



Bachelor of Science in Information Technology (Data Science)

SAQA ID 120690 NQF Level 7

🕒 Mode and duration

Contact

Full-Time (Campus)

- Minimum: 3 years
- Maximum: 5 years

Full-Time (Online)

- Minimum: 3 years
- Maximum: 5 years

Part-Time (Online)

- Minimum: 5 years
- Maximum: 7 years

☰ Qualification description

Be on the cutting edge of digital innovation with the Bachelor of Science in Information Technology (BSc IT) with a Specialisation in Data Science, a broad and rigorous undergraduate qualification designed to equip students with the knowledge and skills required to excel in the field of data science and analytics.

The BSc IT (Data Science) degree is intended to provide students with a well-rounded education that covers both theoretical foundations and practical hands-on experience in the methods, tools, and technologies used in data science. Programming, data manipulation, statistical analysis, machine learning, and data visualisation are some of the skills that are mastered by the students.

The degree's notable achievements can be largely attributed to its unique instructional methodology, characterised by a blended approach that encompasses interactive lecture-based instruction, smaller class sizes, and the integration of technology. In addition, our institution boasts a faculty of exceptionally committed educators who possess esteemed professional accreditations. Moreover, our curriculum remains both pertinent and progressive, consistently staying ahead of emerging trends in the field. The primary emphasis lies in the practical implementation of concepts, encompassing project completion, workshop participation, and the cultivation of fundamental information technology proficiencies.

Upon successful completion of the BSc IT (Data Science), graduates are well-prepared to contribute effectively to the rapidly evolving field of data science and analytics. They may also pursue advanced degrees (e.g., BSc Honours in IT) for further specialisation and research opportunities.

✅ Entry requirements

1. South African National Senior Certificate (NSC) with Bachelor's degree endorsement.
2. Or a National Certificate (Vocational) level 4 issued by the Council of General and Further Education and Training with Bachelor's degree endorsement.
3. Or a letter or certificate confirming an exemption from Universities South Africa (USAf) for any other school-leaving results.
4. Or completion of a Bachelor's degree.
5. Or completion of a relevant Foundation Programme along with a letter or certificate of exemption from Universities South Africa (USAf).
6. Or completion of a relevant Higher Certificate.
7. Or completion of the BSc IT Access programme
8. A student with Mathematics Literacy (50% or more) or with Mathematics (less than 50%, but greater than or equal to 30%) is required to register for and complete Maths for Computing (ITMCA0) before attempting Mathematics 1A (ITMTA1).

📁 Possible career options

Graduates of a BSc IT (Data Science) programme are well-prepared for a variety of roles in the data science and analytics field, such as:

- Business Intelligence Analyst
- Data Scientist, Data Analyst, Data Engineer
- Machine Learning Engineer
- Quantitative Analyst, Predictive Analyst, Statistician
- Systems Analyst, Database Administrator, Network Administrator
- Technical Support Specialist, Cloud Computing Specialist
- IT Project Manager, IT Consultant
- Entrepreneur/Startup Founder

This qualification is offered at the following campuses:

- | | |
|----------------|----------------------|
| • Bedfordview | • Midrand |
| • Bloemfontein | • Nelson Mandela Bay |
| • Claremont | • Potchefstroom |
| • Durban | • Pretoria |
| • East London | • Tyger Valley |
| • Mbombela | • Vanderbijlpark |

📄 Qualification accreditation

- Accredited by the Higher Education Quality Committee (HEQC) of the Council on Higher Education (CHE)
- Registered with the South African Qualifications Authority (SAQA)



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Qualification structure

Year 1

Students are introduced to the fundamental principles of BSc IT (Data Science).

- AI Ethics and Privacy
- Cloud Based Technologies
- Computer Network and Security*
- Computer Network Technologies**
- Computer Skills (Microsoft)
- Introduction to Information Systems
- Introduction to Programming
- Linux-based Operating System
- Mathematics 1A & 1B
- Non-Technical Skills for IT Professionals
- Procedural Programming

* Optional: A+ CompTIA Certification Voucher

** Optional : Network+ CompTIA Certification Voucher

Year 2

Students develop a high level of expertise and competence in the domain of BSc IT (Data Science).

- Artificial Intelligence Techniques
- Data Structures and Algorithms in Python
- Database Systems
- Linear Algebra with Applications
- IT Project Management
- Machine Learning Algorithms
- Network Security
- Probability and Statistics
- Scientific Computing in Python
- Web Server Management

Year 3

Students develop a high level of competence and specialised knowledge in the discipline of BSc IT (Data Science).

- 4IR Technologies
- Business Management and Entrepreneurship
- Object Oriented Systems Analysis and Design
- Operating Systems
- Project: Data Science
- R Programming for Data Science
- Research Design and Methodology
- Sensors Data Management, IoT Mining and Analytics



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Module Descriptors

Year 1

AI Ethics and Privacy

This module provides students with the necessary knowledge and skills to effectively address the ethical and privacy concerns that arise in the dynamic field of artificial intelligence. It aims to equip students with the ability to contribute responsibly to the development and implementation of AI in diverse professional settings.

Cloud Based Technologies

This module offers students a comprehensive examination of cloud concepts, AWS core services, pricing, security measures within the AWS environment, and a selection of AWS products and features that can be utilised to achieve security goals. Additionally, it covers architectural best practises for creating and managing dependable, secure, efficient, and cost-effective systems in the cloud, as well as the support available for these core services.

Computer Network and Security

The module teaches students how to build, support, and upgrade computer hardware, peripherals, primary networks, and provide customer support. Students will comprehend the functions and components of desktop and portable computers, recommend and build custom systems, disassemble and reassemble systems, set up printers, perform maintenance, practice safety, and interact professionally with customers. as well as explore fundamental networking and internet principles.

Computer Network Technologies

This module examines the broad topic of networking, building on the knowledge of computer networks and security. It looks at the different types of networks, their structure, how models explain how data travels over networks, the various media and devices used to move data, the underlying principles of protocols, addressing schemes, services, and standards, as well as the tools and techniques used to manage, monitor, troubleshoot, and secure networks.

Computer Skills (Microsoft)

This module provides students with practical computer skills, with an emphasis on Microsoft software applications. By the end of the module, students should have developed an understanding of information communications and technology (ICT) and be proficient in using Microsoft Word, Excel, PowerPoint, Access, and Outlook for a variety of academic and professional tasks.

Introduction to Information Systems

This module offers students a fundamental comprehension of information systems and their significance in contemporary organisations. In the current era of digitalization, information systems play a pivotal role in facilitating business processes, enhancing decision-making capabilities, and fostering competitiveness. In this module, students will engage in an exploration of fundamental concepts, advanced technologies, and practical applications pertaining to information systems.

Introduction to Programming

This module is designed to equip students with the necessary skills and knowledge to navigate the realm of programming. It aims to establish a solid understanding of fundamental programming concepts, enabling individuals to effectively utilise different platforms for the development of practical applications. This entails proficiency in programming languages such as C#, C++, and Java.

Linux-based Operating System

Students will learn about Linux's origins in this module. They'll learn how to install, configure, and log out of Linux. GNOME will also be taught to students. They will learn to use the powerful command-line interface and explore files and directories. This module also covers text editor functions and Linux terminal and command usage for directories and files. The module concludes with skills to redirect input and output and control Linux processes.

Mathematics 1A

This module equips students with the solid mathematical foundation required for a variety of IT and computer science disciplines. The module covers the properties of graphs and functions, limits and their relationship to derivatives, calculating derivatives using various derivative rules, derivative application problems, and the concept of integration.

Mathematics 1B

Building on the foundation of Mathematics 1A, this module introduces different techniques of integration and mathematical reasoning while providing knowledge of the fundamentals of calculus and its application. This module helps develop the students' ability to understand the concepts of calculus and to evaluate and apply derivatives and their integrals.



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Non-Technical Skills for IT Professionals

Students will develop essential non-technical skills for IT professionals in this module. These skills, which are essential for success in IT roles, include effective communication, research and presentation skills, cultural sensitivity, personality profiles and emotional intelligence, self- and stress management, team dynamics, conflict negotiation and assertiveness, and time management.

Procedural Programming

The purpose of this module is to provide students with an in-depth understanding of the fundamental principles that form the basis of procedural programming. Additionally, it aims to enable students to create and implement procedural programming solutions. Upon completion of this module, students will possess the ability to create, execute, and evaluate procedural programming solutions.



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Module Descriptors

Year 2

Artificial Intelligence Techniques

This module offers a comprehensive examination of different techniques and methodologies employed in the field of artificial intelligence (AI). Its objective is to equip students with the knowledge and skills necessary to comprehend, implement, and utilise AI solutions in practical scenarios. It encompasses various areas of AI, such as machine learning, natural language processing, computer vision, expert systems, robotics, knowledge representation and reasoning, and reinforcement learning.

Data Structures and Algorithms in Python

This module is intended to give students a solid foundation in data structures and algorithmic problem-solving techniques. It emphasises the importance of using the Python programming language to select and implement appropriate data structures and algorithms to optimise programme efficiency and solve real-world computational problems. The following topics are covered: introduction to data structures and algorithms, arrays and lists, stacks and queues, recursion and recursive algorithms, sorting and binary trees, graphs and graph algorithms, dynamic programming, and algorithm design paradigms.

Database Systems

This module introduces database development, database modelling with entity relationship diagrams and advanced concepts, database normalisation, database interaction via the web, database administration and security, transactions, and concurrency to students. It also focuses on SQL, distributed databases, and decision support databases. Introduction to databases, data modelling, relational databases, database design and implementation, data integrity and security, querying databases, transaction management, database administration, NoSQL and NewSQL databases, database applications, and database trends are some of the topics covered.

Linear Algebra with Applications

Linear algebra plays a fundamental role in the realm of data science, serving as the bedrock upon which numerous data analysis and machine learning methodologies are constructed. The purpose of this module is to provide students with a deep understanding of linear algebra principles and their significance within the realm of data science. Linear algebra serves as the fundamental mathematical framework for the manipulation, transformation, and analysis of data, rendering it an indispensable skill for individuals aspiring to thrive in a world heavily reliant on data.

IT Project Management

Students will gain an understanding of project management in an organisational context, including the project management knowledge areas and project management life cycle, as well as the project framework and fundamental principles and processes related to some of the project management knowledge areas. Included are project role players, project coordination and control, project management software, the change control procedure, project termination and closure. Students will apply a variety of project management skills, methods, and tools pertinent to specific knowledge domains.

Machine Learning Algorithms

This module equips students with the mathematical understanding required to comprehend how machine learning algorithm's function. This is applicable to data science, robotics, and other information technology fields. This module will cover four types of machine learning approaches, including supervised and unsupervised learning, semi-supervised learning, and reinforcement learning. Students will be exposed to a variety of machine learning algorithms with Python, including, but not limited to, Naïve Bayes, Linear regression, Logistic regression, Support vector machine (SVM), and Decision tree K-means clustering. Additionally, students will be introduced to the philosophy underlying neural networks and their application in deep learning.



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Network Security

The primary objective of this module is to furnish students with an all-encompassing comprehension of the fundamental principles and practises pertaining to network security, specifically within the framework of Cisco networking technologies. This comprehensive study encompasses a range of network security elements, encompassing potential risks, weaknesses, and protective measures, with a specific emphasis on the execution and administration of security protocols within Cisco networks.

Probability and Statistics

This module covers the basics of statistics and probability, which are methods for collecting, clarifying, summarising, organising, analysing, and interpreting numerical data. It begins with a brief introduction to statistics and quickly moves on to descriptive statistics, introducing graphical and numerical data analysis methods. Also, bivariate data will be described. Students will study combinatorial probability, random, and useful discrete distributions, as well as statistical inference of small and large data samples. They will also learn how to use various estimators for large sample estimation. The techniques required to study the relationship between two or more variables will be examined under the topic, linear and multiple regression analysis. Topics such as nonparametric data and categorical data will also be treated.

Scientific Computing in Python

The goal of this module is to equip students with the necessary skill sets that are relevant for the computation, manipulation, and interpretation of data using the programming language Python. Students will become familiar with Python data structures, functions, and packages, as well as data manipulation and data visualisation techniques, and ultimately Python machine learning packages. When students have successfully finished the module, they will have the ability to import, clean, manipulate, and visualise data, as well as the ability to interpret data using statistical reasoning.

Web Server Management

Students will gain the knowledge and skills necessary to effectively plan, deploy, configure, and manage web servers through the completion of this module. It covers a wide range of topics pertaining to web server technology, such as the various types of web servers, server operating systems, security, performance optimisation, and troubleshooting. Students will acquire hands-on experience in the installation and maintenance of web server environments.



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4IR Technologies

This module is designed to explore the transformative technologies that are shaping the Fourth Industrial Revolution (4IR). It provides an in-depth understanding of various 4IR technologies and their potential impact on industries, businesses, and society as a whole. Students will gain insights into the principles, applications, and challenges associated with these technologies. Topics covered include introduction to the Fourth Industrial Revolution, artificial intelligence (AI), Internet of Things (IoT), blockchain technology, robotics and automation, quantum computing, cybersecurity in the 4IR, digital transformation and industry 4.0, as well as ethical and societal implications.

Business Management and Entrepreneurship

This module is designed to provide students with a comprehensive understanding of essential concepts, skills, and strategies related to business management and the advancement of entrepreneurship. Students will explore the core principles of effective business management and the entrepreneurial mindset required for the successful establishment and sustained profitability of ventures. Upon completion of this module, students will have acquired practical skills, developed critical thinking capabilities, and cultivated an entrepreneurial mindset that can be effectively utilised in diverse business environments, including both entrepreneurial endeavours and established organisations.

Object Oriented Systems Analysis and Design

The purpose of this module is to equip students with the critical knowledge and skills to effectively analyse, design, and model software systems by employing object-oriented principles and methodologies. Topics covered include introduction to systems analysis and design, requirements engineering, object-oriented concepts, unified modelling language (UML), use case modelling, system modelling, object interaction modelling, design patterns, object-relational mapping (ORM), architectural design, system testing and validation, agile and iterative development.

Operating Systems

This module provides students with a comprehensive understanding of computer operating systems, their design, components, and management. It covers the core concepts and functions of operating systems, with an emphasis on their role in managing hardware resources and providing a stable platform for software applications. By the end of this module, students will be able to evaluate an operating system (OS) with regards to different management systems by applying different policies and algorithms to given data, model the business and other non-software systems, explore alternative designs, and validate the architectural design of software.

Project: Data Science

This module is designed for students to apply their knowledge of machine learning algorithms to construct, train, and evaluate predictive models, which are then used to make predictions. This module consists of two parts: Initially, students will be equipped with machine learning-related knowledge and practical skills. Students will analyse, develop, and train models to meet the user's specifications based on an approved proposal, and then submit a mini-dissertation.

R Programming for Data Science

The R programming language is highly versatile and extensively utilised within the data science community. Proficiency in R programming empowers students to efficiently handle data, make informed decisions based on data analysis, and effectively convey findings to relevant stakeholders. The primary objective of this module is to provide students with the necessary knowledge and practical skills to proficiently utilise the R programming language for the purposes of data analysis, visualisation, and statistical modelling. It is designed to cater to the requirements of individuals who aspire to become data scientists, statisticians, and analysts, with the objective of effectively utilising the capabilities of the R programming language for making data-informed decisions.



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Research Design and Methodology

The purpose of this module is to equip students with the knowledge and skills necessary to effectively plan, conduct, and evaluate research. It provides students with a comprehensive understanding of various research paradigms, methodologies, and techniques, enabling them to become proficient researchers in their respective fields. Topics covered include understanding research foundations, research design, research methods, data analysis techniques, and ethical considerations.

Sensors Data Management, IoT Mining and Analytics

The purpose of this module is to furnish students with a thorough comprehension of the management and analysis of data produced by sensors and Internet of Things (IoT) devices. In the current era, the integration of sensor technology and (IoT) applications is causing significant transformations across industries. This module provides students with the requisite knowledge and skills to effectively analyse sensor data and derive valuable insights for diverse applications. The module ensures that graduates possess the necessary knowledge and skills to pursue careers in various industries, such as smart cities, healthcare, agriculture, and manufacturing. Consequently, these individuals become highly valuable assets in the ever-changing realm of IoT and sensor technology.