ADVANCED DIPLOMA IN COMPUTER SYSTEMS ENGINEERING

AdvDip (Computer Systems Engineering) - NQF Level 7 (140 credits)

Qualification code: ADYE20

SAQA ID: 111747, CHE NUMBER: H/H16/E133CAN

Campus where offered: Soshanguve South Campus

REMARKS

a. *Admission requirement(s):*
A National Diploma: Engineering: Computer Systems, **or** a National Diploma: Information Technology in the field of Intelligent Industrial Systems, **or** a National Diploma: Engineering: Electrical (Electronics), **or** a Diploma in Computer Systems Engineering, **or** a relevant bachelor's degree, **or** an equivalent qualification at NQF Level 6 with a minimum of 360 credits.

Holders of any other equivalent South African or international qualification may also be considered, see Chapter 1 of Students' Rules and Regulations.

b. *Selection criteria:*
Admission is subject to selection. Prospective students will be evaluated based on the marks obtained in the previous qualification and/or work experience.

Acceptance is subject to available capacity according to the Student Enrolment Plan (SEP). 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 offered on Saturdays over a period of two years. Online classes are also offered in some instances, but assessments are on campus.

f. *Minimum duration:*
A minimum of one or two years (depending on the programme offering).

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

h. *Re-registration:*
A student may re-register for the module Engineering Project Design 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 module.

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. *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

ATTENDANCE (FIRST OR SECOND YEAR)
Modules are offered as determined by the Head of the Department.

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
DSR117V	Digital Signal Processing	(7)	(15)	
EGD107V	Engineering Project Design	(7)	(30)	
EGD117R	Engineering Project Design (re-registration) (first-semester module, see paragraph h)	(7)	(0)	
EPM117V	Engineering Project Management	(7)	(10)	
FIRST SEMESTER				
AIS117V	Artificial Intelligent Systems	(7)	(15)	
CMD116V	Computational Mathematics	(6)	(15)	
SECOND SEMESTER				
EBD117V	Embedded Systems Design	(7)	(15)	
EER117V	Engineering Ethics and Practices	(7)	(10)	
	plus any two of the following electives:			
First semester				
CNT117V	Computer Networks	(7)	(15)	
IES117V	Intelligent Electro-Mechanical Systems	(7)	(15)	Embedded Systems Design
Second semester				
CAO117V	Computer Architecture and Organisation	(7)	(15)	
CES117V	Computer Emerging Technologies	(7)	(15)	Artificial Intelligent Systems
IIS117V	Intelligent Industrial Systems	(7)	(15)	Artificial Intelligent Systems
SRG117V	Systems Resources Management	(7)	(15)	Computational Mathematics
TOTAL CREDITS FOR THE QUALIFICATION:			**140**	

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 INTELLIGENT SYSTEMS (AIS117V) **1 X 3-HOUR PAPER**
(Module custodian: Department of Computer Systems Engineering)
This module covers introductory on supervised learning (parametric/non-parametric algorithms, support vector machines, kernels, neural networks), unsupervised learning (clustering, dimensionality reduction, recommender systems, deep learning) and best practices in machine learning (bias/variance theory; innovation process in machine learning and AI). After successful completion of this module, the student must be able to design systems that are fully managed by AI. (Total notional time: 150 hours)

C

COMPUTATIONAL MATHEMATICS (CMD116V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This module prepares the student to apply computational mathematics principles and models to solve problems related to the Computer Systems Engineering. The focus is directed towards the Numerical Computing with the emphasis on the mathematical software as a tool to solve most of engineering problems mathematically. After successful completion of this module, the student must be able to apply knowledge of Computational Mathematics to applied engineering procedures, processes, systems and methodologies to solve broadly-defined engineering problems and thus the processes interpreted in mathematical form. (Total notional time: 150 hours)

COMPUTER ARCHITECTURE AND ORGANISATION (CAO117V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This elective module covers a single-core versus multi-core processors and architectures, on-chip interconnect networks, memory controller issues, program partitioning, and programming techniques. The student will be able to design circuitry and develop software to complete a functioning microcontroller application. (Total notional time: 150 hours)

COMPUTER EMERGING TECHNOLOGIES (CES117V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This elective module covers the current breakthrough technologies and disruptive innovations that have emerged over the past few years and the new inventions that are yet to emerge as viable technologies in the field of Computer Systems Engineering. After successful completion of this module, the student must be able to design a system with the components of emerging technologies in the field of computer systems engineering. (Total notional time: 150 hours)

COMPUTER NETWORKS (CNT117V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This module covers various aspects of network security concepts and strategies and is concerned with the relationship with the industry problems. The student is introduced to network security threats, security of network devices, authentication and authorisation, firewall technologies, implementation of intrusion prevention, and management of secure network. At the end of this module, students will be able to design, manage, and maintain a secure network system by applying the knowledge gained throughout the module. (Total notional time: 150 hours)

D

DIGITAL SIGNAL PROCESSING (DSR117V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This module covers an introduction to analogue signals and LTI systems representation and transformation, analogue convolution and analogue filters, Laplace and Z-transform, Digital signals and sampling requirements, Basic types of digital signals, Quantisation error, Time-domain analysis, including Linear-time-invariant discrete system, Block Diagram for LTI discrete systems, Impulse response, Convolution sum, Difference equations, Frequency-domain analysis, and Filter design. After successful completion of this module, the student must be able to design signal process systems and various filters with application in various engineering fields. (Total notional time: 150 hours)

E

EMBEDDED SYSTEMS DESIGN (EBD117V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This module covers embedded computers and networks, which monitor and control the physical processes, usually with feedback loops where these loops affect computations. After successful completion of this module, the student must be able to design broadly-defined embedded systems. (Total notional time: 150 hours)

ENGINEERING ETHICS AND PRACTICES (EER117V) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Computer Systems Engineering)

This module covers introduction to ethical reasoning and engineering ethics, professional practice in engineering, ethics as design, professional responsibility of engineers, rights and responsibilities regarding intellectual property. The student will understand what it takes to maintain continued competence and to keep abreast of up-to-date tools and techniques, understand the ECSA code of conduct, continuing professional development, and know what it takes to accepts responsibility for own actions. (Total notional time: 100 hours)

ENGINEERING PROJECT DESIGN (EGD107V, EGD117R) **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. The student will be introduced to project time management, system development and design lifecycle, circuit analysis and the use of modern tools available to hardware and software engineers. 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. (Total notional time: 300 hours)

ENGINEERING PROJECT MANAGEMENT (EPM117V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This module covers engineering communication, project management, basic management accounting and engineering entrepreneurship. After successful completion of this module, the student must be able to execute engineering project effectively, write quality technical reports and communicate all project information to peers, understand contract law as well as entrepreneurship within industrial digital transformation. (Total notional time: 100 hours)

I

INTELLIGENT INDUSTRIAL SYSTEMS (IIS117V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This elective module covers Review of Artificial Neural Networks, Industrial mobile robots, Coordinate Transformation Trajectory interpolation, Locomotion, Mobile robot kinematics and Case studies with Application of ROS. After successful completion of this module, the student must be able to apply a combination of AI, computer vision, image processing with hardware and software systems in a solution to a given problem. (Total notional time: 150 hours)

INTELLIGENT ELECTRO-MECHANICAL SYSTEMS (IES117V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This elective module covers Computer-based Instrumentation systems, Computer-Integrated Manufacturing Systems with PLCs, Magnetic Circuits and Transformers, Overview of Motors, Mechanical Systems, and basic Power Electronic Devices. After successful completion of this module, the student must be able to adapt cross-discipline skills, particularly in the fields of robotics, automated manufacturing and electro-mechanical power systems to develop intelligent electro-mechanical systems. (Total notional time: 150 hours)

S

SYSTEMS RESOURCES MANAGEMENT (SRG117V) **1 X 3-HOUR PAPER**

(Module custodian: Department of Computer Systems Engineering)

This elective module covers the overview of systems resources management, relevant tools, standards, and/or engineering constraints and several techniques of managing system resource. After successful completion of this module, the student must be able to design with an optimum resource allocation. (Total notional time: 150 hours)