

# BACHELOR OF ENGINEERING TECHNOLOGY IN CIVIL ENGINEERING

BEngTech (Civil Engineering) - NQF Level 7 (420 credits)

**Qualification code: BPCE18**

SAQA ID: 98844, CHE NUMBER: H/H16/E026CAN

Campus where offered:

Pretoria Campus

## REMARKS

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

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

**Admission requirement(s):**

A Senior Certificate with a matriculation endorsement or an equivalent qualification, with a C symbol at Standard Grade or a D symbol at Higher Grade for English, and B symbols at Standard Grade or C symbols at Higher 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 **28**.

**Recommended subject(s):**

None.

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

**Admission requirement(s):**

A National Senior Certificate or an equivalent qualification, with a bachelor's degree endorsement, or an equivalent qualification, with an achievement level of at least 4 for English (home language or first additional language) and 5 for Mathematics or Technical Mathematics, and 5 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 **28** (excluding Life Orientation).

**Recommended subjects:**

Engineering Graphics and Design and Mechanical Technology.

• **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 endorsement, issued by the Council for Quality Assurance in General and Further Education and Training (Umalusi), with at least a 50% (APS of 4) for English, 50% for Life Orientation (excluded for APS calculation), and 60% (APS of 5) for Mathematics and Science, and 60% (APS of 5) for any other three compulsory vocational subjects.

**Selection criteria:**

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **28** (excluding Life Orientation).

**Recommended subject(s):**

None.



- **FOR APPLICANTS WITH A NATIONAL N CERTIFICATE/NATIONAL SENIOR CERTIFICATE AS PUBLISHED IN REPORT 191: N3 (NQF LEVEL 4):**

**Admission requirement(s):**

A National Senior Certificate or a National N Certificate with languages as published in Report 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 50% for English, Mathematics N3, Engineering Sciences N3 and any other two additional subjects.

**Selection criteria:**

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **28**.

**Recommended subject(s):**

None.

- **FOR APPLICANTS WITH AN N6 CERTIFICATE IN A RELATED ENGINEERING FIELD AS PUBLISHED IN REPORT 191: N6:**

**Admission requirement(s):**

An N6 Certificate in a related Engineering field as published in Report 191: N6 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 an average of at least 60% for the qualification, and successful completion of an English Language Proficiency Assessment (done by the University).

**Recommended subject(s):**

None.

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

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

- Higher Certificate in Construction Engineering (NQF Level 5 - 140 credits): with an average of at least 60% for the qualification, and 60% in each of the following modules: Engineering Graphics, Engineering Physics and Technical Mathematics.
- Advanced Certificate in Construction or Civil Engineering (NQF Level 6 - 140 credits): with an average of at least 60% for the qualification.
- Diploma in Civil Engineering Technology (NQF Level 6 - 280 credits): with an average of at least 60% for the qualification.
- National Diploma: Engineering: Civil (NQF Level 6 - 3,000 credits): with an average of at least 55% for the qualification.

- b. **Assessment procedure(s):**

No further assessment will be done (except for candidates with an N6 Certificate (see above)). Applicants who achieve the minimum APS will be considered until the programme complement is full. Acceptance is subject to available capacity according to the Student Enrolment Plan (SEP). 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](http://www.tut.ac.za).

Applicants who do not meet the minimum requirements, might be transferred to the Higher Certificate in Construction Engineering, provided that he/she meet the minimum requirements.



- 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.
- f. *Minimum duration:*  
Three years.
- g. *Exclusion and readmission:*  
See Chapter 2 of Students' Rules and Regulations.

## CURRICULUM

### FIRST YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
COL105X	Computer Literacy	(5)	(5)	
COS105X	Communication Skills	(5)	(6)	
EGC105B	Engineering Graphics	(5)	(14)	
EMA105B	Engineering Mathematics I	(5)	(28)	
ESU105B	Engineering Surveying	(5)	(28)	
INL125C	Information Literacy (block module)	(5)	(1)	
LFS125X	Life Skills (block module)	(5)	(2)	
SEM105B	Mechanics	(5)	(10)	

### FIRST SEMESTER

CEM115B	Civil Engineering Materials	(5)	(14)	
SEP115B	Physics	(5)	(10)	

### SECOND SEMESTER

CSP115B	Construction Principles	(5)	(14)	
SEH115B	Chemistry	(5)	(8)	

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

### SECOND YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
EMA206B	Engineering Mathematics II	(6)	(14)	Engineering Mathematics I
GTE206B	Geotechnical Engineering	(6)	(28)	Chemistry Physics
PAS206B	Probability and Statistics	(6)	(14)	
SAS206B	Structural Analysis and Strength of Materials	(6)	(28)	Mechanics Physics
TRE206B	Transportation Engineering I	(6)	(28)	Physics
WAE206B	Water Engineering I	(6)	(28)	Chemistry Mechanics Physics

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



**THIRD YEAR**

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
CDP307B	Integrated Civil Engineering Design Project (after completion of all first- and second-year modules)	(7)	(28)	
STD307B	Structural Design	(7)	(28)	Structural Analysis and Strength of Materials
TRE307B	Transportation Engineering II	(7)	(28)	Transportation Engineering I
WAE307B	Water Engineering II	(7)	(28)	Water Engineering I

**FIRST SEMESTER**

SCP316B	Scientific Computing	(6)	(14)	
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**SECOND SEMESTER**

CEP317B	Civil 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. At time of publication, the syllabus content was defined as follows:

**C****CHEMISTRY (SEH115B)****1 X 2-HOUR PAPER***(Module custodian: Department of Civil Engineering)*

This module provides knowledge for Civil Engineers on concepts used in the industry that need a basic chemical background. Concepts covered in the module are: Atoms, protons, neutrons, electrons, atomic and mass number, isotopes, the periodic table, molecules, empirical and molecular formula, ions, oxidation, reduction, naming chemical compounds, Bohr model, electron configuration of atoms, covalent bond, ionic bond, polar covalent bond, Hydrogen bond, single replacement reaction, double replacement reaction, combination reaction, decomposition reaction, balancing ionic and net ionic reactions, oxidation numbers, balancing redox reactions, moles, Avogadro's number, conversion of moles to mass/molecules, calculation of reaction mass, mole calculations in solutions, volume calculations of solutions, concentration calculations of solutions, calculation of percentage yield, hydration reaction of cement, role of gypsum as flash setting inhibitor, chemistry of extenders used in cement (GGBS, FA, CSF), chemical composition of various types of clay, the ion exchange reaction, chemical stabilization of clay in soil, water purification process, coagulation, flocculation, sedimentation, filtration, chemical composition of bitumen and polymer modifiers used in bitumen, asphaltenes, resins, aromatics, saturates, production of penetration grade bitumen, types of penetration grade bitumen, types of modifiers. (Total notional time: 80 hours)

**CIVIL ENGINEERING MATERIALS (CEM115B)****1 X 3-HOUR PAPER***(Module custodian: Department of Civil Engineering)*

Identify various types of soil and rock. Understand basic properties of soil. Perform various tests on soil to determine its properties (incl. calculations). Implement various methods to change and improve the properties of soil. Classify soil according to its properties. Describe and classify cement and concrete. Perform various tests on concrete to determine its properties (incl. calculations). Explain the properties of fresh concrete, concrete at an early age and hardened concrete. Design a concrete mix according to specifications as set out by the client. Change the properties of a concrete mix with the addition of admixtures to suit design needs. To introduce the student to steel used to reinforce concrete. Know how bitumen is produced. To classify the various



bitumen products as used in the civil engineering industry. Perform various tests on bitumen to determine its properties (incl. calculations). Know how to apply bitumen in the civil engineering industry and Implement the use of other construction materials like bricks, steel, geosynthetics and wood in the design of a construction project. (Total notional time: 140 hours)

**CIVIL ENGINEERING PRACTICE (CEP317B)**

**1 X 3-HOUR PAPER (OPEN BOOK)**

*(Module custodian: Department of Civil Engineering)*

Engineering communication. Principles of management and management functions. Engineering ethics. Occupational health and safety. Principles of project management. Construction contracts and applicable law. Conditions of construction contract. Engineering specifications. Taking-off quantities and estimation of unit rates. Preparation of payment certificates. Tendering. (Total notional time: 140 hours)

**COMMUNICATION SKILLS (COS105X)**

**1 X 2-HOUR PAPER**

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

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 notional time: 60 hours)

**COMPUTER LITERACY (COL105X)**

**CONTINUOUS ASSESSMENT**

*(Module custodian: End User Computing Unit)*

This module provides foundational knowledge in computing fundamentals, essential digital skills in key applications based on MS Office Suite and network basics (i.e. MS Outlook and Internet). Online exams are mapped with End-User Computing: SAQA 49077 (61591) Core Element as well as Internet and Computing Core Certification. (IC3). (Total notional time: 50 hours)

**CONSTRUCTION PRINCIPLES (CSP115B)**

**1 X 3-HOUR PAPER**

*(Module custodian: Department of Civil Engineering)*

Basic principles of construction project. Characteristics of construction project. Basic concepts of construction technology. Measurement and assessment techniques. Construction models (phases). Capacities of machinery versus production. Assessment and testing of materials. Pavement materials. Assessment and qualification of foundations, structures and pavements. Assess and qualify design and construction of single and double stone surfacing. Assess and design of sand seals, slurries, emulsions, rigid and flexible pavements and maintenance, rehabilitation, construction of pavements and structures. (Total notional time: 140 hours)

**E**

**ENGINEERING GRAPHICS (EGC105B)**

**CONTINUOUS ASSESSMENT**

*(Module custodian: Department of Civil Engineering)*

Drawing apparatus, drawing basics, construction geometry, orthographic projection, sections, isometric projection, CAD fundamentals and application of CAD to building drawings. (Total notional 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 notional time: 280 hours)

**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 notional time: 140 hours)



**ENGINEERING SURVEYING (ESU105B)****1 X 3-HOUR PAPER****(Module custodian: Department of Geomatics)**

Levelling. Survey drawing. Earthworks quantities. The South African coordinate system. The join calculation. The polar calculation. The techniques of using a Theodolite or total station for tachometry. Field observations for tachometry. Tachometry calculations. Planning a site survey. Field observations for a site survey. Survey drawing. Control surveying for Points of Intersections (PI's). Control surveying for horizontal curves. Control surveying for pegging of roads and pipelines. Control surveying for excavation and embankments and intersections. (Total notional time: 280 hours)

**G****GEOTECHNICAL ENGINEERING (GTE206B)****1 X 3-HOUR PAPER****(Module custodian: Department of Civil Engineering)**

Introduction to engineering geology. Rock formation, types, mineralogy and stratigraphy. Rock weathering. Geological structures. Introduction to hydrogeology. Geological maps. Introduction to soil mechanics. Compaction. Subsoil exploration. Introduction to effective stress and pore water pressure. Soil permeability and seepage. Compressibility and consolidation. Shear strength of soil. Lateral earth pressure. Stability of slopes. Ultimate bearing capacity. Ultimate bearing capacity for shallow foundation and load bearing capacity of vertical piles. (Total notional time: 280 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 notional time: 10 hours)

**INTEGRATED CIVIL ENGINEERING DESIGN PROJECT (CDP307B)****PROJECT ASSESSMENT****(Module custodian: Department of Civil Engineering)**

On completion of this module, a student will be able to demonstrate competence in the following Graduate Attributes via real world scenarios: Problem solving, application of scientific and engineering knowledge, engineering design and investigations, experiments and data analysis engineering methods, skills, tools, including information technology, professional and technical communication, sustainability and impact of engineering activity, individual, team and multidisciplinary working, independent learning and engineering professionalism. (Total notional time: 280 hours)

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

Personal, socio-emotional and academic skills development for students in higher education. This module includes 1. Intra- and interpersonal skills (e.g. emotional intelligence, relationships, and conflict management); 2. General study skills (e.g. time management, goal setting, learning styles); 3. Health and wellness (e.g. HIV/AIDS, GBV issues, substance abuse); 4. Student life and adjustment (e.g. identity development, adjusting to a higher education environment); and 5. Financial management. (Total notional time: 20 hours)

**M****MECHANICS (SEM105B)****1 X 3-HOUR PAPER****(Module custodian: Department of Civil Engineering)**

The purpose of this module is to develop an understanding of the field of engineering statics and mechanics within the civil engineering context. The main topics include: introduction to statics, force systems, equilibrium, structures and distributed forces. (Total notional time: 100 hours)



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

Vectors and calculus for physics. Kinematics in 1 dimension. Forces and Newton's laws of motion. Work energy and power. Elasticity. Static and dynamic fluids. Temperature, heat and thermodynamics. Wave properties and electromagnetic waves. Reflection of light and mirrors; refraction of light and lenses and optical instruments. (Total notional time: 100 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 notional time: 140 hours)

**S****SCIENTIFIC COMPUTING (SCP316B)****CONTINUOUS ASSESSMENT****(Module custodian: Department of Electrical Engineering)**

Scientific computing and programming environment. Fundamentals of programming: Selection and loop statements. Use-defined functions. Input, output and graphics. Engineering application case studies and simulations. (Total notional time: 140 hours)

**STRUCTURAL ANALYSIS AND STRENGTH OF MATERIALS (SAS206B)****2 X 3-HOUR PAPERS****(Module custodian: Department of Civil Engineering)**

Introduction to structural analysis and design. Analysis of axial load carrying statically determinate structures (truss/pin-jointed frames, arches and cables). Analysis of statically determinate beams and rigid jointed frames. Influence lines and moving loads for statically determinate beams and trusses. Geometric properties of different structural shapes. Mechanical properties of structural materials. Concept of simple stresses and strains. Moment area method. Virtual work method. Slope deflection method. Moment distribution method. Influence lines for statically indeterminate structures. Flexibility method. Stiffness method. Beams on elastic foundations. Finite element analysis. Analysis of statically indeterminate arches and Beam-Column Analogy. (Total notional time: 280 hours)

**STRUCTURAL DESIGN (STD307B)****2 X 4-HOUR PAPERS (OPEN BOOK)****(Module custodian: Department of Civil Engineering)**

Limit state design principles. Load analysis. Reinforced concrete design. Structural steel design. Masonry design and structural timber design. (Total notional time: 280 hours)

**T****TRANSPORTATION ENGINEERING I (TRE206B)****1 X 3-HOUR PAPER****(Module custodian: Department of Civil Engineering)**

Basic principles of transportation systems. Characteristics of transportation systems. Basic concepts of geometric design. Traffic counting techniques. Traffic flow models. Traffic capacities and levels of service. Design of signal setting. Pavement materials. Design of pavements. Design of single and double stone surfacing. Design of sand seals, slurries and diluted emulsions. Maintenance, rehabilitation and construction of pavements. (Total notional time: 280 hours)

**TRANSPORTATION ENGINEERING II (TRE307B)****1 X 3-HOUR PAPER****(Module custodian: Department of Civil Engineering)**

Water transport and distribution: water distribution network modelling, network operation and maintenance, water loss management. Water Resources Management: water use and development, sustainability in water resources, water resource planning and management models, water allocation and conflict resolution. Dam Engineering: introduction to dam engineering, design of dams, dam safety and stability. Irrigation Engineering: basic soil-water-plant relationship, design of irrigation systems, land levelling in irrigation and drainage system design. (Total notional time: 280 hours)



**WATER ENGINEERING I (WAE206B)****1 X 3-HOUR PAPER****(Module custodian: Department of Civil Engineering)**

Fluid Mechanics: fluid properties, hydrostatics, hydrodynamics, flow measurement. Hydraulics: water distribution networks, open channel flow. Hydraulics: hydraulic systems (machinery and structures). Hydrology: hydrologic cycle and processes, surface runoff, probability analysis, flood routing, groundwater hydrology. Water and wastewater treatment: water quality, water treatment, wastewater quality and wastewater treatment. (Total notional time: 280 hours)

**WATER ENGINEERING II (WAE307B)****1 X 3-HOUR PAPER****(Module custodian: Department of Civil Engineering)**

Water transport and distribution: water distribution network modelling, network operation and maintenance, water loss management. Water resources management: water use and development, sustainability in water resources, water resource planning and management models, water allocation and conflict resolution. Dam Engineering: introduction to dam engineering, design of dams, dam safety and stability. Irrigation Engineering: basic soil-water-plant relationship, design of irrigation systems, land levelling in irrigation and drainage system design. (Total notional time: 280 hours)

