Natural
Sciences

It all starts here®

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

INDEMNITY

Notice

Study information is subject to change and is but a summary of the general fields of study. This information was compiled for introduction and orientation purposes and the North-West University accepts no liability for inaccuracies that may occur in this guide. The official yearbook of the University must in all cases be consulted during the process of compiling a programme for a specific field of study. The appropriate yearbook is available on request at the Admissions Office: magda.fourie@nwu.ac.za or phone 018 299 2636.

Acceptance and boarding

Please note that, owing to specific capacity constraints, the University reserves the right to select candidates for admission to certain fields of study. This means that prospective students who comply with the minimum requirements will not necessarily be admitted to the courses in question. Because of the capacity limitations and the high demand from students for admission to particular fields of study, students will be selected on the basis of their scholastic achievements for admission to these fields. The same rule applies for residence application.

GENERAL enquiery

Potchefstroom Campus

Phone or write to:
The Marketing and Communication Department (NWU-Potchefstroom Campus),
Private Bag X6001, Potchefstroom, 2520.

f	NWU-Pukke		018 299 2772
	NWUPUK	@	navrae@nwu.ac.za
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You Tube	NWU-PUKKEtv	www	nwu.ac.za

www.nwupukvirtual.co.za

Faculty of
NATURAL SCIENCES

Introduction

The combination of world class researchers and the newest facilities and technology ensure that this faculty is one of the leading institutes in South Africa where you can commence your studies as a natural scientist. Collaboration agreements with various employers ensure that students have a broad spectrum of career possibilities/research opportunities from around the world at their disposal after completion of their studies.

DEGREES, STUDY PROGRAMMES AND CURRICULUMS

How do I choose a field of study?

There are a few ways for you to choose a field of study within Natural Sciences.

Choose according to a program

In the decision making process, this method allows the student and relevant parties to see the bigger picture. If the student is unsure of the field he/she wants to specialise in, it will be better to choose a broader package or a program. The Faculty of Natural Sciences presents ten programs:

Program: Actuarial Science *(Program code: 200123)*
Program: Quantitative Risk Management
(Program code: 200166)
Program: Financial Mathematics *(Program code: 200167)*
Program: Data Mining/Business Intelligence

(Program code: 200168)
Program: Computer and Mathematical Sciences
(Program code: 200191)
Program: Information Technology (Computer Science)
(Program code: 264100)
Program: Physical and Chemical Sciences
(Program code: 200190)
Program: Environmental and Biological Sciences
(Program code: 200118)
Program: Tourism *(Program code: 200119)*
Program: Urban and Regional Planning *(Program code: 118101)*

Choose according to a curriculum/major subjects

Curriccula are the smaller, more specific parts of the programs. The name of the curriculum is indicative of what the students' major subjects will be.

If the student for example chooses curriculum N167P (Microbiology and Biochemistry), his/her major subjects will be Microbiology and Biochemistry.

The prospective student can also make a curriculum choice based on their school subjects. If the student likes Geography and Computer Applications Technology, he/she can consider a curriculum such as N166P (Geography and Computer Science). A prospective student will eventually register for one specific curriculum in order to obtain a Bachelor of Science degree (BSc).

Each curriculum forms part of a program. In order to register, the student must know the program code and the curriculum code of his/her particular field of study.

Language medium of the faculty
All classes on the NWU's Potchefstroom campus are presented in Afrikaans. Interpreting services are available in certain faculties. Consult the general brochure on which courses are interpreted.

Baccalaureus Scientiae (BSc)

Business Mathematics and Informatics® (BMI)-programes

Curriculum
The duration of all the programmes for this degree at the Potchefstroom campus is three (3) years and is only presented full-time and in Afrikaans. All actuarial modules are translated and choice of study materials, exams and tests can be obtained in English or Afrikaans.

Do you like Mathematics?
If Mathematics was your favourite subject in school, you should consider enrolling for one of the courses in Business Mathematics and Informatics® (BMI) which is presented by the Centrum for Business Mathematics and Informatics® at the North-West University.

The BMI programs comprise four (4) curriculums:
- Quantitative Risk Management (200166: N134P)
- Financial Mathematics (200167: N135P)
- Data Mining/Business Intelligence (200168: N136P)
- Actuarial Science (200123: N137P)

Contact the Centrum for BMI: 018 299 2575.

Education training
There is a serious shortage of high school teachers with profound knowledge of school subjects such as Physical Science, Life Science, Information Technology and Mathematics.

The BSc curriculums that grant access to the Advanced Postgraduate Certificate in Education (PGCE) are stated clearly in the year book of the Faculty of Natural Sciences. Bursaries are available to PGCE students.

Exposition of the APS-score
Achievement in four identified and two NSC subjects are used in the the calculation of the APS-score. The mark achieved in Life Orientation is not used in calculation.

What do people say of BMI?

"The Centre for BMI hits the sweet spot between academic excellence and practical business skills. Due to this mix we find that BMI graduates are not only bright but hit the ground running with practical business skills. In short industry enjoy excellent productivity from day one and BMI graduates an accelerated career path"
- Pravin Burra (FASSA)
Director Capital Markets, Deloitte & Touche

"I believe that this program has bridged a significant gap between very theoretical research and business reality. The success of candidates in getting jobs with the institutions with whom they have done their research projects clearly indicates how institutions value the project output but just as importantly that they know that they are employing individuals who can add value from day 1"
- David Hodnett
Deputy CEO: Barclays Africa Group

"The SAS institute believes that the world class programs presented at BMI deliver outstanding experts to clients. The core of this success is founded in the quality of their students, tuition and leadership." – Murray de Villiers. General Manager: Alliances SAS® … THE POWER TO KNOW.

"BMI students work in numerous divisions in Absa that ranges from Risk, Internal Audit, Information management, Treasury and Regulation Reporting to Barclays. The feedback from these areas is constantly positive with much appreciation for the maturity and the well-polished, relevant Quantitative Risk knowledge and skills

of the graduates." – Neels Erasmus, Head: Absa Risk Support Services, Absa Risk Division.

Admission requirements for the BMI programs

- Mathematics 70% (level 6).
- A minimum APS-score of 32.

The higher your Mathematics marks the better the chance that you will be accepted for a BMI program.

What school subjects do you need?

All programs require at least Grade 12 Mathematics. Although it is not a strict prerequisite, all learners are advised to take Computer Applications Technology and learners who want to follow the A and B parts (Actuarial Science and Quantitative Risk Management) are advised to take Accounting.

Professional qualifications for which you are prepared:

- •   FASSA - Fellow of the Actuarial Society of South Africa
- •   FIA - Fellow of the Institute of Actuaries
- •   PRM - Professional Risk Manager
- •   CERA - Certifi ed Enterprise Risk Actuary

NWU PUKKE

The Hons BSc Actuarial Science programme of the Centre for Business Mathematics and Informatics® (BMI) is accredited by the Institute and Faculty of Actuaries (IFA) to recommend exemption for CT1-CT8 (http://www.actuaries.org.uk). The Centre for BMI is also accredited for the same courses (A101-A103 and A201-A205) at the Actuarial Society of South Africa (http://www.actuarialsociety.org.za/).

PRMIA (professional risk managers' international association) has accredited the Hons BSc Quantitative Risk Management training programme for Level I and II of their PRM (professional risk manager)(see http://www.prmia.org/).
Upon completion of the Hons. BSc, BMI students are well prepared for the FRM (Financial Risk Management) and CFA (Charter Financial Analist) exams.

The BSc Honors Actuarial Science program of the Centrum for Business Mathematics and Informatics® (BMI) is accredited by

the Institute and Faculty of Actuaries (IFA) in order to recommend exemption for CT1-CT8 (see www.actuaries.org.uk). Interim accreditation from the Actuarial Society of South Africa (AS) was received for AS's A1- and A2-level courses. We are waiting for feedback from AS with regard to our application. ERM-II (see www.ermii.org) accredited the BMI risk training and research programs.

On completion of the BSc Honors, BMI students are well-prepared to also write the Financial Risk Manager (FRM) and the Chartered Financial Analyst (CFA) exams.

What is the risk?
Since all four BMI programmes focus primarily on risk, it is necessary to explain the basics of risk. Risk comes in many forms. Every person and organisation faces risk. As experts in measuring and managing risk, actuaries and risk managers fulfil a significant need in our society. Their contribution to society's psychological, physical and economic wellbeing is immense. If the risk management programmes that actuaries and risk managers develop didn't exist, our economy would not be able to grow as it does.

Consider the following:
- Would as many people be willing to own a home if fire insurance did not exist?
- Would a company build a factory that could be destroyed in an earthquake if it were not protected by insurance?
- Would people spend money today and still be confident about their future if there were no retirement programmes?
- Would the cars people drive be safe if the parts were not

rigorously tested to last for many years using mathematical techniques actuaries, engineers and risk managers routinely use?

- Would parents enjoy risky and adventurous recreational activities such as rock climbing or skiing if their children faced financial disaster in the event of an accident?
- Would the banks (and the money deposited in them) be safe if their assets and liabilities were not carefully managed to control financial risk?
- Would the returns on our investments be high if financial institutions such as mutual funds, banks and insurance companies did not use sophisticated techniques to improve returns without increasing risk too much?

What is Data Science?

Data Science (known as Business Analytics) refers to the skills, technologies, applications and practices for continuous iterative exploration and investigation of huge data bases in order to gain insight and drive business planning. Business Analytics is forward looking taking business objectives into account.

Consider the following:

- The data warehouses of some big retailers now contain information measured in petabytes (1 million gigabytes). How can this be analyzed and used in their business planning?
- How can a combination of social network and other customer data be used to forecast customer behaviour in a telecoms environment?
- Every time customers swipe their credit cards at a grocery store, they require an authorization. Fraud detection in these kinds of transactions has to happen almost instantly.

Actuarial Science *(Interpreted in English)*
presented by the Centrum for Business Mathematics and Informatics®) (Program code: 200123)

Curriculum
Actuarial Science (200123: N137P)
The future is uncertain. Some events that may occur might be undesired. Risks are the possibility that something undesired will happen.

Actuaries are experts in:
- The evaluation of the probability of future events;
- The design of creative ways to reduce the probability of undesired events; and
- The reduction of the impact of undesired events that indeed happens.

The impact of undesired events can be emotional as well as financial. The decrease in the probability of these events helps to alleviate emotional pain. Events like death can't be avoided and it is therefore important to lessen the financial impact thereof.

Actuaries are the foremost experts who find ways to manage risks. It takes a combination of strong analytical skills, business knowledge and understanding of human nature to design and manage programs that controls risks.

Actuaries like what they do. Their work is intellectually challenging and they are well-paid. Actuaries are key players in the management team of the companies that employ them. In a fast changing world with new risks and the continuing need for more

creative ways to managed it, there are always opportunities for personal and professional growth in an actuarial career, as well as the pleasure of lifelong learning. Most actuaries work in a pleasant environment together with other experts and enjoy the respect of their colleagues.

Actuaries are the analytical backbone of our society's financial insurance programs. They are the brain power behind the financial protective precautions that we implemented in our personal lives in order for us to live without worrying too much about the future. It is these precautions that protect us from life's disasters. The insight in risks that actuaries have also helps to ensure that our savings work for us so that everything we love and are precious to us can grow and flourish. The work of actuaries is to everyone's advantage.

What makes Actuarial Science at the NWU unique?
The Actuarial programme at the NWU is closely entwined with the Business Mathematics and Informatics® (BMI) programme. The BMI programme is well known in the financial industry and is supported financially by Absa and SAS. The best achievers in the Actuarial Sciences programme can also apply to enroll for the Masters degree in BMI. It is a unique programme, concentrating on the needs of the industry and also providing the students with unique career opportunities, especially in the financial sector.

The focus of the Actuarial programme at the NWU is on Enterprise-wide Risk Management, while other universities focus on specialist areas such as pensions, health or life insurance. This focus was chosen because it connects with the BMI risk management and risk analysis focus areas. Students who

intend to enrol for the BMI Masters Degree are eligible for Absa bursaries in every study year depending on their academic performance.

What exemptions does the NWU offer?
The NWU is currently accredited by the Actuarial Society of South Africa (ASSA) to provide exemption recommendations for subjects A101-A103, A201-A205 and A301 (IFA subjects CT1-CT8 and CA1). ASSA has launched another fellowship principle

subject in Enterprise-wide Risk Management. This is currently a focus area in the BMI Masters degree and although the subject does not lead to exemption, it has been designed to prepare students for the equivalent professional exam.

Career possibilities

If you specialise in the A part (Actuarial Science) of the BMI program, typical jobs in the financial sector includes:
- Actuary
- Risk Manager

Mainly in large companies in the financial service sector (e.g. Sanlam, Liberty, Old Mutual, Momentum, Absa, SAS, KPMG, Ernst & Young and PricewaterhouseCoopers).

Most important subjects

The curriculum comprises the subjects Mathematics, Statistics, Computer Science, Applied Mathematics, Actuarial Science, Economics, Accounting and Money and Banking.

Admission to postgraduate study

The curriculum grants access to BSc Honors (Actuarial Science) and can also grant access to honors study in Economics of Statistics. On completion of this Honors degree students may apply for admission to the MSc (Quantitative Risk Management/Actuarial) in BMI.

Quantitative Risk Management

(presented by the Centrum for Business Mathematics and Informatics®) (Program code: 200166)

Curriculum
- Quantitative Risk Management (200166: N134P)

What is Quantitative Risk Management?

The importance of risk management at the highest levels of organisations is increasingly acknowledged these days, known in its broadest sense as Enterprise-wide Risk Management (ERM). The most important risk types are market, credit and operational risk.

Market risk is the risk that changes in the financial market prices and rates will reduce the value of the firm's positions. Credit risk is the risk that a change in the credit quality of a counterparty will affect the value of the bank's position. Operational risk refers to potential losses resulting from inadequate systems, management failure, faulty controls, fraud, and human errors.

Quantitative Risk Management at the NWU covers a full range of topics in mainstream risk management and analysis and its applications. The curriculum includes, for example, market risk, credit risk, operational risk, volatility modelling, default models. Basel II regulations and approaches, time series analysis, statistical models and probability, derivatives pricing and hedging, asset price dynamics, risk analysis and extreme events, interest rate and foreign exchange processes, investment decision making, as well as other statistical subjects of relevance to practical financial modelling. This includes practical analyses with state-of-the art software packages such as SAS Risk Dimensions, SAS Operational Risk and SAS Credit Solutions, BARRA and ALMAN.

Career opportunities in Quantitative Risk Management

If you specialize in the B-Leg of the BMI programme, typical jobs in the financial sector are:

• Market or Credit Risk Analyst/Manager
• Commercial Banker
• Corporate Banker
• Treasury Analyst
• Risk Analyst/Manager
• Decision Support Analyst
• Investment Analyst
• Financial Engineer

Where am I going to work?

Mostly in large companies in the financial services sector (e.g. Absa, Barclays, Nedbank, Transunion, Standard Bank, KPMG, Ernst & Young and PricewaterhouseCoopers).

Most important subjects

The curriculums comprise the subjects Business Mathematics, Mathematics, Statistics, Computer Science, Applied Mathematics, Actuarial Science, Economics, Accounting and Money and Banking.

Admission to postgraduate study

On completion of the qualification, students,
Depending on the completed curriculum, may enrol for an honors degree in one of the three (3) specialist fields:
Quantitative Risk Management,
Data Mining.

The curriculums grant access to postgraduate studies in Economics, Statistics, Mathematics or Computer Science. On completion of the honors degree students may apply for admission to the MSc in BMI.

Financial Mathematics

(presented by the Centrum for Business Mathematics and Informatics®) (Program code: 200167)

Curriculum
• Financial Mathematics (200167: N135P)

What is Financial Mathematics?

Financial Mathematics is a flourishing area of modern science.

Its numerous applications have become vital to the day to day functioning of the world's financial institutions. As a consequence, a solid command of the principles and techniques of financial engineering is essential for a responsible approach to the trading, asset management, and risk control of complicated financial positions. Financial Mathematics at the NWU covers a full range of topics in mainstream mathematical finance and its applications.

The curriculum includes, for example, derivatives pricing and hedging, asset price dynamics, risk analysis and extreme events, interest rate and foreign exchange processes, credit and inflation linked products, real options, stochastic optimisation and control, and investment decision making, as well as other mathematical subjects of relevance to practical financial modelling.

This includes practical analyses with state-of-the art software packages such as SAS Risk Dimensions, SAS Optimisation and SAS ETS.

Career opportunities in Financial Mathematics
If you specialise in the M-Leg of the BMI programme, typical jobs in the financial sector would be:
• Financial Product Developer
• Structured Financing Specialist
• Financial Engineer
• Financial Mathematician

Where am I going to work?
Mostly in large companies in the financial services sector (e.g. Absa, Barclays, Nedbank, Transunion, Standard Bank, KPMG, Ernst & Young and PricewaterhouseCoopers).

Most important subjects
The curriculums comprise the subjects Business Mathematics, Mathematics, Statistics, Computer Science, Applied Mathematics, Actuarial Science, Economics, Accounting and Money and Banking.

Admission to postgraduate study
On completion of the qualification, students can, depending on their completed curriculum, enrol for an honors degree in Financial Mathematics or Data Mining.

The curriculums also grant access to postgraduate study in Economics, Statistics, Mathematics or Computer Science. On completion of the honors degree, students may also apply for admission to the MSc in BMI.

Data Mining / Business Analytics
(presented by the Centrum for Business Mathematics and Informatics®) (Program code: 200168)

Curriculum
Data Mining/Business Intelligence (200168: N136P)

What is Data Mining?
Business Analytics is a fast developing field with applications covering a wide range of industries. The field is ideally suited for those students who have an aptitude for mathematics and a keen interest in computer programming. Currently numerous job opportunities exist in various industry sectors, e.g. financial, industrial, communications, retail and mining.

Business Analytics (sometimes called Data Science) refers to the skills, technologies, applications and practices for continuous iterative exploration and investigation of huge data bases in order to gain insight and drive business planning. Business Analytics software is usually based on mathematical algorithms which were developed to analyse large data sets (frequently referred to as Big Data). It allows users to analyse data from many different dimensions or angles, categorise it, summarise the relationships identified and use it for predictive analytics.

Business Analytics is primarily used today by companies with a strong consumer focus – retail, financial, communication and marketing organisations. It enables these companies to determine relationships among "internal" factors such as price, product positioning, and "external" factors such as economic indicators, competition, market events, and customer demographics. It enables them to predict the impact of certain actions or events on sales, customer satisfaction, and corporate profits. With business analytics, a retailer could use point-of-sale records of customer purchases to send targeted promotions based on an individual's purchase history. Adding social network data to customer data a telecommunications company can predict which customers will move to their competitors.

Business Analytics at the NWU covers a full range of topics in mainstream business analytics and its applications. The integrated curriculum includes, for example, practical data mining, statistical time series analysis, survival analysis, statistical model building, neural networks, multi-criteria decision making, data management as well as other statistical and information technology subjects of relevance.

This includes practical analyses with state-of-the art software packages such as SAS Enterprise Miner, SAS ETS, SAS Rapid Predictive Modeler, SAS Enterprise Guide and SAS Forecast Studio.

Career opportunities in Business Analytics
In every business sector, managers have to face the challenges of huge data sets and they need people having advanced analytic skills in order to exploit the business opportunities hidden in

these data sets. Individuals having advanced analytics skills are currently in high demand.

If you specialise in the I-Leg of the BMI programme, typical jobs would be the following:
- Data Scientist
- Analytics Analyst
- Quantitative Strategist
- Credit Risk Analyst/Manager
- Decision Support Analyst
- Financial Statistician
- Data Mining Analyst
- E-Commerce Business Analyst
- Fraud Analyst
- Database Marketing Analyst
- Strategic Business Analyst

Where am I going to work?
Mostly in large companies (e.g. Foschini, Woolworths, Edgars, Makro, Absa, Barclays, Nedbank, Transunion, Standard Bank, KPMG, Ernst & Young and PricewaterhouseCoopers), SASOL, AngloPlatinum or TELKOM.

Most important subjects
The curriculums comprise the subjects Business Mathematics, Mathematics, Statistics, Computer Science, Applied Mathematics, Actuarial Science, Economics, Accounting and Money and Banking.

Admission to postgraduate study
On completion of the qualification, students, depending on their completed curriculum, may enrol for an honors degree in one of two (2) specialised fields: Quantitative Risk Management or Data Mining. The curriculums grant access to postgraduate study in Economics, Statistics, Mathematics or Computer Science. On completion of the honors degree, students may apply for admission to the MSc in BMI.

Computer and Mathematical Sciences
(Program code: 200191)

Curriculum
- Physics and Computer Science (200191: N153P)
- Computer Science and Statistics (200191: N156P)
- Computer Science and Mathematics (200191: N157P)
- Statistics and Mathematics (200191: N158P)
- Mathematics (200191: N159P)
- Computer Science and Economics (200191: N175P)
- Mathematics and Economics (200191: N176P)

Career possibilities
Exciting careers, especially on successful completion of postgraduate study awaits in a variety of institutions such as the CSIR, NECSA, MINTEK, ESKOM, SASOL, Mittal Steel SA,

SABS, DENEL, AECI, MNT and numerous industries and other organisations. There is a large demand for well-qualified teachers in Physical Science, Information Studies and Mathematics.

Admission requirements
- Physics and Computer Science (N153P), Computer Science and Statistics (N156P), Computer Science and Mathematics (N157P) and Statistics and Mathematics (N158P)
- Mathematics level 5 (60-69%) / Physical Science level 4 (50%-59%)
- APS-score: 24

Mathematics
1. A student who wants to follow any module in Mathematics, excluding Mathematical Techniques (WISN112, WISN113 or WISN123), must have obtained a mark of at least 60% (level 5) in the Grade 12 exam or 70% (level 6) in any other exam in Mathematics which the Senate regards as equal.

Remarks
Students who do not meet this requirement, but did obtain a mark of at least 50% (level 4) or at least 60% (level 5) in any other exam in Mathematics which the Senate regards as equal, will be admitted to a refresher course in Mathematics which will be presented in January by the School of Computer, Statistical and Mathematical Sciences. Should these students perform well in the tests given during this course, they may be considered for admittance to studies in Mathematics modules.

1. Prospective students who do not meet the Grade 12 requirement to enrol for WISN111 and also did not attend the refresher course, may be admitted to WISN111 in the second study year by passing the module in Mathematical Techniques (WISN112, WISN113, WISN123) in the first study year, on condition that the student understand that, by following this route to access programs which were not available to them, they may not complete their studies in the minimum period.

2. A student who wishes to take Mathematical Techniques (WISN 112, WISN 113 or WISN 123) has to comply with prerequisites of the program he/she intends to study. If a student wishes to take Mathematical Techniques (WISN 112, WISN 113 or WISN 123) in order to qualify for WISN 111 in the next year, or for non-degree purposes, she/he must have obtained a mark of at least 40% (level 3) in the grade 12 Mathematics exam or at least 50% (level 4) in another Mathematics exam considered by the Senate as equivalent to the above

Mathematics and Economics (N176P) Computer Science and Economics (N175P)
- Mathematics level 4 (60-69%)
- APS-score: 24

Admission to postgraduate study
Successful completion of the qualification grants access to postgraduate study in any of the major subjects of the chosen program. Bursaries are available for postgraduate study, but are subject to selection.

Information Technology and Computer Science
(Program code: 264100)

Curriculum
• Information Technology and Computer Science (IT) (264100: N150P)

This program and curriculum is compiled in such a manner that students are qualified to enter the field of information technology with confidence and to render a valuable service to the industry in South Africa and elsewhere in the world.

Career possibilities
Programmers, system analysts and designers, database designers, database administrators and "IT problem solvers".

Most important subjects
The curriculum was designed after planning sessions with individuals in the industry. It comprises mainly computer modules with content based on the content of the international curriculum, Computing Curricula: Computer Science.

The main streams are programming in the broader sense, system analysis and design and databases. These streams are supported by the traditional and modern computer modules as wells as some modules from Statistics, Mathematics, Accounting and Business Management.

The curriculum is compiled in such a manner that it keeps track of modern development. Amongst other, emphasis is place on the design, development (also programming) and deliverance of computerised systems, the solving of IT related problems, management of information and information sources and entrepreneurship.

A complete course exposition is available in the latest year book on our website www.nwu.ac.za/naturalsciences

Admission requirements
• Mathematics level 4 (50-59%)
• APS-score: 24

Admission to postgraduate study
Successful completion of the degree BSc in IT grants access to an honors degree in Computer Science, subject to selection.

Physical and Chemical Sciences
(Program code: 200190)

These programs equip the student with intellectual and practical skills in Physical and Chemical Sciences. Successful study, especially postgraduate study, in one of these programs offers exciting opportunities in research and development, teaching in higher and secondary teaching sectors, quality control, marketing and sales, as well as management and consultation in this specialised field.

Curriculums
In this program the student may choose from these curriculums.
- Chemistry and Physics (200190: N151P)
- Chemistry, Mathematics and Applied Mathematics (200190: N152P)
- Physics and Mathematics (200190: N154P)
- Physics and Applied Mathematics (200190: N155P)
- Chemistry and Biochemistry (200190: N174P)
- Physiology and Chemistry (200190: N177P)

Environmental and Biological Sciences
(Program code: 200118)

In this programme the following curriculums can be selected:
Chemistry and Botany (200118: N149P)
Chemistry and Zoology (200118: N161P)
Chemistry and Microbiology (200118: N168P)
Chemistry and Geology (200118: N180P)

Career possibilities
Diverse career possibilities are available in various industries and other organisations.
- Petrochemical industry (SASOL, AECI, OMNIA, Sentrachem, SAB)
- Universities and secondary schools
- Government organisations (SABS, MRC, NECSA, MINTEK)
- Pharmaceutical industries
- Water boards
- Forensic laboratories
- Textile industry
- Agriculture sector

Most important subjects
A complete course exposition is available in the latest year book on our website www.nwu.ac.za/naturalsciences

Admission requirements

- Mathematics level 5 (60%-69%)
- Physical Science level 4 (50%-59%)
- APS-score: 24

Admission to postgraduate study

Successful completion of the qualification grants access to any of the major subjects of the chosen program. Bursaries are available for postgraduate study, but are subject to selection.

Environmental and Biological Sciences

(Program code: 200118)

Curriculums and admission requirements

- Zoology and Microbiology (200118: N163P):
  *Mathematics and Physical Science level 4
- Zoology and Botany (200118: N164P):
  *Mathematics and Physical Science level 4
- Zoology and Physiology (200118: N185P):
  *Mathematics and Physical Science level 4
  Physiology and Microbiology (200118: N186P):
  *Mathematics and Physical Science level 4
- Zoology and Biochemistry (200118: N160P):
  *Mathematics level 5, Physical Science level 4
- Zoology and Chemistry (200118: N161P):
  *Mathematics level 5, Physical Science level 4
- Microbiology and Biochemistry (200118: N167P):
  *Mathematics level 5, Physical Science level 4
- Microbiology and Chemistry (200118: N168P):
  *Mathematics level 5, Physical Science level 4
- Microbiology and Botany (200118: N169P):

  *Mathematics level 5, Physical Science level 4
- Botany and Biochemistry (200118: N170P):
  *Mathematics level 5, Physical Science level 4
- Botany and Chemistry (200118: N149P):
  *Mathematics level 5, Physical Science level 4
- Zoology and Geography (200118: N162P):
  * Mathematics and Physical Science level 4
- Geography and Botany (200118: N165P):
  *Mathematics and Physical Science level 4
- Geography and Computer Science (200118: N166P):
  *Mathematics and Physical Science level 4
- Geology and Geography (200118: N147P):
  *Mathematics and Physical Science level 4
- Geology and Botany (200118: N148P):
  *Mathematics and Physical Science level 4
- Geology and Microbiology (200118: N181P):

*Mathematics and Physical Science level 4
- Zoology and Geology (200118: N182P):
  *Mathematics and Physical Science level 4
- • Geology and Chemistry (200118: N180P):
  *Mathematics level 5 and Physical Science level 4

Career possibilities
Universities: lecturers and researchers.
Research: Council for Geoscience, Mintek, Miningtek of the CSIR, WRC and ARC. Private sector: consultation companies with relevance to civil engineering, industries and environmental relevant issues such as pollution and rehabilitation of disturbed areas, mineral mining industry, exploration companies, banking (project financing), environmental conservation consultation companies.Entrepreneurs: with their own mines and consultation businesses.
Government departments: Department of Energy, Mineral Resources, Water Affairs, Agriculture, Forestry and Fisheries.

Career possibilities
Geologists and earth scientists are active in these fields:
- Mining geology
- Exploration geology
- Environmental geology
- Engineering geology
- Mineralogy and geochemistry
- Research geology

For more information on these exciting careers, visit the website www.nwu.ac.za/af/content/geologie-loopbane

Admission requirements
- Mathematics level 4 (50%-59%) or Mathematics level 4 (60%-69%) *(See above mentioned curriculums)
- Physical Science level 4 (50%-59%)
- APS-score: 24

Admission to postgraduate study
Successful completion of the qualification grants access to postgraduate study in any of the major subjects of the chosen program. Bursaries are available for postgraduate study, but are subject to selection.

Tourism
(Program code: 200119)

Curriculums
There are currently three curriculums from which students can choose. The purpose of the curriculums is to equip students with profound knowledge and skills in environment-biology and tourism management in order for all aspects of ecotourism to be planned, developed and managed and also to alleviate the

shortage of trained managers in the field of nature conservation and sustainable development:

- Botany and Zoology (200119: N171P)
- Geography and Botany (200119: N172P)
- Geography and Zoology (200119: N173P)

Career possibilities

The qualification is primarily aimed at the tourism industry in general, but the person who completed this program will be sought after at a large variety of institutes in the private and public sectors

Admission requirements

- Mathematics level 4 (50%-59%)
- Physical Science level 4 (50%-59%)
- APS-score: 24

Admission to postgraduate study

Successful completion of the qualification grants access to postgraduate study in any of the major subjects of the chosen program. Bursaries are available for postgraduate study, but are subject to selection.

Urban and Regional Planning

(Program code: 118101) (interpreted in English)

The duration of all the curriculums in this program is four (4) years and it is only presented full-time.

Curriculum

The single curriculum in this program is designed to train professional urban and regional planners to take care of the development of urban and regional areas in order to improve the quality of life of our country and its people.

- Urban and Regional Planning (118101: N184P)
  The urban and regional planner is involved with a wide variety of planning tasks which include: design and establishment of town areas, including business districts and recreation areas, feasibility studies of mentioned aspects, integrated development plans, rural development, urban renovation strategies, the amendment of land use rights, strategic planning and project management, establishment of land use management systems and specialist advise on property development.

Most important subjects

There is only one curriculum in this program. In this curriculum Geography and Environmental Management and Economics together with Urban and Regional Planning are the four (4) core subjects. The curriculum also comprises modules from Industrial Sociology, Engineering for Planning, Project Management, Private Law, Statistics, Sociology, Mathematics and Computer Science and Information Systems.

Admission requirements

- Mathematics level 5 (60%-69%)
- APS-score: 28
- Subject to a selection exam
- Applications close on 30 June

Career possibilities
On completion of the studies, a student can apply for planning jobs in civil service, provincial government, district government, local government, private sector, universities and technikons. These jobs are only available for professional urban and regional planners. You can also start your own business and provide jobs.

As project manager of local development projects, you can give valuable contributions to work creation and the eradication of poverty.

Admission to postgraduate study
Successful completion of the qualification grants access to study for the qualification M Art et Scien (Planning).

Subject descriptions
Not all the subjects in the Faculty of Natural Sciences are school subjects. For this reason the nature of the subjects are briefly described below:

Biochemistry
Biochemistry is the study of the molecular basis of life. Living organisms such as humans, animals, plants, fungi, bacteria and viruses are made up from unique chemicals. Because these chemicals are so different from the chemical compounds found in non-living systems, we call them biomolecules.

By studying the structure-function relationship of the biomolecules, biochemists contribute for example to the development of vaccines and therapies for infectious diseases, the genetic manipulation of organisms and understanding the molecular basis of enzyme working, fermentation, heredity,

congenital diseases, cancer and the drive towards personalized medicine.

Chemistry
All matter consists of sub-microscopic particles, namely atoms, molecules and ions. The characteristics and behaviour of the compounding particles determine the characteristics and behaviour of the matter. Chemistry is the study of matter and its purpose is to alter the characteristics and behaviour of the compounding particles to the advantage of society. Products like fertiliser soap, washing powder, toothpaste, insect killer, plastic, rubber, fuel, glue, paint and medicine are the result of chemical research and manufactured by the chemical industry. This industry forms the backbone of modern society.

Zoology
Zoology entails the study of animals in order for humans to reign over the Creation in a responsible manner. In Zoology animal variety, their interaction with each other and the environment, as well as their structure and function are studied. It is of utmost importance that we know the animals (and the plants) that share the planet with us as thoroughly as possible. Animals influence the life and wellbeing of humans in various ways.

We are dependant on animals as food source, as companions in the form of pets, as integral part of the ecosystem and also as a source of labour. We compete with various animals. This includes animals that threaten our food sources as well as those animals that parasitize on both humans and animals. Zoologists are needed in diverse fields including: biosystematics, zoological research, ecology, ecotoxicology, epidemiology, agriculture,

nature conservation, natural history museums, environmental management, education, parasitology, pest management, taxidermy, fresh water and marine research and veterinary science.

Physics
Physics try to summarise phenomenon in nature according to scientific laws e.g. the movement laws of Newton. Such laws are formulated to give us knowledge of the physical world. Physics, together with the subjects Chemistry and various divisions of Mathematics, form the basis of Science and Technology. These subjects form part of curriculums from Engineering and various other applicable fields.

The mission of the subject group Physics comprises mainly training while research is conducted in Astrophysics and Space Physics within the Centre for Space Research. This unit is also involved with the South African National Antarctic Centre where research is conducted in Antarctica. Physics gives a person a unique approach to problem solving, a logical scientific mind-set as well as insight and a perspective on the world we live in. These skills contribute to the physicist's ability to adapt in careers other than those of Physics.

The subject group Physics has an elaborate bursary scheme which is aimed at training outstanding students as physicists and to help reduce the great shortage of natural scientist in South Africa.

Geography and Environmental Management
Different characteristics of the natural environment (e.g. climate, minerals, topography, oceans) lead to humans establishing different activities on the earth surface (e.g. a mine, a farm, a city or a resort).

Different activities influence the natural and socio-economic environment in different ways (e.g. pollution or socio-economic and ethical-moral problems). Geography and Environmental Management studies the total human-nature system with the purpose to understand and manage land use patterns and the influences thereof on the environment.

Geology

The subject group Geology focuses on a geological approach in the environmental sciences with a profound substructure in soil scientific and biological or chemical aspects. Subject fields include: Soil Science and Disintegration, Soil Degradation and Neo-tectonics, Environmental Geology, South African Geology, Structure Geology, Sedimentology, Solidification Petrology, Stratigraphy, Mineralogy, Crystallography, Field Studies, Economical Geology, Geochemistry, Geohydrology, Engineering Geology and Geophysical Methods.

Microbiology

Microbiology entails the uncovering of mysteries of microscopic life and the application thereof in modern society. The interaction of viruses, bacteria, archaea and fungi with the enviroment, their industrial industrial application and clinical importance affects almost every area of human life.
Undergraduate study in Microbiology includes the study of different types of microbes as well as applications in microbial ecology, genetics and industrial microbiology

Botany

Plants form the bridge between the biosphere and its energy source, the sun. Plants are furthermore the source of oxygen,

food, fossil and recent fuel, fibre, medicine and building material. Plants, such as cut flowers, are cultivated and planted for their esthetical value. Studies in the basic structure, identification, classification and functioning of plants, their interaction with other organisms and the environment, as well as applied aspects of the subject field, are crucial building blocks in the training of botanists and environmental scientists.

Botanists occupy themselves with the most fundamental questions and needs of humans and animals and are sought after in fields such as: biosystematics, botanical research, ecology, ecotoxicology, biochemistry, agriculture, nature conservation, management of botanical gardens, environmental management,

education, pest control, freshwater and marine research, horticulture, crop production, biotechnology, plant cultivator, greenhouse management, rehabilitation and water purifying.

Computer Science and Information Technology (IT)
These subject fields entail a study of problem solving approaches as well as a study of the computer and all its facets with regard to compilation, application and uses. The problem solving approach is underlying to all the work entered into. The design and creation of an algorithm (the step-by-step procedure for solving a problem), the writing of a computer program and the execution thereof on a modern computer is a stimulating and intellectual-rewarding experience. Knowledge of Computer Science and IT grants access to a large variety of extremely interesting and profitable jobs in the computer industry and private and public sectors.

Statistics
Statistics entails, amongst other, the study of data analysis methods. In laboratories, commercial institutions and factories data are collected on a daily basis. This data needs to be processed in order to extract useful information. Statistics supplies the techniques for this process and is very important for many fields of study and increasingly essential.

Applied Mathematics
Applied Mathematics is the subject that builds bridges between Mathematics and practice. Mathematics entails abstract concepts in order to establish logical structures. The purpose of Applied Mathematics is to solve reality problems by means of mathematical techniques. Applied Mathematics concentrates

mainly on useful areas in Engineering, Physics and Computer Science.

Mathematics
Mathematics on school level comprises algebra, geometry, analytical geometry, trigonometry and differential calculus. All these divisions are studied more in-depth at university level. No student in Physics, Chemistry, Engineering, Statistics or Applied Mathematics can make progress in these subjects without a profound knowledge of the different divisions of Mathematics.

The Faculty of Natural Sciences at the NWU is committed to quality and expertise. The tuition that you receive here prepares you for a modern, fast changing work environment that requires adaptability, practical skills, a multidisciplinary approach and teamwork.

At the faculty we develop balanced, critical thinkers and support is given to pre and postgraduate students so that they can reach their full potential as natural scientists.

NWU PUKKE

- **Vocationally directed**
- **Internationally recognised degrees**
- **Afrikaans (with educational interpreting in some courses)**
- **Pulsating student life**
- **Safe campus**

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