

BACHELOR OF ENGINEERING TECHNOLOGY IN MECHATRONIC ENGINEERING

Qualification code: BPMR18 - NQF Level 7 (420 credits)

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

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 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:*

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.

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. *Minimum duration:*
Three years.
- f. *Presentation:*
Day classes. Working students with a National Diploma may be permitted to register for certain modules on a block-mode basis.
- g. *Exclusion and readmission:*
See Chapter 2 of Students' Rules and Regulations.

Key to asterisks:

- * Modules may be offered in block mode to working students. Full details on the offering is available from the department.

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

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
PAU307B	Process Automation*	(7)	(28)	Engineering Mathematics II Design of Machines Electrical Circuits
TMF307B	Thermoflow*	(7)	(28)	Machines and Drives Engineering Mathematics I Mechanics

FIRST SEMESTER

IDC317B	Industrial Data Communication*	(7)	(14)	Electrical Circuits Electronic Circuits
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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. At time of publication, the syllabus content was defined as follows:

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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 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)



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

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 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)

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. Peripheral devices (ADC, DAC, I/O port expanders, LCDs, 7/ 14 / 16-Segment displays, Dot-matrix displays, Keypads, EEPROM, RAM). Computer Concepts and Microcontrollers (Architecture of 8-bit micro-controllers, programming, flowcharts, Interrupts, Timers and Counters, Serial communication). (Total tuition 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 tuition time: not available)

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)

To prepare the student to effectively plan and execute projects. Write quality technical reports and communicate all project information to peers. (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)

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

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 tuition time: ± 90 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 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)

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

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 tuition time: ± 90 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 tuition time: ± 90 hours)

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

To equip the student with a fundamental understanding of mechanics and how to apply these to a design problem. (Total tuition time: ± 280 hours)

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

To develop the advanced knowledge and understanding of the student in the process of problem assessment and design. (Total tuition 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 tuition time: not available)

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

To provide the student with a fundamental understanding essential for technicians and technologists working in the field of automation engineering. (Total tuition time: ± 180 hours)

S**STRENGTH OF MATERIALS (SOM216B)****1 X 3-HOUR PAPER****(Module custodian: Department of Mechanical and Mechatronics 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 tuition 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 tuition time: not available)

