BACHELOR OF ENGINEERING TECHNOLOGY HONOURS IN ELECTRICAL ENGINEERING

BEngTechHons (Electrical Engineering) - NQF Level 8 (140 credits)

Qualification code: BHEE22

SAQA ID: 117926, CHE NUMBER: H/H16/E203CAN

Campus where offered: Pretoria and eMalahleni campuses

REMARKS

a. *Admission requirement(s):*
A Bachelor of Engineering in Electrical Engineering, **or** a Bachelor of Engineering Technology in Electrical Engineering, **or** a Baccalaureus Technologiae: Engineering: Electrical, **or** an Advanced Diploma in Electrical Engineering, **or** an equivalent qualification with an aggregate of 60% for the final-year of study, **or** an NQF Level 7 qualification in a closely related field, obtained from an accredited South African university.

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.

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:*
Block-mode classes offered over a period of two years.

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 Research Project: Electrical Engineering 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 final project only, and not to redo the whole module, should they fail the module.

CURRICULUM

FIRST YEAR

CODE	MODULE	NQF-L	CREDIT
FIRST SEMESTER			
DAN118S	Data Analysis	(8)	(10)
REA118S	Research Methodology	(8)	(10)
SYD118S	System Dynamics	(8)	(15)
TOTAL CREDITS FOR THE SEMESTER:			35
SECOND SEMESTER			
OTY118S	Optimisation Theory	(8)	(15)
SMG118S	Sustainable Management	(8)	(10)
	Plus a module from any one of the following options:		
Option 1: Control Systems			
CNS118S	Control Systems	(8)	(15)
Option 2: Power and Energy Systems			
CVS118S	Conversion Systems	(8)	(15)
Option 3: Telecommunication Systems			
DCM118S	Digital Communications	(8)	(15)
TOTAL CREDITS FOR THE SEMESTER:			35
TOTAL CREDITS FOR THE FIRST YEAR:			**75**

SECOND YEAR

CODE	MODULE	NQF-L	CREDIT
REG108S	Research Project: Electrical Engineering	(8)	(30)
REG118R	Research Project: Electrical Engineering (re-registration) (semester module, see paragraph h)	(8)	(0)
SECOND SEMESTER			
All modules from one of the following options:			
Option 1: Control Systems			
CIN118S	Computational Intelligence	(8)	(15)
RSY118S	Robotic Systems	(8)	(15)
Option 2: Power and Energy Systems			
EDM118S	Energy Efficiency and Demand Side Management	(8)	(15)
PDG118S	Power and Distributed Generation	(8)	(15)
Option 3: Telecommunication Systems			
FNE118S	Fixed Networks	(8)	(15)
WCO118S	Wireless Communications	(8)	(15)

plus one of the following modules (only CTS116S, EPY116S and ETN116S will be offered until further notice):

CTS116S	Contracts	(6)	(5)
EGU116S	Engineering Education	(6)	(5)
EPY116S	Energy Economics and Policy	(6)	(5)
ETN116S	Entrepreneurship	(6)	(5)
IBO116S	International Business Communication	(6)	(5)
IND116S	Industrial Design	(6)	(5)
ITR116S	Intellectual Property	(6)	(5)

TOTAL CREDITS FOR THE SECOND YEAR: **65**

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:

C

COMPUTATIONAL INTELLIGENCE (CIN118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Electrical Engineering)

Artificial neural networks; Evolutionary computing; Swarm intelligence; Fuzzy systems; and Probabilistic methods. (Total notional time: 150 hours)

CONTRACTS (CTS116S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Civil Engineering)

The place of the law of contract; Concept of contract; Requirements of valid contracts; Mistakes, duress, misrepresentation and undue influence; Valid, void and voidable contracts; Termination of contracts; Remedies available to affected parties; and Legal rules. (Total notional time: 50 hours)

CONTROL SYSTEMS (CNS118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Electrical Engineering)

Introduction to control systems; Modelling in the frequency domain; Modelling in the time domain; Time response; Reduction of multiple subsystems; Stability; Steady state errors; Root locus techniques and design via root locus; and Frequency response and design via frequency response. (Total notional time: 150 hours)

CONVERSION SYSTEMS (CVS118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Electrical Engineering)

Converter theory; Electromechanical systems; Electric materials; Electromagnetic field calculation, distribution (non-linear and transient problems, numerical methods, applications); Transmission planning; and Transmission system design. (Total notional time: 150 hours)

D

DATA ANALYSIS (DAN118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Electrical Engineering)

Exploring data; Describing the distribution of a simple variable; Finding relationships amongst variables; Probability and decision making under uncertainty; Probability and probability distribution; Normal, binomial, poisson and exponential distributions; Statistical inference; Sampling and sampling distributions; Confidence interval estimation; Hypothesis testing; Regression analysis; and Regression analysis - estimating relationships. (Total notional time: 100 hours)

DIGITAL COMMUNICATIONS (DCM118S) **CONTINUOUS ASSESSMENT**
(Module custodian: Department of Electrical Engineering)
Signals and spectra; Source coding; Formatting and baseband modulation; Baseband demodulation or detection methods; Band pass modulation and demodulation/detection methods; and Channel coding and decoding techniques. (Total notional time: 150 hours)

E

ENERGY ECONOMICS AND POLICY (EPY116S) **CONTINUOUS ASSESSMENT**
(Module custodian: Department of Electrical Engineering)
Energy management; Energy accounting; Energy systems and renewable energy. (Total notional time: 50 hours)

ENERGY EFFICIENCY AND DEMAND SIDE MANAGEMENT (EDM118S) **CONTINUOUS ASSESSMENT**
(Module custodian: Department of Electrical Engineering)
Energy management programme design; Energy management audit; Energy management process assessment; Control and process systems; and Corporate governance and good practices. (Total notional time: 150 hours)

ENGINEERING EDUCATION (EGU116S) **CONTINUOUS ASSESSMENT**
(Module custodian: Department of Chemical, Metallurgical and Material Engineering)
Higher education environment; Teaching and learning methods; Assessment; and Lecture planning and design. (Total notional time: 50 hours)

ENTREPRENEURSHIP (ETN116S) **CONTINUOUS ASSESSMENT**
(Module custodian: Department of Civil Engineering)
Entrepreneurship and entrepreneurial characteristics; Steps to establish a business; Forms of business ventures; Funding options in business; and Business plans. (Total notional time: 50 hours)

F

FIXED NETWORKS (FNE118S) **CONTINUOUS ASSESSMENT**
(Module custodian: Department of Electrical Engineering)
Computer networks and the internet; Application layer; Transport layer; The Network Layer; The Link layer - links, access networks, and LANs; Multimedia networking; and Security in computer networks. (Total notional time: 150 hours)

I

INDUSTRIAL DESIGN (IND116S) **CONTINUOUS ASSESSMENT**
(Module custodian: Department of Architecture and Industrial Design)
Design thinking; Design, make, test, refine; Business model canvas; Costing and break-even graphs; and Spin outs and licensing. (Total notional time: 50 hours)

INTELLECTUAL PROPERTY (ITR116S) **CONTINUOUS ASSESSMENT**
(Module custodian: Department of Industrial Engineering)
Disclosure analysis; Novelty assessment; IP forms; Methods of protecting IP; IP laws/legislations; Patent protection strategies; and Commercialisation of IP (route to market). (Total notional time: 50 hours)

INTERNATIONAL BUSINESS COMMUNICATION (IBO116S) **CONTINUOUS ASSESSMENT**
(Module custodian: Department of Applied Languages)
Introduction to the language of choice (culture, sounds, syllables and words); Introducing oneself; Formation of simple sentences; Greeting/address forms (work/industry); and Business protocol in chosen language (organogram). (Total notional time: 50 hours)

O

OPTIMISATION THEORY (OTY118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Electrical Engineering)

Convexity; Optimality conditions; Nonlinear programming; Linear programming and duality; Quadratic programming; and Mixed integer programming. (Total notional time: 150 hours)

P

POWER AND DISTRIBUTED GENERATION (PDG118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Electrical Engineering)

Introduction (structure of a power system); Steady state analysis (line load ability, reactive compensation); Load flow studies; Short-circuit analysis; Transient analysis (numerical methods of solution, direct methods of analysis); HVDC, FACTS and stabilizing devices; and Power system control. (Total notional time: 150 hours)

R

RESEARCH METHODOLOGY (REA118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Industrial Engineering)

Conceptual Design (research objective, research framework, research questions, defining concepts, conceptual modelling); Technical Design (research strategies, research material, research planning); Communicating your research (thesis/dissertation/project layout, research proposal, oral presentation, referencing, style; research paper writing); Statistics in research; and Research Professionalism (plagiarism, ethics in research, predator journal avoidance, intellectual property (IP) in research). (Total notional time: 100 hours)

RESEARCH PROJECT: ELECTRICAL ENGINEERING (REG108S, REG118R) **PROJECT ASSESSMENT**

(Module custodian: Department of Electrical Engineering)

Project Design and Development; Conference poster and oral presentation; Proposed design and preliminary results; Conference paper and oral presentation; Final implementation and results; final Report: Introduction and project plan, literature review, detail design and implementation, test results and conclusion. (Total notional time: 300 hours)

ROBOTIC SYSTEMS (RSY118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Electrical Engineering)

Introduction to robotic systems; Robotic sensors and actuators; Position and orientation in space; Forward and inverse kinematics; Jacobian matrix; Dynamic models of robotic systems; and Control of robotic systems. (Total notional time: 150 hours)

S

SUSTAINABLE MANAGEMENT (SMG118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Civil Engineering)

An overview of the technical processes found in systems engineering; The emergence of sustainable strategic management; In search of sustainability; Environmental analysis for sustainable strategic management; Sustainable strategic management resource assessment; Concepts and instruments for corporate sustainability management; Innovation and technology management in the engineering field; Project management in the engineering field; and Sustainable management assignment and group presentation. (Total notional time: 100 hours)

SYSTEM DYNAMICS (SYD118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Chemical, Metallurgical and Material Engineering)

Introduction to system dynamics and mechanistic models; Causal models; Dynamics of mechanistic models, based on fundamental conservation principles; Structure and behaviour of dynamics systems, based on causal dependencies; Steps in fundamental and causal modelling; Agent-based modelling; and Distributed systems in engineering modelling. (Total notional time: 150 hours)

W

WIRELESS COMMUNICATIONS (WCO118S) **CONTINUOUS ASSESSMENT**

(Module custodian: Department of Electrical Engineering)

Fundamentals of wireless communications; Capacity of wireless channels; Cellular systems - multiple access and interference management; MIMO wireless communications; Wireless communication link analysis; and Radio resource management techniques for next generation wireless networks. (Total notional time: 150 hours)