



Bachelor of Science in Information Technology (Software Engineering)

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 with a Specialisation in Software Engineering, a broad and rigorous undergraduate qualification designed to prepare students for careers in software development and engineering.

The BSc IT (Software Engineering) programme integrates theoretical understanding and practical proficiency in the field of software development. Upon completion of their studies, graduates are well-prepared to assume a variety of positions within the information technology (IT) industry. They possess the necessary skills and knowledge to actively contribute to the creation of software solutions that foster innovation and propel technological progress.

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 (Software Engineering), graduates are well-prepared for careers in designing, creating, and maintaining software systems and applications. They may also pursue advanced degrees, such as a 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).

📄 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)

This qualification is offered at the following campuses:

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



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Qualification structure

Year 1

Students are introduced to the fundamental principles of BSc IT (Software Engineering).

- 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 (Software Engineering).

- Database Systems
- IT Project Management
- Mobile Application Development and Big Data
- Network Security
- Software and Security Engineering
- Software Process, Architecture Design and Quality Assurance
- Web Server Management
- Usability Engineering
- Elective - Choose 1:
 - Programming in Java
 - Programming in C#
 - Programming in Python
- Elective - Choose 1:
 - Data Structures and Algorithms in Java
 - Data Structures and Algorithms in C#
 - Data Structures and Algorithms in Python

Year 3

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

- 4IR Technologies
- Object Oriented Systems Analysis and Design
- Operating Systems
- Project: Mobile Application and Web Services
- Research Design and Methodology
- Web Development and e-Commerce
- Elective: Choose 1:
 - Enterprise Programming in Java
 - Enterprise Programming in C#
 - Enterprise Programming in Python

Possible career options

BSc IT (Software Engineering) graduates have a variety of career options, with employment opportunities in both IT and business:

- Cloud Computing Specialist
- Enterprise Programmer: Java, C#, or Python
- Entrepreneur/Startup Founder
- IT Project Manager, IT Consultant
- Researcher/Academic
- Machine Learning Engineer
- Artificial Intelligence Developer
- Network Administrator/Engineer
- Mobile App Developer
- Software Developer, Web Developer
- Software Engineer, DevOps Engineer
- Systems Analyst, Database Administrator
- Technical Support Specialist
- Quality Assurance Engineer



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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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Module Descriptors

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

Data Structures and Algorithms in Java

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 Java 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.

Data Structures and Algorithms in C#

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 C# 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.

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.

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.

Mobile Application Development and Big Data

This module provides an in-depth examination of two rapidly evolving areas of information technology: Mobile Application Development and Big Data. In an era characterised by the prevalence of smartphones and the exponential growth of data, aspiring IT professionals must understand how to harness the power of mobile applications and big data analytics. Students who complete this module will be able to create mobile apps and use Big Data for smart decision-making.

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.



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Module Descriptors

Programming in Java

General-purpose, concurrent, strongly typed, class-based object-oriented Java. In this module, students will learn why Java is one of the most popular programming languages for web programming, fundamentals of programming like variables, conditional and iterative execution, methods, etc., object-oriented programming in Java like defining classes, invoking methods, using class libraries, etc., and important software development topics and principles. They will also learn how to write Java functions and pass arguments, read and write files in Java streams, and use exception handling for error handling. Finally, students will learn Java's Collection Framework, Multithreading, Networking, and XML processing while developing platform-independent GUIs.

Programming in C#

C# is a modern, multi-paradigm programming language that includes object-oriented (class-based) programming. Students will learn why C# is a useful high-level programming language for developers, C# data types, variables, and operators, the .NET framework, and C# branching and flow control in this module. They will also learn C# classes, objects, properties, methods, object-oriented techniques, delegates and events, generics, exceptions, file input and output, and collections classes. They will finish with C# graphical user interface-database applications, regular expression, multithreading, networking, and XML processing.

Programming in Python

Simple syntax and powerful libraries make Python a high-level programming language. In this module, students will learn why Python is a useful scripting language for developers, how to design and programme Python applications, how to use lists, tuples, and dictionaries, identify Python object types, and use indexing and slicing to access data. In Python, students will learn to write loops, decision statements, functions, pass arguments, build and package modules, read and write files, design object-oriented programmes, use class inheritance, and handle errors with exceptions. Finally, students will learn Python Regular Expression, Multithreading, Networking, and XML processing while developing GUI-database applications.

Software and Security Engineering

This module introduces students to software engineering principles and practises, with a strong emphasis on security. It teaches you everything you need to know about designing, developing, and maintaining secure software systems. Students will become familiar with the most recent security threats and vulnerabilities, as well as how to mitigate them throughout the software development lifecycle. Topics covered include software development fundamentals, security fundamentals, secure software development, security in the SDLC, secure design, vulnerability analysis, security testing, secure

Software Process, Architecture Design and Quality Assurance

This module is designed to equip students with the necessary knowledge and skills to design procedures and methods that can effectively and reliably develop software systems. It also addresses the challenges associated with creating large-scale software systems, particularly in adapting to changing demands while maintaining cost-effectiveness and meeting reasonable timelines. By the end of this module, students will be able to develop an understanding of software engineering concepts and ethical issues related to this discipline, software engineering processes and the agile methodology, requirements engineering and system modelling procedures using the Unified Modelling Language (UML), object-oriented design and the use of design patterns, software testing and its usage in system development, software evolution processes and maintenance of legacy systems, software quality management, and software measurement.

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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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: Mobile Application and Web Services

This module requires students to use their systems development knowledge to create a medium-to-large-complex information system and document its development. This module is two-fold: First, students will learn and practise IOS, Android, and Web Services mobile app development. Students will analyse, design, and develop an information system to meet user needs based on an approved proposal and submit a mini-dissertation in the second part.

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.

Web Development and e-Commerce

This module is designed to equip students with the practical skills and critical knowledge required to develop interactive and dynamic websites and e-commerce platforms. It covers web development technologies, programming languages, design principles, and best practices necessary for building effective web applications and online stores. Topics covered include: introduction to Web development, HTML (Hypertext Markup Language), CSS (Cascading Style Sheets), JavaScript programming, Web development frameworks, database integration, server-side scripting, content management systems (CMS), security in Web development, Web performance optimization, Web accessibility and usability, e-Commerce fundamentals, creating an e-commerce Website, search engine optimization (SEO), and Web hosting and deployment.



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Usability Engineering

This module will immerse students in the principles and practises of designing user-centric, intuitive, and highly functional digital products and systems. This module equips students with the knowledge and skills required to design and evaluate user interfaces that meet the needs and expectations of diverse user groups in an increasingly competitive environment where user experience (UX) is a critical differentiator. Topics covered include understanding usability, user-centred design, usability evaluation, as well as accessibility and inclusive design.



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Module Descriptors

Year 3

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.

Advanced Networking

This module is designed to equip students with the knowledge and skills necessary to install, configure, operate, and troubleshoot small to medium-sized enterprise networks. This module provides a comprehensive understanding of networking principles, Cisco networking technologies, and the ability to work with Cisco devices.

Topics covered include introduction to networking, network fundamentals, Cisco router and switch configuration, internet protocol (IP) routing, switching technologies, network services, security fundamentals, WAN (wide area network) technologies, wireless networking, as well as network management and troubleshooting.

Enterprise Programming in Java

This module introduces Java Enterprise programming concepts to students who have a foundational understanding of Java programming. It covers the most recent versions of the most popular Java EE specifications, such as JavaServer Faces (JSF), the Java Persistence API (JPA), Enterprise JavaBeans (EJB), Contexts and Dependency Injection (CDI), the Java API for JSON Processing (JSON-P), the new Java API for JSON Binding (JSON-B), the Java API for WebSocket, the Java Messaging Service (JMS) API 2.0, the Java API for XML. It will also cover the Java EE 8 Security API for securing Java EE applications.

Enterprise Programming in C#

This module introduces C# Enterprise programming concepts to students who have a foundational understanding of C# programming. Students will learn best practises for enterprise application architecture development using .NET Core. The module will also cover emerging fields like DevOps and Big Data to provide a broader perspective. Students will be given a description of enterprise architecture (EA) and the essential components of EA practise. The module will also introduce students to the SOLID principles and design patterns used in software development.

Enterprise Programming in Python

This module teaches enterprise Python programming and enterprise application knowledge. Enterprise applications are tailored to a company's needs. These applications are designed to meet an organization's growing daily demands with excellent performance and scalability. The module introduces enterprise Python, then discusses enterprise application testing, performance, security, micro-services, and integration. It discusses using Python to build high-performance, scalable enterprise applications and improve delivery. Finally, students will learn about application development architecture and enterprise application integration.

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.