

BACHELOR OF ENGINEERING TECHNOLOGY IN ELECTRICAL ENGINEERING

Qualification code: BPEE19 - NQF Level 7 (420 credits)

SAQA ID: 101903, CHE NUMBER: H/H16/E022CAN

Campus where offered: Pretoria and eMalahleni campuses

Please note that this electronic Prospectus differs from the printed booklet.

REMARKS

a. *Admission requirement(s) and selection criteria:*

• **FOR APPLICANTS WHO OBTAINED A SENIOR CERTIFICATE BEFORE 2008:**

Admission requirement(s):

A Senior Certificate or an equivalent qualification, with C symbols (60 – 69%) at Standard Grade or D symbols (50–59%) at Higher Grade for English, an additional language, Mathematics and Physical Science, and any two additional subjects.

Selection criteria:

To be considered for this qualification, applicants must have an Admission Points Score (APS) of at least **30**.

• **FOR APPLICANTS WHO OBTAINED A NATIONAL SENIOR CERTIFICATE IN OR AFTER 2008:**

Admission requirement(s):

A National Senior Certificate, with a bachelor's degree endorsement, or an equivalent qualification, with an achievement level of at least 5 for English (home language or first additional language), an additional language, Mathematics or Technical Mathematics, Physical Sciences or Technical Sciences and two additional subjects.

Selection criteria:

To be considered for this qualification, applicants must have an Admission Points Score (APS) of at least **30**.

• **FOR APPLICANTS WHO OBTAINED A QUALIFICATION FROM TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET) COLLEGES (PREVIOUSLY KNOWN AS FET COLLEGES):**

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 endorsement, issued by the Council for Quality Assurance in General and Further Education and Training (Umalusi), with at least a 60% (APS of 5) for English, Mathematics, (excluded for APS calculation) and at least 70% (APS of 6) for Physical Sciences or Applied Engineering Technology and any three other vocational subjects.

Selection criteria:

To be considered for this qualification, applicants must have an Admission Points Score (APS) of at least **34**.



Applicants with a National N Certificate as published in Nated 191: N3 (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 (DHET) and the Council for Quality Assurance in General and Further Education and Training (Umalusi), with at least 60% (APS of 5) for English and at least 60% (APS of 5) for Mathematics N3 and Engineering Sciences N3.

Selection criteria:

To be considered for this qualification, applicants must have an Admission Points Score (APS) of at least **30**.

Applicants with a N Diploma as published in Nated 191: N4/N5/N6 (NQF Level 5):

Admission requirement(s):

A National Senior Certificate and a National N Diploma (Nated 191: N4/N5/N6) at NQF Level 5, issued by both the Department of Higher Education (DHET) and the Council for Quality Assurance in General and Further Education and Training (Umalusi), with at least 60% (APS of 5) for English and at least 60% (APS of 5) for Mathematics N4, N5 and N6 and Engineering Sciences N4.

Selection criteria:

To be considered for this qualification, applicants must have an Admission Points Score (APS) of at least **30**.

• **FOR APPLICANTS WITH QUALIFICATIONS ON THE HIGHER EDUCATION QUALIFICATION SUB-FRAMEWORK (HEQSF) OFFERED BY UNIVERSITIES OF TECHNOLOGY:**

Admission will be based on academic performance; availability of space; and an interview.

The applicant will be considered for admission to the programme, if any of the following qualifications has been completed:

- Higher Certificate in Electrical Engineering (NQF Level 5 - 140 credits): at least 60% for all modules completed.
- Advanced Certificate in Electrical Engineering (NQF Level 6 - 140 credits): at least 60% for all modules completed.
- Diploma in Electrical Engineering Technology (NQF Level 6 - 280 credits): at least 60% for all modules completed.
- Diploma in Electrical Engineering (NQF Level 6 - 360 credits): at least 60% for all modules completed.
- National Diploma: Engineering: Electrical (NQF Level 6 - 3,000 credits): at least 60% for all subjects completed.

b. *Assessment procedure (not applicable to applicants with qualifications on the HEQSF):*

All applications received by the published due dates will be ranked according to the APS achieved. After consideration of the departmental Student Enrolment Plan (SEP), only the top performing applicants will be selected. A waiting list consisting of the remainder of the applicants will provide an opportunity for applicants to fill places created by accepted students failing to meet enrolment dates. Applicants will be informed per official letter from the Office of the Registrar.

c. *Minimum duration:*

Three years.

d. *Presentation:*

Day classes.



- e. *Intake for the qualification:*
January only.
- f. *Exclusion and readmission:*
See Chapter 2 of Students' Rules and Regulations.
- g. *Recognition of Prior Learning (RPL), equivalence and status:*
See Chapter 30 of Students' Rules and Regulations.
- h. *Module credits:*
Module credits are shown in brackets after each module.

CURRICULUM

FIRST YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
COL105X	Computer Literacy	(5)	(5)	
COS105X	Communication Skills	(5)	(6)	
EGL105B	Engineering Graphics	(5)	(14)	
ELC105B	Electrical Circuits	(5)	(28)	
ELS105B	Electronic Circuits	(5)	(28)	
EMA105B	Engineering Mathematics I	(5)	(28)	
INL125C	Information Literacy (block module)	(5)	(1)	
LFS125X	Life Skills (block module)	(5)	(2)	
SEM105B	Mechanics	(5)	(10)	

FIRST SEMESTER

SEP115B	Physics	(5)	(10)	
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SECOND SEMESTER

SEC115B	Chemistry	(5)	(8)	
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TOTAL CREDITS FOR THE FIRST YEAR: **140**

SECOND YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
EBS206B	Embedded Systems	(6)	(28)	Electronic Circuits
EMA206B	Engineering Mathematics II	(6)	(14)	Engineering Mathematics I
ESG206B	Engineering Software Design	(6)	(28)	Computer Literacy
PAS206B	Probability and Statistics	(6)	(14)	Engineering Mathematics I

FIRST SEMESTER

AUT216B	Automation	(6)	(14)	Computer Literacy
CVS216B	Conversion Systems	(6)	(14)	Electrical Circuits Engineering Mathematics I

SECOND SEMESTER

EFW216B	Electromagnetic Fields and Waves	(6)	(14)	Engineering Mathematics I Physics
GES216B	Green Energy Systems	(6)	(14)	Electrical Circuits

TOTAL CREDITS FOR THE SECOND YEAR: **140**



THIRD YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
ACS307B	Advanced Conversion Systems	(7)	(28)	Conversion Systems
CNS307B	Control Systems	(7)	(28)	Engineering Mathematics II
PWS307B	Power Systems	(7)	(28)	Conversion Systems
SPR307B	Signal Processing	(7)	(28)	Engineering Mathematics II

FIRST SEMESTER

AES317B	Advanced Embedded Systems	(7)	(14)	Embedded Systems
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SECOND SEMESTER

EPR317B	Engineering Practice	(7)	(14)	
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TOTAL CREDITS FOR THE THIRD YEAR: **140**

TOTAL CREDITS FOR THE QUALIFICATION: **420**

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. On 8 August 2018, the syllabus content was defined as follows:

A

ADVANCED CONVERSION SYSTEMS (ACS307B) CONTINUOUS ASSESSMENT
(Module custodian: Department of Electrical Engineering)
Single-Phase Induction Motors. Three-Phase Induction Machines. Three-Phase Synchronous Machines. Power Electronic Components. Power Converters. (Total tuition time: ± 180 hours)

ADVANCED EMBEDDED SYSTEMS (AES317B) CONTINUOUS ASSESSMENT
(Module custodian: Department of Electrical Engineering)
16 bit Micro controllers. Digital Communication Protocols and standards. Wireless communication. Serial-Interface electrical standard. Peripherals. (Total tuition time: ± 140 hours)

AUTOMATION (AUT216B) 1 X 3-HOUR PAPER
(Module custodian: Department of Electrical Engineering)
Flow-sheet symbols and functional diagramming for process instrumentation diagrams. Measurements; Manipulation; Hierarchical control; Programmable logic controllers (plc); Distributed control systems (DCS); Supervisory control and data acquisition (SCADA); an introduction to networks in process automation. (Total tuition time: ± 140 hours)

C

CHEMISTRY (SEC115B) 1 X 2-HOUR PAPER
(Module custodian: Department of Chemistry)
The Language Chemistry and Matter consists of Particles; The Atom; The Elements and the Periodic Table; Ionic and Molecular Compounds; Chemical equations and stoichiometric calculations; Redox reactions and electricity. (Total tuition time: ± 60 hours)



COMMUNICATION SKILLS (COS105X)**1 X 2-HOUR PAPER****(Module custodian: Department of Applied Languages)**

To identify and apply basic competencies related to communicating in a technical or engineering environment. These competencies include presenting technical information to a variety of audiences, preparing technical reports, participating constructively in formal meetings and preparing a variety of business and technical documents. (Total tuition time: ± 40 hours)

COMPUTER LITERACY (COL105X)**CONTINUOUS ASSESSMENT****(Module custodian: End User Computing Unit)**

Students have to acquire foundational knowledge in Computing Fundamentals, essential digital skills in key applications based on Ms Office Suite (i.e. MS Word, MS Excel, MS PowerPoint, MS Visio Professional and MS Access) and network basics (i.e. MS Outlook and Internet). A complete syllabus and module outlines are described in the study guide. Students will do online exams that are mapped with SAQA and IC3 Essential Skills for Digital Literacy (International Certification). (Total tuition time: not available)

CONTROL SYSTEMS (CNS307B)**1 X 3-HOUR PAPER****(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 sub-systems; Stability; Steady State Errors; Root Locus Techniques and Design via Root Locus; Frequency Response and Design via Frequency Response; Digital Control systems; Practical work and Project. (Total tuition time: ± 280 hours)

CONVERSION SYSTEMS (CVS216B)**1 X 3-HOUR PAPER****(Module custodian: Department of Electrical Engineering)**

Magnetic Circuits. Single-Phase Transformers. Three-Phase Transformers. DC Machines. (Total tuition time: ± 140 hours)

E**ELECTRICAL CIRCUITS (ELC105B)****1 X 3-HOUR PAPER****(Module custodian: Department of Electrical Engineering)**

Direct current circuits. Magnetism and electromagnetism. Single phase alternating current systems. Active components in electric circuits. Alternating current with passive and active components in electric circuits. Three-phase alternating current systems. (Total tuition time: ± 280 hours)

ELECTROMAGNETIC FIELDS AND WAVES (EFW216B)**1 X 3-HOUR PAPER****(Module custodian: Department of Electrical Engineering)**

Introduction. Electric and Magnetic Fields. Transmission Lines. Wave Propagation. Project –electromagnetic systems. (Total tuition time: ± 140 hours)

ELECTRONIC CIRCUITS (ELS105B)**1 X 3-HOUR PAPER****(Module custodian: Department of Electrical Engineering)**

Identification of electronic components. Basic circuit calculations. Understanding of different electrical signals use. Electrical measurements using the laboratory equipment. Conduction in semiconductors and analysis, design and building of basic power supply circuits. Current flow in transistors and analysis, design and building of single transistor circuits. Design and building of practical op-amp application circuits. Design, analysis and building of practical power supplies. Analysis, design and building of different small signal amplifiers configurations. (Total tuition time: not available)

EMBEDDED SYSTEMS (EBS206B)**1 X 3-HOUR PAPER****(Module custodian: Department of Electrical Engineering)**

Introduction to digital concepts. Number systems (Decimal, Binary, Hexadecimal, Octal). Logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR), Boolean Algebra, Karnaugh Maps, Design Techniques and Code Converters. Combinational Logic: Adders, Comparators, Multiplexers, De-multiplexers, Encoders, Decoders, Code converters. Latches and Flip-Flops, Shift registers, 555 Timers. Asynchronous and Synchronous counters. Programmable logic (FPGAs, VHDL). Peripheral devices (ADC, DAC, I/O port expanders, LCDs, 7 / 14 / 16-Segment displays, Dot-matrix displays, Keypads, EEPROM, RAM). Computer Concepts and Micro-controllers (Architecture of 8-bit micro-controllers, programming, flowcharts, Interrupts, Timers and Counters, Serial communication). (Total tuition time: ± 280 hours)



ENGINEERING GRAPHICS (EGL105B)**CONTINUOUS ASSESSMENT****(Module custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

Introduction to graphics communication. Dimensioning and tolerance practices. Geometrical construction. Pictorial projections. Interpenetration and development. Machine drawings. Civil drawings including electrical diagrams. (Total tuition time: ± 140 hours)

ENGINEERING MATHEMATICS I (EMA105B)**2 X 2-HOUR PAPERS****(Module custodian: Department of Mathematics and Statistics)**

Trigonometry, geometry, functions, complex numbers, vector algebra, matrices and transformations, single-variable differentiation and integration, partial differentiation, multiple-variable intervals, introduction to differential equations. (Total tuition time: not available)

ENGINEERING MATHEMATICS II (EMA206B)**1 X 3-HOUR PAPER****(Module custodian: Department of Mathematics and Statistics)**

Mathematical modelling, first-order ordinary differential equations (ODEs), higher-order ODEs, Laplace transforms, systems of ODE's, numerical solutions of ODEs, Sturm-Liouville problems, partial differential equations. (Total tuition time: not available)

ENGINEERING PRACTICE (EPR317B)**1 X 3-HOUR PAPER****(Module custodian: Department of Electrical Engineering)**

Engineering Communication; Project Management; Management and Ethics; Contracts and Intellectual Property; Entrepreneurship. (Total tuition time: ± 140 hours)

ENGINEERING SOFTWARE DESIGN (ESG206B)**CONTINUOUS ASSESSMENT****(Module custodian: Department of Electrical Engineering)**

Variables and I/O, Loops (for/while). Program flow (if - else). Functions. Structures. Pointers. GUI's. Dynamic data types. Classes and Objects and Networking. (Total tuition time: ± 280 hours)

G**GREEN ENERGY SYSTEMS (GES216B)****1 X 3-HOUR PAPER****(Module custodian: Department of Electrical Engineering)**

Fundamentals on Energy Conversion; Solar (Photovoltaic) Energy Conversion; Hydro Power Conversion; Wind Energy Conversion Systems; Energy Storage. (Total tuition time: ± 140 hours)

I**INFORMATION LITERACY (INL125C)****CONTINUOUS ASSESSMENT****(Module custodian: Directorate of Library and Information Services)**

Introduction of information literacy. Development of a search strategy and application of a search string to search engines and academic databases. Evaluation of information sources. Ethical and legal use of information. (Total tuition time: ± 10 hours)

L**LIFE SKILLS (LFS125X)****CONTINUOUS ASSESSMENT****(Module custodian: Directorate of Student Development and Support)**

Academic, personal and socio-emotional skills development for students in higher education. Personal and social dimensions address: Effective planning and self-management (goal setting and time management); Adjusting to university life (student life, diversity and change); Intra- and interpersonal skills development (conflict management, self-esteem, relationship management); Effective living (healthy living, HIV education, substance abuse). Academic dimension addresses: Academic skills for university (e.g. critical thinking, creativity, managing assignments and assessments). (Total tuition time: ± 20 hours)



M**MECHANICS (SEM105B)****1 X 3-HOUR PAPER****(Module custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

Introduction and SI units. Kinematics. Force's and Newton's laws of motion. Dynamics of uniform circular motion. Work and Energy. Impulse and momentum and rotational dynamics and torque. (Total tuition time: ± 100 hours)

P**PHYSICS (SEP115B)****1 X 2-HOUR PAPER****(Module custodian: Department of Physics)**

Fluids, heat and thermodynamics, waves and sound, electric and magnetic fields and forces, electromagnetic waves and light. Total tuition time: ± 100 hours)

POWER SYSTEMS (PWS307B)**CONTINUOUS ASSESSMENT****(Module custodian: Department of Electrical Engineering)**

The basic operation and the requirements of the different types of power stations. Evaluate and comparison of the power stations in terms of their performance, cost-effectiveness and impact on the environment. Selection of the most economical supply system and conductor size for a new power line. Design of transmission lines. Sizing of cables for power distribution. Power flow analysis and stability analysis in planning and operation of power systems. Power system protection, the principle of operation of circuit breakers, fuses and relays. Analysis of fault levels in the power systems. Protective relaying in power systems. (Total tuition time: ± 280 hours)

PROBABILITY AND STATISTICS (PAS206B)**1 X 3-HOUR PAPER****(Module custodian: Department of Mathematics and Statistics)**

Sampling techniques and descriptive statistics. Probability. Counting rules. Inferential statistics. Analysis of variance. Regression and correlation analysis. Non-parametric tests. (Total tuition time: not available)

S**SIGNAL PROCESSING (SPR307B)****CONTINUOUS ASSESSMENT****(Module custodian: Department of Electrical Engineering)**

Introduction to signals and systems; Time-domain analysis of continuous-time systems; Signal representation by Fourier series; Continuous-time system analysis using Fourier transform; Continuous-time system analysis using Laplace transform; Frequency response and analogue filters; Discrete-time signals and systems; Time-domain analysis of discrete-time systems; Fourier analysis of discrete-time signals; Discrete-time systems analysis using the z-transform; Frequency response and digital filters. (Total tuition time: ± 280 hours)

