Faculty of
Information Technology

Eduvos
Your Education. Your Future

Higher Certificate in Computing (Computer Systems Architecture)

SAQA ID 120669 NQF Level 5

Mode and duration

Contact
Full-Time (Campus)
- Minimum: 1 year
- Maximum: 3 years

Full-Time (Online)
- Minimum: 1 year
- Maximum: 3 years

Qualification description

The Higher Certificate in Computing is an intensive, career-focused qualification designed to give students a solid background in computing and its real-world applications. This qualification aims to widen access to higher education and boost career prospects in the rapidly evolving field of information technology (IT).

This qualification provides a robust foundational understanding of the key concepts in computing, ensuring students gain proficiency in a comprehensive core of essential skills. The programme structure is designed to align with current industry needs and global IT trends, thereby ensuring the skills acquired are relevant and in demand.

The emphasis on performance-based learning and performance-based assessments is a distinguishing feature of this programme. These allow students to demonstrate their practical skills and competencies, providing tangible evidence of their abilities to prospective employers. Students will graduate with not only the theoretical knowledge required to understand the complex world of IT but also the practical skills to apply this knowledge effectively.

Students who complete the qualification will be able to demonstrate problem-solving, critical thinking, and analytical reasoning skills, as well as be well-prepared to enter the workforce in a variety of IT roles or advance to more specialised IT programmes or bachelor's degrees in related fields.

Entry requirements

1. South African National Senior Certificate (NSC) with Bachelor's degree, Diploma or Higher Certificate endorsement.
2. Or a National Certificate (Vocational) level 4 issued by the Council of General and Further Education and Training with Bachelor's degree, Diploma or Higher Certificate endorsement.
3. Or a Certificate of evaluation on a minimum NQF level 4 for foreign qualification confirmed by SAQA.
4. Or a letter or certificate confirming an exemption from Universities South Africa (USAf) for any other school-leaving results.
5. Or completion of a Bachelor's degree, Diploma, Higher Certificate or equivalent.

Possible career options

Careers for you, as a Higher Certificate in Computing graduate, are varied and include:

- Computer Systems Architect, Computer Hardware Engineer
- Database Developer, IT Project Manager
- Network Administrator, Network Engineer
- Python Programmer
- Security Engineer, Information Security Analyst

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

- Computer Systems Architecture
- Database Design and Development
- Managing a Successful Computing Project
- Maths for Computing
- Networking
- Professional Practice
- Programming Fundamentals
- Security

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Module Descriptors

Computer Systems Architecture
This module presents students with the fundamentals of computer systems architecture, incorporating the intertwined hardware and software components and subsystems. These essential components facilitate the input, processing, and output of data within a computer system.

The module further explores the concepts of operating systems, hardware management and computer networks together with the practical skills needed to diagnose, troubleshoot, and maintain computer systems taking the security of these systems into consideration.

This module encompasses a broad range of topics including Central Processing Units (CPUs), memory systems, input and output devices, Arithmetic Logic Unit (ALU) operations, and program execution. It also delves into operating systems, covering elements such as kernel operations, file systems, Application Programming Interfaces (APIs), and system calls. Also, it addresses hardware management, installation procedures, firmware, device drivers, and networking, with an emphasis on the OSI and TCP/IP models. Other essential components include error and information collection, fault diagnosis, security measures, and problem resolution strategies.

On successful completion of this module, students will be able to:

- Explain the relationships between hardware components and the subsystems used in a computer system.
- Categorise the key features and services provided by different computer operating systems and hardware.
- Use network communication technology and the associated services to connect computer systems.
- Demonstrate diagnostic and troubleshooting skills to solve hardware, software, and networking related issues.

Database Design and Development
In this module, students will develop and translate an understanding of the concepts and issues relating to database design and development into the design and creation of complex databases.

Database design and development is a fundamental and highly beneficial skill for computing students to master, regardless of their specialisation. Thus, an understanding of database tools and technologies is an essential skill for designing and developing systems to support them.

Among the topics included in this module are examination of different design tools and techniques, examination of different development software options, considering the development features of a fully functional robust solution covering data integrity, data validation, data consistency, data security and advanced database-querying facilities across multiple tables, appropriate user interfaces for databases and for other externally linked systems, creating complex reports (or dashboards), testing the system against the user and system requirements, and elements of complete system documentation.

On successful completion of this module, students will be able to:

- Use an appropriate design tool to design a relational database system for a substantial problem.
- Develop a fully functional relational database system, based on an existing system design.
- Test the system against user and system requirements.
- Produce technical and user documentation.

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Module Descriptors

Managing a Successful Computing Project

The aim of this module is to provide students with a platform to showcase their competency in managing and executing a computing project within a professional setting. This encompasses the application of both theoretical knowledge and practical skills pertinent to the field. Students will undertake independent research and investigation for carrying out and executing a computing project, which meets appropriate aims and objectives. This module will enable students to explore and examine a relevant and current topical aspect of computing in the context of a business environment. Students will conduct independent research and exploration to execute a computing project that aligns with pertinent aims and objectives. This process will foster their confidence in decision-making and problem-solving, leveraging project management skills for research activities.

On successful completion of this module, students will be able to:

- Establish project aims, objectives and timeframes based on the chosen theme.
- Conduct small- and medium-scale research, information gathering, and data collection to generate knowledge to support the project.
- Present the project and communicate appropriate recommendations based on meaningful conclusions drawn from the evidence findings and/or analysis.
- Reflect on the value gained from conducting the project and its usefulness to support sustainable organisational performance.

Maths for Computing

The aim of this module is to provide students with a strong foundation in essential mathematical concepts, techniques, and their applications, enabling them to effectively solve computational problems and enhance their problem-solving skills in computer science and related fields.

In this module, students will engage with number theory, probability theory, geometrical and vector methods, as well as differential and integral calculus through a combination of case studies, scenarios, and task-based assessments. These diverse approaches will allow them to apply these mathematical theories and methodologies across a range of scenarios, ultimately enabling them to evaluate and solve complex problems in these areas. This module covers a range of topics such as prime number theory, sequences and series, probability theory, geometry, and the fundamentals of differential and integral calculus.

On successful completion of this module, students will be able to:

- Use applied number theory in practical computing scenarios.
- Analyse events using probability theory and probability distributions.
- Determine solutions of graphical examples using geometry and vector methods.
- Evaluate problems concerning differential and integral calculus.

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Module Descriptors

Networking

The aim of this module is to provide students with wider background knowledge of computer networking essentials, how they operate, protocols, standards, security considerations and the prototypes associated with a range of networking technologies.

Students will explore a range of hardware, with related software, and will configure and install these to gain knowledge of networking systems. A range of networking technologies will be explored to deliver a fundamental knowledge of Local Area Networking (LAN), Wide Area Networking (WAN) and their evolution to form large-scale networks and the protocol methodologies related to IP data networks will be explored.

Students will gain knowledge and skills to successfully install, operate, and troubleshoot a small network; and the operation of IP data networks, router, switching technologies, IP routing technologies, IP services and basic troubleshooting.

On successful completion of this module, students will gain knowledge and skills to successfully:

- Examine networking principles and their associated protocols.
- Explain networking devices and operations.
- Design efficient networked systems.
- Implement and diagnose networked systems.

Professional Practice

This module provides a foundation for good practice in a variety of contexts. The ability to communicate effectively using different tools and mediums will ensure that practical, research design, reporting and presentation tasks are undertaken professionally and in accordance with various communication conventions.

Among the topics included in this module are the development of communication skills and communication literacy, the use of qualitative and quantitative data to demonstrate analysis, reasoning, and critical thinking; and tasks that require the integration of others within a team-based scenario and planning and problem solving.

On successful completion of the module, students will be able to:

- Demonstrate a range of interpersonal and transferable communication skills to a target audience.
- Apply critical reasoning and thinking to a range of problem-solving scenarios.
- Discuss the importance and dynamics of working within a team and the impact of team working in different environments.
- Examine the need for continuing professional development (CPD) and its role within the workplace and for higher-level learning.

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Module Descriptors

Programming Fundamentals
The aim of this module is to make students become proficient in designing and implementing algorithms in a chosen programming language (e.g., Python) within a suitable open-source cross-platform integrated development environment (IDE).

In this module, students will be introduced to the core concepts of programming with an introduction to algorithms and the characteristics of programming paradigms. Among the topics included in this module are introduction to algorithms, procedural, object-orientated, and event-driven programming, security considerations, the IDE, and the debugging process.

Students will gain the proficiency to create and execute algorithms using Python within an appropriate Integrated Development Environment (IDE), such as Spyder. This IDE will serve as a platform for code development and as a tool for identifying and resolving any coding issues.

On successful completion of this module, students will be able to:

- Define basic algorithms to carry out an operation and outline the process of programming an application.
- Explain the characteristics of procedural, object-orientated, and event-driven programming, and conduct an analysis of a suitable IDE.
- Design and implement basic algorithms in code using an IDE.
- Determine the debugging process and explain the importance of a coding standard.

Security
The aim of this module is to provide students with knowledge of security, associated risks and how security breaches impact on business continuity.

Students will examine security measures involving access authorisation, regulation of use, implementing contingency plans and devising security policies and procedures.

This module introduces students to the detection of threats and vulnerabilities in physical and IT security, and how to manage risks relating to organisational security.

Among the topics included in this module are network security design and operational topics, including address translation, demilitarized zone (DMZ), virtual private network (VPN), firewalls, anti-virus (AV) and intrusion detection systems. Remote access will be covered, as will the need for frequent vulnerability testing as part of organisational and security audit compliance.

On successful completion of this module, students will be able to:

- Assess risks to IT security.
- Describe IT security solutions.
- Review mechanisms to control organisational IT security.
- Manage organisational security.