

BACHELOR OF ENGINEERING TECHNOLOGY IN METALLURGICAL ENGINEERING

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

Qualification code: **BPML20**

SAQA ID: 111393, CHE NUMBER: H/H16/E105CAN

Campus where offered:

Pretoria Campus

REMARKS

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

• **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.

• **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.

• **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.



- **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.

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

Admission requirement(s):

A 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.

- **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 Metallurgical Engineering (NQF Level 5 - 140 credits): with an average of at least 60% for the qualification.
- Advanced Certificate in Metallurgical Engineering (NQF Level 6 - 140 credits): with an average of at least 60% for the qualification.
- Diploma in Metallurgical Engineering (NQF Level 6 - 280 credits): with an average of at least 55% for the qualification.
- National Diploma: Engineering: Metallurgy (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 a N4 Certificate). Applicants who achieve the minimum APS will be considered until the programme complement is full. 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. Presentation:

Day classes.



- e. *Intake for the qualification:*
January only.
- f. *Minimum duration:*
Three years.
- g. *Exclusion and readmission:*
See Chapter 2 of Students' Rules and Regulations.
- h. *Re-registration:*
A student may re-register for the module Project Metallurgy 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	PREREQUISITE MODULE(S)
COL105X	Computer Literacy	(5)	(5)	
COS105X	Communication Skills	(5)	(6)	
EGH105B	Engineering Graphics	(5)	(14)	
EMA105B	Engineering Mathematics I	(5)	(28)	
INL125C	Information Literacy (block module)	(5)	(1)	
LFS125X	Life Skills (block module)	(5)	(2)	

FIRST SEMESTER

CHE115B	Chemistry	(5)	(14)	
GPS115B	General Physics	(5)	(14)	
MMA115B	Metallurgical Materials	(5)	(14)	

SECOND SEMESTER

MCY115B	Metallurgical Chemistry	(5)	(14)	Chemistry
MTY115B	Metallurgical Thermodynamics	(5)	(14)	
SOT115B	Strength of Materials	(5)	(14)	

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
MIP206B	Mineral Processing	(6)	(28)	
PAS206B	Probability and Statistics	(6)	(14)	Engineering Mathematics I
PHM206B	Physical Metallurgy	(6)	(28)	Metallurgical Materials

FIRST SEMESTER

RFN216B	Refractory Engineering	(6)	(14)	
SML216B	Scientific Computing	(6)	(14)	

SECOND SEMESTER

HYM216B	Hydrometallurgy	(6)	(14)	Metallurgical Thermodynamics
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PYM216B Pyrometallurgy (6) (14) Metallurgical Chemistry

TOTAL CREDITS FOR THE SECOND YEAR: 140

THIRD YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
PDM307B	Production Metallurgy	(7)	(28)	Physical Metallurgy
PMD307B	Process Metallurgy and Design	(7)	(28)	Hydrometallurgy Mineral processing Pyrometallurgy
PML307B	Project Metallurgy	(7)	(28)	Hydrometallurgy Mineral processing Physical Metallurgy Pyrometallurgy
PML317R	Project Metallurgy (re-registration) (first-semester module, see paragraph h)	(7)	(0)	

FIRST SEMESTER

ISM317B	Iron and Steel Making	(7)	(14)	
NFM317B	Non-Ferrous Metallurgy	(7)	(14)	Hydrometallurgy

SECOND SEMESTER

COR317B	Corrosion	(7)	(14)	Chemistry
EML317B	Engineering Practice	(7)	(14)	

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:

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CHEMISTRY (CHE115B) 1 X 3-HOUR PAPER

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

Matter; Metallurgical reaction and stoichiometry; Periodic properties and elementals and metallurgical bonding; Metallurgical equilibria; Electrochemistry; and Introduction to organic chemistry. (Total notional time: 140 hours)

COMMUNICATIONAL 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)

CORROSION (COR317B)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Fundamentals of Corrosion; Corrosion Electro Metallurgical; Corrosion Thermodynamics; Identification of different types of Corrosion, Failure and Prevention; Corrosion in water, atmospheric conditions and high temperature corrosion. (Total notional time: 140 hours)

E**ENGINEERING GRAPHICS (EGH105B)****CONTINUOUS ASSESSMENT****(Module custodian: Department of Chemical, Metallurgical and Materials Engineering)**

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

ENGINEERING MATHEMATICS I (EMA105B)**2 X 2-HOUR PAPER****(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 PRACTICE (EML317B)**CONTINUOUS ASSESSMENT****(Module custodian: Department of Electrical Engineering)**

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

G**GENERAL PHYSICS (GPS115B)****1 X 3-HOUR PAPER****(Module custodian: Department of Physics)**

Motion along straight line: displacement, velocity, acceleration. Projectile motion in two dimensions and three dimensions. Force and Newton's Laws, friction, circular motion. Impuls and momentum, elastic and inelastic collisions. Rotation, kinetic energy, torque. Temperature, heat and first law of thermodynamics. Oscillations and waves. (Total notional time: 140 hours)

H**HYDROMETALLURGY (HYM216B)****1 X 3-HOUR PAPER****(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

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: 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 notional time: 10 hours)

IRON AND STEEL MAKING (ISM317B)**1 X 3-HOUR PAPER****(Module custodian: Directorate of Chemical, Metallurgical and Material Engineering)**

Blast Furnace Thermodynamics; Alternative Iron Making Processes; Steelmaking Processes; Gases in Iron and Steel; Ladle Metallurgy and continuous casting; and Project Iron and Steelmaking. (Total notional time: 140 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**METALLURGICAL CHEMISTRY (MCY115B)****1 X 3-HOUR PAPER****(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Introduction to Analytical Metallurgy; Introduction to Metallurgical Chemistry; Fundamentals of Metallurgical Chemistry; Introduction to Thermochemistry and Metallurgical Equilibria; and Electrochemistry. (Total notional time: 140 hours)

METALLURGICAL MATERIALS (MMA115B)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Atomic Bonding and Crystal Structure of Engineering Materials; Physical and Chemical Properties of Engineering Materials; Mechanical Properties and Behaviours of Materials; Applications and Processing of Metal Alloys; Introduction to the Chemistry and Prevention of Corrosion; Polymers and their Properties, and Glass and Ceramic Materials. (Total notional time: 140 hours).

MINERAL PROCESSING (MIP206B)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Fundamentals of metallurgical principles, Fundamentals of Mineral Processing; Size Reduction; Classification; Concentration Techniques; and Dewatering Techniques. (Total notional time: 280 hours)

METALLURGICAL THERMODYNAMICS (MTY115B)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemical, Metallurgical and Materials Engineering)**

Introduction to thermodynamics; The first law of thermodynamics; The second law of thermodynamics; Solutions and reactions involving gases with gibbs free energy composition in phase diagrams; and Introduction to metallurgical kinetics. (Total notional time: 140 hours)

N**NON-FERROUS METALLURGY (NFM317B)****1 X 3-HOUR PAPER****(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Introduction to Hydrometallurgy; Separation, purification and enrichment processes of leach solution; Precipitation process for metal recovery from solution; Electrolytic processes from recovery and purification of metals. (Total notional time: 140 hours)



P**PHYSICAL METALLURGY (PHM206B) 1 X 3-HOUR PAPER****(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Introduction to Project Metallurgy; Project Communication; Research Project Design; Materials Testing and Analysis; and Technical report writing. (Total notional 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 notional time: 140 hours)

PROCESS METALLURGY AND DESIGN (PMD307B) CONTINUOUS ASSESSMENT**(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Design Development; General Design Consideration; Computer Aided Design; Design and Optimisation of a Mineral Processing Plant; Furnace Design; and Project. (Total notional time: 280 hours)

PRODUCTION METALLURGY (PDM307B) CONTINUOUS ASSESSMENT**(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Bulk deformation processes; Foundry technology; Metal powder processing; Metal joining methods; Welding; Metal sheet welding processes; and Advanced manufacturing techniques. (Total notional time: 280 hours)

PROJECT METALLURGY (PML307B/PML317R) PROJECT ASSESSMENT**(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

This module focuses on the various learning skills needed to understand the features, importance and procedure for conducting a research project. This module is an introduction to Project Metallurgy, Project Communication Research Project Design, Materials Testing and Analyses and Technical Report Writing. (Total notional time: 280 hours)

PYROMETALLURGY (PYM216B) 1 X 3-HOUR PAPER**(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Simple Stress and Strain; Torsion of Circular Shafts; Temperature Stresses; Catenaries; Beams-Shear Force and Bending Moment. (Total notional time: 140 hours)

R**REFRACTORY ENGINEERING (RFN216B) 1 X 3-HOUR PAPER****(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

Refractory Materials, compositions and Forms; Refractory Engineering and installation Technology; Refractory in Steelmaking Industry; Refractory in the Ferro-Alloy Industry; Refractory in the Non-Ferrous Industry; Refractory in the Foundry Industry; and Refractory in other Industries. (Total notional time: 140 hours)

S**SCIENTIFIC COMPUTING (SML216B) 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)

STRENGTH OF MATERIALS (SOT115B) 1 X 3-HOUR PAPER**(Module custodian: Department of Chemical, Metallurgical and Material Engineering)**

To provide a thorough foundation to the behaviour of materials under the action of external forces as required at higher levels of study and for the purpose of economically designing machine components. (Total notional time: 140 hours)

