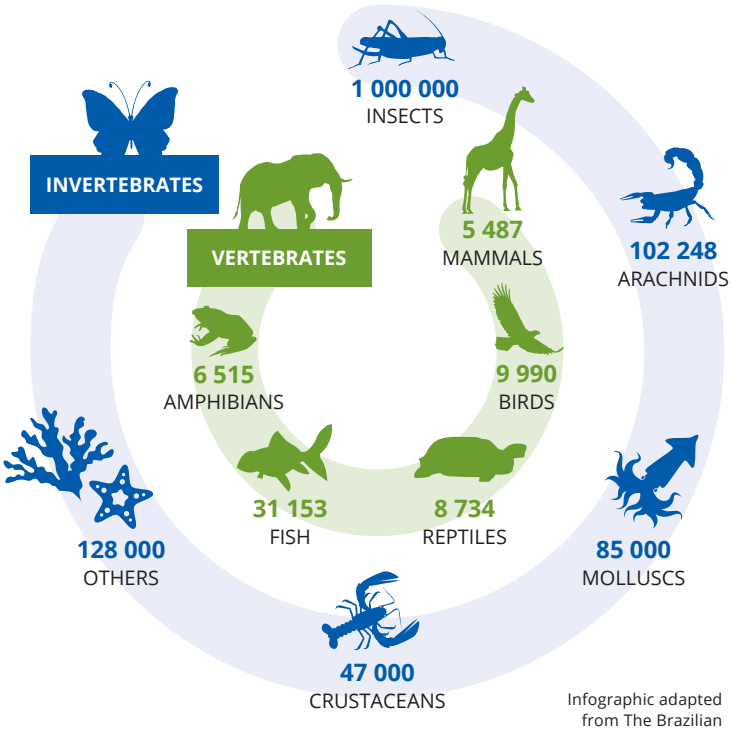
Career opportunities

This degree can lead to a career as a wildlife or marine biologist, biology teacher, conservation officer, animal welfare officer, environmental consultant or manager, zoo or aquarium curator, museum collection curator, game ranger, epidemiologist and researcher, among others.

Which companies employ our graduates?

National, provincial and local governments, international and private conservation organisations, zoos and aquariums, museums, environmental consultancies, environmental education initiatives, academic and training institutions, and many more.

There are so many animal species on Earth that the questions still to be answered are limitless.



Infographic adapted from The Brazilian Biodiversity Information System

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Zoology* [3 years]	5	5	5	**32**

Agricultural and Food Sciences

Agricultural Economics, Extension and Rural Development

Bachelor of Science in Agriculture in Agricultural Economics in Agribusiness Management

The Bachelor of Science in Agriculture in Agricultural Economics in Agribusiness Management programme provides students with an overview of the global food and agricultural sector and teaches them vital skills in business and science. These skills enable them to build careers in food and agricultural value chains, from seed to plate, and everything in between.

Who is the ideal candidate?

The Bachelor of Science in Agriculture in Agricultural Economics in Agribusiness Management programme is ideal for students who have competencies in science and business subjects and are passionate about these fields.

Which companies employ our graduates?

Companies, where our alumni are employed, include commercial banks (eg ABSA, FNB, Landbank, Nedbank, and Standard Bank), insurance companies (Santam), agricultural input providers (Syngenta, Omnia, and John Deere), agricultural service providers (Afgri, NWK, TWK and VKB), agricultural producers organisations (AgriSA, Agri WC, GrainSA, Potato SA, SAPPO and VinPro), agricultural associations (Agbiz), grain trading companies (Majesty Oil, Louis Dreyfus Company and Grainvest), investment groups (Russell Stone Group), food manufacturers (Tiger Brands), government departments (Department of Agriculture, Land Reform and Rural Development and Department of Environment, Forestry and Fisheries), research institutes (Agricultural Research Council and Bureau for Food and Agricultural Policy), and international bodies (Food and Agriculture Organization and World Bank) to name a few.

What makes this programme unique?

The programme develops problem solvers with unique skill sets who contribute to feeding and clothing the world. This programme is also the foundation to Environmental and Natural Resource Economics.

'My postgraduate studies take a multidimensional approach to policy economics and aims to determine how we can maintain and assure the global supply and flow of food, especially in the difficult times we are facing. We balance science and numbers and use the results to inform policy changes to establish sustainable and resilient agricultural supply chains to feed nations.'

Dipuo Boshomane – Postgraduate student

'Not only does our degree focus on theory, but teaches you so many skills that are necessary in life ranging from time management to critical thinking to analysis of markets and the greater agribusiness environment. Work place possibilities range (as our degree is incredibly flexible), if you would like to work in an office from 9 to 5 you can, or you can be travelling from farm to farm providing advice on farming techniques etc. This degree is perfect for someone who doesn't necessarily know where they want to end up. It provides you with various tools to be able to work in various occupations and grow and learn as you go.'

Hanco Marias – Bachelor of Science in Agriculture in Agricultural Economics in Agribusiness Management

Agricultural and Food Sciences

Agricultural Economics, Extension and Rural Development

Career opportunities

Employment opportunities for agricultural economists exist in, for example, the government, commercial banks, multinational agribusiness companies, agribusinesses, commodity trading houses, food processors and manufacturers, and research councils.

The work done by our agricultural economists includes:

- Advising clients in the agricultural sector on how to manage their finances and risks
- Advising the government on how to ensure that there will be enough food for all South Africans
- Analysing and understanding consumer behaviour in terms of people's wants, needs and willingness to pay for food and clothing
- Conducting research in environmental economics to assist the efforts of governments and businesses to ensure the sustainable use of scarce resources such as water
- Conducting research to ensure the sustainable and profitable supply of food and clothing across the various supply chains
- Managing various aspects of agribusinesses, food companies and food supply chains
- Trading of financial instruments and agricultural commodities on global and local stock markets
- Training of smallholder farmers by providing extension services

'As a foodie, my degree has made me more appreciative of food and where it comes from. We have a wide variety of food on this continent, and thanks to global food supply chains, we all have unlimited opportunities for experiencing the world of food. It gives me joy and a sense of fulfilment to know that through my studies, I am part of solving the problem of feeding the world.'

Chikomborero Chiobvu – Postgraduate student

'A Bachelor of Science in Agriculture in Agricultural Economics in Agribusiness Management is a rather broad degree. You begin with a solid foundation in the sciences, introductory accounting and get into economics, business management and statistics in the second half of your degree. It is very broad but that is also its appeal. If you're like I was and didn't know where you wanted to go, this degree is an excellent choice for you. It pulls from a variety of disciplines; its focal point will be you and you become the jack of all trades. You can really go lots of places with a degree like this, figuratively and literally, from Agricultural Economics, to Risk management and insurance, to Consulting, to financing, to even farming, the world (or agricultural sector) becomes your oyster. '

William Carson – Bachelor of Science in Agriculture in Agricultural Economics in Agribusiness Management

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science in Agriculture in Agricultural Economics in Agribusiness Management [4 years]	5	5	5	**32**

Agricultural and Food Sciences

Animal Science

Bachelor of Science in Agriculture in Animal Science

Livestock, pig and poultry production is one of the major sectors in South African agriculture and contributes substantially to the economy of the country. Animal Science is the science of livestock production, with a focus on animal breeding and genetics, animal nutrition, and production animal physiology (growth and reproduction physiology).

Animal science covers all aspects of animal production and animal welfare in intensive and extensive production systems. This includes the husbandry of several livestock species (cattle, sheep, goats, pigs, poultry, ostriches and horses), and the products derived from them (meat, milk and dairy products, wool, mohair, eggs, skins, leather and feathers). It also includes the nutrition and breeding of companion animals.

Who is the ideal candidate?

The ideal candidate is someone who has a passion for science and working with livestock, game and companion animals, as well as those interested in sustainable animal production for food and profit.

What makes this programme unique?

Bachelor of Science in Agriculture in Animal Science graduates can register as professional animal scientists and make a meaningful contribution to improve animal husbandry practices and sustainable food production for profit.

Which companies employ our graduates?

Our graduates are employed by:
- Animal feed companies and feed mills
- Pharmaceutical companies
- Agricultural Research Council
- Universities and Universities of Technology
- Private consultants
- Agricultural co-operations
- Semen and embryo collection and artificial insemination companies
- Breeders' societies
- SA Studbook
- Nature reserves and game farms
- NGOs and Department of Agriculture

Career opportunities

Depending on the level of specialisation in animal science, employment opportunities may be found in the following fields:
- Agricultural development institutions (eg NGOs, Department of Agriculture)
- Animal husbandry industry (eg feed companies, small or large livestock production systems ranging from small farms to large systems like feedlots or abattoirs, and animal breeding companies, animal breed societies, or in the corporate sector)
- Animal products industry (eg dairy and poultry products)
- Breeding organisations (eg breeders' societies, SA Studbook)
- Consultancy and advisory services (eg private consultant, agricultural co-operations)
- Educational institutions (eg universities, technical colleges)
- Feed industry (eg animal feed production companies)
- Legislative/regulative institutions (eg Department of Agriculture)
- Nature conservation institutions (eg nature reserves, game farms)
- Pharmaceutical industry (eg pharmaceutical companies)
- Research institutions (eg the Agricultural Research Council)
- Semen and embryo collection and artificial insemination companies

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science in Agriculture in Animal Science [4 years]	5	5	5	**32**

Agricultural and Food Sciences

Consumer and Food Sciences

Bachelor of Science in Food Management [Option: Culinary Science]

Culinary science is a broad-based discipline that combines food chemistry, microbiology, culinary art and food product development, and lends itself to innovation and entrepreneurship. The practical training includes the characterisation of various food ingredients and their utilisation in recipe development. The research component focuses on understanding the functional properties of various food types and their application in the food service industry.

This degree is for those who are not only interested in creating food that tastes and looks great, but also want to understand why food tastes and looks the way it does.

Any candidate wishing to pursue a career in the culinary science stream requires not only technical ability, but also has to be an analytical problem solver who pays attention to detail.

What makes this programme unique?

This degree offers a seamless integration of culinary art and science to equip future graduates with a degree embedded in science and technology and tailored to changing culinary trends.

Career opportunities

Culinary scientists, culinologists, sensory analysts, food researchers, food product developers, food service managers, safety and quality assurers, food production managers, entrepreneurs and food legislation experts.

Which companies employ our graduates?

Research institutions, food processing companies (McCain, Enterprise, BRM Foods, Mondelez), flavour houses (McComick, Firmenich), the food service industry (Famous Brands), Leading retailers (Woolworths, Pick n Pay, Checkers), government institutions and various institutions of higher learning.

'I was very excited when I heard about the Bachelor of Science in Food Management [Option: Culinary Science] programme. I enrolled because it offers a perfect mix between food and science, which are two of my major passions. I really enjoy my study programme because it includes cooking and recipe development, but does not neglect the science behind what happens to the food on the molecular level. This degree opens the door to many careers in the food industry, but my dream job is to be a flavour scientist.'

Danae Bezuidenhout – Bachelor of Science in Food Management [Option: Culinary Science]

'This degree combines the creativity of culinary arts with the rationality of food science and through my studies I have obtained a unique scientific view of food service management. Over the past four years I have realised the importance of consumer satisfaction to both food service managers and food technologists. I believe that my degree will open many doors for me in the future, notably in my main field of interest, which is recipe development. I enjoy applying my specific scientific knowledge while experimenting with food.'

Christine Janik – Bachelor of Science in Food Management [Option: Culinary Science]

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science in Food Management [Option: Culinary Science] [4 years]	5	5	5	**32**

Agricultural and Food Sciences

Consumer and Food Sciences

Bachelor of Science in Food Management [Option: Nutrition]

The Bachelor of Science in Food Management [Option: Nutrition] programme involves the study of concepts from various disciplines, including food chemistry and food composition, biochemistry, physiology and human nutrition. An ideal candidate is someone who has analytical skills and a keen interest in the science of food and nutrition.

What makes this programme unique?

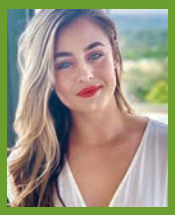
This is an interfaculty programme presented jointly by the Departments of Consumer and Food Sciences (Natural and Agricultural Sciences) and Human Nutrition (Health Sciences).

Bachelor of Science in Food Management [Option: Nutrition] graduates will become nutritional scientists eligible for registration as natural scientists with the South African Council for Natural Scientific Professions and the Nutrition Society of South Africa.

Career opportunities

A varied field with numerous career opportunities, which include:

- Food product and supplement development to meet specific nutritional needs of the consumer
- Project management and implementation of food programmes and legislation for government departments, international organisations and NGOs
- Entrepreneurship and small business development
- Nutrition research in the food industry or research institutes

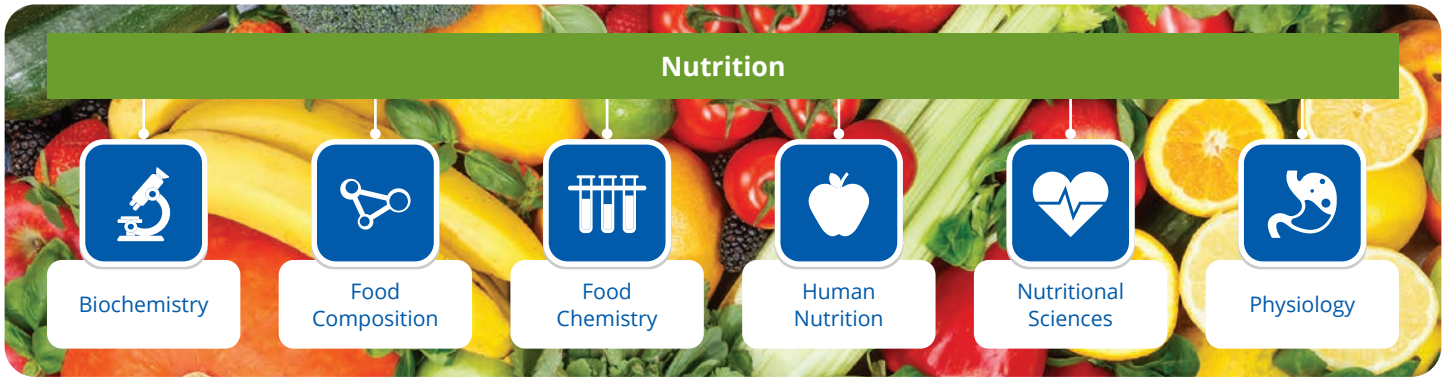


'I have found the four-year Bachelor of Science in Food Management [Option: Nutrition] degree programme to be very interesting as it consists of a variety of modules that cover topics ranging from human physiology to food sciences. Being taught by the experts in the department has really made studying very enjoyable. This degree caters perfectly for my two passions, which are science and helping others. I dream of becoming a policy developer and making a contribution towards ending hunger.'

Natasha Howes – Bachelor of Science in Food Management [Option: Nutrition]

'My journey as a Bachelor of Science in Food Management [Option: Nutrition] student has exceeded all my expectations. The workload is intense, which forced me to grow personally and perform academically. Our exposure to different science disciplines broadens our understanding of the world of science and helps us to incorporate the role of a nutritional scientist with the roles of scientists in other disciplines. My dream is to partner with major organisations to help reduce nutrition-related diseases and teach people how to maintain good health affordably.'

Ntŝepase Princess Matete – Bachelor of Science in Food Management [Option: Nutrition]



Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science in Food Management [Option: Nutrition] [4 years]	5	5	5	**32**

Bachelor of Science in Food Management [Option: Nutrition] is an interfaculty degree programme, presented jointly by Consumer and Food Sciences (Faculty of Natural and Agricultural Sciences) and Human Nutrition (Faculty of Health Sciences).

www.up.ac.za/department-of-consumer-and-food-sciences

Agricultural and Food Sciences

Consumer and Food Sciences

Bachelor of Science *Food Science*

This programme focuses on the chemical composition, structure and nutritional value of food. The interaction of food components during processing, preservation and storage is studied by making use of chemistry, physics, biological and mathematical principles. Candidates who are likely to excel are those who enjoy science and are keen on understanding food production from farm to fork.

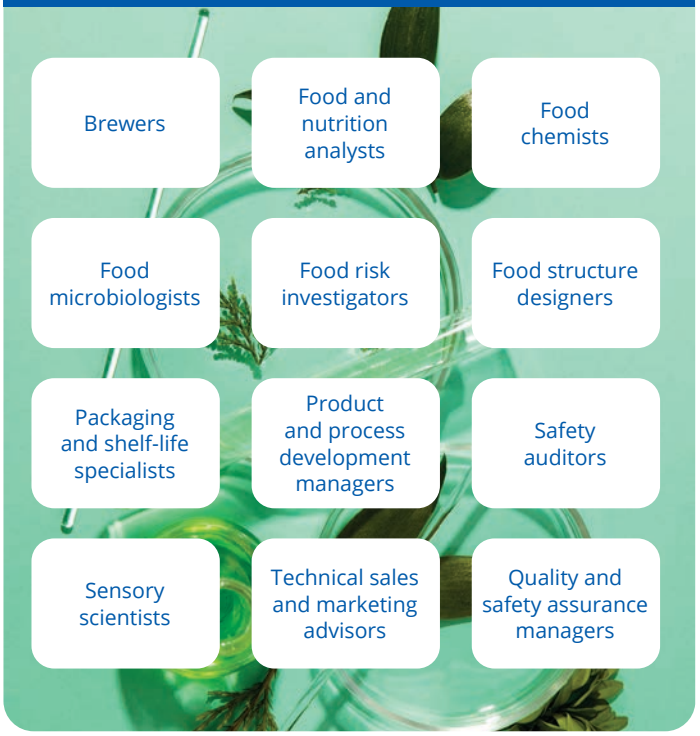
What makes this programme unique?

Candidates study a product that is used daily by all people and therefore prepare themselves to play a role in feeding the nation. A graduate with a Bachelor of Science *Food Science* degree is eligible for registration as a natural scientist with the South African Council of Natural Scientific Professions (SACNASP).

Which companies employ our graduates?

Our graduates are employed by all major food production companies eg Nestlé, RCL Foods, In2Foods, Unilever and the Rhodes Food Group; by major food retailers eg Shoprite and Checkers, Woolworths, Pick n Pay; by flavour and additive producing companies eg SAAFFI and Cell-Chem; and laboratories that specialise in analysing food in South Africa and all over the world.

Career opportunities



Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Food Science* [3 years]	5	5	5	**32**

Agricultural and Food Sciences

Consumer and Food Sciences

Bachelor of Consumer Science *Clothing Retail Management*

Clothing Retail Management combines clothing construction, design, fashion, textiles, consumer behaviour, and retail and merchandising subjects with various marketing and business modules to prepare students for the exciting and ever-changing textile and clothing industry. Candidates who excel in this programme are those who are both creative and analytical, and can function well under pressure and in team-oriented environments.

What makes this programme unique?

This is a vocational programme that balances theory, practical application, and experiential training in the industry. Through the programme students are exposed to the entire clothing supply chain and can specialise in a particular area of interest once they graduate. Graduates are well-trained and ready to venture into the many different areas offered in the textile and clothing industry.

Career opportunities

Graduates are typically employed as clothing buyers and planners, allocation planners, brand managers, product developers, fashion designers, fashion marketers, social media content managers, quality assurance managers, sourcing coordinators, textile technologists, visual merchandisers, and pattern technologists or can become entrepreneurs.

Which companies employ our graduates?

All the major clothing retailers in South Africa (eg, Mr Price (MRP), Truworths, TFG group, Pep, Woolworths, Cape Union Mart) and various brands (eg, Lacoste, Guess) employ our graduates.

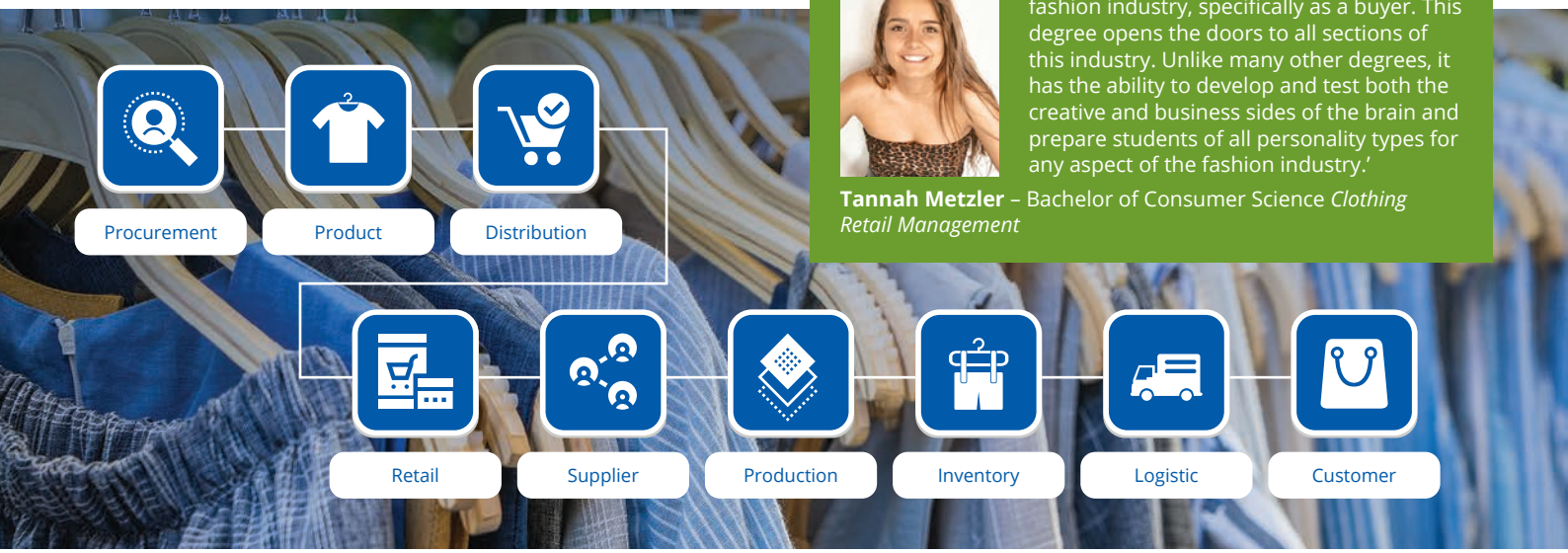
Students are also appointed as merchandisers, account managers, or production coordinators at suppliers, production companies, and licensing companies (eg, Blue Horizon for Mattel, Character group, Cosmic Options).

'I thoroughly enjoyed this degree programme as it combines my two passions, namely fashion and business, and develops the students' creative and analytical abilities to achieve all-round excellence. I appreciated the focus on sustainability, especially in the final year, which provides the tools needed to have a positive environmental impact in the clothing and textile industry. I dream of becoming a sustainable fashion planner/buyer.'

Shanna Howarth – Bachelor of Consumer Science *Clothing Retail Management*

'I have always dreamed of working in the fashion industry, specifically as a buyer. This degree opens the doors to all sections of this industry. Unlike many other degrees, it has the ability to develop and test both the creative and business sides of the brain and prepare students of all personality types for any aspect of the fashion industry.'

Tannah Metzler – Bachelor of Consumer Science *Clothing Retail Management*



Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
	English Home Language or English First Additional Language	Mathematics	
Bachelor of Consumer Science *Clothing Retail Management* [4 years]	5	4	**28**

Agricultural and Food Sciences

Consumer and Food Sciences

Bachelor of Consumer Science *Food Retail Management*

Food retail management covers the entire food supply chain in one programme—from farm to fork. The food retail programme focuses on incorporating not only the fundamentals of food preparation, food service management, nutrition, food safety and hygiene, but also recipe development and standardisation, consumer aspects of foods and sustainable food retail logistics. Emphasis is placed on future retail trends, such as omni-channel retailing, blockchain and the creation of immersive customer experiences. The programme also includes various marketing and business modules. In order to fit into the dynamic world of retailing, candidates need to be inquisitive, confident team players with good numerical and organisational skills and a degree of commercial awareness.

What makes this programme unique?

Students are exposed to every aspect of the food retail industry through on-site visits and exposure to guest speakers from local and international industries. Students are also required to complete experiential training/internships.

Career opportunities

Food retail graduates pursue managerial positions as brand or sales managers, store managers, food and beverage buyers and planners, food stylists, food product marketers, food product category managers, quality assurance managers, visual merchandisers, consumer insight specialists and entrepreneurs.

Which companies employ our graduates?

All key South African retailers (Woolworths, Shoprite – Checkers, Spar, PnP, Dischem), related subsidiary companies and/or other supply chain stakeholders (such as Freshmark, RCL, In2Food, SABMiller, DotActiv, RSA Market Agent). Graduates have also been employed by various consumer research companies, such as Consulta and Ask-Africa.

'The wealth of knowledge that I gained throughout my four years of study has taught me everything from economics all the way through to consumer behaviour and sustainability in the retail environment. This degree has helped me to put my passion for sustainability into practise. We live in a time when it is simply unacceptable not to think about the impact that you have on the earth. That is why I would like to become a chief sustainability officer at a major retailer.'

Daniella Klut – Bachelor of Consumer Science *Food Retail Management*

'This programme has given me valuable insight into various disciplines and has taught me how to work well with a diverse group of people. I learnt that consumer science is not only relevant, but is central to the well-being and sustainability of our society. I dream of becoming a consumer insights specialist.'

Kathryn Geldenhuys – Bachelor of Consumer Science *Food Retail Management*

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
	English Home Language or English First Additional Language	Mathematics	
Bachelor of Consumer Science *Food Retail Management* [4 years]	5	4	**28**

Agricultural and Food Sciences

Consumer and Food Sciences

Bachelor of Consumer Science *Hospitality Management*

Hospitality management seeks to prepare students for employment with leading food companies, master chefs working in top kitchens and other experts in the food and hospitality industry. Graduates will not only learn to create exceptional dishes, but will also be involved in culinary art, food product development, recipe development, food styling, large-scale food production, restaurant management and events management. Various marketing and business modules are also included in the programme. To fit into the vibrant, innovative and creative hospitality world, candidates must be team players who are curious by nature and service oriented, and have a passion for food and the hospitality industry. If you have boundless patience, perseverance and creativity, this degree is perfect for you.

What makes this programme unique?

Students are introduced to every aspect of the hospitality and tourism industries through hands-on training and site visits, and are exposed to guest speakers from local and international industries. They are also required to complete experiential training/internships, which allow them the opportunity to familiarise themselves with the workplace and gain first-hand experience of the real-world hospitality industry.

This degree is unique as it combines science, creativity, art and business management practices to create a practical hands-on experience that provides students with many possible work opportunities to choose from after graduating. In South Africa, this programme is one of only a few hospitality degrees that is still being offered in a traditional university setting.

Career opportunities

Hospitality Management graduates pursue managerial positions such as accommodation managers, catering managers, conference centre managers, events managers, hotel managers, fast food managers, game and lodge managers, restaurant managers (both back- and front-of-house) and public house managers.

This degree also opens up many work opportunities in the culinary world, including chef, food stylist, food photographer, sommelier, menu engineer, recipe and product developer, product marketer, food safety consultant, improvement specialist, culinary idea conceptualisation specialist and entrepreneur. Many graduates also choose to become academics or teachers.

Which companies employ our graduates?

Graduates who completed the degree have been employed in the following fields, among others:

- Hotel and tourism management
- Small business enterprises and recipe/product development
- Consumer research and food journalism
- Academia and teaching

'This amazing degree programme not only taught me a lot about food and cooking, but also about conducting business. I chose this degree as it qualifies students for just about any position in the hospitality industry. I have learnt how to manage a business, I know what consumers want and I have food preparation experience. My dream job is to own and manage my own wedding/events venue and this qualification will help to make my dream come true.'

Melissa Fourie – Bachelor of Consumer Science *Hospitality Management*

'The extensive and in-depth nature of this four-year Bachelor of Consumer Science *Hospitality Management* degree has ensured that I have a strong business, entrepreneurial and culinary background, which will stand me in good stead in my future endeavours in the hospitality sector. My years as a student at UP have enabled me to grow as an individual, broaden my knowledge and develop a genuine appreciation of the industry. The opportunities I have been given and the skills that I acquired will enable me to pursue a future in food media and photography.'

Taylen Kench – Bachelor of Consumer Science *Hospitality Management*

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
	English Home Language or English First Additional Language	Mathematics	
Bachelor of Consumer Science *Hospitality Management* [4 years]	5	4	**28**

Agricultural and Food Sciences

Plant and Soil Sciences

Bachelor of Science in Agriculture in Plant Pathology

The Bachelor of Science in Agriculture in Plant Pathology programme entails the study and control of plant diseases.

Who is the ideal candidate?

The ideal candidate is a creative thinker who wants to explore and understand problems, why and how they arose, and to find solutions. Finding the culprit (ie the pathogen) that caused disease or even death (of plants) is very much like being a detective working at a crime scene to figure out what happened. Like veterinary scientists and medical doctors, plant pathologists also work with patients but with the difference that they cannot communicate with the plant. They therefore have to rely on observation, experience and intuitive knowledge to figure out what is wrong and to find a solution. A student who does well in this programme is often one who is curious, creative, passionate, driven and ambitious, wanting to explore new challenges.

Agricultural scientists often work in the field or in plant nurseries, farms, pack houses, processing plants, markets or retail. They may also be involved in the local or international food trade. They are multifaceted thinkers who enjoy solving problems, are curious about nature and want to provide food for the table by ensuring healthy plants, crop protection, high yields and reduced waste and losses.

What makes this programme unique?

The programme covers both basic and applied research and ensures safe food and food security for all.

Career opportunities

- Consultant plant pathologists often collaborate with economists, soil scientists, horticulturists, entomologists and farmers, big corporates, pesticide companies or retailers. They not only advise, but also influence governments, industry and the general public regarding critical matters such as trade, phytosanitary and sanitary matters, and the right to food.
- Lecturers and researchers at universities and technical colleges provide quality creative education and share their skills and experiences with students to prepare them for careers in the flower industry, turf grass or horticultural sectors, crop production, viticulture, agronomy, soil sciences and entomology, as well as agricultural economics. They are classical transdisciplinary thinkers who can solve mega problems and are innovative in finding practical solutions for farmers and others in the agricultural sector.
- Agricultural scientists and researchers at various companies and academic institutions research many different aspects of plant health, crop protection, food security and food safety.

Which companies employ our graduates?

Our graduates are employed at:

- National Department of Agriculture
- Agricultural Research Council
- Agrochemical companies
- Seed and plant production companies
- Undercover crop production endeavours, eg vertical farming, greenhouses and hydroponics
- Tissue culture laboratories
- Diagnostic laboratories
- Biological control companies
- Nurseries and garden centres
- Lawn and landscape maintenance firms
- Agricultural cooperatives
- Private agricultural estates, farms and big corporate estates
- The SA Bureau of Standards (SABS) and Council for Scientific and Industrial Research (CSIR)
- Exporting or importing companies
- Fresh Produce Markets and Retailers
- National and International certification bodies such as auditors, assessors or technical experts in good agricultural practices or food safety
- United Nations, Food and Agricultural Organisation, World Health Organisation, World Trade Organisation or International Standards Organisations
- Researchers and lecturers at Colleges, Technical universities or Universities

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science in Agriculture in Plant Pathology [4 years]	5	5	5	**32**

Agricultural and Food Sciences

Plant and Soil Sciences

Bachelor of Science in Agriculture in Applied Plant and Soil Sciences

Bachelor of Science in Agriculture in Applied Plant and Soil Sciences is a four-year, full-time degree programme. It teaches the principles of plant-based agriculture within the disciplines of agronomy, horticultural science, pasture science and soil science. Graduates can embark on a diverse range of careers in the agricultural and environmental fields.

Who is the ideal candidate?

Students who have a keen interest in plants and soil, would like to improve their understanding of the environment and want to make a difference in the world are the ideal candidates for this degree. Graduates make a direct contribution to sustainable food production, while simultaneously protecting our natural resources.

What makes this programme unique?

This programme is unique in terms of the combination of disciplines taught within the degree. Students are exposed to the various fields within plant production and soil sciences, which ensures that graduates are well-rounded and able to access a wide array of career opportunities, or make informed decisions on specialisation should they wish to continue with postgraduate studies.

Our graduates are highly sought after and often have to choose between several offers of employment. The degree is accredited by the South African Council for Natural Scientific Professions (SACNASP) and graduates can be registered as professional natural scientists.

Career opportunities

Public sector

The Agricultural Research Council (ARC); government departments that address issues related to agriculture and rural development, water supply, conservation and the environment; the Council for Scientific and Industrial Research (CSIR); provincial departments of agriculture and nature conservation; the South African National Biodiversity Institute (SANBI); municipalities; South African National Parks; and national farming and food production agencies.

Entrepreneurial

Consultants to producers of crops, pastures, vegetables, medicinal and aromatic plants, and ornamental and cut-flowers; landscaping enterprises; managing own farms and nurseries for extensive (field) or intensive (tunnel/greenhouse) production systems involving various crops; and managing companies specialising in irrigation, reclamation and soil conservation.

Private sector

Companies involved in seed, fertilizer and plant protection research, development and marketing; environmental planning and management; nurseries; vegetable, fruit, ornamental and cut flower production; and irrigation.

Extension services involving knowledge transfer

Nature conservation; national and provincial departments of agriculture and the environment; environmental management and rehabilitation, including mine lands; nurseries; crop, turf grass and weed management; private companies servicing field crops, vegetables, medicinal and aromatic plants, fruit, ornamental and cut-flower production.

Agricultural and Food Sciences

Plant and Soil Sciences

Bachelor of Science in Agriculture in Applied Plant and Soil Sciences (continued)

Which companies employ our graduates?

- Agro-chemical companies
- Drone companies
- Environmental consulting firms
- Export companies
- Farming co-operatives
- Farming operations (extensive and intensive)
- Fertilizer companies
- Government departments
- Insurance companies
- Irrigation companies
- Nurseries
- Patent attorneys
- Research institutions
- Seed companies

'What I enjoyed most about this degree is that it exposed students to the diverse range of disciplines that form the basis of crop production, and that each discipline is unique yet connected to the others. Crop production is the perfect field for anyone who enjoys working on solving complex problems to have a meaningful impact on people's quality of life. My dream job is to continue with the work I am doing for my postgraduate studies, which is to find ways of making agricultural science accessible to smallholder farmers and the public in order to build a more equitable food system.'

– Richard Hay (MSc student)

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science in Agriculture in Applied Plant and Soil Sciences [4 years]	5	5	5	**32**

Physical Sciences

Chemistry

Bachelof of Science *Chemistry*

Chemistry is the study, understanding and analysis of substances and materials and how they interact. This is achieved through carefully designed laboratory experiments using sophisticated instrumentation, mathematical calculations, data processing and modelling.

Who is the ideal candidate?

The ideal candidate will have the following characteristics:

- Ability to work with high precision and accountability;
- Good time management;
- Proficiency in scientific writing;
- Ability to work in a team;
- Good management skills; and
- Environmental consciousness in work ethic.

What makes this programme unique?

Bachelof of Science *Chemistry* graduates have the ability to combine concepts across different fields. They develop excellent analytical and problem-solving skills, which can also be applied in less traditional fields, for example the financial sector and information technology. Chemistry is a central science and links with many other subjects, including physics, mathematics, biochemistry, computer science, geology, etc.

Career opportunities

Graduates are equipped for careers in the following fields:

- Chemical manufacturing;
- Education;
- Environmental studies;
- Health;
- Industrial chemistry;
- Information technology;
- Journalism;
- Law; and
- Research.

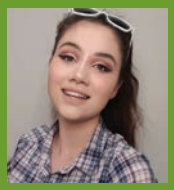
Which companies employ our graduates?

Our graduates are employed by:

- chemical manufacturers;
- mining companies;
- government departments;
- the media;
- law firms;
- laboratories;
- cosmetic companies;
- instrument manufacturers;
- pharmaceutical companies; and
- education companies.

'If someone had told me while I was in high school that I would one day enroll for a degree in chemistry, I would have called them crazy. Not that I did not like the subject but I did not find it interesting. When I registered for the module in first year, it was just a core module that I had to do but when I started learning more, I fell in love with it. For the first time, everything that I had been introduced to in high school made perfect sense. It was even more amazing that I could explain why and how certain reactions take place. My dream has always been to work in the field of forensic science. The added fact that it is such a broad field makes forensic chemistry my destination.'

– Daisy Mdeka



'Chemistry used to be that one class I dreaded taking back in high school, but that completely changed for me when I started taking chemistry in my first year as a BSc student. Chemistry went from this impossible amount of memorization to this fascinating field of logic that I got to witness in my everyday life. I started realising how applicable the principles of chemistry are in my life and found myself wanting to learn more for that reason. When it came to choosing a career, I decided to focus on biochemistry and delve into how chemistry plays a role in biotic factors and am now pursuing a career in food safety.'

– Chrizelda Visser

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelof of Science *Chemistry* [3 years]	5	5	5	**34**

Physical Sciences

Geology

Bachelor of Science *Geology*

Geology is the study of the Earth and includes aspects related to its formation, composition, structure and processes. South Africa is known for its large reserves of gold, platinum, chromium, vanadium and other metal ores, as well as substantial diamond and coal reserves. A mere hour's drive from UP takes one to the Karoo coalfields, the site where the Cullinan diamond was discovered, the Bushveld platinum mines and the gold mines of the Witwatersrand. South Africa also has some of the Earth's oldest well-exposed geology and significant fossils informing us about the history of the planet.

Who is the ideal candidate?

The programme requires an appreciation for mathematics and chemistry. A love for the Earth and working outdoors, and an interest in geology or geomorphology will be beneficial. Depending on your personality, you can decide how you would like to divide your time between working in the field and working in the office.

What makes this programme unique?

UP is well situated within easy reach of the mining and applied geological industries and offers a strong programme in the applied fields of economic geology, structural geology and mechanics, and engineering geology and hydrogeology. Candidates who successfully complete this programme qualify for professional registration as geological scientists.

Career opportunities

Geology is split into many subdisciplines which include mineralogy (the study of rock-forming minerals), petrology (the study of rock formation), structural geology (the deformation and behaviour of rock under stress) and economic or mining geology (identification of mineral resources and contribution to the day-to-day operations of mines).

As a geologist, you can choose whether you would prefer to work in a mine or laboratory, or as an exploration geologist in the field. The programme also allows entry into applied geological professions such as hydrogeology and engineering geology.

Apart from working in the mining industry, candidates also find employment at analytical facilities, in forensics, or in the insurance industry.

Which companies employ our graduates?

Our graduates are employed as economic or exploration geologists in the mining industry, or work for parastatals (Council for Geoscience, CSIR, Mintek) or government (Mineral Resources; Energy).

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Geology* [3 years]	5	5	5	**34**

Physical Sciences

Geology

Bachelor of Science *Environmental and Engineering Geology*

The degree offers further specialisation in engineering geology and hydrogeology. Engineering geology is the study of the behaviour of ground (soil and rock) and how likely it is to affect engineering works. It comprises geotechnical studies and relates to construction (eg founding or excavation) on and with geological materials (eg construction materials), and to the influences of geological, geomorphological and hydrological processes on construction and development. Hydrogeology refers to the occurrence, distribution and movement of water below the Earth's surface. The study of groundwater is generally both quantitative (eg water supply, safe abstraction and the influences of pumping) and qualitative (eg contamination, remediation and drinking water).

Who is the ideal candidate?

The programme requires a strong understanding of mathematics and mechanics. Genuine concern for Planet Earth, a desire to work outdoors and an interest in geology or geomorphology will be an advantage. Depending on your personality, you can choose how you would like to divide your time between doing fieldwork and working on a computer.

What makes this programme unique?

Very few universities offer professional qualifications in engineering geology and hydrogeology. UP offers both, which places it in a strong position on the interface between infrastructure development and subsurface water. The qualification complies with the requirements for professional registration.

Career opportunities

Engineering geologists work closely with civil engineers, mining engineers, town planners and environmental scientists. Your work will require you to identify geological hazards, source building materials and supply foundation solutions.

As a hydrogeologist you will be involved in the supply of water for urban, agricultural and industrial use. Nowadays many graduates work in contaminant transport and remediation, which involves identifying sources of pollution and finding suitable remediation solutions.

Which companies employ our graduates?

Our graduates are employed by civil and infrastructure industries, the mining industry and parastatals (Council for Geoscience; CSIR), as well as by government (Department of Water Affairs; the NHBRC; local governments).

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Environmental and Engineering Geology* [3 years]	5	5	5	**34**

Physical Sciences

Geography, Geoinformatics and Meteorology

Bachelor of Science *Geography* [Option: Geography and Environmental Science]

Geographers and environmental scientists study processes, relationships and the interdependence between the natural environment and humans. Anyone who has a passion for the environment and has a background in the sciences will be interested in the Bachelor of Science *Geography* [Option: Geography and Environmental Science] programme.

What makes this programme unique?

The programme enhances students' understanding of the physical, social and constructed environments, incorporating all the natural processes that take place on earth, as well as the socio-political and cultural activities that dominate the planet.

Which companies employ our graduates?

- **Private sector**, such as real estate, planning, architectural and engineering firms, and banks, tourism organisations, environmental conservation bodies and industry
- **Government departments**, such as the Departments of Environment, Forestry and Fisheries (DEFF), Agriculture, Land Reform and Rural Development (DALRRD), Water and Sanitation (DWS), Tourism (DT), Basic Education (DBE) and Higher Education and Training (DHET), and Statistics South Africa (Stats SA)
- **Parastatal organisations**, such as the South African Bureau of Standards (SABS), the South African Biodiversity Institute (SANBI) and the Council for Scientific and Industrial Research (CSIR)
- **Self-employed**, working mainly in areas such as marketing, planning, development, tourism, cartography, remote sensing, environmental analysis, social impact assessments and environmental auditing

Career opportunities

Geography and environmental science offer a range of career paths, including teaching, research (for a variety of bodies) and careers requiring the application of geographical knowledge and skills in practice. Graduates can focus on environmental management; urban development issues, regional and rural development; and environmental health or environmental issues, including pollution, climate change and the understanding and addressing of negative impacts on biodiversity/ ecosystem services through activities such as mining, agriculture and tourism.

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Geography* [Option: Geography and Environmental Science] [3 years]	5	5	5	**34**

Physical Sciences

Geography, Geoinformatics and Meteorology

Bachelor of Science *Geoinformatics*

The Bachelor of Science *Geoinformatics* programme entails the collection, storage, analysis, visualisation and management of geospatial information by using an assortment of geospatial analytical methods and tools to help with decision making and providing solutions to geographic problems. Our graduates have a passion for geography, an interest in collecting, processing, displaying and analysing geographic information, and deriving, geospatial data products, and an interest in using computing technology and quantitative techniques to address geographical problems.

What makes this programme unique?

The programme is accredited by the South African Geomatics Council for registration as candidate Geomatics Technologists in GISc (GTg, GISc).

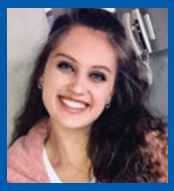
Career opportunities

Web programmer, geospatial data officer, geospatial software developer, mobile app developer, geovisualisation specialist, GIS project manager, GISc consulting, map designer, spatial data analyst, earth observation data analyst and systems analyst.

Which companies employ our graduates?

Graduates with a Bachelor of Science *Geoinformatics* readily find work at organisations such as:

- The Environmental Systems Research Institute (ESRI) South Africa;
- Intergraph Systems Southern Africa;
- The Council for Scientific and Industrial Research (CSIR);
- The Agricultural Research Council (ARC);
- AfriGIS; GeoTerraImage; GISCOE; Aurecon;
- The South African National Space Agency (SANSA);
- South Africa's national mapping organisation (National Geospatial Information (NGI);
- Any municipality in the country;
- Many government departments (eg Environmental Affairs, Forestry and Fisheries (DEFF); Science and Innovation (DSI); Statistics South Africa; and Agriculture, Land Reform and Rural Development (DALRRD); and Water and Sanitation (DWS).



'I enjoy the Bachelor of Science *Geoinformatics* degree programme because we are exposed to many different fields in a short time: geography, business, IT, law, mathematics, remote sensing, cartography, geodesy and statistics. This degree programme is challenging, yet extremely interesting. I am never bored! I enjoy statistics and analysis, this combination can be used in GIS. Any job that combines these activities would definitely be my dream job! Most of all I dream of working in Google's spatial department!'

– Kayla Theron

'Geoinformatics is a fascinating degree as it allows you to work in a variety of fields from agriculture to transport planning which I enjoy as I have many interests. I enjoyed the visual and programming aspects of the degree as they are very rewarding as you can see a final product at the end. In the future, I aim to be a GIS specialist that can work on projects that can help impact people's lives for the better by creating spatial solutions.'

– Terisha Pillay

'I have a passion for solving real-world issues and enjoy working with state-of-the-art technologies. The Bachelor of Science *Geoinformatics* programme also teaches problem solving, critical thinking, project management and other highly sought-after skills. My dream job is to work for a GIS consultancy. This will allow me to work in many different industries while I continue learning.'

– Nicholas de Kock

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Geoinformatics* [3 years]	5	5	5	**34**

Physical Sciences

Geography, Geoinformatics and Meteorology

Bachelor of Science *Meteorology*

The Bachelor of Science *Meteorology* programme focuses on the study of atmospheric processes. An ideal candidate is someone who is fascinated by weather phenomena and is interested in all things concerned with natural science.

What makes this programme unique?

This is the only Meteorology programme offered in South Africa and the SADC region. A student who has successfully completed the BScHons *Meteorology* degree will be regarded as a Class 1 Meteorologist by the World Meteorological Organisation.

The BScHons *Meteorology* degree, which is required to become a professional meteorologist, complies fully with the Manual on the Implementation of Education and Training Standards in Meteorology and Hydrology Volume I – Meteorology.

Which companies employ our graduates?

Meteorologists are employed by institutions involved in the study, interpretation and prediction of weather and climate-related phenomena. Our graduates are employed at:

- The South African Weather Service (SAWS)
- International Weather Services and companies (for instance in New Zealand, Dubai and Australia)
- The Council for Scientific and Industrial Research (CSIR)
- Universities in South Africa and abroad

Career opportunities

Researchers

They research all aspects of the weather and climate to improve man's understanding of atmospheric phenomena. Atmospheric modellers use supercomputers to solve complex flow dynamic equations of the atmosphere. The monitoring of air quality and the modelling of the impact of air pollution on society are two important aspects that need to be addressed. Research on climate change is receiving increasing attention.

Weather forecasters

The weather forecaster must analyse data and predict the weather by using models that are run on supercomputers. Weather forecasts are issued on different time scales, from very short-range forecasting to forecasts that are valid for months ahead, as well as seasonal forecasts.

Private positions for people with this qualification include presenting the weather forecast on television.

Climatologists

They manage essential data sets that contain large volumes of information gathered by the SAWS and other organisations.

Consultants

Some meteorologists who work as consultants in the private sector and at universities provide specialised research services.

Lecturers

A few academic positions for meteorologists and climatologists are available at South African universities.

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Meteorology* [3 years]	5	5	5	**34**

Physical Sciences

Physics

Bachelor of Science *Physics*

The useful and transferable skills that physics students acquire in theoretical, experimental and computational physics equip them for a variety of career options. The Bachelor of Science *Physics* programme will appeal to students who are passionate about understanding nature, are driven by curiosity, are interested in mathematics and are willing to put in the required effort.

What makes this programme unique?

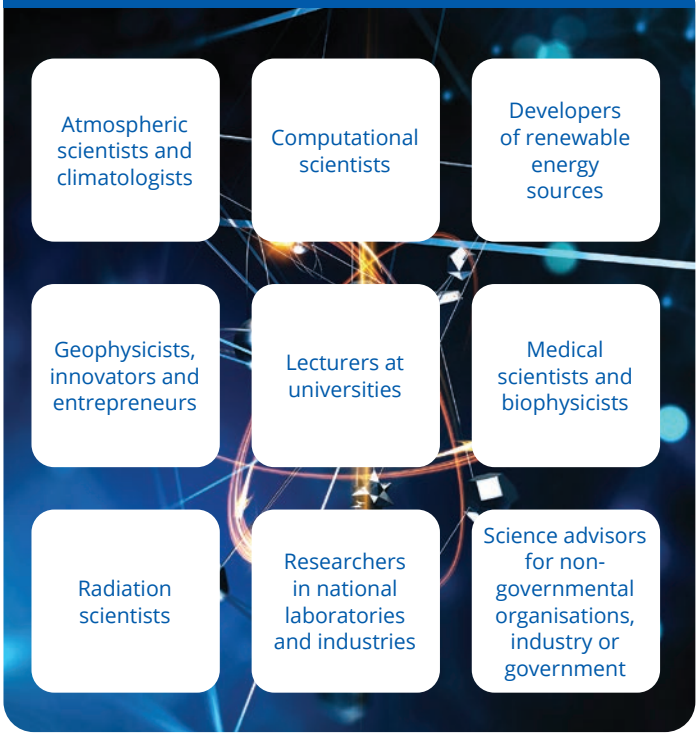
Physics students will develop their creativity, inventiveness, problem-solving abilities, analytical thinking skills and their ability to communicate complex ideas.

Which companies employ our graduates?

Our graduates are employed by:

- Nuclear Energy Corporation of South-Africa (NECSA)
- South African Astronomical Observatory (SAAO)
- Square Kilometre Array (SKA)
- South African National Space Agency (SANSA)
- iThemba LABS (Laboratory for Accelerator-based Sciences)
- The Council for Scientific and Industrial Research (CSIR)
- DENEL and IBM

Career opportunities



Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025			
	Achievement level			APS
	English Home Language or English First Additional Language	Mathematics	Physical Sciences	
Bachelor of Science *Physics* [3 years]	5	5	5	**34**

Mathematical Sciences

Actuarial Science

Bachelor of Science *Actuarial and Financial Mathematics*

The modern financial world has a growing need for graduates who are well skilled in analytical problem solving, modelling and other quantitative techniques. The programme provides students with a broad education and skills development in these areas. Students can tailor their coursework to either an actuarial or a financial mathematics option.

The actuarial programme is structured to provide the aspiring actuary with the opportunity to fulfil the requirements needed for exemption from the Actuarial Society of South Africa examinations in the shortest possible time. For aspiring financial analysts or financial engineers, the programme provides depth and develops the student's ability to design and analyse financial products.

What is an actuary?

An actuary is a professional who applies analytical, statistical and mathematical skills to financial and business problems. This is especially valuable when facing real-world problems that involve uncertain future events or financial risk. This ability to quantify that which is unclear helps individuals and businesses to safeguard their future, confidently and at a fair price, in an ever-changing world. (Actuarial Society of South Africa).

Who is the ideal candidate?

The ideal candidates are students who achieve seven or more A's easily in high school. They are involved in a variety of sports and cultural activities and usually hold leadership positions throughout high school. They are well-balanced and very motivated.

While not prerequisites at school, prospective students are probably taking and enjoying an AP Mathematics course, where possible. They are also likely to enjoy coding or solving problems using a computer where these opportunities are available.

Which companies employ our graduates?

Bachelor of Science *Actuarial and Financial Mathematics* graduates are generally employed by accounting firms; banks; consulting firms; insurance companies; investment companies; medical schemes and universities.

What makes this programme unique?

The study programme prepares students for qualification as actuaries or financial engineers. Specialisation in either of these fields occurs in the third year of study and continues at postgraduate level.

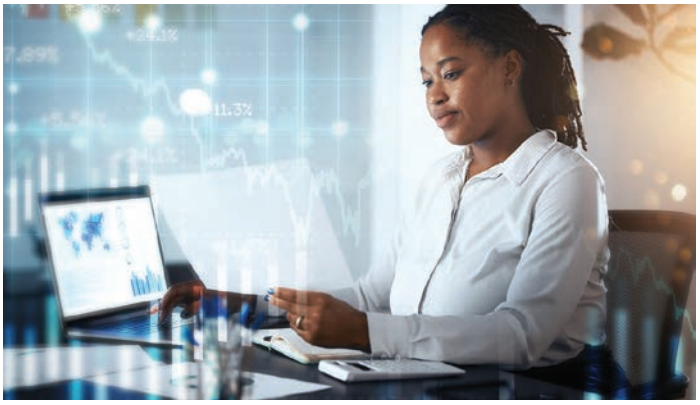
The programme is accredited with the Actuarial Society of South Africa and gives students the opportunity to earn exemptions from the A100 and A200 subjects of the Actuarial Society during their undergraduate degree. To achieve further exemptions, a follow-up honours degree is recommended.

We prepare our students to compete in the actuarial workplace. Large employers of actuarial students speak highly of our graduates and some actively seek students from our programme.

Career opportunities

Many actuaries follow careers in the more traditional fields of insurance and retirement funds. However, actuaries are also increasingly working in other fields following recognition of their analytical skills. This includes healthcare, financial consulting, risk management and banking. Because of their unique skills, many actuaries are appointed to senior management positions after their initial analytical roles.

Financial engineers can be employed by banks and financial institutions, brokerage firms and investment institutions. They are essential in portfolio and risk management. Activities include asset management (trading in bonds, futures and derivative instruments such as options), designing new financial products and devising strategies to control credit risk.



Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
	English Home Language or English First Additional Language	Mathematics	
Bachelor of Science *Actuarial and Financial Mathematics* [3 years]	5	7	**36**

Mathematical Sciences

Mathematics and Applied Mathematics

Bachelor of Science *Mathematics* and Bachelor of Science *Applied Mathematics*

Mathematics, which originated from arithmetic and geometry, is based on patterns and structures and is the fundamental language of science and technology. Applied mathematics is concerned with the modelling and treatment of real-life problems in a variety of fields, such as engineering, finance, statistics, physics and biology. The power of mathematics and applied mathematics lies in their abstract, analytical and computational nature. Nowadays, mathematics is essential for all technological, financial and managerial industries, which form the backbone of the South African economy.

Who is the ideal candidate?

Mathematics students who enjoy the course and excel in it are those who enjoy solving problems and have a strong background in the basics of the subject.

What makes this programme unique?

The Department of Mathematics and Applied Mathematics is not only one of the largest departments on the Hatfield Campus, but also one of the largest mathematics departments in the country, with approximately 17 500 student enrolments for mathematics modules. The Department prides itself on excelling in teaching and research, as well as in community-based activities.

The diverse and competent staff has expertise in various fields. The Department regularly hosts international visitors and its researchers frequently travel abroad to attend conferences and pay research visits. No fewer than 31 of its researchers have received NRF ratings in fields ranging from more traditional abstract analysis to contemporary epidemiology, where the modelling of biological phenomena leads to exciting options.

A degree in mathematics trains students to apply, evaluate and adapt existing problem-solving techniques, or to develop new mathematical models and techniques to solve problems stemming from natural, technological and financial phenomena.

Career opportunities

Graduates in mathematics and applied mathematics are employed by research institutions, in education (universities and schools), the public sector (government and medical institutions) and the private sector (engineering companies, financial institutions and the computer industry).

The training of these graduates in abstract, analytical and computational thinking provides them with the versatile background required to easily adjust to changing circumstances in the professional environment and to construct mathematical models of natural, technological and financial phenomena. Mathematicians and applied mathematicians apply, evaluate and adapt existing problem-solving techniques or develop new techniques to solve those problems.

Which companies employ our graduates?

A Bachelor of Science *Mathematics* or Bachelor of Science *Applied Mathematics* degree is a solid foundation for a professional career in many fields. Many of our graduates are employed by the banking and financial sector, but also in new fields like bioinformatics, genetics, management consulting, weather forecasting, etc. As there is a general shortage of mathematicians in South Africa, top performing students opt for further studies and an academic career.

Bachelor of Science *Mathematics*

Compulsory modules are:

- Analysis
- Abstract algebra
- Geometry (third-year level)
- Calculus
- Linear algebra
- Differential equations
- Discrete structures (second-year level)
- Mathematical modelling
- Mathematical statistics
- Numerical analysis
- Dynamical processes (first-year level)

Bachelor of Science *Applied Mathematics*

Compulsory modules are:

- Analysis
- Continuum mechanics
- Numerical analysis
- Partial differential equations
- Dynamical systems (third-year level)
- Calculus
- Linear algebra
- Discrete structures
- Differential equations (second-year level)
- Mathematical modelling
- Mathematical statistics
- Dynamical processes (first-year level)

Minimum admission requirements

Programmes	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
	English Home Language or English First Additional Language	Mathematics	
Bachelor of Science *Mathematics* **Bachelor of Science *Applied Mathematics*** [3 years]	5	6	**34**

Mathematical Sciences

Statistics

Bachelor of Science *Mathematical Statistics*

Statistics is the science of extracting information from a variety of data sources utilising cutting-edge technologies that enable companies and institutions to remain abreast and to be globally competitive. Statistics and data science form the foundation on which so much future development takes place. Superb opportunities exist for students who are keen to distinguish themselves in this field. You will not only enjoy an extraordinary and rewarding career, you will also receive an above-average remuneration package.

Who is the ideal candidate?

An ideal candidate for this programme is someone with:
- strong numerical skills;
- interest in computers and computer programming;
- logical reasoning ability and critical thinking skills; and
- strong problem-solving skills.

What makes this programme unique?

The Statistics programme can uniquely combine students' interest in mathematical statistics with their interest in, for example, insurance science, economics, mathematics and applied mathematics.

By completing this programme you will therefore be positioned at the forefront of analytical thinking and application in the statistical, computational and interdisciplinary environments of the future.

Which companies employ our graduates?

- Commerce companies (especially online shopping, customer analytics and recommender systems)
- Financial and banking companies
- Health companies
- Information technology companies
- Insurance and accounting companies
- Logistics and transport companies
- Pharmaceutical industries
- Research and development organisations
- Telecommunication companies
- Universities and other education bodies

Career opportunities

Minimum admission requirements

Programme	Minimum requirements for NSC/IEB for 2025		
	Achievement level		APS
	English Home Language or English First Additional Language	Mathematics	
Bachelor of Science *Mathematical Statistics* [3 years]	5	6	**34**

Student life/Community engagement initiatives

Student life

NATHouse

NATHouse is the official student house of the Faculty of Natural and Agricultural Sciences. By default, all students registered with the Faculty of Natural and Agricultural Sciences are members of NATHouse. Our logo, which shows a stem sprouting leaves, represents our belief that the desire to learn is a guide to life. It expresses our drive to continuously overcome daily difficulties by looking for new methods to solve them. Science is, after all, focused on research and innovation.

We aim to help students to reach their academic goals and achieve optimal academic performance. The House also assists with non-academic issues and provides some 'off-the desk' activities to help students take a break from their studies.

Our Vision

We believe that the love of learning is a guide to life and aim to:

- motivate our student members to achieve academic excellence in the sciences;
- connect our members with the working sector, inspiring them to cultivate their talents and contribute to society;
- emphasise the value of sciences – on campus and in our communities;
- participate in University activities on various levels; and
- provide students with the necessary personal and professional development through personal and professional well-being sessions, various community engagement projects and sports.

Contact information

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Agricultural Annex 2–6
Hatfield Campus
Tel +27 (0)12 420 6540
Email nathousetuks@gmail.com
Website www.up.ac.za/nathouse

A problem shared is a problem halved! Visit us at our offices to discuss any issues, academic or non-academic that might be troubling you. We are here to assist you, and while we are at it, we may even offer you some coffee!

Community engagement initiatives

Sci-Enza

Sci-Enza, a science centre at the University of Pretoria, is the oldest science centre on the African continent and has been involved in raising science awareness and communicating science to the South African public for more than 40 years. Our mission is to make science accessible to learners of all ages in a fun and entertaining way and, in doing so, to raise science awareness.

Our vision is to promote greater understanding and awareness of science and technology among South Africans and to foster public engagement with science. We are committed to creating a learning environment where SCIENCE AND IMAGINATION UNITE! This is achieved through interactive exhibits, exciting programmes and memorable experiences with science both on the premises and through outreach. Sci-Enza is open during office hours on weekdays.

Please contact +27 (0)12 420 3767 or email sci-enza@up.ac.za for more information and to make an appointment.

Faculty of Natural and Agricultural Sciences
Fakulteit Natuur- en Landbouwetenskappe
Lefapha la Disaense tša Tlhago le Temo
Make today matter

Periodic Table of the Elements

- **Pink** *(left)*: the **s** block elements (consisting: hydrogen, alkali metals, alkaline earth metals).
- **Blue** *(middle)*: the **d** block elements (they are the transition metals).
- **Yellow** *(right)*: the **p** block elements (consisting:some metals, metalloids, non-metals, noble gases, and halogens).
- **Peach** *(two rows at the bottom)*: the **f** block elements (they are the inner transition elements, consisting of actinides and lanthanides).
- **Symbols** printed in **solid black:** solids at 25˚C.
- **Symbols** printed in **white with outline:** gases at 25˚C.
- **Symbols** printed in **grey with outline:** liquids at 25˚C.

1 Ia	2 IIa	3 IIIb	4 IVb	5 Vb	6 VIb	7 VIIb	8 VIIIb	9 VIIIb	10 VIIIb	11 Ib	12 IIb	13 IIIa	14 IVa	15 Va	16 VIa	17 VIIa	18 VIIIa
Hydrogen **H** 1 1.0079 2.2 $1s^1$																	Helium **He** 2 4.0026 $1s^2$
Lithium **Li** 3 6.941 1.0 $[He]\ 2s^1$	Beryllium **Be** 4 9.0122 1.5 $[He]\ 2s^2$											Boron **B** 5 10.811 2.0 $[He]\ 2s^2\ 2p^1$	Carbon **C** 6 12.011 2.5 $[He]\ 2s^2\ 2p^2$	Nitrogen **N** 7 14.007 3.1 $[He]\ 2s^2\ 2p^3$	Oxygen **O** 8 15.999 3.5 $[He]\ 2s^2\ 2p^4$	Fluorine **F** 18.998 4.1 $[He]\ 2s^2\ 2p^5$	Neon **Ne** 10 20.18 $[He]\ 2s^2\ 2p^6$
Sodium **Na** 11 22.990 1.0 $[Ne]\ 3s^1$	Magnesium **Mg** 12 24.305 1.2 $[Ne]\ 3s^2$											Aluminium **Al** 13 26.982 1.5 $[Ne]\ 3s^2\ 3p^1$	Silicon **Si** 14 28.086 1.7 $[Ne]\ 3s^2\ 3p^2$	Phosphorus **P** 15 30.974 2.1 $[Ne]\ 3s^2\ 3p^3$	Sulphur **S** 16 32.066 2.4 $[Ne]\ 3s^2\ 3p^4$	Chlorine **Cl** 17 35.453 2.8 $[Ne]\ 3s^2\ 3p^5$	Argon **Ar** 18 39.948 $[Ne]\ 3s^2\ 3p^6$
Potassium **K** 19 39.098 0.9 $[Ar]\ 4s^1$	Calcium **Ca** 20 40.078 1.0 $[Ar]\ 4s^2$	Scandium **Sc** 21 44.956 1.2 $[Ar]\ 3d^1\ 4s^2$	Titanium **Ti** 22 47.88 1.3 $[Ar]\ 3d^2\ 4s^2$	Vanadium **V** 23 50.942 1.5 $[Ar]\ 3d^3\ 4s^2$	Chromium **Cr** 24 51.996 1.6 $[Ar]\ 3d^5\ 4s^1$	Manganese **Mn** 25 54.938 1.6 $[Ar]\ 3d^5\ 4s^2$	Iron **Fe** 26 55.845 1.6 $[Ar]\ 3d^6\ 4s^2$	Cobalt **Co** 27 58.933 1.7 $[Ar]\ 3d^7\ 4s^2$	Nickel **Ni** 28 58.693 1.8 $[Ar]\ 3d^8\ 4s^2$	Copper **Cu** 29 63.546 1.8 $[Ar]\ 3d^{10}\ 4s^1$	Zinc **Zn** 30 65.41 1.7 $[Ar]\ 3d^{10}\ 4s^2$	Gallium **Ga** 31 69.723 1.8 $[Ar]\ 3d^{10}4s^2\ 4p^1$	Germanium **Ge** 32 72.64 2.0 $[Ar]\ 3d^{10}4s^2\ 4p^2$	Arsenic **As** 33 74.922 2.2 $[Ar]\ 3d^{10}4s^2\ 4p^3$	Selenium **Se** 34 78.96 2.5 $[Ar]\ 4d^{10}4s^2\ 4p^4$	Bromine **Br** 35 79.904 2.7 $[Ar]\ 3d^{10}\ 4s^2 4p^5$	Krypton **Kr** 36 83.8 $[Ar]\ 3d^{10}\ 4s^2\ 4p^6$
Rubidium **Rb** 37 85.468 0.9 $[Kr]\ 5s^1$	Strontium **Sr** 38 87.62 1.0 $[Kr]\ 5s^2$	Yttrium **Y** 39 88.906 1.1 $[Kr]\ 4d^1\ 5s^2$	Zirconium **Zr** 40 91.2245 1.2 $[Kr]\ 4d^2\ 5s^2$	Niobium **Nb** 41 92.906 1.2 $[Kr]\ 4d^4\ 5s^1$	Molybdenum **Mo** 42 95.94 1.3 $[Kr]\ 4d^5\ 5s^1$	Technetium **Tc** 43 98.906 1.4 $[Kr]\ 4d^6\ 5s^1$	Ruthenium **Ru** 44 101.07 1.4 $[Kr]\ 4d^7\ 5s^1$	Rhodium **Rh** 45 102.91 1.5 $[Kr]\ 4d^8\ 5s^1$	Palladium **Pd** 46 106.42 1.4 $[Kr]\ 4d^{10}$	Silver **Ag** 47 107.87 1.4 $[Kr]\ 4d^{10}\ 5s^1$	Cadmium **Cd** 48 112.41 1.5 $[Kr]\ 4d^{10}\ 5s^2$	Indium **In** 49 114.82 1.5 $[Kr]\ 4d^{10}5s^2\ 5p^1$	Tin **Sn** 50 118.71 1.7 $[Kr]\ 4d^{10}5s^2\ 5p^2$	Antimony **Sb** 51 121.76 1.8 $[Kr]\ 4d^{10}\ 5s^2$	Tellurium **Te** 52 127.6 2.0 $[Kr]\ 4d^{10}5s^2\ 5p^4$	Iodine **I** 53 126.904 2.2 $[Kr]\ 4d^{10}\ 5s^2\ 5p^5$	Xenon **Xe** 54 131.29 $[Kr]\ 4d^{10}\ 5s^2\ 5p^6$
Caesium **Cs** 55 132.91 0.9 $[Xe]\ 6s^1$	Barium **Ba** 56 137.33 1.0 $[Xe]\ 6s^2$	Lanthanum **La** 57 138.91 1.1 $[Xe]\ 5d^1\ 6s^1$	Hafnium **Hf** 72 178.49 1.2 $[Xe]\ 4f^{14}\ 5d^2\ 6s^2$	Tantalum **Ta** 73 180.95 1.3 $[Xe]\ 4f^{14}\ 5d^3\ 6s^2$	Tungsten **W** 74 183.84 1.4 $[Xe]\ 4f^{14}\ 5d^4\ 6s^2$	Rhenium **Re** 75 186.21 1.5 $[Xe]\ 4f^{14}\ 5d^5\ 6s^2$	Osmium **Os** 76 190.23 1.5 $[Xe]\ 4f^{14}\ 5d^6\ 6s^2$	Iridium **Ir** 77 192.22 1.6 $[Xe]\ 4f^{14}\ 5d^7\ 6s^2$	Platinum **Pt** 78 195.08 1.4 $[Xe]\ 4f^{14}\ 5d^9\ 6s^1$	Gold **Au** 79 196.97 1.4 $[Xe]\ 4f^{14}\ 5d^{10}\ 6s^1$	Mercury **Hg** 80 200.59 1.5 $[Xe]\ 4f^{14}\ 5d^{10}\ 6s^2$	Thallium **Tl** 81 204.38 1.4 $[Xe]\ 4f^{14}5d^{10}6s^26p^1$	Lead **Pb** 82 207.20 1.6 $[Xe]\ 4f^{14}5d^{10}6s^26p^2$	Bismuth **Bi** 83 208.98 1.7 $[Xe]4f^{14}5d^{10}6s^26p^3$	Polonium **Po** 84 208.98 1.8 $[Xe]\ 4f^{14}5d^{10}6s^26p^4$	Astatine **At** 85 210 2.0 $[Xe]\ 4f^{14}5d^{10}6s^26p^5$	Radon **Rn** 86 222.02 $[Xe]\ 4f^{14}5d^{10}6s^26p^6$
Francium **Fr** 87 223.02 0.9 $[Rn]\ 7s^1$	Radium **Ra** 88 226.03 1.0 $[Rn]\ 7s^2$	Actinium **Ac** 89 227.03 1.0 $[Rn]6d^17s^2$	Rutherfordium **Rf** 104 261.11	Dubnium **Db** 105 262.11	Seaborgium **Sg** 106 266	Bohrium **Bh** 107 264	Hassium **Hs** 108 277	Meitnerium **Mt** 109 268	Darmstadtium **Ds** 110 271	Roentgenium **Rg** 111 272	Copernicium **Cn** 112 285	Nihonium **Nh** 113 286	Flerovium **Fl** 114 289	Moscovium **Mc** 115 289	Livermorium **Lv** 116 293	Tennesine **Ts** 117 294	Oganesson **Og** 118 294

Cerium **Ce** 58 140.12 1.1 $[Xe]\ 4f^2\ 6s^2$	Praseodymium **Pr** 59 140.91 1.1 $[Xe]\ 4f^3\ 6s^2$	Neodymium **Nd** 60 144.24 1.1 $[Xe]\ 4f^4\ 6s^2$	Promethium **Pm** 61 146.92 1.1 $[Xe]\ 4f^5\ 6s^2$	Samarium **Sm** 62 150.36 1.1 $[Xe]\ 4f^6\ 6s^2$	Europium **Eu** 63 151.96 1.0 $[Xe]\ 4f^7\ 6s^2$	Gadolinium **Gd** 64 157.25 1.1 $[Xe]\ 4f^7\ 5d^1\ 6s^2$	Terbium **Tb** 65 158.93 1.1 $[Xe]\ 4f^9\ 6s^2$	Dysprosium **Dy** 66 162.50 1.1 $[Xe]\ 4f^{10}\ 6s^2$	Holmium **Ho** 67 164.93 1.1 $[Xe]\ 4f^{11}\ 6s^2$	Erbium **Er** 68 167.26 1.1 $[Xe]\ 4f^{12}\ 6s^2$	Thulium **Tm** 69 168.93 1.1 $[Xe]\ 4f^{13}\ 6s^2$	Ytterbium **Yb** 70 173.04 1.1 $[Xe]\ 4f^{14}\ 6s^2$	Lutetium **Lu** 71 174.97 1.1 $[Xe]\ 4f^{14}\ 5d^1\ 6s^2$
Thorium **Th** 90 232.04 1.1 $[Rn]\ 6d^2\ 7s^2$	Protactinium **Pa** 91 231.04 1.1 $[Rn]\ 5f^2\ 6d^1$	Uranium **U** 92 238.03 1.2 $[Rn]\ 5f^3\ 6d^1\ 7s^2$	Neptunium **Np** 93 237.05 1.2 $[Rn]\ 5f^4\ 6d^1\ 7s^2$	Plutonium **Pu** 94 244.08 1.2 $[Rn]\ 5f^6\ 7s^2$	Americium **Am** 95 244.06 1.2 $[Rn]\ 5f^7\ 7s^2$	Curium **Cm** 96 247.07 1.2 $[Rn]\ 5f^7\ 6d^1\ 7s^2$	Berkelium **Bk** 97 247.07 1.2 $[Rn]\ 5f^9\ 7s^2$	Californium **Cf** 98 251.08 1.2 $[Rn]\ 5f^{10}\ 7s^2$	Einsteinium **Es** 99 252.08 1.2 $[Rn]\ 5f^{11}\ 7s^2$	Fermium **Fm** 100 257.10 1.2 $[Rn]\ 5f^{12}\ 7s^2$	Mendelevium **Md** 101 258.10 1.2 $[Rn]\ 5f^{13}\ 7s^2$	Nobelium **No** 102 259 $[Rn]\ 5f^{14}\ 7s^2$	Lawrencium **Lr** 103 262.11 $[Rn]\ 5f^{14}\ 6d^1\ 7s^2$

Atomic number → 88
Symbol → Ra
Element name → Radium
Atomic mass → 226.03
Electronegativity → 1.0
Electron configuration → [Rn] $7s^2$

For more information please visit our website at www.up.ac.za/nas

2025

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Natural and Agricultural Sciences

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