

BACHELOR OF ENGINEERING TECHNOLOGY IN MECHATRONIC ENGINEERING

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

Qualification code: BPMR18

SAQA ID: 99604, CHE NUMBER: H/H16/E023CAN

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.

• **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 Mechanical 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, Mechatronics and Technical Mathematics.
- Advanced Certificate in Mechanical Engineering (NQF Level 6 - 140 credits): with an average of at least 60% for the qualification.
- National Diploma: Engineering: Mechanical (NQF Level 6 - 3,000 credits): with an average of at least 55% for the qualification.
- National Diploma: Mechatronics (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.

Applicants who do not meet the minimum requirements, might be transferred to the Higher Certificate in Mechanical Engineering, provided that he/she meets 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) | |
| EGE105B | 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) | |
| MEC105B | Mechanics | (5) | (28) | |

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

SECOND YEAR

Modules must be taken in the combinations and in the sequence indicated. There are four scenarios to consider:

- In scenario one, a student registers and passes EBS206B and ESG206B.
- In scenario two, a student registers for both modules. If a student passes ESG206B and fails EBS206B, he or she must register for EBS206B only, to repeat the module in the next academic year.
- In scenario three, a student registers for both modules. If a student passes EBS206B and fails ESG206B, he or she must register for ESG206B only, to repeat the module the next academic year.
- In scenario four, if a student registers for both modules and fails both of them, he or she must co-register both modules, or only ESG206B in the next academic 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

| | | | | |
|---------|-----------------------|-----|------|--|
| DOM216B | Design of Machines | (6) | (14) | Engineering Mathematics I Mechanics |
| SOM216B | Strength of Materials | (6) | (14) | Engineering Mathematics I Mechanics |



SECOND SEMESTER

| | | | | |
|---------|-------------------------|-----|------|---|
| LSM216B | Linear System Modelling | (6) | (14) | Electrical Circuits Engineering Mathematics I Mechanics |
| MDR216B | Machines and Drives | (6) | (14) | Electrical Circuits Engineering Mathematics I Mechanics |

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

THIRD YEAR

| CODE | MODULE | NQF-L | CREDIT | PREREQUISITE MODULE(S) |
|---------|------------------------------|-------|--------|--|
| CNS307B | Control Systems | (7) | (28) | Engineering Mathematics II |
| MED307B | Mechatronics Design Projects | (7) | (28) | Design of Machines Engineering Mathematics II |
| PAU307B | Process Automation | (7) | (28) | Design of Machines Electrical Circuits Machines and Drives |
| TMF307B | Thermoflow | (7) | (28) | Engineering Mathematics I Mechanics |

FIRST SEMESTER

| | | | | |
|---------|-------------------------------|-----|------|--|
| IDC317B | Industrial Data Communication | (7) | (14) | Electrical Circuits Electronic Circuits |
|---------|-------------------------------|-----|------|--|

SECOND SEMESTER

| | | | | |
|---------|----------------------|-----|------|--|
| EPR317B | 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:

C

COMMUNICATION SKILLS (COS105X)

1 X 2-HOUR PAPER

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

The purpose of this module is 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)



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 notional time: 280 hours)

D**DESIGN OF MACHINES (DOM216B)****1 X 3-HOUR PAPER (PRESCRIBED OPEN BOOK)****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

The purpose of this module is to develop the advanced knowledge and understanding of the student in the process of problem assessment and design. At the end of this module, provided that the student has completed all tutorials, assignments and presentations successfully, the student will have a theoretical and practical understanding and knowledge of problem definition, design, communication and computer skills, use of engineering science and knowledge, and can undertake advanced tasks related to the design of components, assemblies and related equipment.

(Total notional 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 notional time: 280 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 notional time: 280 hours)

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. Peripheral devices (ADC, I/O port expanders, LCDs, 7/14/16-Segment displays, Keypads, EEPROM, RAM). Computer Concepts and micro-controllers (Architecture of 8-bit micro-controllers, programming, flowcharts, Interrupts, Timers and Counters). (Total notional time: 280 hours)

ENGINEERING GRAPHICS (EGE105B)**CONTINUOUS ASSESSMENT****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

Introduction to graphics communication. Dimensioning and tolerance practices. Geometrical construction. Orthographic projections. Machine drawing and introduction to computer-aided design and assemblies. (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 PRACTICE (ENP317B)**CONTINUOUS ASSESSMENT****(Module custodian: Department of Electrical Engineering)**

The purpose of this module is to prepare the student to effectively plan and execute projects. Write quality technical reports and communicate all project information to peers. (Total notional 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 notional time: 280 hours)

I**INDUSTRIAL DATA COMMUNICATION (IDC317B)****1 X 3-HOUR PAPER****(Module custodian: Department of Electrical Engineering)**

The purpose of this module is to develop the necessary knowledge, understanding and skills required for the student's further progress towards becoming a competent mechatronics engineering technician. It will enable the student to build, operate, diagnose and maintain networks and communications equipment. (Total notional time: 140 hours)

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)

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)

LINEAR SYSTEM MODELLING (LSM216B)**1 X 3-HOUR PAPER****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

The purpose of this module is to develop the necessary knowledge, understanding and skills required for the student's further progress towards becoming a competent mechatronics engineer. It will enable the student to model, operate, diagnose. (Total notional time: 140 hours)

M**MACHINES AND DRIVES (MDR216B)****1 X 3-HOUR PAPER****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

Electric machines have a ubiquitous presence in our modern daily lives, from the generators that supply electricity to motors of all sizes that power countless applications. Providing a balanced treatment, the module takes a ground-up approach that emphasises fundamental principles. The module carefully deploys physical insight, mathematical rigor, and computer simulation to clearly and effectively present electric machines and drive systems. (Total notional time: 140 hours)



MECHANICS (MEC105B)**1 X 3-HOUR PAPER****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

The purpose of this module is to equip the student with a fundamental understanding of mechanics and how to apply these to a design problem. (Total notional time: 280 hours)

MECHATRONICS DESIGN PROJECTS (MED307B)**CONTINUOUS ASSESSMENT****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

The purpose of this module is to develop the advanced knowledge and understanding of the student in the process of problem assessment and design. (Total notional time: 280 hours)

P**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 AUTOMATION (PAU307B)**1 X 3-HOUR PAPER****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

The purpose of this module is to provide the student with a fundamental understanding essential for technicians and technologists working in the field of automation engineering. (Total notional time: 280 hours)

S**STRENGTH OF MATERIALS (SOM216B)****1 X 3-HOUR PAPER****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

The purpose of this module is 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)

T**THERMOFLOW (TMF307B)****1 X 3-HOUR PAPER****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

Introduction to fluid flow, fluid mechanics and the basics of heat flow in the form of fundamental thermodynamics and principles thereof. (Total notional time: 280 hours)

