

# NATIONAL DIPLOMA: INFORMATION TECHNOLOGY: COMMUNICATION NETWORKS

Qualification code: NDIK12 - NQF Level 6

Campus where offered: Soshanguve South Campus

## Important notification to new applicants:

No new applications will be accepted as from 2020. Students who enrolled for this qualification for the first time in 2017 (or thereafter), should note that it will not be possible to continue with any Baccalaureus Technologiae as from 2020, since it is being replaced by qualifications aligned with the newly-implemented Higher Education Qualification Sub-Framework. Potential students are advised to consult the University's website for any new qualifications which might not be published in this Prospectus.

## REMARKS

- a. *Admission requirement(s) and selection criteria:*  
**See qualification NDIK12 listed under the ICT First Years' and Foundation Unit.**
- b. *Minimum duration:*  
Three years.
- c. *Presentation:*  
Day classes.
- d. *Intake for the qualification:*  
January only.
- e. *Exclusion and readmission:*  
See Chapter 2 of Students' Rules and Regulations.
- f. *Recognition of Prior Learning (RPL), equivalence and status:*  
See Chapter 30 of Students' Rules and Regulations.
- g. *Industry Exposure IIIB (Work-Integrated Learning):*  
Students may register for this subject only with the permission of the Head of Department. See Chapter 5 of Students' Rules and Regulations (paragraphs 5.2 and 5.3).
- h. *Subject credits:*  
Subject credits are shown in brackets after each subject.

Key to asterisks:

- \* Information does not correspond to information in Report 151.  
(Deviations approved by the Senex on 22 June 2011.)

## CURRICULUM

### FIRST YEAR

Please note that students will register for all first-year subjects under qualification code NDIK12, where they will be introduced to the basic principles of computers and information technology skills.

| CODE                            | SUBJECT                    | CREDIT  | PREREQUISITE SUBJECT(S) |
|---------------------------------|----------------------------|---------|-------------------------|
| <b>FIRST SEMESTER</b>           |                            |         |                         |
| CFS10AT                         | Computing Fundamentals IA* | (0,125) |                         |
| CGS10AT                         | Computing Systems IA*      | (0,125) |                         |
| CMK10AT                         | Computing Skills IA*       | (0,125) |                         |
| DSO17AT                         | Development Software IA    | (0,125) |                         |
| TOTAL CREDITS FOR THE SEMESTER: |                            | 0,500   |                         |



## SECOND SEMESTER

|                                   |                            |              |                         |
|-----------------------------------|----------------------------|--------------|-------------------------|
| CFS10BT                           | Computing Fundamentals IB* | (0,125)      |                         |
| CGS10BT                           | Computing Systems IB*      | (0,125)      |                         |
| CMK10BT                           | Computing Skills IB*       | (0,125)      |                         |
| DSO17BT                           | Development Software IB    | (0,125)      | Development Software IA |
| TOTAL CREDITS FOR THE SEMESTER:   |                            | 0,500        |                         |
| TOTAL CREDITS FOR THE FIRST YEAR: |                            | <b>1,000</b> |                         |

## SECOND YEAR

| CODE                               | SUBJECT                    | CREDIT       | PREREQUISITE SUBJECT(S)                             |
|------------------------------------|----------------------------|--------------|---|
| <b>FIRST SEMESTER</b>              |                            |              |   |
| COB20AT                            | Communication Networks IIA | (0,125)      | Computing Systems IB                                |
| DSA20AT                            | Distributed Systems IIA    | (0,125)      |   |
| IIE20AT                            | IT Electronics IIA         | (0,125)      |   |
| ITT10AT                            | IT Mathematics IA          | (0,125)      |   |
| TPG12AT                            | Technical Programming IA   | (0,125)      | Development Software IB                             |
| TOTAL CREDITS FOR THE SEMESTER:    |                            | 0,625        |   |
| <b>SECOND SEMESTER</b>             |                            |              |   |
| COB20BT                            | Communication Networks IIB | (0,125)      | Communication Networks IIA<br>IT Mathematics IA     |
| DSA20BT                            | Distributed Systems IIB    | (0,125)      | Distributed Systems IIA<br>Technical Programming IA |
| IIE20BT                            | IT Electronics IIB         | (0,125)      | IT Electronics IIA                                  |
| ITT10BT                            | IT Mathematics IB          | (0,125)      | IT Mathematics IA                                   |
| TPG12BT                            | Technical Programming IB   | (0,125)      | Technical Programming IA                            |
| TOTAL CREDITS FOR THE SEMESTER:    |                            | 0,625        |   |
| TOTAL CREDITS FOR THE SECOND YEAR: |                            | <b>1,250</b> |   |

## THIRD YEAR

| CODE                            | SUBJECT                     | CREDIT  | PREREQUISITE SUBJECT(S)  |
|---------------------------------|-----------------------------|---------|--|
| <b>FIRST SEMESTER</b>           |                             |         |  |
| COB30AT                         | Communication Networks IIIA | (0,125) | Communication Networks IIB   |
| COB30BT                         | Communication Networks IIIB | (0,125) | Communication Networks IIB   |
| DSA30AT                         | Distributed Systems IIIA*   | (0,125) | Communication Networks IIB<br>Distributed Systems IIA<br>Distributed Systems IIB |
| DSA30BT                         | Distributed Systems IIIB*   | (0,125) | Communication Networks IIB<br>Distributed Systems IIA<br>Distributed Systems IIB |
| IDC30AT                         | Industry Exposure IIIA      | (0,125) |  |
| TOTAL CREDITS FOR THE SEMESTER: |                             | 0,625   |  |



## SECOND SEMESTER

On completion of all the above subjects. Students with only one subject outstanding may be allowed to register for that subject and Industry Exposure IIIB with the approval of the Head of Department.

|                                      |                        |              |
|--------------------------------------|------------------------|--------------|
| IDC30BC                              | Industry Exposure IIIB | (0,125)      |
| TOTAL CREDITS FOR THE SEMESTER:      |                        | 0,125        |
| TOTAL CREDITS FOR THE THIRD YEAR:    |                        | <b>0,750</b> |
| TOTAL CREDITS FOR THE QUALIFICATION: |                        | <b>3,000</b> |

### SUBJECT INFORMATION (OVERVIEW OF SYLLABUS)

The syllabus content is subject to change to accommodate industry changes. Please note that a more detailed syllabus is available at the Department or in the study guide that is applicable to a particular subject. On 02 August 2018, the syllabus content was defined as follows:

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#### **COMMUNICATION NETWORKS IIA (COB20AT) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Information Technology)**

This subject covers various aspects and technologies involved in data communication and networking. Students are introduced to topics such as network topologies, transmission fundamentals, contention protocols, data compression techniques, data security and integrity, flow-control protocols and the various IEEE standards. The emphasis is on giving students a sound understanding of local area networks (LANs), although aspects of wide area networks (WANs) are also covered briefly. (Total tuition time: ± 80 hours)

#### **COMMUNICATION NETWORKS IIB (COB20BT) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Information Technology)**

This subject equips the student to install, configure, operate, and troubleshoot medium-size routed and switched networks. Topics covered include Switched and Routed Networks, Static and Dynamic Routing, IOS, IPv4, IPv6, RIP (Routing Information Protocol), single area OSPF (Open Shortest Path First), VLANs, VLSM, DHCP (Dynamic Host Configuration Protocol), and ACLs (Access Control Lists). (Total tuition time: ± 80 hours)

#### **COMMUNICATION NETWORKS IIIA (COB30AT) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Information Technology)**

To provide a practical survey of network security applications and standards. The subject covers concise survey of the cryptographic algorithms and protocols underlying network security applications, network security tools and applications, and system-level security issues. (Total tuition time: ± 80 hours)

#### **COMMUNICATION NETWORKS IIIB (COB30BT) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Information Technology)**

This subject covers various aspects and technologies involved in wireless and mobile networks. Students are introduced to topics such as ad-hoc network, wireless routing protocols, vehicular area network, wireless sensor networks, IEEE 802.11 (WLAN), Bluetooth, GSM network, handoff and roaming, channel allocation, and satellite systems. The subject is aimed at giving students a solid understanding of wireless networks, mobile systems and satellite systems. (Total tuition time: ± 80 hours)

#### **COMPUTING FUNDAMENTALS IA (CFS10AT) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Computer Science)**

The student is introduced to the fundamentals of computers and information systems, computer organisation and data processing. (Total tuition time: ± 90 hours)

#### **COMPUTING FUNDAMENTALS IB (CFS10BT) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Computer Science)**

The basic concepts of system development, data management, management information systems, ethics, privacy and security, purchasing and maintaining microcomputers, number systems and binary logic. (Total tuition time: ± 54 hours)



**COMPUTING SKILLS IA (CMK10AT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Informatics)**

This subject aims to equip the student with fundamentals of IT Soft skills for both the ICT industry and other working environments upon which a successful career can be built. In addition, it will also improve the student's relation and interaction abilities needed within the dynamic ICT industry. The student who successfully completes this subject must identify and implement various thinking skills and learning styles, state the legal and cultural sensitivity issues of IT, identify and explain the variety of soft skills including study skills and strategies, research, presentation as well as communication skills, and identify and explain interpersonal skills in relation to character, time management and team building dynamics and conflict resolution. (Total tuition time: ± 60 hours)

**COMPUTING SKILLS IB (CMK10BT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Informatics)**

The aim of this subject is to extend the skills in CMK10 AT so as to improve on student's relations and interaction capabilities that will be applicable within the dynamic ICT industry and the external environment. The student who successfully completes this subject must describe, distinguish and portray changes in terms of personality profiles, emotional intelligence, self-management, stress management and relationship management; identify and apply the notion of team dynamics; deal with conflict and understand the dynamics behind change; report on effective correspondence; produce meeting documents; conduct meetings; and demonstrate the required communication skills to develop interpersonal business relationships through by means of group work. (Total tuition time: ± 60 hours)

**COMPUTING SYSTEMS IA (CGS10AT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Computer Systems Engineering)**

Introduction to hardware, operating systems, motherboards, processors, memory, hard drives, installing and supporting I/O devices, multimedia devices and mass storage, PC maintenance and troubleshooting strategies, and installing and maintenance of Windows. (Total tuition time: ± 54 hours)

**COMPUTING SYSTEMS IB (CGS10BT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Information Technology)**

Provides the foundation of data communications and local area management, OSI model and/ or TCP/IP protocol stack model, data transmission principles, media, major protocols, topologies, routing methods, introduction to networking principles and network operating system fundamentals. (Total tuition time: ± 54 hours)

**D****DEVELOPMENT SOFTWARE IA (DSO17AT)****1 X 4-HOUR COMPUTER-BASED****(Subject custodian: Department of Computer Science)**

Aim: To learn to solve problems using the basic programming principles, and then practically apply that knowledge in C++. Objectives: To enable the student to understand problems and know how to solve them by using a computer; understand the general concepts and arithmetic used in programming, sequence, selection and iteration control structures and a variety of built-in data types, including strings. The students are exposed to the concept of event-driven programming in a visual programming environment focusing on the development of graphical user interfaces to solve real-life practical programming problems. (Total tuition time: ± 72 hours)

**DEVELOPMENT SOFTWARE IB (DSO17BT)****1 X 4-HOUR COMPUTER-BASED****(Subject custodian: Department of Computer Science)**

Aim: To expand on the already mastered knowledge obtained in Development Software IA. Objectives: To broaden the programming skills base of the student by adding the following topics: write an algorithm and applying it in VB.NET/C++ using functions and sub-procedures, and write an algorithm containing one-dimensional arrays. String manipulation will be continued as well as a brief introduction to text file processing. (Total tuition time: ± 72 hours)

**DISTRIBUTED SYSTEMS IIA (DSA20AT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Information Technology)**

Aim: To introduce the student to principles and paradigms of distributed systems. Outcomes: To be able to understand and discuss distributed systems fundamental; the architectural design of distributed systems; the functionalities of processes playing a key role in distributed systems; the inter-processes communication modes in distributed systems; the ways by which resources or entities can be identified and located; how distributed system concepts are applied in some real world systems. Topics: Characterisation of a distributed system, distributed systems architecture, processes, inter-process communication, naming services and distributed file systems. (Total tuition time: ± 80 hours)



**DISTRIBUTED SYSTEMS IIB (DSA20BT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Information Technology)**

This subject builds on DSA20AT. It covers synchronisation algorithms for time and events, mutual exclusion, election of coordinator, fault tolerance, replication and consistency. Examples of distributed system are also discussed. (Total tuition time: ± 80 hours)

**DISTRIBUTED SYSTEMS IIIA (DSA30AT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Information Technology)**

Aim: To give a comprehensive introduction to the theory and applications of distributed algorithms, as these algorithms arise in a range of network communication systems. Outcomes: To be able to understand the aspects that make determination of global configurations or behaviour of distributed systems not to be easy; model message-passing communicating systems using formal methods; apply communication protocols and routing algorithms in interconnected collection of processes; apply traversal and election algorithms in general synchronous networks. Topics: Transition systems and algorithms; Balanced Sliding Window Protocol; Routing Algorithms, Wave and Traversal algorithms; Election algorithms. (Total tuition time: ± 80 hours)

**DISTRIBUTED SYSTEMS IIIB (DSA30BT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Information Technology)**

This subject covers a comprehensive introduction to the Cloud computing technology. The three-layered Cloud service model, with emphasis on the infrastructure as a service(IaaS) and platform as a service(PaaS), Cloud deployment models and Cloud security are some of the topics in this subject.(Total tuition time: ± 80 hours)

**I****INDUSTRY EXPOSURE IIIA (IDC30AT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Informatics)**

This subject enables students to gain insight to organisational characteristics and behaviour, personal and technological entrepreneurship; other issues include ethical and professional conduct in the workplace. The subject will also increase their knowledge of individual behavioural aspects, namely biographical characteristics, values attitudes, job satisfaction and personality and emotions, perceptions and individual decision making; broaden their understanding of the administrative structures of organisations, bureaucratic behaviour in global and diverse context; and develop interpersonal skills in applying and integrating contemporary theories of motivation. (Tuition time: ± 60 hours)

**INDUSTRY EXPOSURE IIIB (IDC30BC)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Information Technology)**

Industry Exposure IIIB is career-orientated and is aimed at integrating academic training with practical skills, as demanded by industry. Students work in industry for six months. (No formal tuition)

**IT ELECTRONICS IIA (IIE20AT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Computer Systems Engineering)**

Basic components of digital circuits, such as NOT, AND and OR gates. The more complex gate and logic functions are built by using these basic components. Boolean algebra and Karnaugh maps are used to simplify functions. Combination logic circuits, including adders, multi-vibrators, comparators, decoders, encoders, multiplexers and de-multiplexers, are discussed. Binary, octal, decimal and hexadecimal number systems are included. Theoretical presentations are supported by practical experiments in a laboratory. (Total tuition time: ± 80 hours)

**IT ELECTRONICS IIB (IIE20BT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Computer Systems Engineering)**

Basic components of sequential circuits, namely latches and flip-flops. More complex memory components, such as adders and registers, are derived from the basic components. Different analogue-to-digital and digital-to-analogue converters are discussed. In the introduction to microprocessor systems, the central processor, memory, ports and interrupts are dealt with. (Total tuition time: ± 80 hours)

**IT MATHEMATICS IA (ITT10AT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mathematics and Statistics)**

Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration. (Total tuition time: ± 90 hours)



**(Subject custodian: Department of Mathematics and Statistics)**

Revision of differentiation (Mathematics I). Differentiation of functions with more than one variable. Further integration. Numerical methods. First-order ordinary differential equations. Matrices (Gauss elimination). (Total tuition time: ± 90 hours)

**T****TECHNICAL PROGRAMMING IA (TPG12AT)****1 X 4-HOUR COMPUTER-BASED**

**(Subject custodian: Department of Computer Science)**

Aim/Purpose: To introduce the student to object-orientated concepts using the Java programming language. Objectives: The student must be able to set up the Java development environment, use the applications coming along with the Java language to compile, bundle together, run and document programs create programs that are in accordance with the Java Naming Convention use pre-defined classes in programs create own classes, use decision statements in a program, use iterative statements in a program manipulate strings and characters in a program, use arrays in a program. Key topics: Java classes, methods, objects, decision making, loops, strings, primitive arrays, reference arrays. (Total tuition time: ± 78 hours)

**TECHNICAL PROGRAMMING IB (TPG12BT)****1 X 4-HOUR COMPUTER-BASED**

**(Subject custodian: Department of Computer Science)**

Aim/Purpose: To introduce the student to advanced OOP principles, robust programming, files manipulation and advanced graphical user interfaces using the java programming language. Objectives: To introduce the students to advanced concepts of OOP such as inheritance, polymorphism. Exception handling mechanisms, introduction to basic graphic and advanced graphic user interface design. Key topics: File manipulations, inheritance, polymorphism, exception handling, GUI components. (Total tuition time: ± 80 hours)

