DIPLOMA IN COMPUTER SYSTEMS ENGINEERING
(Extended curriculum programme with foundation provision)
Dip (Computer Systems Engineering) - NQF Level 6 (360 credits)
Qualification code: DPYEF0
SAQA ID: 111837, CHE NUMBER: H/H16/E077CAN

Campus where offered: Soshanguve South Campus

REMARKS

a.   Admission requirement(s) and selection criteria:

- **FOR APPLICANTS WITH A SENIOR CERTIFICATE OBTAINED BEFORE 2008:**

    Admission requirement(s):
    A Senior Certificate or an equivalent qualification with an E symbol at Higher Grade or a D symbol at Standard Grade for English and a D symbol at Higher Grade or a C symbol at Standard Grade for Mathematics and Physical Science.

    Selection criteria:
    To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **23**.

- **FOR APPLICANTS WITH A NATIONAL SENIOR CERTIFICATE OBTAINED IN OR AFTER 2008:**

    Admission requirement(s):
    A National Senior Certificate with a bachelor's degree or a diploma endorsement, or an equivalent qualification, with an achievement level of at least 3 for English (home language or first additional language) and 4 for Mathematics or Technical Mathematics and 3 for Physical Sciences or Technical Sciences.

    Selection criteria:
    To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **23** (with Mathematics or Technical Mathematics). Life Orientation is excluded for APS calculation.

    Assessment procedures:
    Applicants who achieve the minimum APS of **23** will be considered. Applicants with a score of **21** (with Mathematics or Technical Mathematics) will be added to a waiting list.

- **FOR APPLICANTS WITH A NATIONAL CERTIFICATE (VOCATIONAL) AT NQF LEVEL 4:**

    Admission requirement(s):
    A National Certificate (Vocational) at NQF Level 4 with a bachelor's degree or a diploma endorsement, with at least 40% (APS of 3) for English (home language or first additional language) and 50% (APS of 4) for Mathematics and 40% (APS of 3) for Physical Science or Applied Engineering Technology and 50% for Life Orientation (excluded for APS calculation), and 50% (APS of 4) for any two compulsory vocational subjects.

    Selection criteria:
    To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **23** (excluding Life Orientation).

- **FOR APPLICANTS WITH A NATIONAL N CERTIFICATE AS PUBLISHED IN NATED 191: (NQF LEVEL 4):**

   Admission requirement(s):
   A National Senior Certificate and a National N Certificate as published in Nated 191: N3 (NQF Level 4) issued by both the Department of Higher Education and Training (DHET) and the Council for Quality Assurance in General and Further Education and Training (Umalusi), with at least 40% (APS of 3) for English and 50% (APS of 4) for Mathematics N3 and Engineering Sciences N3.

b. *Assessment procedure(s):*
   No further assessment will be done. Applicants who achieve the minimum APS will be considered until the programme complement is full.

   Please take note that all completed applications received within the published due dates will be ranked. After consideration of the Departmental Student Enrolment Plan, only the top ranking applicants will be selected. Once a programme is full, a waiting list will be in place to provide an opportunity for applicants to fill places of those who did not register on time. Applicants will be informed of their status per official letter from the Office of the Registrar, alternatively, they can check their application status on the TUT website, www.tut.ac.za.

c. *Recognition of Prior Learning (RPL), equivalence and status:*
   See Chapter 30 of Students' Rules and Regulations.

d. *Intake for the qualification:*
   January only.

e. *Presentation:*
   Day classes. Classes and assessments take place during the week and on Saturdays. Online classes are also offered in some instances, but assessments are on campus.

f. *Minimum duration:*
   Four years.

g. *Exclusion and readmission:*
   See Chapter 2 of Students' Rules and Regulations.

h. *Work-Integrated Learning 326:*
   See Chapter 5 of Students' Rules and Regulations.

i. *Engineering Council of South Africa (ECSA):*
   This programme is accredited by the Engineering Council of South Africa (ECSA), and students completing the qualification will be able to register with that Council. The Department or ECSA can be contacted for additional information and registration purposes.

j. *Re-registration:*
   A student may re-register for the module Project Design 365 only with the permission of the Head of the Department. The purpose of the re-registration is to provide students with an opportunity to complete the project only, and not to redo it, should they fail the subject.

k. *Personal equipment:*
   Access to a laptop or desktop computer is essential to participate in multimodal learning experiences as well as to complete assignments and projects. NSFAS students receive an allowance to acquire a laptop, and using this allowance for this purpose is critical for academic success. Students are encouraged to consult the faculty website where the minimum requirements for specific programmes are published.

CURRICULUM

FIRST YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
CMSF05D	Communication Science 165	(5)	(10)	
DE1F05D	Digital Electronics 115	(5)	(10)	
EIPF05D	Electrical Principles 115	(5)	(10)	
EL1F05D	Electronics 115	(5)	(10)	
MT1F05D	Mathematics 115	(5)	(10)	
PG1F05D	Programming 115	(5)	(10)	

TOTAL CREDITS FOR THE FIRST YEAR: **60**

SECOND YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
DE2F06D	Digital Electronics 126	(6)	(10)	Digital Electronics 115
EL2F06D	Electronics 126	(6)	(10)	Electronics 115
MT2F06D	Mathematics 126	(6)	(10)	Mathematics 115
NWSF05D	Network Systems 125	(5)	(10)	
PCOF05D	Project Construction 125	(5)	(10)	Electrical Principles 115 Electronics 115
PG2F06D	Programming 126	(6)	(10)	Programming 115

TOTAL CREDITS FOR THE SECOND YEAR: **60**

THIRD YEAR
Modules are offered as determined by the Head of the Department.

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)

FIRST SEMESTER

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
CAG216D	Computer Architecture and Organisation 216	(6)	(10)	Digital Electronics 115 Digital Electronics 126
DAB215D	Databases 215	(5)	(10)	
DEL216D	Digital Electronics 216	(6)	(10)	Digital Electronics 115 Digital Electronics 126
DP1216D	Digital Process Control 216	(6)	(10)	Digital Electronics 115 Digital Electronics 126
MHS216D	Mathematics 216	(6)	(10)	Mathematics 115 Mathematics 126
PGM216D	Programming 216	(6)	(10)	Programming 115 Programming 126

TOTAL CREDITS FOR THE SEMESTER: 60

SECOND SEMESTER

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
DP2216D	Digital Process Control 226	(6)	(10)	Digital Process Control 216 Programming 216
LOD216D	Logic Design 226	(6)	(10)	Computer Architecture and Organisation 216 Digital Electronics 216
OPS216D	Operating Systems 226	(6)	(10)	Programming 216
PLC216D	Programmable Logic Controllers 226	(6)	(10)	Digital Process Control 216 Programming 216

plus two of the following electives:

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
ARI216D	Artificial Intelligence 226	(6)	(10)	Mathematics 216 Programming 216
MRO216D	Mobile Robotics 226	(6)	(10)	Computer Architecture and Organisation 216 Digital Electronics 216 Digital Process Control 216 Programming 216
NWS216D	Network Systems 226	(6)	(10)	Network Systems 125

TOTAL CREDITS FOR THE SEMESTER:		60	
TOTAL CREDITS FOR THE THIRD YEAR:		**120**	

FOURTH YEAR
Modules are offered as determined by the Head of the Department.

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
WYE306D	Work-Integrated Learning 326	(6)	(60)	Digital Process Control 226 Logic Design 226 Operating Systems 226 Programmable Logic Controllers 226

FIRST SEMESTER

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
EMS316D	Embedded Systems 316	(6)	(10)	Digital Process Control 226 Logic Design 226 Programmable Logic Controllers 226
PBS316D	Probability and Statistics 316	(6)	(10)	Mathematics 115
PD1315D	Project Design 365	(5)	(10)	Digital Process Control 226 Logic Design 226 Programmable Logic Controllers 226
PD1315R	Project Design 365 (re-registration) (second-semester module, see paragraph j)	(5)	(0)	
SFE316D	Software Engineering 316	(6)	(10)	Databases 215 Programming 216

SECOND SEMESTER
On completion of all modules.

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
PD2316D	Project Design 376	(6)	(20)	
PD2316R	Project Design 376 (re-registration) (first-semester module, see paragraph j)	(6)	(0)	

TOTAL CREDITS FOR THE FOURTH YEAR:		**120**	
TOTAL CREDITS FOR THE QUALIFICATION:		**360**	

Faculty of Information and Communication Technology
Dip (Computer Systems Engineering)

MODULE 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 module. At time of publication, the syllabus content was defined as follows:

A

ARTIFICIAL INTELLIGENCE 226 (ARI216D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Systems Engineering)
This module covers applied intermediate artificial intelligence and is concerned with the implementation of intermediate level artificial intelligence concepts. The student will be introduced to autonomous agents, state-driven design, basic user interaction concepts, autonomous virtual world generation, path finding and basic network programming. After successful completion of this module, the student must be able to create and design autonomous agents in a virtual world that achieve specific given goals using intermediate artificial intelligence concepts. (Total notional time: 100 hours)

C

COMMUNICATION SCIENCE 165 (CMSF05D)   **1 X 3-HOUR PAPER**
(Module custodian: ICT First Years' and Foundation Unit
This module covers the discipline of communication as a whole and touches on adjusting to and thriving in a tertiary environment and is concerned with the life skills needed for study at a university, using a computer for writing, doing research, and techniques for presenting research. The student will be introduced to concepts of change and personal adjustment, goal setting and time management, interpersonal skills, and listening and study skills. (Total notional time: 100 hours)

COMPUTER ARCHITECTURE AND ORGANISATION 216 (CAG216D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Systems Engineering)
This module covers microcontroller principles and their applications and is concerned with design, development, and construction of microcontroller applications. The student will be introduced to architecture of a microcontroller, memory architectures, DMA transfers, basic I/O principles and devices, interrupts, and embedded application designs. (Total notional time: 100 hours)

D

DATABASES 215 (DAB215D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Science)
This module covers the world of database systems and their use in industry and is concerned with the use and construction of databases as part of a solution to a problem. After successful completion of this module, the student must be able to display a firm grasp of database systems and their application as part of a solution to a problem. (Total notional time: 100 hours)

DIGITAL ELECTRONICS 115 (DE1F05D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Systems Engineering)
This module covers introductory digital electronics and is concerned with the building blocks of digital systems. After successful completion of this module, the student must be able to design, troubleshoot and build basic digital system circuits. (Total notional time: 100 hours)

DIGITAL ELECTRONICS 126 (DE2F06D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Systems Engineering)
This module introduces data storage, data transmission, data processing and control, and signal conversion and processing, through the implementation of basic digital electronic concepts. On completion of this module, students should be able to explain how the mentioned systems are built using basic digital electronic building blocks. (Total notional time: 100 hours)

DIGITAL ELECTRONICS 216 (DEL216D) 1 X 3-HOUR PAPER
(Module custodian: Department of Computer Systems Engineering)
This module covers introductory microcontroller concepts and is concerned with the basics of an 8-bit micro-controller. After successful completion of this module, the student must be able to design, program and debug a program, using assembler language for an 8-bit microcontroller. (Total notional time: 100 hours)

DIGITAL PROCESS CONTROL 216 (DP1216D) 1 X 3-HOUR PAPER
(Module custodian: Department of Computer Systems Engineering)
This module covers introductory intelligent systems that encompass the integration of software and electronic systems and is concerned with the implementation of control systems. After successful completion of this module, the student must be able to apply a combination of hardware and software systems in a solution to a given problem. (Total notional time: 100 hours)

DIGITAL PROCESS CONTROL 226 (DP2216D) 1 X 3-HOUR PAPER
(Module custodian: Department of Computer Systems Engineering)
This module covers the theory of mobile robotics and is concerned with robotics and related technologies. The student will be introduced to the theory behind sensor integration using various sensors, applying a variety of algorithms and techniques to a robotic platform in order to solve problems, these include and are not limited to localisation, path finding, map generation, proportional integral derivative control, and navigation. After successful completion of this module, the student must be able to describe, explain and solve various robotic related problems. (Total notional time: 100 hours)

E

ELECTRICAL PRINCIPLES 115 (EIPF05D) 1 X 3-HOUR PAPER
(Module custodian: Department of Computer Systems Engineering)
This module covers electrical principles and is concerned with the study and application of electricity, electronics and electromagnetism. The student will be introduced to basic principles of modern day electrical engineering technology. After successful completion of this module, the student must be able to deal with the basic principles of electricity, e.g. the analysis of direct current circuits, the analysis of alternating current circuits, electromagnetism, magnetic circuits, inductors, capacitors and some mechanical calculations. (Total notional time: 100 hours)

ELECTRONICS 115 (EL1F05D) 1 X 3-HOUR PAPER
(Module custodian: Department of Computer Systems Engineering)
This module covers electronic components and their operations and is concerned with atomic theory, electrical charge, electrical voltage, current, resistance, series and parallel circuits, conductors and insulators. After successful completion of this module, the student must be able to design basic power supplies and biasing circuits for BJT, FET transistors and operational amplifiers. (Total notional time: 100 hours)

ELECTRONICS 126 (EL2F06D) 1 X 3-HOUR PAPER
(Module custodian: Department of Computer Systems Engineering)
This module covers the analysis and design of simple electronic circuits and is concerned with the modelling of electronic components and their application in circuit analysis and design. After successful completion of this module, the student must be able to design and analyse simple power supplies, basic filters, transistor amplifiers and calculate heat sink requirements for power circuits. (Total notional time: 100 hours)

EMBEDDED SYSTEMS 316 (EMS316D) 1 X 3-HOUR PAPER
(Module custodian: Department of Computer Systems Engineering)
This module covers the implementation of software on an embedded system and is concerned with the model and design of the joint dynamics of software, networks, and physical processes. After successful completion of this module, the student must be able to model, design and implement an embedded systems. (Total notional time: 100 hours)

LOGIC DESIGN 226 (LOD216D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Systems Engineering)
This module covers the design principles of logic circuits using a hardware descriptive language and is concerned with the building blocks in understanding logic design principles using a hardware descriptive language. After successful completion of this module, the student must be able to design basic logic circuits using relevant components (PALs, PLAs, FPGAs, CPLDs, development boards, etc.), tools (HDL compilers, programming suites, etc.) and methods (relevant optimisation methods, FSMs, etc.) to design logic circuits. (Total notional time: 100 hours)

M

MATHEMATICS 115 (MT1F05D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Mathematics and Statistics)
This module covers basic mathematics and is concerned with introductory mathematical concepts such as algebra, exponents, differentiation, integration, functions, matrices, vectors, and data handling. After successful completion of this module, the student must be able to find solutions to problems involving methods of basic mathematical calculation. (Total notional time: 100 hours)

MATHEMATICS 126 (MT2F06D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Mathematics and Statistics)
This module covers intermediate level mathematics and is concerned with differentiation of multi-variable functions, integration, numerical methods, first-order ordinary differential equations, and matrices and Gauss elimination. After successful completion of this module, the student must be able to find solutions to linear, non-linear and partial differentiation problems and applications. (Total notional time: 100 hours)

MATHEMATICS 216 (MHS216D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Mathematics and Statistics)
This module covers advanced concepts in pure and discrete mathematics and is concerned with principles relating to the field. After successful completion of this module, the student must be able to understand and implement principles of pure and discrete mathematics to solve practical problems relating to the field. (Total notional time: 100 hours)

MOBILE ROBOTICS 226 (MRO216D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Systems Engineering)
This module covers practical mobile robotics and is concerned with robotics and related technologies. After successful completion of this module, the student must be able to apply various techniques on a mobile robot using dedicated software such as ROS or Player/Stage in order to solve given problems. (Total notional time: 100 hours)

N

NETWORK SYSTEMS 125 (NWSF05D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Information Technology)
This module covers various networking concepts and strategies and is concerned with ensuring the student knows and can apply various networking concepts and strategies to industry related problems. After successful completion of this module, the student must be able to make effective presentations to a range of audiences about technical problems and their solutions. (Total notional time: 100 hours)

NETWORK SYSTEMS 226 (NWS216D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Information Technology)
This module covers various networking concepts and strategies and is concerned with ensuring the student knows and can apply various networking concepts and strategies to industry related problems. After successful completion of this module, the student must be able to make effective presentations to a range of audiences about technical problems and their solutions. (Total notional time: 100 hours)

O

OPERATING SYSTEMS 226 (OPS216D)   **1 X 4-HOUR COMPUTER-BASED**
(Module custodian: Department of Computer Systems Engineering)
This module covers base knowledge surrounding operating systems and is concerned with creating an in-depth understanding of operating systems that can then be further applied in the up-coming modules. After successful completion of this module, the student must be able to demonstrate a sound knowledge of operating systems aiding them in developing OS specific applications and even operating systems themselves. (Total notional time: 100 hours)

P

PROBABILITY AND STATISTICS 316 (PBS316D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Mathematics and Statistics)
This module covers aspects of probability and statistics and is concerned with discrete probability, continuous probability, expectation, stochastic processes, sampling distributions, estimation, and hypothesis testing. After successful completion of this module, the student must be able to understand and implement probability and statistics and its various applications. (Total notional time: 100 hours)

PROGRAMMABLE LOGIC CONTROLLERS 226 (PLC216D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Systems Engineering)
This module is concerned with designing and implementing PLC based systems. Various sensors, actuators and control methods are looked at and utilised practically. After successful completion of this module, the student must be able to identify and explain the main design characteristics, internal architecture, and operating principles of Programmable Logic Controllers and implement a PLC in designing solution to a given problem. (Total notional time: 100 hours)

PROGRAMMING 115 (PG1F05D)   **1 X 4-HOUR COMPUTER-BASED**
(Module custodian: Department of Computer Science)
This module covers introductory engineering programming principles and is concerned with the application of programming and software engineering principles to provide solutions to a range of problems emanating in the IT industry. After successful completion of this module, the student must be able to write a basic C++ program, evaluate C++ expressions using arithmetic operators, enable a program to make decisions, enable a program to repeat instructions, create and work with functions and manipulate collections of data. (Total notional time: 100 hours)

PROGRAMMING 126 (PG2F06D)   **1 X 4-HOUR COMPUTER-BASED**
(Module custodian: Department of Computer Science)
This module covers intermediate engineering programming principles and is concerned with object-oriented programming concepts such as inheritance and polymorphism, producing documentation and implementing advanced solutions to problems arising in the software industry. After successful completion of this module, the student must be able to design and implement computer application/software that can solve various software and hardware based problems. (Total notional time: 100 hours)

PROGRAMMING 216 (PGM216D)   **1 X 4-HOUR COMPUTER-BASED**
(Module custodian: Department of Computer Science)
This module covers intermediate/advanced engineering programming principles and is concerned with Using Rapid Application Development Tool (RAD) for problem solving in a GUI environment. After successful completion of this module, the student must be able to solve intermediate/advanced level programming problems using intermediate/advanced level programming skills. (Total notional time: 100 hours)

PROJECT CONSTRUCTION 125 (PCOF05D)   **PROJECT ASSESSMENT**
(Module custodian: Department of Computer Systems Engineering)
This module covers all aspects of constructing an electronic project and is concerned with design, research manufacturing, and basic hand skills required to complete an electronic project. After successful completion of this module, the student must be able to successfully construct an electronic project using the necessary electronic knowledge, hand skills and safety procedures needed for completion. (Total notional time: 100 hours)

PROJECT DESIGN 365 (PD1315D/R)   **PROJECT ASSESSMENT**
(Module custodian: Department of Computer Systems Engineering)
This module covers professional conduct, project design approach and design considerations and is concerned with personal and interpersonal skills, self-management, team dynamics and cultural diversity, legal issues in IT, computer assisted design, knowledge of materials and construction, manufacturing tools and processes, environmental design skills, and an overview of current technology. After successful completion of this module, the student must be able to operate efficiently in a working environment, and successfully research, plan, and design appropriate artefacts for the work environment. (Total notional time: 100 hours)

PROJECT DESIGN 376 (PD2316D/R)   **PROJECT ASSESSMENT**
(Module custodian: Department of Computer Systems Engineering)
This module is concerned with identifying a particular existing problem and solving it through the development and implementation of a software and hardware solution. After successful completion of this module, the student must be able to solve problems by making responsible, safety-conscious decisions and using critical and creative thinking; Manage oneself and one's study activities responsibly and effectively by submitting the documents in time and budgeting your project time effectively; Research, collect, organise, and evaluate information in order to form a complete picture regarding the selected project; Communicate effectively using visual, mathematical and language skills when completing and submitting the project design documents; Exploring career opportunities by investigating possible employment options; Communication, including receiving advice from supervisors; Self-management by organising and managing oneself and one's activities responsibly and effectively. (Total notional time: 200 hours)

S

SOFTWARE ENGINEERING 316 (SFE316D)   **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Systems Engineering)
This module covers advanced software development and is concerned with creating robust programming solutions for real world problems. After successful completion of this module, the student must be able to create robust solutions for real world problems utilising advanced software engineering concepts. (Total notional time: 100 hours)

W

WORK-INTEGRATED LEARNING 326 (WYE306D)   **WORK-INTEGRATED LEARNING**
(Module custodian: Department of Computer Systems Engineering)
This module covers integrating the student into a work environment and exposing him/her to a professional work environment. The student will be introduced to the professional world in an industry related to the programme. (Total notional time: 600 hours)

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