Bachelor of Science in Information Technology (Robotics)

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 Robotics, a broad and rigorous undergraduate qualification designed to prepare students to design, develop, and implement robotic systems.

The BSc IT (Robotics) is designed to provide a well-rounded education that includes both theoretical foundations and practical hands-on experience in robotics. The programme equips students with the expertise needed to work with robotic systems, from their design and development to their deployment in various practical applications, making them valuable contributors to the rapidly advancing field of robotics, mechatronics, and automation.

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 (Robotics), graduates are well-prepared to contribute effectively to the rapidly advancing field of robotics, mechatronics, and automation. 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 (Robotics) program are prepared for a range of career opportunities in the field of robotics and automation, including roles such as:
- Automation Engineer
- Entrepreneur/Startup Founder
- Industrial Automation Specialist, Mechatronics Engineer
- IT Project Manager, IT Consultant
- Machine Learning Robotics Engineer
- Network Administrator
- Robotics Engineer, Control Systems Engineer
- Research Scientist in Robotics
- Robotics Software Developer
- Robotic Process Automation (RPA) Developer
- Systems Analyst, Database Administrator
- Technical Support Specialist, Cloud Computing Specialist

This qualification is offered at the following campuses:

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

Eduvos
Your Education. Your Future

Bachelor of Science in Information Technology (Robotics)

SAQA ID 120690 NQF Level 7

Qualification structure

Year 1

Students are introduced to the fundamental principles of BSc IT (Robotics).
- 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 (Robotics).
- Control Systems in Robotics
- Database Systems
- Data Structures and Algorithms in Python
- Digital Electronics and Microcontrollers
- IT Project Management
- Machine Learning Algorithms
- Math Fundamentals for Robotics
- Network Security
- 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 (Robotics).
- 4IR Technologies
- Business Management and Entrepreneurship
- Machine Learning for Robotics Applications
- Object Oriented Systems Analysis and Design
- Operating Systems
- Programmable Logic Controller (PLC) Programming
- Project: Python Robotics
- Research Design and Methodology

Bachelor of Science in Information Technology (Robotics)

SAQA ID 120690 NQF Level 7

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.

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 nowledge 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.

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.

Eduvos
Your Education. Your Future

Bachelor of Science in Information Technology (Robotics)

SAQA ID 120690 NQF Level 7

Module Descriptors

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.

Bachelor of Science in Information Technology (Robotics)

SAQA ID 120690 NQF Level 7

Module Descriptors

Year 2

Control System

Control systems play a pivotal role in the field of robotic technology as they dictate the movement, interaction with the surroundings, and efficient task execution of robots. The present module explores the fundamental principles and advanced concepts of control systems as they are applied to the field of robotics. This module is designed to provide students with a deep understanding of the design, implementation, and optimisation of control systems in order to develop intelligent and autonomous robotic systems.s in Robotics

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.

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.

Digital Electronics and Microcontrollers

The primary objective of this module is to provide students with a thorough comprehension of essential principles in digital electronics and the practical implementation of systems based on microcontrollers. This comprehension will be accomplished by providing students with both theoretical and practical instruction. The scope of the material includes the fundamental principles of digital logic and electronic circuits, in addition to the more practical aspects of Arduino programming and the establishment of connections between microcontrollers for the purpose of developing embedded systems.

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, Nave 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.

Bachelor of Science in Information Technology (Robotics)

SAQA ID 120690 NQF Level 7

Module Descriptors

Math Fundamentals for Robotics

This module is designed to provide students with a solid understanding of the fundamental algorithms and mathematical reasoning applied to robotic platforms, as well as where and how these mathematical principles are implemented. Several topics in applied/advanced mathematics are covered in this module. Among these are numerical solutions of equations and interpolations, Laplace, Z, and Fourier transforms, Fourier series, Power series, and numerical solutions of ordinary differential equations, partial differentiation and partial differential equations, multiple integrations, vector analysis, complex analysis, optimisation, and linear programming, as well as factorisations, such as lower-upper (LU) decomposition, singular value decomposition (SVD), QR, and Cholesky decompositions.

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.

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.

Bachelor of Science in Information Technology (Robotics)

SAQA ID 120690 NQF Level 7

🎛 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.

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.

Machine Learning for Robotics Applications

The field of robotics is being significantly transformed by the integration of machine learning (ML), as it empowers robots to effectively perceive, adapt to, and make intelligent decisions within intricate environments. This module examines the incorporation of machine learning methodologies into the field of robotics, with a focus on their practical implementation and utilisation. It provides students with the knowledge and skills necessary to effectively utilise machine learning algorithms and tools in order to augment the functionalities of robotic systems, encompassing areas such as perception, control, and decision-making.

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.

Programmable Logic Controller (PLC) Programming

PLCs play a crucial role in industrial automation and control systems. This module introduces PLC programming and its diverse applications across multiple industries. It encompasses the acquisition of skills in the areas of PLC design, programming, and troubleshooting, thereby equipping students with the necessary competencies to proficiently engage with industrial automation systems. The successful completion of the module provides students with the necessary skills and knowledge to effectively operate in industrial automation and control settings. Consequently, students become highly valuable assets to industries that heavily depend on PLC-based systems to ensure efficient and secure operations.

Bachelor of Science in Information Technology (Robotics)

SAQA ID 120690 NQF Level 7

Module Descriptors

Project: Python Robotics

This module teaches students robotics fundamentals, how to build a medium-to-large-complex robotic system, and how to document it in Python. This module is two-fold: Students will learn robot mechanics, modelling, and control first. In the second part, students will develop and analyse a mathematical model, design and implement a robotic system in Python based on an approved proposal and submit a mini-dissertation.

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.