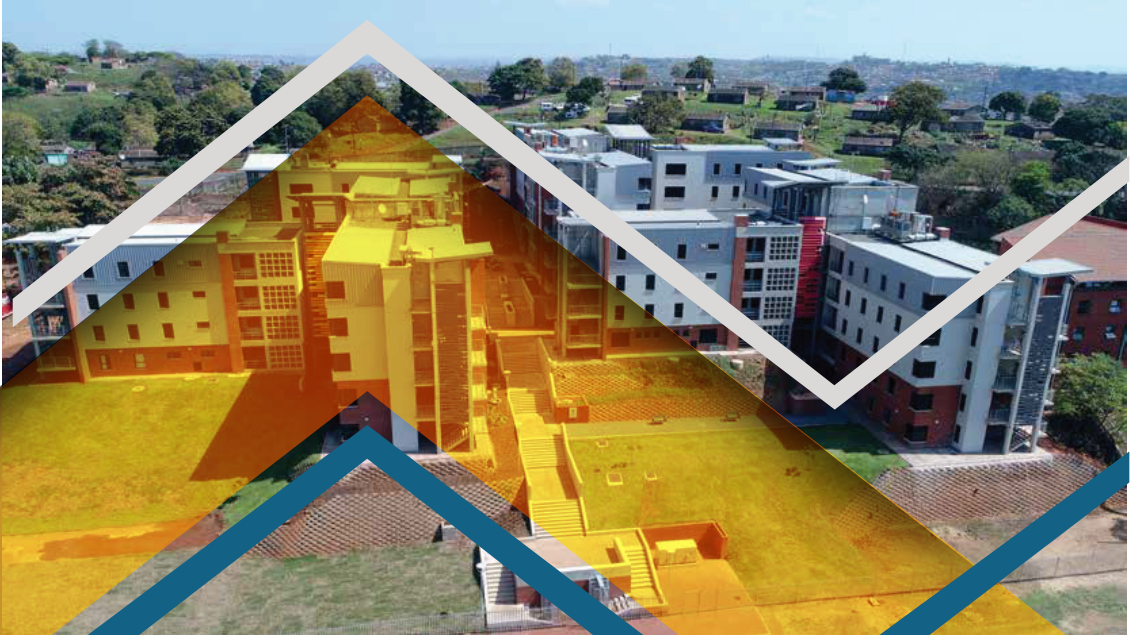




FACULTY OF
ENGINEERING

2023

shape and own the future



FACULTY OF ENGINEERING PROSPECTUS 2023

All National Diploma programmes will be completely phased out at the end of 2023 academic year.

Registration towards National Diploma programmes will not be permitted beyond 2023 academic year.

CONTENTS

Page

1. Department of Chemical Engineering	4 - 25
Access Course	
Diploma in Chemical Engineering	
Advanced Diploma in Chemical Engineering	
2. Department of Civil Engineering and Survey	26- 52
Access Course in Civil Engineering /Surveying	
Diploma in Engineering Civil	
Diploma in Surveying	
Diploma in Engineering Civil Extended Curriculum Programme	
Diploma in Engineering Surveying Extended Curriculum Programme	
3. Department of Electrical Engineering	53-81
Diploma in Engineering Electrical	
Diploma in Engineering: Electrical Extended Curriculum Programme	
Access Course	
4. Department of Mechanical Engineering	82-106
Diploma in Engineering Mechanical	
Diploma in Engineering: Mechanical Extended Curriculum Programme	
Access Course	

This faculty prospectus must be read in conjunction with the Mangosuthu University of Technology's General Rules contained in the current General Regulations handbook for Students.

Further information may be obtained from:

The Registrar
Mangosuthu University of Technology
P O Box 12363
Jacobs, Durban
4026
South Africa
Tel: +27(31) 9077111 / 9077181
Fax: +27(31) 9072892 / 9068872

CONTACT DETAILS

All Faculty queries to:

Acting Dean	:	Prof F Bakare*	Tel. No. : +27 31 907 7224
Senior Secretary	:	Ms ND Khumalo	Tel. No. : +27 31 907 7236
Faculty Officer	:	Ms SP Mthembu	Tel. No.: +27 31 907 7172

Heads of Departments

Chemical Engineering

Mrs JI Baah

Julia@mut.ac.za

Tel. No. : +27 31 907 7318

Civil Engineering & Surveying

Mr P Bhengu*

bhengu@mut.ac.za

Tel. No : +27 31 907 7

Construction Management & Quantity Surveying

(THIS DEPARTMENT HAS A SEPARATE HANDBOOK)

Mr I Dala

Ismail@mut.ac.za

Tel. No.: +27 31 907 7558

Electrical Engineering

Dr RF Chidzonga:

RCfoya@mut.ac.za

Tel. No. : +27 31 907 7221

Mechanical Engineering

Dr J Mukuna*

mukunaj@mut.ac.za

Tel. No : +27 31 819 9504

1. DEPARTMENT OF CHEMICAL ENGINEERING

Chemical Engineering is an area of study which prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of systems employing chemical processes, such as chemical reactors, kinetic systems, electrochemical systems, energy conservation processes, heat and mass transfer systems, and separation processes, and the applied analysis of chemical problems such as corrosion, particle abrasion, energy loss, pollution and fluid mechanics.

Successful completion of the programmes which are offered in this Department will lead to the award of the following qualifications:

Qualification	SAQA NLRD Number
Diploma in Chemical Engineering	96854
ND: Engineering: Chemical (Phased out from 2018)	72290
Advanced Diploma in Chemical Engineering	101988
BTech: Chemical Engineering (Phased out from 2020)	72279

1.1 Bridging Course: Chemical Engineering

Statement of Purpose

The purpose of this course is to enhance and bridge the candidates' existing skills, knowledge and attitude with the skills, knowledge and attitude required to gain entry to the study towards Diploma in Chemical Engineering

a. Duration of the course

Duration of the course is six months only.

PLEASE NOTE: This Course May Not Be Repeated.

b. Admission Requirements

i) National Senior Certificate (NSC) with rating codes:

English Home Language	3
English First Additional Language	3
Mathematics	3
Physical Science	3

Satisfactory achievement in their Home Language 4

A minimum of 130 total credits, with a maximum of 60 credits with "Partial Achievement", at NQF Level 4

ii) Senior Certificate or equivalent qualification with a pass in

Mathematics	E(SG)/F(HG)
Physical Science	E(SG)/F(HG)
English	E(SG)/F(HG)

iii) An N3 qualification with a minimum of 50% passes in English, Mathematics and Physical Science.

iv) An appropriate GCE Certificate with five subjects including Mathematics, Science and English with Symbol A, B or C. Three of the five subjects must have been passed at the same examination sitting.

v) NCV level 4 with a minimum of 40% pass in English and Mathematics (Mathematical Literacy would not be considered) and a minimum of 50% pass in Physical Science.

ALL ADMISSIONS ARE BASED ON A SELECTION PROCESS ONLY!!!

Applicants who satisfy the minimum requirements will be subjected to a selection process. Applicants will be ranked based on their academic results and selected for admission accordingly. Mathematical Literacy will not be considered.

c. Curriculum Compilation

All the instructional offerings are compulsory.

ACCESS COURSE: CHEMICAL ENGINEERING			
Code	Subjects	Semester offered	Assessment Method
ACHEM11	Chemistry	1&2	Examination
APHYC11	Physics	1&2	Examination
AMACH11	Mathematics	1&2	Examination
ADRAW11	Drawing	1&2	Continuous assessment
ACOCK11	Communications	1&2	Examination
ALABC11	Lab Practice	1&2	Continuous assessment

d. Learning, Teaching and Assessment

- Students are expected to attend all practicals, lectures and tutorials offered in the course (as per time-table).
- All subjects are evaluated by means of compulsory tests, practicals and/or assignments and the end of semester examination. If a student misses a test or a practical due to illness, he/she may apply for an aegrotat test on prescribed form and attach a doctor's certificate. If this is not done, "0" mark would be entered for missed assessment.
- All students will be admitted to the end of semester examination.
- The final mark for a subject is calculated based on the performance in ALL compulsory assessments. To pass a subject, the student should obtain a final mark of no less than 50%.

PLEASE NOTE THAT THIS COURSE MAY NOT BE REPEATED.

All other rules for examinations apply as in the handbook of General Rules and Regulations for Students – Rule: G22.

e. Promotion to Higher Level

To qualify for admission into S1 Chemical Engineering, students should pass (obtain 50%) in all six subjects offered in this course.

f. Course Content

▪ Chemistry (ACHEM11)

The syllabus includes: units of measurements; matter, atomic theory; nomenclature; chemical reactions; stoichiometry, acids and bases and chemical energies.

▪ Physics (APHYC11)

The syllabus includes: units and dimensions; motion in a straight line; motion in free fall; projectile motion; momentum and elastic collision; Newton's laws of motion; work, energy and power.

- **Mathematics (AMACH11)**

The syllabus includes: algebra; plane analytic geometry; equations; functions; perimeter, area and volume and trigonometry.

- **Drawing (ADRAW11)**

The course content starts with the use of a pencil to print letters and figures as well as drawing freehand sketches. It then proceeds to the use of drawing instruments to draw geometrical constructions, orthographic projections, isometric drawings and sectional drawings.

- **Communications (ACOCK11)**

The syllabus includes: oral communication; vocabulary building skills; language usage skills; basic reading skills, business correspondence.

- **Lab Practice (ALABC11)**

The practicals include use of: mass and electronic top-loading balances; gas burner; instruments for measurement of volume and temperature; filtration and evaporation equipment; etc.

1.2 **Diploma in Chemical Engineering**

NQF Level : 6

SAQA Credits : 360

Rationale for the Qualification

Professional Chemical Engineering Technicians are characterized by the ability to apply proven, commonly understood techniques, procedures, practices and codes to solve well-defined engineering problems. They manage and supervise chemical engineering operations and activities. They work independently and responsibly within an allocated area or under guidance.

Professional Engineering Technicians must therefore have a working understanding of engineering sciences underlying the techniques used, together with financial, commercial legal, socio-economic, health, safety and environmental methodologies, procedures and best practices.

The process of professional development of a Professional Engineering Technician starts with the attainment of a qualification that meets this standard. After graduation a programme of training and experience is completed to attain the competencies for registration in the category Professional Engineering Technician.

Statement of Purpose

This qualification is primarily industry oriented. The knowledge emphasizes general principles and application or technology transfer. The qualification provides students with a sound knowledge base in a chemical engineering field and the ability to apply their knowledge and skills to particular career or professional contexts, while equipping them to undertake more specialized and intensive learning. Programme leading to this qualification has a strong professional or career focus and holders of this qualification are normally prepared to enter a specific niche in the labour market.

Specifically, the purpose of the Diploma in Chemical Engineering is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing Professional Engineering Technician. This qualification provides:

1. Preparation for careers in engineering and related areas, for achieving technical leadership and to make a contribution to the economy and national development;
2. The educational requirement towards registration as a Professional Engineering Technician with the Engineering Council of South Africa (ECSA) as well as to allow the graduate to pursue careers in engineering and related fields;
3. A thorough grounding in mathematics, natural sciences, engineering sciences, engineering modelling, engineering design and the ability to enable applications in fields of emerging knowledge together with an appreciation for the world and society in which engineering is practiced;
4. For graduates with an appropriate level of achievement in the programme, the minimum entry requirement for admission to an Advanced Diploma, as specified in E-23-P, designed to support articulation to satisfy an engineering technologist education benchmark qualification

Qualification Rules

The learner will be awarded this qualification if he/she has successfully completed all modules (as outlined in section (c) below) and demonstrated competence (to the satisfaction of the assessors) in all Graduate Attributes as per E-02-PN ECSA standard outlined below.

ECSA Graduate Attributes

Graduate Attribute 1: Problem Solving

Identify, formulate, analyse and solve well-defined engineering problems

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural sciences, engineering fundamentals and an engineering speciality to solve well-defined engineering problems.

Range Statement:

Mathematics, natural science and engineering sciences are applied in analysis and modelling of engineering situations, and for reasoning about and solving well-defined engineering problems.

Graduate Attribute 3: Engineering Design

Perform procedural design and synthesis of components, systems, engineering works, products or processes.

Range Statement:

Design problems used in exit-level assessment must conform to the definition of a well-defined engineering problem. A design problem should be used to provide evidence. The design knowledge base and components, systems, engineering works, products or processes to be designed are dependent on the sub-discipline or practice area

Graduate Attribute 4: Investigations, experiments and data analysis

Demonstrate competence to design and conduct investigations and experiments.

Range Statement:

The balance of investigation and experiment should be appropriate to the sub-discipline. Research methodology is to be applied in research or an investigation where the student engages with selected knowledge in the

research literature of the sub-discipline.

Note: An investigation differs from a design in that the objective is to produce knowledge and understanding of a phenomenon and a recommended course of action rather than specifying how an artefact could be produced.

Graduate Attribute 5: Engineering methods, skills and tools, including Information Technology

Demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology.

Range Statement:

A range of methods, skills and tools appropriate to the disciplinary designation of the program including:

- Sub-discipline-specific tools, processes or procedures;
- Computer packages for computation, modelling, simulation, and information handling;
- Computers and networks and information infrastructures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork.

Graduate Attribute 6: Professional and Technical Communication

Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.

Range Statement:

Material to be communicated is in an academic or simulated professional context. Audiences range from engineering peers, academic personnel and related engineering peers, using appropriate academic or professional discourse. Written reports range from short (300 words) to long (a minimum of 2000 words excluding tables, diagrams and appendices), covering material at exit-level. Methods of providing information include the conventional methods of the sub-discipline, for example engineering drawings, as well as subject-specific methods.

Graduate Attribute 7: Sustainability and impact of engineering activity

Demonstrate critical awareness of the sustainability and impact of engineering activity on the social, industrial and physical environment.

Range Statement:

The combination of social, workplace (industrial) and physical environmental factors must be appropriate to the sub-discipline or other designation of the qualification. Comprehension of the role of engineering in society and identified issues in engineering practice in the sub-discipline: health, safety and environmental protection; risk assessment and management and the impacts of engineering activity: economic, social, cultural, environmental and sustainability.

Graduate Attribute 8: Individual, team and multidisciplinary working.

Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments.

Range Statement:

Multidisciplinary tasks require co-operation across at least one disciplinary boundary. Co-operating disciplines may be engineering disciplines with different fundamental bases other than that of the programme or may be outside engineering

Graduate Attribute 9: Independent learning ability

Demonstrate competence to engage in independent learning through well-developed learning skills.

Range Statement:

Operate in well-structured environment with some unfamiliar elements requiring personal responsibility and initiative, accurately self-evaluate and take responsibility for learning requirements; be aware of social and ethical implications of applying knowledge in particular contexts.

Graduate Attribute 10: Engineering professionalism

Demonstrate critical awareness of the need to act professionally and ethically and to exercise judgment and take responsibility within own limits of competence.

Range Statement:

Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. Ethics and the professional responsibility of a technician and the contextual knowledge specified in the range statement of Graduate Attribute 7 is generally applicable here.

Graduate Attribute 11: Engineering management

Demonstrate knowledge and understanding of engineering management principles and economic decision-making.

Range Statement:

Basic techniques from economics, business management; project management applied to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

Graduate Attribute 12: Workplace practices

Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved.

Range Statement:

Tasks to demonstrate this outcome should be designed to connect academic learning with workplace practice and may be performed in one or more of the following types of work-integrated learning

- i) Work-directed theoretical learning.
- ii) Problem-based learning.
- iii) Project-based learning.
- iv) Work-based learning, and
- v) Simulated learning.

Note: While attribute 12 is specific to workplace practices, other attributes may be demonstrated simultaneously

*****Please note that GA 8 (as outlined in 2021 Prospectus) is now split into two GAs with separate assessments in line with updated E-02-PN ECSA standard effective from 2022 academic year.**

a. Admission requirements

- i) National Senior Certificate with rating codes:
 - English Home Language 4
 - English First Additional Language 4
 - Mathematics 4
 - Physical Science 4

- OR
- ii) Senior Certificate or equivalent qualification with passes in
 Mathematics D(HG)/C(SG)
 Physical Science D(HG)/C(SG)
 English D(HG)/C(SG)
- iii) Students who have successfully completed the Chemical Engineering Bridging Course are also considered.
- iv) NCV level 4 with a minimum of 50% pass in English and Mathematics (Mathematical Literacy would not be considered) and a minimum of 60% pass in three compulsory vocational subjects: Physical Science, Process Technology and Process Chemistry or Process Control.

ALL ADMISSIONS ARE BASED ON A SELECTION PROCESS ONLY!!!

Applicants who satisfy the minimum requirements will be subjected to a selection process. Applicants will be ranked based on their academic results and selected for admission accordingly. Mathematical Literacy will not be considered.

b. Duration of Study

The minimum duration of study is three years, of which two years are spent in the University full time study, plus 1 year of appropriate Work Integrated Learning as a learner technician. *All instructional offerings indicated in the next section are compulsory.*

c. Curriculum Compilation and Pre-Requisites

Diploma in Chemical Engineering								
Code	Subjects	Credits	Semester of study	Assessment Method	NQF Level	Pre-requisites	Co-requisites	GA assessed
CHEM112	Engineering Chemistry I	12	1	Examination	5			
COMC112	English Communication Skills I	8	1	Examination	5			
MACH111	Mathematics I	12	1	Examination	5			
PHYS112	Physics I	12	1	Examination	5			
COSC111	Computer Skills I	12	1	Examination	5			
CHTE112	Introduction to Chem Eng Tech 1	8	1	Examination	5		CHEM112 PHYS112 & MACH111	
CHTE212	Chem Eng. Tech II	12	2	Examination	6	CHEM112, CHTE112, MACH111, PHYS112		
MACH211	Mathematics II	12	2	Examination	6	MACH111		
DRAC212	Chemical Engineering Drawing	8	2	Continuous Assessment	5			
CPIN221	Chemical Process Industries II	12	2	Examination	5			
ORCH222	Engineering Chemistry II (Module 1)	12	2	Examination	5	CHEM112		
CHYC222	Engineering Chemistry II (Module 2)	12	2	Examination	5	CHEM112, MACH111		
CHPL332	Chemical Plant III	12	3	Examination	6	CHTE212		
CHTE311	Chem Eng Tech III (Module 1)	12	3	Examination	6	CHTE212, CHYC222		GA 9

CHTE312	Chem Eng Tech III (Module 2)	12	3	Examination	6	CHTE212, CHYC222		
CEEP032	Chem Eng Laboratory Practicals III	8	3	Continuous Assessment	6		CHPL332	
THCE301	Thermodynamics: Chem Eng III	12	3	Examination	6	MACH211, CHTE212, CHYC222		
CPDP311	Chem Eng Design and Professional Practice (Principles)	14	3	Continuous Assessment	6	MACH211, CHTE212, CHYC222	CHTE311, ENPC031	GA 7 & GA 10
ENPC031	Engineering Practice and Communications	8	3	Continuous Assessment	5	COMC112, CHTE212, DRAC212, CPIN221, ORCH222, CHYC222, MACH211, COSC111	CPDP311	
CPDP321	Chem Eng Design and Professional Practice III	14	4	Continuous Assessment	6	CHTE311, CHTE312, CPDP311		GA 3, GA 5, GA 6, GA 11
CEEP042	Chem Eng Laboratory Practicals IV	8	4	Continuous Assessment	6	CHTE311, CHTE312		GA 4
PRCO331	Process Instrumentation and Control	12	4	Examination	6	MACH211, CHPL332		GA 1 & GA 2
THAP331	Thermodynamics (Applied) III	12	4	Examination	6	All S1 & S2 subjects		
ENST301	Engineering Statistics	12	4	Examination	6	All S1 & S2 subjects		
MASK212	Management Skills	8	4	Examination	5	All S1 & S2 subjects		
CEIS012	Chem Eng Practice I (P1)	40	5	Continuous assessment	6	ENPC031		
CEIS022	Chem Eng Practice II (P2)	44	6	Continuous assessment	6	CEIS012, CHPL332, CEEP032, THCE301, CHTE311, CHTE312, CPDP311		GA 8 & GA 12

*****Please note that GAs number and allocation to indicated subjects has changed effective from 2022 academic year to satisfy changes in ECSA E-02-PN standard.***

d. Teaching, Learning and Assessment

- All subjects offered are semester long.
- Students are expected to attend all practicals, lectures and tutorials offered in the course (as per time-table).
- All subjects are evaluated through combination of compulsory tests, assignments, project/practical reports, oral presentations and the end of semester examination as outlined in the learner guides. If a student misses a test or practical due to illness, he/she may apply for an aegrotat test on prescribed form and attach a doctor's certificate. If this is not done, "0" mark would be entered for missed assessment.
- A pass in the practical component of some of the courses is a prerequisite for a semester mark to be attained (specified in the subjects' learner guides).
- Demonstration of competency in graduate attributes may be required for examination admission and successful completion of the course in some subjects (specified in subjects' learner guides).

- All other rules are per General Rules and Regulations in Students handbook.

e. **Work Integrated Learning**

It is the student's responsibility to register his/her training. This must be done before or on commencement of the training. Students who experience any problem when trying to register must contact their Heads of Department for advice.

Students who do not register their work integrated learning cannot be monitored nor evaluated and their training will NOT be recognised.

Students doing work integrated learning must obtain a manual containing the details of the training procedures from the Department of Chemical Engineering. Students are only eligible for graduation after completion, submission and evaluation of all the necessary reports.

f. **Curriculum Content**

- **Engineering Chemistry I (CHEM112)**

The syllabus includes: matter and energy; chemical equations and stoichiometry; solutions; acids, bases and salts; chemical reactions, chemical equilibrium; electrochemistry and redox reactions; introduction to inorganic and organic chemistry and appropriate laboratory practicals.

- **English Communication Skills I (COMC112)**

The syllabus includes: academic writing skills, communication theory; meetings; public speaking & presentation skills; report writing skills.

- **Mathematics I (MACH111)**

The syllabus includes: basic algebra and trigonometry; differential calculus with applications; integral calculus with applications; statistics, complex numbers and hyperbolic functions.

- **Physics I (PHYS112)**

The syllabus includes: mechanics; heat; electricity and magnetism; FLUIDS and corresponding laboratory work.

- **Computer Skills I (COSC111)**

The syllabus includes: hardware; software; data communications; computer applications; Windows; theory of computer and introduction to excel, word processing and spreadsheets.

- **Introduction to Chemical Engineering Technology 1 (CHTE112)**

The syllabus includes: what do chemical engineering technicians do; chemical processes and fundamentals of material and energy balances.

- **Chemical Engineering Technology II (CHTE212)**

The syllabus includes: fundamentals of material balances; single phase systems; multi-phase systems; energy balances and balances on reactive and non-reactive systems.

- **Mathematics II (MACH211)**

The syllabus includes: further differential and integral calculus with applications; matrix algebra; linear

programming; differential equations.

- **Chemical Engineering Drawing (DRAC212)**

The syllabus includes: isometric projection; conics and engineering curves including ellipse; development and intersection of surfaces; application of CHEMCAD and CADWorx plant professional tools for drawing flow diagrams, piping systems and chemical plant layout.

- **Chemical Process Industries II (CPIN221)**

The syllabus includes: coal processing; petroleum refining; synthetic rubber; plastics; paper and pulp; sugar refining; agrochemicals; iron and steel and heavy chemicals.

- **Engineering Chemistry II - Module 1 (ORCH222)**

The syllabus includes: aliphatic hydrocarbons; alkyl halides; alkenes; aromatic compounds; alcohols and ethers; aldehydes and ketones; polymers; carboxylic acids and derivatives; chemical bonding and group elements of the periodic table and corresponding laboratory work.

- **Engineering Chemistry II – Module 2 (CHYC222)**

The syllabus includes: gases; liquids; chemical kinetics; chemical equilibrium; colloids; colligative properties of solutions; electrochemistry and corresponding laboratory work.

- **Chemical Plant III (CHPL332)**

The syllabus includes: separation processes; size reduction; water treatment; cooling towers; conveying of gases and mixing of liquids.

- **Chemical Engineering Technology III - Module 1 (CHTE311)**

Modules covers fundamental principles of incompressible fluid flow; compressible fluid flow; heat transfer; mass transfer and their applications.

- **Chemical Engineering Technology III - Module 2 (CHTE312)**

Covers basic principles and concepts underpinning operations of units encountered in the chemical and allied industries as well as their sizing. The syllabus includes: drying; distillation; absorption; leaching and single stage evaporation.

- **Chemical Engineering Laboratory Practicals III (CEEP032)**

It relates theory to practice and equips students with the necessary skills to handle projects in industry. The following practical sessions are undertaken: solid-liquid extraction; reciprocating pump test; centrifugal pump test; sedimentation; solids handling and cooling towers.

- **Thermodynamics: Chemical Engineering III (THCE301)**

The syllabus includes: introduction; first law of thermodynamics; heat capacity; second and third laws of thermodynamics; real gases; thermodynamic relationships; properties of mixtures and absorption.

- **Chemical Engineering Design and Professional Practice (Principles) (CPDP311)**

The syllabus includes: the design process; chemical process selection; environmental protection; chemical process safety; pumping of fluids; pumps and piping design procedures; process flow-sheeting; introduction to

HAZOP study and the design project.

- **Engineering Practice and Communications (ENPC031)**

The syllabus includes: professional and technical writing skills; oral presentation skills, CV writing; interview skills; professional outlook and work readiness.

- **Chemical Engineering Design and Professional Practice III (CPDP321)**

The syllabus includes: optimum design and design strategy; chemical process safety; process equipment design; agitation and mixing of fluids; process equipment cost estimation; HAZOP study and engineering ethics.

- **Chemical Engineering Laboratory Practicals IV (CEEP042)**

It relates theory to practice and equips students with the necessary skills to handle projects in the industry. The following practical sessions are undertaken: distillation; heat exchanger; absorption; heat convection; fluidized bed reactor; convective dryer and study of pressure drop due to friction.

- **Process Instrumentation and Control (PRCO331)**

The syllabus includes: P&I diagram; instrumentation; sizing of control valves, simple and advanced control systems; alarms, safety trips, interlocks and hazard and operability studies: introduction to an integrated suite of intuitive chemical process engineering software (CHEMCAD).

- **Thermodynamics: Applied III (THAP331)**

The syllabus includes: perfect gases; reversible non-flow processes; working fluid; second law of thermodynamics; heat engine cycle; steam plant, compressors, refrigeration, gas turbines and nozzles.

- **Management Skills (MASK212)**

The syllabus includes: human relations in organisations; principles and practice of management; project management; work study and accuracy; industrial legislation; basic principles of the law contract; type of business; financial management; marketing and business decisions.

- **Engineering Statistics (ENST301)**

The syllabus includes: descriptive statistics; basic probability concepts; statistical distributions; regression analysis and computer-aided statistical analysis of data (using Excel).

- **Chem Eng Practice I (CEIS012)**

To promote integration of theoretical concepts learned in the academic environment with industrial practice. To develop other skills, that cannot be fully developed in a classroom or laboratory environment.

- **Chem Eng Practice II (CEIS022)**

To promote integration of theoretical concepts learned in the academic environment with industrial practice. To develop other skills, that cannot be fully developed in a classroom or laboratory environment.

1.3 National Diploma: Engineering: Chemical
NQF Level: 6

SAQA Credits: 360

NB: The National Diploma: Engineering: Chemical has been phased out with effect from January 2018. Students who fail to obtain the necessary credits after two attempts or acquire the qualification within a period of twice of minimum prescribed time are required to migrate to the Diploma in Chemical Engineering programme. Credits for the subjects within which Graduate Attributes are assessed will not be granted and they need to be repeated regardless of previous achievements. The department has not been offering S1 and S2 levels of the National Diploma programme as from January 2019, and S3 and S4 subjects as from January 2022. Last date for completion of this qualification is December 2023.

Rationale for the Qualification

The Engineering profession contributes to the technological, socio-economic, built environment and environmental infrastructure of the country, facilitating socio-economic growth and sustainability. A National Diploma: Engineering: Chemical and Bachelor of Technology: Engineering: Chemical aim to meet the needs of the country in respect of engineering competence.

Chemical Engineering is an area of study which prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of systems employing chemical processes, such as chemical reactors, kinetic systems, electrochemical systems, energy conservation processes, heat and mass transfer systems, separation processes analysis of chemical problems such as corrosion, particle abrasion, energy loss, pollution and fluid mechanics.

Statement of Purpose

This qualification is intended for process or chemical engineering technicians working in the process related industries. Learners achieving this qualification have the competence to apply existing process technology to chemical engineering problems in chemical processes and plant operations. The target market for the qualification is primarily (but not limited to) the chemical and allied industry.

Qualification Rules

The learner will be awarded with this qualification if he/she has provided evidence (to the satisfaction of the assessors) that the outcomes of the programme specified below have been achieved.

Exit Level Outcomes

A learner who successfully completes this programme will be able to:

1. Identify, evaluate, formulate and solve process related technical and operational problems.
2. Design process equipment in order to modify existing sections of the plant.
3. Plan and implement the production of required products.
4. Plan and implement projects using project management tools and skills.
5. Communicate effectively both orally and in writing with variety of audiences using appropriate language structure, style and graphical support.
6. Have knowledge of the Safety, Health and Environmental (SHE) impacts of chemical processing activities in order to identify the impacts and measures used to control these impacts.
7. Use IT in the application of engineering methods, skills and tools.

Specified Outcomes:

The qualifying learner will have competence to:

1. Apply knowledge of mathematics, basic sciences and chemical engineering sciences to solution of engineering problems.
2. Identify and solve process bottleneck problems to maximize production throughput.

3. Monitor the process, in order to take corrective action timeously.
4. Modify the design of chemical plant units in order to optimise equipment for efficient and effective performance.
5. Produce technical and process drawings to communicate the design.
6. Design basic equipment according to process specification.
7. Rate equipment in order to compare design to actual performance.
8. Schedule production activities and manage resources.
9. Store, handle and transport materials and chemicals according to safety and environmental regulations and process conditions and operating budget.
10. Manage the operating budget.
11. Plan and manage projects.
12. Perform economic justification of projects.
13. Write technical reports effectively in order to convey the design problem, possible causes and a proposed solution.
14. Communicate information orally to specified audiences.
15. Apply environmental management principles regarding effluent treatment, air pollution, and solid waste disposal.
16. Execute Environmental Impact Assessment (EIA) studies.
17. Select and implement appropriate engineering tools.
18. Use computer applications as required by the discipline.

g. Duration of Study

The minimum duration of study is three years, of which two years are spent in the University full time study, plus 1 year of appropriate Work Integrated Learning as a learner technician. *All the instructional offerings are compulsory.*

h. Curriculum Compilation and Pre-Requisites

National Diploma: Engineering: Chemical							
Code	Subjects	Credits	Semester of study	Assessment Method	NQF Level	Pre-requisites	Co-requisites
CHEM211	Chemistry I	16	1	Examination	5		
COMC311	Communication Skills I	5	1	Examination	5		
DRAC211	Drawing: Chemical Eng I	13	1	Examination	5		
MATCH01	Mathematics I	10	1	Examination	5		
PHYS411	Physics I	16	1	Examination	5		
COSCH01	Computer Skills I	10	1	Examination	5		
CHTE111	Introduction to Chem Eng Tech I	4	1	Examination	5		Chemistry I, Physics I & Mathematics I
CHTE122	Chem Eng Tech II	8	2	Examination	5	Introduction to Chem Eng Tech I, Chemistry I, Physics I & Mathematics I	
MATCH02	Mathematics II	10	2	Examination	6	Mathematics I	
ENPH021	Engineering Physics II	8	2	Examination	5	Physics I, Mathematics I	
INOC321	Inorganic Chemistry II	10	2	Examination	5	Chemistry I	
ORCH221	Organic Chemistry II	10	2	Examination	5	Chemistry I	
CHYC221	Physical Chemistry II	10	2	Examination	5	Chemistry I, Mathematics I	

CHPL431	Chemical Plant III	16	3	Examination	6	Chem Eng Tech II	
CHTE301	Chem Eng Tech III (Module 1)	10	3	Examination	6	Chem Eng Tech II, Eng Physics II, Physical Chem II	
CHTE302	Chem Eng Tech III (Module 2)	10	3	Examination	6	Chem Eng Tech II, Eng Physics II, Physical Chem II	
CEEP031	Chem Eng Practicals III	4	3	Continuous Assessment	6		Chem Plant III
THCE031	Thermodynamics: Chem Eng III	10	3	Examination	6	Mathematics II, Chem Eng Tech II, Physical Chem II	
CPIN021	Chemical Process Industries II	10	3	Examination	5		
CPDP031	Chem Process Design Principles III	10	4	Examination	6	Chemical Plant III, Chem Eng Tech III (modules 1&2)	
CEEP041	Chem Eng Practicals IV	4	4	Continuous Assessment	6	Chem Eng Tech III (modules 1&2)	
PRCO031	Process Control III	10	4	Examination	6	Mathematics II, Chem Plant III	
THAP031	Thermodynamics: Applied III	10	4	Examination	6		
MASK211	Management Skills I	16	4	Examination	5		
CEIS011	Chem Eng Practice I (P1)	60	5	Continuous assessment	6	All level 2 subjects passed	
CEIS021	Chem Eng Practice II (P2)	60	6	Continuous assessment	6	All level 3 subjects passed	

Please note that only P1 and P2 will still be offered in 2023.

i. Teaching, Learning and Assessment

- All subjects offered are semester long.
- Students are expected to attend all practicals, lectures and tutorials offered in the course (as per time-table).
- All subjects are evaluated through combination of compulsory tests, assignments, project/practical reports, oral presentations and the end of semester examination as outlined in the learner guides. If a student misses a test or practical due to illness, he/she may apply for an aegrotat test on prescribed form and attach a doctor's certificate. If this is not done, "0" mark would be entered for missed assessment.
- A pass in the practical component of some of the courses is a prerequisite for a semester mark to be attained (specified in the subjects' learner guides).
- All other rules are per General Rules and Regulations in Students handbook.

j. Work Integrated Learning

It is the student's responsibility to register his/her training. This must be done before or on commencement of the training. Students who experience any problem when trying to register must contact their Heads of Department for advice.

Students who do not register their work integrated learning cannot be monitored nor evaluated and their training will NOT be recognised.

Students doing work integrated learning must obtain a manual containing the details of the training procedures from the Department of Chemical Engineering. Students are only legible for graduation after completion, submission and evaluation of all the necessary reports.

k. **Curriculum Content**

▪ **Chemistry I (CHEM211)**

The syllabus includes: matter and energy; chemical equations and stoichiometry; solutions; acids, bases and salts; chemical reactions; chemical equilibrium; electrochemistry and redox theory; introduction to inorganic and organic chemistry and related practicals.

• **Communication Skills (COMC311)**

The syllabus includes: academic writing skills, communication theory; meetings; public speaking & presentation skills; report writing skills.

▪ **Drawing: Chemical Engineering I (DRAC211)**

The syllabus includes: introduction; construction; projection; drawing aids; penetration and development of geometrical bodies; free hand sketches; isometric projection; sketches of plant and lay out and symmetric pipe drawing.

▪ **Mathematics I (MATCH01)**

The syllabus includes: basic algebra and trigonometry; differential calculus with applications; integral calculus with applications; statistics, complex numbers and hyperbolic functions.

▪ **Physics 1 (PHYS411)**

The syllabus includes: mechanics; heat; electricity and magnetism; nuclear physics and corresponding laboratory work.

▪ **Computer Skills 1 (COSCH01)**

The syllabus includes: hardware; software; data communications; computer applications; Dos; Windows; theory of computer and introduction to Office XP, word processing and spreadsheets.

▪ **Introduction to Chemical Engineering Technology 1 (CHTE111)**

The syllabus includes: what do chemical engineering technicians do; chemical processes and fundamentals of material and energy balances.

▪ **Chemical Engineering Technology II (CHTE122)**

The syllabus includes: fundamentals of material balances; single phase systems; multi-phase systems; energy balances and balances on reactive and non-reactive systems.

▪ **Mathematics II (MATCH02)**

The syllabus includes: further differential and integral calculus with applications; matrix algebra; linear programming; statistics and differential equations.

▪ **Engineering Physics II (ENPH021)**

The syllabus includes: transfer of heat; electrical principles; nuclear reactions; hydrodynamics and hygrometry.

▪ **Inorganic Chemistry (INOC321)**

The syllabus includes: introduction to chemical bonding and an advanced study of ionic bonding; chemical reactions in aqueous and non-aqueous solutions; redox chemistry; descriptive inorganic chemistry and corresponding laboratory work.

▪ **Organic Chemistry (ORCH211)**

The syllabus includes: introduction; aliphatic hydrocarbons; benzene; alkyl and aryl halides; alkanols and alkoxyalkanes; phenols; alkanals and alkanones; carboxylic acids and derivatives; amines and corresponding laboratory work.

- **Physical Chemistry (CHYC221)**
The syllabus includes: gases; liquids; chemical kinetics; chemical equilibrium; colloids; colligative properties of solutions; electrochemistry and corresponding laboratory work
- **Chemical Plant III (CHPL431)**
The syllabus includes: handling and storage of solids; size reduction; mechanical separation; water treatment; material technology; corrosion; environment protection; pumps and piping; compressors; steam plants; combustion; mixing; valves and cooling towers.
- **Chemical Engineering Technology III - Module 1 (CHTE301)**
The syllabus includes: incompressible fluid flow; compressible fluid flow; heat transfer; introduction to mass transfer and single stage evaporation.
- **Chemical Engineering Technology III - Module 2 (CHTE302)**
To provide students with the basic principles of processes and concepts encountered in the chemical and allied industries. The syllabus includes: humidity; drying; distillation; absorption and leaching.
- **Chemical Engineering Practicals III (CEEP031)**
It relates theory to practice and equips students with the necessary skills to handle projects in industry. The following practical sessions are undertaken: solid-liquid extraction; reciprocating pump test; centrifugal pump test; sedimentation; solids handling and cooling towers.
- **Thermodynamics: Chemical Engineering III (THCE031)**
The syllabus includes: introduction; first law of thermodynamics; heat capacity; second and third laws of thermodynamics; real gases; thermodynamic relationships; properties of mixtures and absorption.
- **Chemical Process Industries II (CPIN021)**
The syllabus includes: coal processing; petroleum refining; synthetic rubber; plastics; paper and pulp; sugar refining; agrochemicals; iron and steel and heavy chemicals.
- **Chemical Process Design Principles III (CPDP031)**
The syllabus includes: the design process; environmental protection; chemical process safety; process creation; heuristics for process synthesis; process flow-sheeting; piping system design and instrumentation; construction details and design of process equipment and the design project.
- **Chemical Engineering Practicals IV (CEEP041)**
It relates theory to practice and equips students with the necessary skills to handle projects in the industry. The following practical sessions are undertaken: distillation; heat exchanger; absorption; heat convection; fluidized bed reactor; convective dryer and study of pressure drop due to friction.
- **Process Control III (PRCO031)**
The syllabus includes: P&I diagram; instrumentation; sizing of control valves, simple and advanced control systems; alarms, safety trips, interlocks and hazard and operability studies: introduction to an integrated suite of intuitive chemical process engineering software (CHEMCAD).
- **Thermodynamics: Applied III (THAP031)**
The syllabus includes: perfect gases; reversible non-flow processes; working fluid; second law of thermodynamics; heat engine cycle; steam plant, compressors, refrigeration, gas turbines and nozzles.

- **Management Skills I (MASK211)**

The syllabus includes: human relations in organisations; principles and practice of management; project management; work study and accuracy; industrial legislation; basic principles of the law contract; type of business; financial management; marketing and business decisions.

- **Chem Eng Practice I (CEIS011)**

To promote integration of theoretical concepts learned in the academic environment with industrial practice. To develop other skills, that cannot be fully developed in a class room or laboratory environment.

- **Chem Eng Practice II (CEIS021)**

To promote integration of theoretical concepts learned in the academic environment with industrial practice. To develop other skills, that cannot be fully developed in a classroom or laboratory environment.

1.4 **Advanced Diploma in Chemical Engineering** **NQF Level: 7 SAQA Credits: 142**

Rationale for the Qualification

This qualification is aimed at Process or Chemical Engineering Technologists working in the process related industries. This qualification is primarily industry oriented.

The process of professional development in engineering has three principal phases: education, training and experience leading to registration and continual development during practice.

Statement of purpose

In this qualification the knowledge component emphasises general principles and application or technology transfer. The qualification provides students with a sound knowledge and skills in their professional life while equipping them to undertake more specialised and intensive learning.

The purpose of the qualification is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing Engineering Technologist.

Professional Engineering Technologists are characterized by the ability to apply established and newly developed engineering technology to solve broadly-defined problems, develop components, systems, services and processes. They provide leadership in the application of technology in safety, health, engineering and commercially effective operations and have well-developed interpersonal skills. They work independently and responsibly, applying judgment to decisions arising in the application of technology and health and safety considerations to problems and associated risks. Professional Engineering Technologists have a specialised understanding of engineering sciences underlying a deep knowledge of specific technologies together with financial, commercial, legal, social and economic, health, safety and environmental matters.

Specifically, the purpose of this Advanced Diploma in Chemical Engineering qualification is to provide graduates with:

1. Preparation for careers in engineering and related areas, for achieving technical leadership and to make a contribution to the economy and national development;

2. The educational requirement towards registration as a Professional Engineering Technologist with the Engineering Council of South Africa as well as to allow the graduate to pursue careers in engineering and related fields;
3. A thorough grounding in mathematics, natural sciences, engineering sciences, engineering modelling, engineering design and the ability to enable applications in fields of emerging knowledge together with an appreciation for the world and society in which engineering is practiced;
4. For graduates with an appropriate level of achievement in the programme, the ability to proceed to study in Level 8 programmes e.g. Bachelor Degree, Honours Degree or Postgraduate Diploma in Engineering or other fields and then proceed to Masters Degrees studies.

Qualification Rules

The learner will be awarded this qualification if he/she has successfully completed all modules (as outlined in section (c) below) and demonstrated competence (to the satisfaction of the assessors) in all Graduate Attributes as per E-05-PT ECSA standard outlined below.

ECSA Graduate Attributes (GAs):

Graduate Attribute 1: Problem solving

Identify, formulate, analyse and solve broadly-defined engineering problems

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural sciences, engineering fundamentals and an engineering speciality to solve broadly-defined engineering problems.

Range Statement: Mathematics, natural science and engineering sciences are applied in formal analysis and modelling of engineering situations, and for reasoning about and conceptualizing engineering problems.

Graduate Attribute 3: Engineering design

Perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes.

Range Statement: Design problems used in exit-level assessment must conform to the definition of a broadly-defined engineering problem.

- i) A major design problem should be used to provide evidence.
- ii) The selection of components, systems, engineering works, products or processes to be designed are dependent on the discipline or practice area

Graduate Attribute 4: Investigations, experiments and data analysis

Demonstrate competence to design and conduct investigations and experiments

Range Statement: The balance of investigation and experiment should be appropriate to the discipline. Research methodology is to be applied in research or an investigation where the student engages with selected knowledge in the research literature of the discipline.

Note: An investigation differs from a design in that the objective is to produce knowledge and understanding of a phenomenon and a recommended course of action rather than specifying how an artefact could be produced.

Graduate Attribute 5: Engineering methods, skills and tools, including information technology.

Demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology.

Range Statement: A range of methods, skills and tools appropriate to the disciplinary designation of the program including:

- Discipline-specific tools, processes or procedures;
- Computer packages for computation, modelling, simulation, and information handling;
- Computers and networks and information infrastructures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork.

Graduate Attribute 6: Professional and technical communication.

Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences the community at large.

Range Statement: Material to be communicated is in an academic or simulated professional context.

- i) Audiences range from engineering peers, management and lay persons, using appropriate academic or professional discourse.
- ii) Written reports range from short (300-1000 words plus tables diagrams) to long (10 000 to 15 000 words plus tables, diagrams and appendices), covering material at exit-level.
- iii) Methods of providing information include the conventional methods of the discipline, for example engineering drawings, as well as subject- specific methods

Graduate Attribute 7: Sustainability and impact of engineering activity.

Demonstrate critical awareness of the sustainability and impact of engineering activity on the social, industrial and physical environment.

Range Statement: The combination of social, workplace (industrial) and physical environmental factors must be appropriate to the discipline or other designation of the qualification. Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: health, safety and environmental protection; risk assessment and management and the impacts of engineering activity: economic, social, cultural, environmental and sustainability.

Graduate Attribute 8: Individual, team and multidisciplinary working.

Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments.

Range Statement: Multidisciplinary tasks require co-operation across at least one disciplinary boundary. Co-operating disciplines may be engineering disciplines with different fundamental bases other than that of the programme or may be outside engineering.

Graduate Attribute 9: Independent learning ability.

Demonstrate competence to engage in independent learning through well-developed learning skills.

Range Statement: Operate independently in complex, ill-defined contexts requiring personal responsibility and initiative, accurately self-evaluate and take responsibility for learning requirements; be aware of social and ethical implications of applying knowledge in particular contexts.

Graduate Attribute 10: Engineering professionalism.

Demonstrate critical awareness of the need to act professionally and ethically and to exercise judgment and take responsibility within own limits of competence.

Range Statement: Evidence includes case studies typical of engineering practice situations in which the graduate

is likely to participate. Ethics and the professional responsibility of an engineer and the contextual knowledge specified in the range statement of Graduate Attribute 7 is generally applicable here.

Graduate Attribute 11: Engineering management.

Demonstrate knowledge and understanding of engineering management principles and economic decision-making.

Range Statement: Basic techniques from economics, business management; project management applied to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

*****Please note that GA 8 (as outlined in 2021 Prospectus) is now split into two GAs with separate assessments in line with updated E-05-PT ECSA standard effective from 2022 academic year.**

a. Entry Requirements

The minimum requirement for admission into the qualification is either: an appropriate Diploma, NQF level 6 or a Bachelor's Degree in Chemical Engineering or related field.

b. Duration of Programme

The minimum formal study time is one year full time or two years part-time. *All the instructional offerings are compulsory.*

c. Curriculum Compilation and Pre-Requisites

ADVANCED DIPLOMA IN CHEMICAL ENGINEERING								
Code	Subjects	Credits	Semester offered	Assessment Method	NQF Level	Pre-requisites	Co-requisites	GA assessment
MATH471	Engineering Mathematics III	14	1 & 2	Examination	7			
CHTE471	Fluid Flow IV	14	1	Examination	7			
CHTE472	Heat & Mass Transfer IV	14	1	Examination	7			
CHTE473	Unit Operations IV	14	1	Examination	7			GA 1; GA 2
INST471	Instrumental Analysis	8	1	Continuous Assessment	7			
CPDE471	Chemical Engineering Design IV	28	Annual	Continuous Assessment	7		CHTE472 & CHT473	GA 3; GA 7; GA 10; GA 11
PECI471	Production Management	14	2	Examination	7			
PRCO471	Chemical Process Control IV	14	2	Examination	7		MATH471	GA 5
RTEC471	Reactor Technology IV	14	2	Examination	7			GA 4; GA 8
RMCE471	Research Methodology	8	2	Continuous assessment	7			GA 6; GA 9

Please note, the intake of new students only takes place in the first semester.

**** Please also note that number of GAs and their allocation to indicated subjects has changed in line with updated E-05-PT ECSA standard with effect from 2022 academic year.**

d. **Teaching, Learning and Assessment**

- All subjects offered, except for the Chemical Engineering Design IV are semester long courses.
- Students are expected to attend all practicals, lectures and tutorials offered in the course (as per time-table), presentations
- All subjects are evaluated through combination of compulsory tests, assignments, project/practical reports, oral presentations and the end of semester examination as outlined in the learner guides.
- If a student misses an assessment due to illness, he/she may apply for an aegrotat test on prescribed form and attach a doctor's certificate. If this is not done, "0" mark would be entered for missed assessment.
- Demonstration of competency in graduate attributes may be required for examination admission and successful completion of the course in some subjects (specified in subjects' learner guides).
- All other rules are as per General Rules and Regulations for Students handbook.

e. **Course Content**

▪ **Engineering Mathematics III (MATH471)**

The syllabus includes: Integration; first and second order ordinary differential equations; linear differential equations with constant coefficients; Laplace transforms and numerical methods.

▪ **Fluid Flow IV (CHTE471)**

The syllabus includes: macroscopic mass, energy and momentum balances and elements of boundary layer theory; fluid flow through pipes, ducts, fittings and open channels; pumping of fluids, pumps in series and parallel; flow through porous media; compressible fluids flow; particle dynamics in settling; non-Newtonian fluids flow and mixing of fluids.

▪ **Heat and Mass Transfer IV (CHTE472)**

The syllabus includes: boundary layer fundamentals; forced convection in laminar, turbulent and transitional flow; forced convection over exterior surface; heat transfer with change in phase; molecular diffusion in fluids and solids; prediction of diffusivities in fluids; diffusion through solid barrier; molecular diffusion in laminar flow; mass transfer in turbulent flow and diffusion between phases.

▪ **Unit Operations IV (CHTE473)**

The syllabus includes: multiple-effect evaporation; crystallization; distillation; absorption; liquid-liquid extraction and computer-aided simulation of separation processes.

▪ **Instrumental Analysis (INST471)**

The syllabus includes: Spectroscopic Techniques; Chromatographic Techniques; Electro-analytical Techniques and Hyphenated Techniques.

▪ **Chemical Engineering Design IV (CPDE471)**

The syllabus includes: general design considerations, process design development, process and instrumentation diagrams development, software use in process design, cost estimation, design optimization and design strategy.

▪ **Production Management (PECI471)**

The syllabus includes: organizational goals and society; planning; control; process and project management; financial management; people management and innovation management.

- **Chemical Process Control IV (PRCO471)**

The syllabus includes: process control overview; mathematical modeling principles; linearization of non-linear equations, Laplace transformation of important functions; analysis of dynamic behaviour of chemical engineering processes using inverse Laplace transform; the feedback controllers and analytical expression for closed loop response and stability analysis of control systems.

- **Reactor Technology (RTEC471)**

The syllabus includes: mole balances; the rate of reaction; the general mole balance equation; batch reactors (BR); continuous-flow reactors (CSTR, PFR, PBR); conversion and reactor sizing; rate law and stoichiometry; isothermal reactor design; collection and analysis of rate data;

- **Research Methodology (RMCE471)**

The syllabus include: overview of research and its methodologies; literature search, review and citation practices; problem identification; design of experiments; analysis and interpretation of data; presentation of research findings; writing research proposals.

2. DEPARTMENT OF CIVIL ENGINEERING & SURVEYING

Note: The National Diploma programmes were phased out from January 2018 and replaced by the new Diploma programmes. In future, returning and pipeline students will have to migrate to the Diploma programmes.

2.1 Qualification Name : Diploma in Civil Engineering

SAQA ID Number : 96855

NQF Level : 6

SAQA Credits : 360

Duration : 3 years

Mission

The mission of the department of Civil Engineering and Surveying is to provide superior quality, technologically advanced instructional programmes and services in the field of civil engineering and surveying, which respond to local, regional and national industry for which we produce competent graduates.

Statement of Purpose

The purpose of the Diploma: Engineering: Civil is to prepare a civil engineering technician, who will satisfy the criteria for registration as a professional technician (by the Engineering Council of South Africa (ECSA), for articulated advanced study in civil engineering and/or to gain employment by function as a competent member of an engineering team in the execution of technical tasks, under supervision, by applying his/her knowledge, skills and techniques necessary for civil engineering practice.

Qualification Rules:

The qualification will be awarded to a learner who has provided evidence to the satisfaction of the assessors that the stated competence of the qualification, as detailed in the outcomes, has been achieved, either through education and training in a single provider's learning programme, or through experience that complies with the stated outcomes.

Exit Level Outcomes:

A person in possession of this qualification will be able to do the following:

- Identify, analyse and produce solutions to problems related to the civil engineering/ surveying environments as presented in classroom and laboratory examples and practicals; and as encountered in the real-life work context as part of experiential learning.
- Apply analytical and practical techniques and knowledge related to the specific disciplines of civil engineering/ surveying.
- Conduct civil engineering/ surveying operations and apply practical skills related to the specific real-life working environment as addressed through laboratory practicals, and specific skills training and projects done in industry during experiential training.
- Communicate in a professional manner using the language, concepts, models, techniques and equipment encountered in the engineering/ surveying working environment.
- Apply mathematical techniques and interpret results of mathematical calculations to assist in the solving of engineering/ surveying problems.
- Use basic scientific and technological principles in an engineering / surveying applied context.

- Analyse the overall functioning and purpose of a particular organisation.
- Organise and give directions to the work of self and others.
- Work as part of a team or independently as required by the work environment.
- Work ethically, safely and responsibly with due consideration for the environment and fellow human beings.

ECSA Graduate Attributes

The learner will be awarded this qualification if he/she has successfully completed all modules (as outlined in section (c) below) and demonstrated competence (to the satisfaction of the assessors) in all Graduate Attributes as per E-02-PN ECSA standard outlined below.

Graduate Attribute 1: Problem Solving

Identify, formulate, analyse and solve well-defined engineering problems.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural sciences, engineering fundamentals and an engineering specialty to solve well-defined engineering problems.

Range Statement:

Mathematics, natural science and engineering sciences are applied in analysis and modelling of engineering situations, and for reasoning about and solving well-defined engineering problems.

Graduate Attribute 3: Engineering Design

Perform procedural design and synthesis of components, systems, engineering works, products or processes.

Range Statement:

Design problems used in exit-level assessment must conform to the definition of a well-defined engineering problem. A design problem should be used to provide evidence. The design knowledge base and components, systems, engineering works, products or processes to be designed are dependent on the sub-discipline or practice area.

Graduate Attribute 4: Investigations, experiments and data analysis

Demonstrate competence to design and conduct investigations and experiments.

Range Statement:

The balance of investigation and experiment should be appropriate to the sub-discipline. Research methodology is to be applied in research or an investigation where the student engages with selected knowledge in the research literature of the sub-discipline.

Note: An investigation differs from a design in that the objective is to produce knowledge and understanding of a phenomenon.

Graduate Attribute 5: Engineering methods, skills and tools, including Information Technology

Demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology.

Range Statement:

A range of methods, skills and tools appropriate to the disciplinary designation of the program including:

- Sub-discipline-specific tools, processes or procedures;
- Computer packages for computation, modelling, simulation, and information handling;
- Computers and networks and information infrastructures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork.

Graduate Attribute 6: Professional and Technical Communication

Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.

Range Statement:

Material to be communicated is in an academic or simulated professional context. Audiences range from engineering peers, academic personnel and related engineering peers, using appropriate academic or professional discourse. Written reports range from short (300 words) to long (a minimum of 2000 words excluding tables, diagrams and appendices), covering material at exit-level. Methods of providing information include the conventional methods of the sub-discipline, for example engineering drawings, as well as subject-specific methods.

Graduate Attribute 7: Sustainability and impact of engineering activity

Demonstrate critical awareness of the sustainability and impact of engineering activity on the social, industrial and physical environment.

Range Statement:

The combination of social, workplace (industrial) and physical environmental factors must be appropriate to the sub-discipline or other designation of the qualification. Comprehension of the role of engineering in society and identified issues in engineering practice in the sub-discipline: health, safety and environmental protection; risk assessment and management and the impacts of engineering activity: economic, social, cultural, environmental and sustainability.

Graduate Attribute 8: Individual, team and multidisciplinary working

Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments.

Range Statement:

Multidisciplinary tasks require co-operation across at least one disciplinary boundary. Co-operating disciplines may be engineering disciplines with different fundamental bases other than that of the programme or may be outside engineering.

Graduate Attribute 9: Independent learning ability

Demonstrate competence to engage in independent learning through well-developed learning skills.

Range Statement:

Operate in well-structured environment with some unfamiliar elements requiring personal responsibility and initiative, accurately self-evaluate and take responsibility for learning requirements; be aware of social and ethical implications of applying knowledge in particular contexts.

Graduate Attribute 10: Engineering professionalism

Demonstrate critical awareness of the need to act professionally and ethically and to exercise judgment and take responsibility within own limits of competence.

Range Statement:

Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. Ethics and the professional responsibility of a technician and the contextual knowledge specified in the range statement of Graduate Attribute 7 is generally applicable here.

Graduate Attribute 11: Engineering management

Demonstrate knowledge and understanding of engineering management principles and economic decision-making.

Range Statement:

Basic techniques from economics, business management; project management applied to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Graduate Attribute 12: Workplace practices

Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved.

Range Statement:

Tasks to demonstrate this outcome should be designed to connect academic learning with workplace practice and may be performed in one or more of the following types of work-integrated learning.

- I. Work-directed theoretical learning
- II. Problem-based learning
- III. Project-based learning
- IV. Work-based learning, and
- V. Simulated learning.

2.1.1 Minimum Admission Requirements

- i) National Senior Certificate with rating codes:

English Home Language	(4)
English First Additional Language	(4)
Mathematics	(4)
Physical Science	(4)
- ii) A minimum of 130 total credits, with a maximum of 60 credits with "Partial Achievement", at NQF Level 4
- iii) Adequate achievement rating code 3: 40%-49% in the relevant subject in the Manufacturing, Engineering and Technology learning field will be an advantage.
- iv) Pass all the Pre-Tech subjects with a minimum of 50%
- v) National Senior Certificate / Standard 10 / Matric Certificate with a minimum:

Maths	D (HG)
Physical Science	D (HG)
English	E (SG)
- vi) An appropriate N4 Certificate with minimum 50% pass in all subjects and a minimum of 50% for Maths at the N4 level and an E (SG) Symbol for English
- vii) An appropriate GCE, GCSE, IGSCE or Cambridge School Certificate with at least five subjects (including Mathematics, Science and English) passed with an A, B or C symbol. Three of the five subjects must have been passed at the same examination sitting.

2.1.2 Duration of Study

Four semesters of attendance at the University together with two semesters of appropriate work integrated learning.

2.1.3 Diploma: Subjects, Curriculum Compilation, Course Codes

DIPLOMA IN CIVIL ENGINEERING. SAQA CODE 96855							
National Diploma	Diploma	Subjects	Assessment Method	NQF Level	Pre-requisites	Co-requisites	SAQA Credits
Semester 1							
APME111	AMCE101	Applied Mechanics for Civil Engineers	Exam	5			12
COSC101	COSK101	Computer Skills I	Exam	5			12
COST611	CMET101	Construction Methods I	Exam	5			8
DRAW011	CIED101	Civil Engineering Drawing 1	Continuous	5			8
MATCI01	MATH101	Mathematics I	Exam	5			12
SURV111	SUTP101	Surveying: Theory and Practical	Exam	5			12
Semester 2							
COMS411	COSK102	Communication Skills IA	Exam	5			8
COST511	CMAT102	Construction Materials I	Exam	5	Construction Methods I		12
DRAW021	CIED 102	Civil Engineering Drawing II	Continuous	5	Civil Engineering Drawing 1		8
MACI011	CEMA102	Civil Engineering Management	Exam	5			8
MATCI02	MATH102	Mathematics II	Exam	5	Mathematics I		12
THES121	THST102	Theory of Structures II	Exam	5	Applied Mechanics I and Mathematics I		12
	EPAC 102	Engineer practice and communication (Engineer in Society and Professional Ethics)	Exam	5			8
Semester 3							
GEEN021	GESM201	Geology and Soil Mechanics	Exam	6	Mathematics II, Theory of Structures II, Construction Materials I and Construction Methods I		12
RECO031	RECM201	Reinforced Concrete & Masonry Design III	Continuous	6	Theory of Structures II, Drawing II, Mathematics II and		12

					Construction Materials I		
TREN021	TENG201	Transportation Eng.	Exam	6	Civil Engineering Drawing II, Surveying T/P, Mathematics II and Construction Materials I		8
WAEN021	WENG 201	Water Engineering I	Exam	6	Theory of Structures II and Mathematics II		12
	ENVE201	Introduction to Environmental Engineering	Exam	6	Mathematics II and Civil Engineering Management		8
	CENS 201	Engineering Statistics	Exam	6	Mathematics II		12
DOCU031	DOCE201	Documentation for Civil Engineers	Continuous	6			8
Semester 4							
	CIED 202	Civil engineering design	Continuous	6	Completion of S3		16
GEEN031	GEOT 202	Geotechnical Eng.	Exam	6	Geology and Soil Mechanics		12
STAN031	STRU 202	Structural Analysis	Exam	6	Theory of Structures II and Mathematics II		12
STEE031	SSTM 202	Structural Steel & Timber Design III	Continuous	6	Theory of Structures II & Civil Eng., Drawing II		12
TREN031	EWPD 202	Earthworks and Pavement Design	Exam	6	Transportation Eng.		12
WAEN031	WENG 202	Water Engineering II	Exam	6	Water Engineering I		12
	CEPR000	Work readiness program					
In-service Training							
CEPR011	CIEP301	Civil Engineering Pract. I		5	Engineer practice and communication (Engineer in Society and Professional Ethics)		40

CEPR021	CENP302	Civil Engineering Pract. II		6	Civil Engineering Pract. I		40
Total Credits 360							

Note: The revised diploma above has been phased-in gradually and it will be fully phased-in by the 1st semester of 2023. Also, the following S3 and S4 old diploma modules below will be phased-out by the end 2023.

Semester 3						
GEEN021	GEEN201	Geotechnical Eng. II	6	Mathematics II, Theory of Structures II, Construction Materials I and Construction Methods I		10
MACI021	MACI201	Management (Civil) II	6	Management (Civil) I		10
RECO031	RCMD201	Reinforced Concrete & Masonry Design III	6	Theory of Structures II, Drawing II, Mathematics II and Construction Materials I	Structural Analysis II	10
STAN021	STAN201	Structural Analysis II	6	Theory of Structures II and Mathematics II		10
TREN021	TREN201	Transportation Eng. II	6	Drawing II, Surveying (Civil) II, Mathematics II and Construction Materials I		10
WAEN021	WAEN201	Water Engineering II	6	Theory of Structures II and Mathematics II		12
-	CEPR000	Work readiness program	-	-	-	-
Semester 4						
DOCU031	DOCU202	Documentation III	6			10
GEEN031	GEEN202	Geotechnical Eng. III	6	Geotechnical Engineering II		10
STAN031	STAN202	Structural Analysis III	6	Structural Analysis II		10
STEE031	SSTD202	Structural Steel & Timber Design III	6	Theory of Structures II & Drawing II	Structural Analysis III	10
TREN031	TREN202	Transportation Eng. III	6	Transportation II		10
WAEN031	WAEN202	Water Engineering III	6	Water Engineering II		12
In-service Training						

CEPR011	CIEP301	Civil Engineering Pract. I	5	Work readiness program		60
CEPR021	CIEP302	Civil Engineering Pract. II	6	Civil Engineering Pract. I		60

2.1.4 **Work Integrated Learning**

Two (2) semesters of appropriate Civil Engineering work integrated learning to be completed after S2.

It is the student's responsibility to register his/her training. This must be done before or on commencement of the training. Students who experience any problem when trying to register must contact their Head of Department for advice.

Students who do not register their work integrated learning cannot be monitored and evaluated resulting in the training NOT being recognised.

2.1.5 **Restriction on Subjects**

A student can only continue with a subject of the same name at the next level if the same subject at the preceding level has been passed.

2.1.6 **Examination Regulations**

Refer to General Handbook Rule: 22

2.1.7 **Pass Requirements**

A candidate passes a subject if a final mark of at least 50% is obtained. The final mark consists of 40% of the year mark and 60% of the examination mark for examination subjects.

A candidate must obtain a sub-minimum of 40% in the examination to pass a course. Where the examination in a course consists of two or more papers, a sub-minimum of 40% must be obtained in each paper.

The student's performance in certain subjects is assessed by Continuous Evaluation, and no examinations are written. Details of this assessment method are included in the relevant subject Study Guides.

2.1.8 **Practicals/Laboratory**

Practical work is done in the following subjects and forms part of the assessment:

Surveying I & Surveying (Civil) II

Details of the assessment of the practicals are given in the relevant Study Guides.

Laboratory work is done in the following subjects:

Applied Mechanics for Civil Engineers	Geotechnical Engineering
Construction Materials I	Earthworks and Pavement Design
Civil Engineering Drawing II	Water Engineering II
Theory of Structures II	Reinforced Concrete and Masonry Design III
Structural Analysis III	Structural Steel and Timber Design III
Water Engineering I	
Geology and Soil Mechanics	

Details of the assessment of laboratory work are given in the relevant Study Guides.

Note: Students have to report to the relevant subject lecturer for all their practical classes within the first week of lectures. **This also applies to students who register late.**

2.2 **Qualification Name** : Diploma in Surveying

SAQA ID Number : 96867

NQF Level : 6

SAQA Credits : 360

Rationale for Qualification:

To be able to survey, collect and present spatial data in different forms, and set out and control positions of structures on the ground of basic engineering works.

Statement of Purpose:

The Diploma in Surveying qualifies the technician for employment with contractors, consultants, government departments and municipalities where he/ she could form part of the team headed usually by a professional engineer or professional surveyor. He/ She would be involved in the measurement for the production of maps, the setting out and monitoring of civil engineering structures and the relocation of property boundaries.

Qualification Rules:

The qualification will be awarded to a learner who has provided evidence to the satisfaction of the assessors that the stated competence of the qualification, as detailed in the outcomes, has been achieved, either through education and training in a single provider's learning programme, or through experience that complies with the stated outcomes.

Exit Level Outcomes:

A person in possession of this qualification will be able to do the following:

- Identify, analyse and produce solutions to problems related to the civil engineering/ surveying environments as presented in classroom and laboratory examples and practicals; and as encountered in the real-life work context as part of experiential learning.
- Apply analytical and practical techniques and knowledge related to the specific disciplines of civil engineering/ surveying.
- Conduct civil engineering/ surveying operations and apply practical skills related to the specific real-life working environment as addressed through laboratory practicals, and specific skills training and projects done in industry during experiential training.
- Communicate in a professional manner using the language, concepts, models, techniques and equipment encountered in the engineering/ surveying working environment.
- Apply mathematical techniques and interpret results of mathematical calculations to assist in the solving of engineering/ surveying problems.
- Use basic scientific and technological principles in an engineering/surveying applied context.
- Analyse the overall functioning and purpose of a particular organisation.
- Organise and give directions to the work of self and others.
- Work as part of a team or independently as required by the work environment.

- Work ethically, safely and responsibly with due consideration for the environment and fellow human beings.

2.2.1 Admission Requirements:

- National Senior Certificate with rating codes:
 English Home Language (4)
 English First Additional Language (4)
 Mathematics (4)
 Physical Science (4)
- A minimum of 130 total credits; with a maximum of 60 credits with "Partial Achievement", at NQF Level 4
- Pass all Pre-Tech subjects with a minimum of 50%
- National Senior Certificate/Standard 10 / Matric Certificate with a minimum
 Maths D (HG)
 Physical Science D (HG)
 English E (SG)
- An appropriate N4 Certificate with minimum 50% passes in all subjects and a minimum of 50% for Maths at the N4 level and an E (SG) symbol for English
- An appropriate GCE, GCSE, IGCSE or Cambridge School Certificate with at least five subjects (including Mathematics, Science and English) passed at the same examination sitting.

2.2.2 Duration of Study:

Four semesters of attendance at the University together with two semesters of appropriate work integrated learning.

2.2.3 Subjects, Curriculum Compilation, Course Codes

National Diploma CISURC	Diploma CISEND	Subjects	NQF Level	Pre-requisites	Co- requisites	SAQA Credits
Semester 1						
COSSU01	COML101	Computer Skills I	5			12
COST611	CMET101	Construction Methods I	5			10
SURD011	DRNG101	Drawing I	5			10
MATSU01	MATE101	Mathematics I	5			12
SSUR111	SURY101	Surveying I	5			12
PHYB021	PHSC101	Physics I	5			10
				Sub-Total		66
Semester 2						
COMS411	COLL102	Communication Skills IA	5			5
GEOG111	GEOG102	Geography I	5			10
MATSU02	MATE102	Mathematics II	5	Mathematics I		12
PHOT121	PHOT102	Photogrammetry II	5	Surveying I, Mathematics I		12
SSUR221	SURY102	Surveying II	5	Drawing I		12
SURD121	SURD102	Survey Drawing II	5	Surveying I		10

National Diploma CISURC	Diploma CISEND	Subjects	NQF Level	Pre-requisites	Co- requisites	SAQA Credits
				Sub-Total		61
Semester 3						
COMS511	COLL201	Communication Skills IB	6	Communication Skills IA		2,5
CSUR031	COSU201	Control Surveying III	6	Surveying II		15
LEPR011	LEGP201	Legal Principles I	6			10
STAT311	STTT201	Statistics I	6	Mathematics II		12
PHOT341	PHOT201	Photogrammetry III	6	Photogrammetry II		12
MASU011	MCIV201	Management (Civil) I	6			10
				Sub-Total		61,5
Semester 4						
ADOE031	ADER202	Adjustment of Errors III	6	Statistics I, Mathematics II, Surveying II		12
CASU031	CASU202	Cadastral Surveying III	6	Survey Drawing II, Surveying II, Legal Principles I		12
COMS611	COLL202	Communication Skills IC	6	Communication Skills IB		2,5
COAP031	COAP202	Computer Applications III	6	Computer Skills I, Surveying II		12
SSUR331	SURY202	Surveying III	6	Surveying II		15
GINS031	GEIS202	Geographic Information Systems III	6		Computer Applications III	12
-	SUPR000	Work Readiness Program	-	-	-	-
					Sub-Total	65,5
In-Service Training						
SUPR011	SUPR301	Survey Practice I	5	Work Readiness Program Surveying II		120
SUPR021	SUPR302	Survey Practice II	5	Survey Practice I		120
					Sub-Total	120
				Total Credits		374

Curriculum Compilation: A student can only continue with a subject of the same name at the next level if the same subject at the preceding level has been passed.

2.2.7 Practicals

Practical work is done in the following subjects and forms part of the assessment:

Surveying I, Surveying II, Control Surveying III, Surveying III, Cadastral Surveying III, Geographic Information Systems III & Photogrammetry III.

Details of the assessment of the practicals are given in the relevant Study Guides.

All practicals are compulsory.

Note: Students have to report to the relevant subject lecturer for all their practical classes within the first week of lectures. **This also applies to students who register late.**

2.2.8 Work Integrated Learning

Work integrated learning consists of two semesters where the student is placed with an employer which will provide training of survey related work as specified in the Work Integrated Log Book. This experiential learning will be evaluated by Mangosuthu University, in consultation with the Employer, and the Diploma can only be awarded once the experiential learning has been completed satisfactorily.

The Department will set up periodical meetings with representatives of training providers and academic staff will visit students in training and their mentors at least once to discuss the progress students are making with experiential training. The emphasis during these visits will be on co-operation with the employers so that the student will gain maximum benefit from the experiential training component of the course.

Experiential training has to be verified by the training provider before the Diploma can be awarded. This means that the mentor must sign each page of the student's log book.

The University requires that verification of experiential training be carried out by a senior person within the organisation who is registered with PLATO in one of the following categories; Surveyor; Professional Surveyor (Engineering) or Professional Land Surveyor.

2.3 Access Courses: (Pre Tech) – Civil Engineering (Pre-Tech) – Surveying

2.3.1 Admission Requirements

- i) National Senior Certificate with rating codes:
 - English Home Language (3)
 - English First Additional Language (3)
 - Mathematics (3)
 - Physical Science (3)
 - Satisfactory achievement in Home Language (4)
- ii) A minimum of 130 total credits, with a maximum of 60 credits with "Partial Achievement" at NQF Level 4
- iii) Senior Certificate or equivalent qualification with a pass in
 - Mathematics SG (D)
 - Physical Science SG (D)
- iii) N3 certificate and a minimum E (SG) symbol in English

2.3.2 Duration of Study

Study will be for a period of six months.

2.3.3 Subjects, Curriculum Compilation, Course Codes

Code	Subjects	*C/O	Assessment Method
Access Course: Civil Engineering			
ACOMC11	Communication	C	Exam
AMATC11	Mathematics	C	Exam
ADRAC11	Drawing	C	Continuous
APHYS11	Physics	C	Exam

ASURV11	Surveying	C	Continuous
AINC011	Introduction to Construction	C	Exam
Access Course: Surveying			
ACOMC11	Communication	C	Exam
AMATC11	Mathematics	C	Exam
ADRAS11	Survey Drawing	C	Continuous
APHYB11	Survey Physics	C	Exam
AGEOM11	Introduction to Geomatics	C	Continuous
ASCOMP1	Computation in Surveying	C	Continuous
C=Compulsory; O=Optional			

2.3.4 Examination Regulations

Refer to General Handbook Rule 22

2.3.5 Pass Requirements

Students should pass ALL subjects at 50%.

2.3.6 Practicals

Students are expected to attend all practicals offered in the course.

This course may not be repeated.

2.4 Diploma in Civil Engineering : (4-Year Programme - ECP)

NQF Level : 6

SAQA Credits : 360

Duration : 4 years

The minimum study period for the Diploma: Engineering Civil is usually three years. However, students are usually under-prepared and some complete the programme in 4, 5 or 6 years. A 4-year programme (also known as the Extended Curriculum programme) has been designed to provide structured support to students over a period of four years. A range of additional interventions are offered to students who are accepted to this programme. This programme has been a response to the well-known inequalities in the South African society and to cater for varying levels of student preparedness. It ensures that sufficient support is provided during the initial years of study while guaranteeing the same exit standards as the 3-year programme.

The 4-year programme addresses gaps and disparities in students' educational and life experience so that they can be better equipped to manage the diploma programme. It also provides students with broad educational and life skills, including Mathematics, language literacy and subject knowledge. While students are mostly tutored separately in small classes in the first year, they undertake their studies and lectures as integral members of the Diploma student group.

This programme in Civil Engineering is further unique and designed in such a way that after the first semester, students may transfer to similar programmes in Mechanical Engineering or Electrical Engineering without sacrificing time or quality of training.

Statement of Purpose

The purpose of the Diploma: Engineering: Civil is to prepare a civil engineering technician, who will satisfy the criteria for registration as a professional technician (by the

Engineering Council of South Africa (ECSA), for advanced study in civil engineering and/or to gain employment by function as a competent member of an engineering team in the execution of technical tasks, under supervision, by applying his/her knowledge, skills and techniques necessary for civil engineering practice.

2.4.1 Exit Level Outcomes

A person in possession of this qualification will be able to do the following:

- Identify, analyse and produce solutions to problems related to the civil engineering/ surveying environments as presented in classroom and laboratory examples and practicals; and as encountered in the real-life work context as part of experiential learning.
- Apply analytical and practical techniques and knowledge related to the specific disciplines of civil engineering/ surveying.
- Conduct civil engineering/ surveying operations and apply practical skills related to the specific real-life working environment as addressed through laboratory practicals, and specific skills training and projects done in industry during experiential training.
- Communicate in a professional manner using the language, concepts, models, techniques and equipment encountered in the engineering/ surveying working environment.
- Apply mathematical techniques and interpret results of mathematical calculations to assist in the solving of engineering/ surveying problems.
- Use basic scientific and technological principles in an engineering/surveying applied context.
- Analyse the overall functioning and purpose of a particular organisation.
- Organise and give directions to the work of self and others.
- Work as part of a team or independently as required by the work environment.
- Work ethically, safely and responsibly with due consideration for the environment and fellow human beings.

2.4.2 Minimum Admission Requirements

Admission for selection to the 4-year programme is granted to those applicants who meet the minimum admission requirements for the corresponding regular programme. Candidates shall have obtained a valid National Senior Certificate or Senior Certificate or NQF Level 4 with the following minimum rating codes:

Table 1: Minimum admission requirements for applicants with a National Senior Certificate

Programme	English Home Language or English Additional Language	Mathematics	Physical Science	Home Language
ECP	4 or 5	4	4	-
RP	4 or 5	4	4	-

In addition the minimum total points must be 20.

Table 2: Minimum admission requirements for applicants with a Senior Certificate

Programme	English	Mathematics	Physical Science	Technical Drawing
ECP	D(HG) or C(SG)	D(HG) or C(SG)	D(HG) or C(SG)	D(HG) or C(SG)
RP	D(HG) or C(SG)	D(HG) or C(SG)	D(HG) or C(SG)	D(HG) or C(SG)

In addition the minimum total points must be 20.

Table 3: Minimum admission requirements for applicants with NQF Level 4

Programme	Credits required
ECP	A minimum of 130 total credits, with a maximum of 60 credits with "Partial Achievement", at NQF Level 4
RP	A minimum of 130 total credits, with a maximum of 60 credits with "Partial Achievement", at NQF Level 4

ECP: Extended Curriculum Programme; **RP:** Regular Programme;
HG: Higher Grade; **SG:** Standard Grade;
NQF: National Qualifications Framework

Note:

Even if a candidate satisfies the stated admission requirements, he/she will not automatically be accepted. Admission is based on applicants passing an entrance test, on merit and the number of available spaces.

2.4.3 Subjects, Curriculum Compilation, Course Codes

National Diploma (ECP)	Diploma (ECP)	Subjects	*C/O	Semester /Year	NQF Level	Pre-requisites	Co-requisites	
BASC001	BASC000	Basic Science I	C		4			
COSL001	CLIT000	Computer Literacy I	C		4			
FLS118	LSSS000	Life Skills and Study Skills	C		4			
DRAW001	DWIN000	Drawing	C		4			
MAT001	MATH000	Mathematics	C		4			
COMS001	CKIL000	Communication Skills I	C		4			
ENCA001	ENGC000	Engineering Calculations	C		4	Mathematics		
ENSC001	ESCI000	Engineering Science I	C		4	Basic Science I		
COSL010	CAPL000	Computer Applications I	C		4	Computer Literacy I		
DRAW002	DRIG000	Drawing002	C		4	Drawing001 and Basic Science I		
APME118	APPC101	Applied Mechanics for Civil Engineers	C	S1	5	Engineering Science I		12
COSC118	CMSK101	Computer Skills I	C	S1	5	Computer Applications I		12

COST118	CSTM101	Construction Methods I	C	S1	5			8
DRAW118	CEDR101	Civil Engineering Drawing 1	C	S1	5	Drawing 001/002 and Basic Science I		8
MATC118	MAMT 101	Mathematics I	C	S1	5	Mathematics		12
	STPR101	Surveying: Theory and Practical	C	S1	5			12
COMC118	CMMS102	Communication Skills IA	C	S2	5	Communication Skills		8
CONST18	CSTM102	Construction Materials I	C	S2	5			12
DRAW128	CEDR 102	Civil Engineering Drawing II	C	S2	5	Drawing I		8
MACI118	CENM 102	Civil Engineering Management	C	S2	5			8
MATC128	MAMT 102	Mathematics II	C	S2	5	Mathematics I		12
THES128	TSTR 102	Theory of Structures II	C	S2	5	Applied Mechanics I		12
	ENPC 102	Engineer practice and communication (Engineer in Society and Professional Ethics)	C	S2	5			8
GEEN128	GSME 201	Geology and Soil Mechanics	C	S3	6	Mathematics II, Construction Materials I, Construction Methods I and Theory of Structures II		12
RECO138	RFCM 201	Reinforced Concrete & Masonry Design III	C	S3	6	Theory of Structures II, Drawing II and Mathematics II	Structural Analysis II	12
TREN128	TRPE 201	Transportation Eng.	C	S3	6	Drawing II, Surveying (Civil) II, Mathematics II and Construction Materials I		8
WAEN128	WATE 201	Water Engineering I	C	S3	6	Theory of Structures II and Mathematics II		12
-	ENVE128	Introduction to Environmental Engineering	C	S3	6	Mathematics II and Civil Engineering Management	-	8
	CENS 201	Engineering Statistics	C	S3	6	Mathematics II		12
	DOCE201	Documentation for Civil Engineers	C	3	6			8
	CEDE 202	Civil engineering design	C	S4	6	Completion of S3		16

GEEN138	GEEG 202	Geotechnical Eng.	C	S4	6	Geology and Soil Mechanics		12
STAN138	SANL202	Structural Analysis	C	S4	6	Theory of Structures II and Mathematics II		12
STEE138	STTD 202	Structural Steel & Timber Design III	C	S4	6	Theory of Structures II & Civil Eng., C E Drawing II		12
TREN138	EAPD 202	Earthworks and Pavement Design	C	S4	6	Transportation Eng.		12
WAEN138	WATE202	Water Engineering II	C	S4	6	Water Engineering I		12
	CEPR000	Work readiness program						
CEPR018	CIPR301	Civil Engineering Pract. I	C		5	Engineer practice and communication (Engineer in Society and Professional Ethics)		40
CEPR028	CIPR302	Civil Engineering Pract. II	C		6	Civil Engineering Practice I		40
O=Optional; C=Compulsory								

Note: The revised diploma above has been phased-in gradually and it will be fully phased-in by the 1st semester of 2023. Also, the following S3 and S4 old diploma modules below will be phased-out by the end 2023.

GEEN128	GEOE201	Geotechnical Engineering II	C	S3	6	Mathematics II, Construction Materials I, Construction Methods I and Theory of Structures II	
MACI128	MANC201	Management (Civil) II	C	S3	6	Management(Civil) I	
RECO138	RECM201	Reinforced Concrete and Masonry Design III	C	S3	6	Theory of Structures II, Drawing II and Mathematics II	Structural Analysis II
STAN128	STRA201	Structural Analysis II	C	S3	6	Theory of Structures II, Mathematics II	
TREN128	TRAN201	Transportation Engineering II	C	S3	6	Drawing II, Surveying (Civil) II, Mathematics II and Construction Materials I	
WAEN128	WATE201	Water Engineering II	C	S3	6	Theory of Structures II and Mathematics II	
-	CEPR000	Work Readiness program	-	-	-	-	-
DOCU138	DOCM202	Documentation III	C	S4	6		
GEEN138	GEOE202	Geotechnical Engineering III	C	S4	6	Geotechnical Engineering II	
STAN138	STRA202	Structural Analysis III	C	S4	6	Structural Analysis II	

STEE138	STST202	Structural Steel and Timber Design III	C	S4	6	Theory of Structures II and Drawing II	Structural Analysis III
TREN138	TRAN202	Transportation Engineering III	C	S4	6	Transportation II	
WAEN138	WATE202	Water Engineering III	C	S4	6	Water Engineering II	
CEPR018	CIVP301	Civil Engineering Practice I	C			Work Readiness program	
CEPR028	CIVP302	Civil Engineering Practice II	C			Civil Engineering Practice I	

2.4.4 Two (2) semesters of appropriate Civil Engineering work integrated learning to be completed. See Par. 2.1.4 above.

It is the student's responsibility to register his/her training. This must be done before or on commencement of the training. Students who experience any problem when trying to register must contact the Head of Department for advice.

Students who do not register their work integrated learning cannot be monitored and evaluated resulting the training **NOT** being recognised.

2.4.5 Course Content

Diploma (ECP)	Diploma	Subjects	Contents
APPC101	AMCE101	Applied Mechanics for Civil Engineers	Unit 1: Numbers and conversions, Unit2 : Forces, Equilibrium concept and first condition of equilibrium , unit 4: Moment of forces and second condition of equilibrium, beams, frames, support reactions , shear force , bending moment, Unit 4 : Internal forces in structures and frames , Unit5 : centre of gravity and centroids , Unit 6: Moment of inertia , Unit 7 : Friction and wedges ,unit 8 : Work ,power and energy , Unit 9 : Conservation of momentum , unit 10 : simple machines , Unit 11 : applied Kinematics Practicals : Forces , Moment of forces , centroids
CMSK101	COSK101	Computer Skills I	The syllabus includes: hardware; software; data communications; computer applications; Windows; theory of computer and introduction to excel, word processing and spreadsheets.
CSTM101	CMET101	Construction Methods I	This course covers the very basics of the following topics: earthworks, structures, road engineering, dams, bridges, tunnels, harbours, railways, airports, safety, drainage, and labour-enhanced construction.
CEDR101	CIED101	Civil Engineering Drawing 1	The syllabus includes: Reinforced Concrete, Structural Steelwork, and Surveying.
MAMT 101	MATH101	Mathematics I	The syllabus includes: basic algebra and trigonometry; differential calculus with applications; integral calculus with applications; statistics, complex numbers and hyperbolic functions.

STPR101	SUTP101	Surveying: Theory and Practical	Surveying ,Geomatics, Types of Surveying ,Branches of Surveying ,Spatial Data,Co-ordinate systems and map projection systems used in South Africa Coordinate calculations Joins and Polars ,Levelling ,Introduction to Spirit Levelling, Principles of Spirit Levelling ,Angle and distance measurement Introduction to Electromagnetic Distance Measurement (EDM),Traversing, Site Surveying, Coordinates of intersecting lines Traversing, Coordinate calculations Joins and Polars, Circular curves, Transition curves, Vertical Curves, Angle and distance measurement, Construction surveying, GIS.
CMMS102	COSK102	Communication Skills IA	The syllabus includes: hardware; software; data communications; computer applications; Dos; Windows; theory of computer and introduction to Office XP, word processing and spreadsheets.
CSTM102	CMAT102	Construction Materials I	The syllabus includes: The study of soil, concrete, bitumen, other common materials found on construction site, environment issues and internal building materials and finishes; introduction to Soil and concrete practicals.
CEDR 102	CIED 102	Civil Engineering Drawing II	The syllabus includes: Introduction to AutoCAD, Geometric Construction, First Angle Orthographic, Isometric, and Beams & Slabs.
CENM 102	CEMA102	Civil Engineering Management	The syllabus includes: Management of construction project, Management of construction company, Management of engineering design, Economic analysis, Contract management, Management of industrialized building and Management information systems.
MAMT 102	MATH102	Mathematics II	The syllabus includes: further differential and integral calculus with applications; matrix algebra; linear programming; statistics and differential equations.
TSTR 102	THST102	Theory of Structures II	The syllabus includes: The study of sectional properties of structural members, stresses and strains, simply supported beams and cantilevers with point loads, uniformly distributed and uniformly varying loads and analysis of statically determinate pin-jointed frames.
ENPC 102	EPAC 102	Engineer practice and communication (Engineer in Society and Professional Ethics)	The syllabus includes: The world of work, developing employability skills, developing employability skills, skills inventory, professional writing, interviews, industry presentations, discipline-specific topics.
GSME 201	GESM201	Geology and Soil Mechanics	The syllabus includes: The study of soil in terms of densities, moisture contents, liquid limits, soil classification, identifying the type of material to be used during construction
RFCM 201	RECM201	Reinforced Concrete & Masonry Design III	The syllabus includes: Loading & resistance (partial factors), limit states design & Analysis (Ultimate and serviceability limit state), design of

			structural members (Beam, slabs, columns and foundations) and concrete practicals (flexural strength test, workability of concrete and cubes test)
TRPE 201	TENG201	Transportation Eng.	The syllabus includes: Transportation planning, traffic engineering, route location, design criteria, horizontal alignment, vertical alignment, cross-sectional elements, safety barriers, intersection and interchange design.
WATE 201	WENG 201	Water Engineering I	The syllabus includes: The study of pressures in fluids, calculating hydrostatic forces on various shapes of sluice gates, fluid flow by means of gravitational acceleration, fluid flow by means of centrifugal pumps, losses in pipes. It involves also general aspects of water treatment, general methods of water treatment, overview of conventional water treatment processes, stabilization of water for domestic use, processes for desalination of water, treatment problems related to the operation of treatment plants, safety issues in treatment plant, wastewater treatment processes and sludge disposal.
ENVE128	ENVE201	Introduction to Environmental Engineering	The syllabus includes: General aspects of Water treatment, Conventional Water treatment processes, Point of use treatment processes, Treatment of sewage, The complete treatment, Wastewater flows and characteristics, Operations of water works, Wastewater collection systems, and Urban Planning
CENS 201	CENS 201	Engineering Statistics	The syllabus includes: Descriptive Statistics, Basic Probability concepts, Random variables and Probability distributions, Statistical intervals of a single sample, Estimation of parameters and testing of Hypotheses, Regression analysis, Computer-aided statistical analysis of data (e.g.: Excel®, R Statistics and Design Expert®). And Applications on engineering problems
DOCE201	DOCE201	Documentation for Civil Engineers	The syllabus includes: The study of Quantities, Estimating, Specifications and General Conditions of Contract.
CEDE 202	CIED 202	Civil engineering design	This module involve the provision of solution to basic civil engineering problems through design projects and its presentation.
GEEG 202	GEOT 202	Geotechnical Eng.	The syllabus includes: Total, pore-water and effective stresses, shear strength of soils, permeability of water through soils, consolidation, slope stability, foundations, and site investigations.
SANL202	STRU 202	Structural Analysis	Structural analysis is the determination of the effects of loads on physical structures and their components. The syllabus includes the analysis for the following; Moment area theorem, Moment distribution, Plastic theory, Strain energy for frames.
STTD 202	SSTM 202	Structural Steel & Timber Design III	The syllabus includes: Loading and resistance (partial factors), limit states design and Analysis, connection design (bolted and welded connections), columns base plate connection, elements design (grade of structural steel, axial tension, axial compression, bending and deflection); practical (timber test).

EAPD 202	EWPD 202	Earthworks and Pavement Design	The syllabus includes: The study of Bitumen, coal tar, Pavement materials, Surfacing materials, Modified Bitumen, Bitumen surfacing and seal design and pavement rehabilitation and design. It also includes; introduction to Bitumen Practical and model maker software.
WATE202	WENG 202	Water Engineering II	The syllabus includes: The study of hydrology, stormwater design, Patching of records for rainfall, Open channel uniform flows and open channel non uniform flows, Water demand and distribution, Dam design, Borehole construction and water resources management. It includes abstraction from a single well in an unconfined aquifer piratical and ARCGIS software.

2.4.6 Restriction on Subjects

A student can only continue with a subject in the 4-year programme of the same name at the next level if the same subject at the preceding level has been passed. In addition, the following pre-requisites apply with respect to the subjects and associated credits in the 4-year programme:

2.4.7 Examination Regulations

Refer to General Handbook Rule: 22

2.4.8 Pass Requirements

A candidate passes a subject if a final mark of at least 50% is obtained. The final mark consists of 40% of the year mark and 60% of the examination mark for examination subjects.

A candidate must obtain a sub-minimum of 40% in the examination to pass a course. Where the examination in a course consists of two or more papers, a sub-minimum of 40% must be obtained in each paper.

The student's performance in certain subjects is assessed by Continuous Evaluation, and no examinations are written. Details of this assessment method are included in the relevant subject Study Guides.

2.4.9 Practicals / Laboratory

Practical work is done in the following subjects and forms part of the assessment:

Surveying I & Surveying (Civil) II

Details of the assessment of the practicals are given in the relevant Study Guides.

Laboratory work is done in the following subjects:

Applied Mechanics I	Structural Analysis III
Construction Materials I	Water Engineering III
Theory of Structures II	Geotechnical Engineering III
Structural Analysis II	Reinforced Concrete and Masonry Design III
Drawing II	Structural Steel and Timber Design III
Water Engineering II	Transportation Engineering III
Geotechnical Engineering II	

Details of these assessments of laboratory work are given in the relevant Study Guides.

Note: Students have to report to the relevant subject lecturer for all their practical classes within the first week of lectures. **This also applies to students who register late.**

- 2.5 **Diploma in Surveying** : (4-Year Programme - ECP)
NQF Level : 6
SAQA Credits : 360
Duration : 4 years

The Extended Curriculum Programme (ECP) for Surveying is a four year course. The first year of study is foundational and is split into two semesters. From the second year the courses are identical to the diploma programme.

The admission requirements for the ECP Programme are as below:

2.5.1 Minimum Admission Requirements

Admission for selection to the 4-year programme is granted to those applicants who meet the minimum admission requirements for the corresponding regular programme. Candidates shall have obtained a valid National Senior Certificate or Senior Certificate or NQF Level 4 with the following minimum rating codes:

- **Table 1:** Minimum admission requirements for applicants with a National Senior Certificate

Programme	English Home Language or English Additional Language	Mathematics	Physical Science	Home Language
ECP	4 or 5	4	4	-
RP	4 or 5	4	4	-

In addition the minimum total points must be 20.

- **Table 2:** Minimum admission requirements for applicants with a Senior Certificate

Programme	English	Mathematics	Physical Science	Technical Drawing
ECP	D(HG) or C(SG)	D(HG) or C(SG)	D(HG) or C(SG)	D(HG) or C(SG)
RP	D(HG) or C(SG)	D(HG) or C(SG)	D(HG) or C(SG)	D(HG) or C(SG)

In addition the minimum total points must be 20.

Table 3: Minimum admission requirements for applicants with NQF Level 4

Programme	Credits required
ECP	A minimum of 130 total credits, with a maximum of 60 credits with "Partial Achievement", at NQF Level 4
RP	A minimum of 130 total credits, with a maximum of 60 credits with "Partial Achievement", at NQF Level 4

ECP: Extended Curriculum Programme;

HG: Higher Grade;

NQF: National Qualifications Framework

RP: Regular Programme;

SG: Standard Grade;

Note: Even if a candidate satisfies the stated admission requirements, he/she will not automatically be accepted. Admission is based on applicants passing an entrance test, on merit and the number of available spaces.

2.5.2 Subjects, Curriculum Compilation, Course Codes

SUBJECTS	National Diploma (ECP) CISURE	Diploma (ECP) CISENE	PREREQUISITES
YEAR 1			
First Semester			
Basic Science	EFBS101	BCIE001	-
Computer Literacy	EFCL101	COLI001	-
Introduction to English Communication Skills	EFCS101	IECS001	-
Basic Drawing	EFBD101	BADR001	-
Basic Mathematics	EFBM101	BAMA001	-
Second Semester			
Mathematics	EFMA102	MATH002	Basic Mathematics
Survey Drawing	EFSD102	SURD002	Basic Drawing
Survey Physics	EFSP102	SUPH002	Basic Science
Introduction to Geomatics	EFIG102	INGE002	- -
Computation in Surveying	EFCO102	COSU002	Computer Literacy
YEAR 2			
First Semester			
Computer Skills I	ERCO201	CMPK101	Computation in Surveying
Construction Methods I	ERCM201	CONM101	- -
Drawing I	ERDR201	DANG101	Survey Drawing
Mathematics I	ERMA201	MAMT101	Mathematics
Surveying I	ERSU201	SRVY101	Introduction to Geomatics
Physics I	ERPH201	PSCS101	Survey Physics
Second Semester			
English Communication Skills I	EREC202	ECMK102	Introduction to English Communication Skills
Geography I	ERGG202	GEGR102	- -
Mathematics II	ERMA202	MAMT102	Mathematics I
Photogrammetry II	ERPG202	PHTO102	Surveying I & Mathematics I
Surveying II	ERSU202	SRVY102	Surveying I
Survey Drawing II	ERSD202	SDRW102	Drawing I
YEAR 3			
First Semester			
English Communication Skills II	EREC301	ECMK201	English Communication Skills I
Control Surveying III	ERSU301	CSRV201	Surveying II

Legal Principles I	ERLP301	LGLP201	- -
Statistics I	ERST301	STSS201	Mathematics II
Photogrammetry III	ERPG301	PHTO201	Photogrammetry II
Management (Civil) I	ERMC301	MCVL201	-
Second Semester			
Adjustment of Errors III	ERAE302	ADJE202	Statistics I, Mathematics II, Surveying II
Cadastral Surveying III	ERCS302	CADS202	Survey Drawing II, Surveying II, Legal Principles I
Computer Applications III	ERAC302	CMA202	Computer Skills I, Surveying II
Geographic Information Systems III	ERGI302	GINS202	CO-REQUISITE: Computer Applications III
Surveying III	ERSU301	SRVY202	Surveying II
English Communication Skills III	ERES302	EMCK301	English Communication Skills II
Work Readiness Program	-	SUPR000	-
YEAR 4			
First Semester			
Survey Practice I (WIL)	ERSP401	SPRA301	Work Readiness Program Surveying II
Second Semester			
Survey Practice II (WIL)	ERSP402	SPRA302	Survey Practice I

2.5.3 Course Content Diploma / ECP

- **Computer Skills I (COML101 / CMPK101)**

The syllabus includes: Computers and Information Processing, Windows 10, Word processing, Spreadsheets, Internet and e-mail, Online collaboration

- **Construction Methods I (CMET101 / CONM101)**

The syllabus includes: earthworks & construction plants, structures (steel, concrete & bricks), dams, transportation: (road; bridge; tunnel; railway; harbour; airport), drainage & water supply, policy matters, safety, labour-enhanced construction.

- **Drawing I (DRNG101 / DANG101)**

the syllabus includes: introduction to CAD, introduction to google earth, use CAD to draw longitudinal profiles, a topographical plan, a cadastral diagram, traverse data.

- **Mathematics I (MATE101 / MAMT101)**

The syllabus includes: Find equations of ellipse and to sketch them, solve exponential and logarithmic equations, sketch trigonometric graphs and solve trigonometric equations in radians, find derivatives of functions and to apply differentiation for maximisation and minimization, integrate and use integration to find area under a curve, work with complex numbers, use matrix in solving system of equations.

- **Surveying I (SURY101 / SRVY101)**

The syllabus includes: spirit levelling, angular observations, distance measurement, the South African coordinate system, join and polar calculations, traversing, tacheometry, area and volume calculations.

- **Physics I (PHSC101 / PSCS101)**

The syllabus includes: graphing & vectors, density, kinematics, dynamics, energy, electrostatics, magnetic fields.

- **Communication Skills IA (COLL102) / English Communication Skills I (ECMK102)**

The syllabus includes: academic writing skills, communication theory; meetings; public speaking & presentation skills; report writing skills.

- **Geography I (GEOG102 / GEGR102)**

The syllabus includes: the solar system, climatology, oceanography, geomorphology, map, projections, GIS.

- **Mathematics II (MATE102 / MAMT102)**

The syllabus includes: further differential and integral calculus with applications; matrix algebra; statistics and differential equations, hyperbolic functions.

- **Photogrammetry II (PHOT102 / PHTO102)**

The syllabus includes: digital images, determination of heights of images, parallax measurements, planimetric positions, use of digital photogrammetric software, flight planning.

- **Surveying II (SURY102 / SRVY102)**

The syllabus includes: electromagnetic distance measurement, intersection, resection, trilateration, setting out of curves, topographic surveys, GPS.

- **Survey Drawing II (SURD102 / SDRW102)**

The syllabus includes: advanced CAD functions, complex topographical plan, cadastral working plan, cadastral diagram from working plan, using CAD to present horizontal curve data.

- **Communication Skills IB (COLL201) / English Communication Skills II (ECMK201)**

The syllabus includes: the process of writing, business writing, visual literacy, surveying terms, progress report writing, status reports, business correspondence, meetings.

- **Control Surveying III (COSU201 / CSRV201)**

The syllabus includes: triangulation networks, resection with graphical adjustment, calibration of total stations and EDMs, traverse with external orientation, trilateration with graphical adjustment, trigonometric levelling networks, advanced GPS surveys.

- **Legal Principles I (LEGP201 / LGLP201)**

The syllabus includes: classification of South African law, the South African judiciary, contract law, business enterprises, personal and real rights, ownership, leases and servitudes, registration of surveyors, Geomatics Act, Land Survey Act, Expropriation Act.

- **Statistics I (STTT201 / STSS201)**

The syllabus includes: probability density functions, Binomial distribution, normal distribution, mean and variance of random variable, normal approximation to the Poisson distribution, hypothesis testing, regression, chi-squared table, confidence intervals

- **Photogrammetry III (PHOT201 / PHTO201)**

The syllabus includes: stereo photogrammetry, absolute orientation, photogrammetric control, aerial triangulation, ortho rectification, DEM generation, mosaicing, terrestrial photogrammetry, digital photogrammetry, LIDAR

- **Management (Civil) I (MCIV201 / MCVL201)**

The syllabus includes: economic analysis, contract management, management of – a construction project; a construction company; engineering design; an industrialised building; information systems.

- **Adjustment of Errors III (ADER202 / ADJE202)**

The syllabus includes: theory of errors, statistical analysis, matrix algebra. least squares adjustment, network adjustment

- **Cadastral Surveying III (CASU202 / CADS202)**

The syllabus includes: Surveying of boundaries, Land Rights, Forms of Land Title, Surveys conducted by Land Surveyors, Survey Records, Diagrams and General Plans.

- **Communication Skills IC (COLL202) / English Communication Skills III (EMCK301)**

The syllabus includes: corporate CV, interviews, negotiation, small group communication, cross-cultural communication.

- **Computer Applications III (COAP202 / CMAP202)**

The syllabus includes: Apply problem solving techniques and programming skills to solve commercial/scientific problems, apply basic business principles and effectively analyse Business, to be able to provide solutions for specific problems, Implement software solutions in one or more development environments

- **Surveying III (SURY202 / SRVY202)**

The syllabus includes: circular curves, transition curves, vertical curves, deformation surveys, precise levelling, and construction survey.

- **Geographic Information Systems III (GEIS202 / GINS202)**

The syllabus includes: Introduction to Geographic Information Systems, Spatial Data Concepts, Spatial Referencing in GIS, GIS Data Acquisition and Structuring, Spatial Data Quality and Data Sharing, Management of Data in a GIS, Data Analysis in a GIS, Presentation & Dissemination of Spatial Data

- **Work Readiness Program (SUPR000)**

The syllabus includes: Prepares the student for the world of work.

- **Survey Practice I (SUPR301 / SPRA301)**

To promote integration of theoretical concepts learned in the academic environment with industrial practice. To develop other skills, that cannot be fully developed in a classroom, practicals or laboratory environment.

- **Survey Practice II (SUPR302 / SPRA302)**

To promote integration of theoretical concepts learned in the academic environment with industrial practice. To develop other skills, that cannot be fully developed in a classroom, practicals or laboratory environment.

2.5.4 **For Work Integrated learning, see Par 2.2.8 above.**

It is the student's responsibility to register his/her training. This must be done before or on commencement of the training. Students who experience any problem when trying to register must contact the Head of Department for

advice. Students who do not register their work integrated learning cannot be monitored and evaluated resulting the training **NOT** being recognised.

2.5.5 **Restriction on Subjects**

A student can only continue with a subject in the 4-year programme of the same name at the next level if the same subject at the preceding level has been passed. In addition, the following pre-requisites apply with respect to the subjects and associated credits in the 4-year programme:

2.5.6 **Examination Regulations**

Refer to General Handbook Rule: 22

2.5.7 **Pass Requirements**

A candidate passes a subject if a final mark of at least 50% is obtained. The final mark consists of 40% of the year mark and 60% of the examination mark for examination subjects. A candidate must obtain a sub-minimum of 40% in the examination to pass a course. Where the examination in a course consists of two or more papers, a sub-minimum of 40% must be obtained in each paper.

The student's performance in certain subjects is assessed by Continuous Evaluation, and no examinations are written. Details of this assessment method are included in the relevant subject Study Guides.

2.5.8 **Practicals**

Practical work is done in the following subjects and forms part of the assessment:

Surveying I, Surveying II, Control Surveying III, Surveying III, Cadastral Surveying III, Geographic Information Systems III & Photogrammetry III

Details of the assessment of the practicals are given in the relevant Study Guides.

All practicals are compulsory.

Note: Students have to report to the relevant subject lecturer for all their practical classes within the first week of lectures. **This also applies to students who register late.**

3. DEPARTMENT OF ELECTRICAL ENGINEERING

3.1 Diploma in Electrical Engineering

SAQA ID	:	96856
NQF Level	:	6
SAQA Credits	:	360
Duration	:	3 years
Qualification Code	:	ELENDI

Purpose and Rationale of the Qualification

A qualifying learner will be competent to apply technical knowledge, engineering principles and problem-solving techniques in the field of Electrical Engineering by operating within the relevant standards and codes in collaboration with other members of the engineering team.

The qualified person will be able to register with the Engineering Council of South Africa (ECSA) as a Technician-in-Training in the field of Electrical Engineering.

Qualification Rules

The qualification will be awarded to a learner who has provided evidence to the satisfaction of the assessors that the stated competence of the qualification, as detailed in the specified outcomes, has been achieved, either through education or training in a single provider's learning programme or through experience that complies with the stated specified outcomes.

Exit Level Outcomes

A learner who successfully completes this qualification will be able to:

- Practice Electrical Engineering activities and applications at the level expected of a Professional Technician (Engineering)
- Manage Electrical Engineering activities and applications at the level expected of a Professional Technician (Engineering)

3.1.1. Minimum Admission Requirements (3-year Diploma)

- National Senior Certificate with rating codes:
English Home Language (4)
or
English First Additional Language (4)
Mathematics (4)
Physical Science (4)
- A pass in all subjects in the bridging programme offered by the Department of Electrical Engineering at Mangosuthu University of Technology (MUT).
- Senior Certificate or equivalent with a minimum subject-related symbol as follows:
Physical Science C (SG) / D (HG)
Mathematics C (SG) / D (HG)
English C (SG) / D (HG)

- A minimum of 60% pass in N4 Engineering Science, Maths and two other electrical subjects, plus a Matric Certificate or equivalent with English (50% pass).
- NCV Level 4 with a minimum of 50% pass in the following subjects: 3 Fundamental: English, Mathematics (not Maths Literacy) and Life Orientation. A minimum of 60% in Physical Science and any two Electrical-related subjects, preferably Electrical Principles & Practice and Electronic Control & Digital Electronics.
- An appropriate GCE, GCSE, IGCSE or Cambridge School Certificate with at least five subjects at GCE 'O' level including Mathematics, Science and English that has been passed with an A, B or C symbol. Three of the five subjects must have been passed at the same examination sitting. This applies to learners from SADC countries.
- N5/ N6 – Not considered for registration purposes or credit/exemption purposes.

Please take note of the following:

- **Selection will be based on merit and availability of space.**
- **Meeting the minimum requirements does not, in any way, guarantee admission.**

Students with technical College qualifications can apply to be considered for the granting of exemptions according to the Recognition of Prior Learning (RPL) as listed below if they have passed with a minimum of **50%** in every subject.

Technical/FET College Subjects	University Exempted Subjects
Communication N4 and N5	Communication Skills I
Computer Principles N4 and N5	Computer Skills I
Mathematics N4 and N5	Mathematics I
Industrial Electronics N4 and N5	Electronics I
Digital Electronics N4 and N5	Digital Systems I
Electrotechnics N4 and N5	Electrical Engineering I
Engineering Science N4 and N5	Physics I
Strength of Materials and Structures N4 and N5	Strength of Materials II

3.1.2. Duration of Study

Three years, consisting of Four Semesters (S1, S2, S3 & S4) of formal time (full-time study at the University) over a minimum of **two years**, and two semesters (P1 & P2) of experiential time (in-service training) undertaken at an accredited training provider/employer over **one year**, in accordance with a prescribed syllabus, and subject to the University's evaluation and approval.

- **Electrical Engineering Practice I (P1) may be done after successful completion of ALL S1, S2, S3 and S4 subjects.**
- Electrical Engineering Practice II (P2) must be done after the successful completion of P1.
- Electrical Engineering Practice (P1 or P2) must be registered on the date the training commences.

3.1.3. Curriculum Compilation and Pre-Requisites

- i) The Diploma will be issued on completion of 268 credits of formal time taken from the offerings below, and 92 credits of experiential time, for a total of 360 credits.
- ii) Attendance of P0 (a work readiness program) is compulsory and is used as an eligibility criterion for placement for Work Intergraded Learning.
- iii) A learner doing P1, registers for Electrical Engineering Practice I, and one doing P2 registers for Electrical Engineering Practice II. **Registration must be done on or before the date of commencement.** Completion of two semesters of experiential training, in accordance with the guidelines laid down in the logbook, will generate a credit of 92.
- iv) There are four specialisation streams i.e., Power Systems Engineering (**ELDIPS**), Electronics and Telecommunication Engineering (**ELDIET**), Process Automation and Control Engineering (**ELDIME**) and Mechatronics Engineering (**ELDIME**).
- v) Students select their area of specialization during the S2 level enrollment. After registration for S2 no further changes of streams are allowed. For curriculum compilation, the department will consider electives as compulsory subjects for the chosen stream. All specialization subjects are compulsory for graduation.
- vi) The offering of specialization subjects in each stream may alternate between semesters.
- vii) The effective commencement date of this curriculum was the First Semester of 2021.
- viii) The twelve (12) ECSA GAs are assessed in exit levels subjects, Table 1.
- ix) If a student fails a Graduate Attribute (GA) assessment in any exit level subject, he/she automatically fails the subject.
- x) Students need to achieve a sub-minimum mark of 50% in the Practical to be granted DP. Otherwise, they automatically fail the subject.

Table 1. ECSA Graduate Attributes Table at the Expose, Develop and Assessment Stages

Subjects	NQF Level	Credits	Core/ Elective	Assessment Method	Exposure	Development	Assessment
SEMESTER 1							
					EXPOSED	DEVELOPED	ASSESSED
Mathematics I	5	12	C	EXAM	GA1, GA9		
Physics I	5	12	C	EXAM		GA2, GA4	
Communication Skills I	5	5	C	EXAM	GA6, GA8		
Computer Skills I	5	5	C	EXAM	GA5, GA9		
Electrical Engineering I	5	10	C	EXAM	GA1, GA5		
Electronics I	5	10	C	EXAM	GA1, GA5		
Digital Systems I	5	10	C	EXAM	GA3, GA5		
SEMESTER 2							
Mathematics II	5	12	C	EXAM		GA1, GA9	
Electrical Engineering II	5	10	C	EXAM		GA1, GA9	
Electronics II	5	10	C	EXAM		GA1, GA5	
Digital Systems II	5	10	C	EXAM		GA3, GA5	
Projects I	5	10	C	CONT	GA3, GA7		

Electrical Machines II	5	10	E	EXAM		GA5,	
Electronic Communication II	5	10	E	EXAM		GA2	
Process Instrumentation II	5	10	E	EXAM		GA4	
Strengths of Materials II	5	10	E	EXAM		GA5,	
SEMESTER 3							
Digital Systems III	6	12	C	EXAM		GA3, GA5	
Mathematics III	6	12	C	EXAM		GA1, GA9	
Projects II	5	10	C	CONT		GA3, GA7	
Software Design II	6	12	C	EXAM		GA5,	
Control Systems II	6	12	C	EXAM		GA4, GA5	
Electrical Engineering III	6	12	E	EXAM		GA1, GA5	
Digital Communications II	6	12	E	EXAM		GA2	
Process Instrumentation III	6	12	E	EXAM			GA4
Mechatronics III	6	12	E	EXAM		GA5,	
SEMESTER 4							
Design Projects III	6	12	C	CONT			GA3, GA6, GA7,GA8
Software Design III	6	12	C	EXAM			GA11
Power Electronics III	6	12	E	EXAM			GA1
Electrical Machines III	6	12	E	EXAM			GA5
Electrical Distribution III	6	12	E	EXAM			GA4
Electrical Protections III	6	12	E	EXAM			GA2
Radio Engineering III	6	12	E	EXAM			GA2
Signal Processing III	6	12	E	EXAM			GA5
Electronics III (Elective)	6	12	E	EXAM			GA1
Microwave Communications III	6	12	E	EXAM			GA4
Control Systems III	6	12	E	EXAM			GA2
Automation III	6	12	E	EXAM			GA5
Robotics III	6	12	E	EXAM			GA4
WIL (P1)	6	44			GA9, GA12	GA10, GA9, GA12	GA10,
WIL (P2)	6	48					GA9, GA10,GA12

GA1-Problem solving
GA2-Application of scientific and engineering knowledge
GA3-Engineering Design
GA4-Investigation
GA5-Engineering methods, and tools, including information technology
GA6-Professional and Technical communication
GA7-Impact of Engineering activity
GA8-Individual and teamwork
GA9-Independent learning
GA10-Engineering professionalism
GA11-Engineering management
GA12-Workplace practice

4.1.4 Diploma in Electrical Engineering course summary (ELENDI)

Diploma in Electrical Engineering (96856) (3 Years)			
S1 Subjects			
Communication Skills I			
Computer Skills I			
Mathematics I			
Electrical Engineering I			
Electronics I			
Digital Systems I			
Physics I			
S2 Subjects			
Power Systems Engineering (ELDIPS)	Electronics and Telecommunication Engineering (ELDIET)	Process Automation and Control Engineering (ELDIPA)	Mechatronics Engineering (ELDIME)
Digital Systems II	Digital Systems II	Digital Systems II	Digital Systems II
Electronics II	Electronics II	Electronics II	Electronics II
Electrical Engineering II	Electrical Engineering II	Electrical Engineering II	Electrical Engineering II
Mathematics II	Mathematics II	Mathematics II	Mathematics II
Projects I	Projects I	Projects I	Projects I
Electrical Machines II	Electronic Communication II	Process Instrumentation II	Strengths of Materials II
S3 Subjects			
Digital Systems III	Digital Systems III	Digital Systems III	Digital Systems III
Mathematics III	Mathematics III	Mathematics III	Mathematics III
Projects II	Projects II	Projects II	Projects II
Software Design II	Software Design II	Software Design II	Software Design II
Control Systems II	Control Systems II	Control Systems II	Control Systems II
Electrical Engineering III	Digital Communications II	Process Instrumentation III	Mechatronics III
S4 Subjects			
Design Projects III	Design Projects III	Design Projects III	Design Projects III
Software Design III	Software Design III	Software Design III	Software Design III
Power Electronics III	Electronics III	Electronics III	Power Electronics III
Electrical Machines III	Microwave Communications III	Automation III	Automation III
Electrical Distributions III	Radio Engineering III	Control Systems III	Control Systems III
Electrical Protections III	Signal Processing III	Signal Processing III	Robotics III

4.1.5 Subjects, Curriculum Compilation, Course Codes and Pre-requisites

Diploma in Electrical Engineering (3208105) (3 Years)								
Code	Subjects	C/O/E	Semester /Year	Assessment Method	NQF Level	SAQA Credit	Pre-requisites	Co-requisites
CSKI101	Communication Skills I	C	S1	CA	5	5		
COMS101	Computer Skills I	C	S1	CA	5	5		
MATM101	Mathematics I	C	S1	EX	5	12		
ELEN101	Electrical Engineering, I	C	S1	EX	5	10		
ECTR101	Electronics I	C	S1	EX	5	10		
DISY101	Digital Systems I	C	S1	EX	5	10		
PHYC101	Physics I	C	S1	EX	5	12		
	TOTAL S1 Weighting					64		
MTMT102	Mathematics II	C	S2	EX	5	12	Mathematics I	
ELEN102	Electrical Engineering II	C	S2	EX	5	10	Electrical Eng. I Mathematics I	
DISY102	Digital Systems II	C	S2	EX	5	10	Digital Systems I	
PROJ102	Projects I	C	S2	CA	5	10	Electrical Eng. I Electronics I Communication Skills I	
ECTR102	Electronics II	C	S2	EX	5	10	Electronics I	

							Electrical Eng I	
ELMA102	Electrical Machines II	E	S2	EX	5	10	Electrical Eng. I Physics I	Mathematics II
ELCO102	Electronic Communication II	E	S2	EX	5	10	Electronics I Digital Systems I Physics I	
PINS201	Process Instrumentation II	E	S2	EX	5	10	Electrical Eng. I Physics I	
STRE102	Strength of Materials II	E	S2	EX	5	10	Physics I Mathematics I	
TOTAL S2 Weighting						62		
MTMT201	Mathematics III	C	S3	EX	6	12	Mathematics II	
DISY201	Digital Systems III	C	S3	EX	6	12	Digital Systems II	
SFDE201	Software Design II	C	S3	EX	6	12	Digital Systems II	
PRJT201	Projects II	C	S3	CA	5	10	Projects I Electronics II Electrical Engineering II	
COSY201	Control Systems II	C	S3	EX	6	12	Mathematics II	Mathematics III
ELEN202	Electrical Engineering III	E	S3	EX	6	12	Electrical Eng. II Mathematics II	
DIGC202	Digital Communications II	E	S3	EX	6	12	Electronic Comm. II	Mathematics III
PINS202	Process Instrumentation III	E	S3	EX	6	12	Process Instr. II	Mathematics III
MECH201	Mechatronics III	E	S3	EX	6	12	Strength of Materials II Electronics II Digital Systems II	
TOTAL S3 Weighting						70		
DPRO202	Design Project III	C	S4	CA	6	12	Projects II Digital Systems III Maths III	
ELDI202	Electrical Distribution III	E	S4	EX	6	12	Electrical Eng. III	
SFDE202	Software Design III	C	S4	EX	6	12	Software Design II	
PWRE202	Power Electronics III	E	S4	EX	6	12	Electronics II Electrical Eng. II Mathematics III	
ELMA201	Electrical Machines III	E	S4	EX	6	12	Electrical Mach. II Electrical Eng. III	
EPRO202	Electrical Protection III	E	S4	EX	6	12	Electrical Eng. III Mathematics II	Electrical Distribution III
RADE201	Radio Engineering III	E	S4	EX	6	12	Digital Communication II	
ECTR202	Electronics III	E	S4	EX	6	12	Electronics II Mathematics III	
SIPR202	Signal Processing III	E	S4	EX	6	12	Mathematics III	
MCRC202	Microwave Communication III	E	S4	EX	6	12	Mathematics III Digital Communication II	
COSY202	Control Systems III	E	S4	EX	6	12	Control Systems II Mathematics III	

ROBO202	Robotics III	E	S4	EX	6	12	Control Systems II Mechatronics III Mathematics III Digital Systems III	
AUTM202	Automation III	E	S4	EX	6	12	Control Systems II Mathematics III Digital Systems III	
ELDI00	Work Readiness Program	C	S4	CA	NA	NA		
TOTAL S4 Weighting						72		

4.1.6 Examination Regulations

Refer to the General Handbook Rule: G22

4.1.7 Work Integrated Learning (In-Service Training- 92 Credits)

Electrical Engineering Practice I (P1) 44

Electrical Engineering Practice II (P2) 48

Learners who acquired any form of work experience and wishes for this experience to be considered for P1/P2 training will need to comply with institution's RPL Policy. Such applicants may be admitted to diploma qualifications through one of the purposes of RPL namely, access, exemption, accreditation and advancement;

4.1.8 Course Content

CSK1101	Communication Skills I
	Offered by Service Department Communication theory, non-verbal communication (body language), oral presentations, interviews, developing leadership and participation skills. Technical reports and correspondence.
COMS101	Computer Skills I
	Offered by Service Department Learners must acquire theory and practical skills and knowledge. Theory knowledge to be learned is Personal Computer Basics, Computer Filing, Display Devices, Internet Privacy and Security, Connectors and Adapters, Network Basics, Multimedia Devices, Processors and Memory, Data Storage Devices, Network Security Overview and Safety. Practical skills to be acquired are Operating System XP and Application Software Microsoft Office 365 which include Microsoft Word, Microsoft Excel and MS PowerPoint and MS Teams. Introduction to MATLAB and Simulink
MATM101	Mathematics I
	Formative assessment - Tutorials. Summative assessment - Three class tests and Examination. Major Test 1 40% Major Test 2 40% Minor Test 20% Overview of Syllabus: Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration.

ELEN101	Electrical Engineering I
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 35% Test 2 35% Tutorials 10% Practicals 20% Overview of Syllabus: Electrical and Mechanical Quantities, Basic Electrical Components, DC theory and Network Analysis, Electromagnetism and Magnetic circuits, Inductance and Capacitance, Basic AC theory.
ECTR101	Electronics I
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Practical Assignments, Examination Test 1 25% Test 2 25% Tutorials 25% Practicals 25% Overview of Syllabus: Oscilloscopes, Semiconductor theory and atomic structure, PN Diodes and their applications, Bipolar junction transistors and Operational Amplifiers
DISY101	Digital Systems I
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical) and Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Introduction to Digital Systems, Logic gates, Boolean Algebra and Logic Simplification, Combination Logic Analysis, Functions of Combinational Logic, Number Systems:- operation and Codes.
PHYC101	Physics I
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical and mini-project), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Remedial mathematics, basic units, vectors and scalars, kinetics, mechanics, momentum, moments, work, energy and power, pressure, density, heat, optics, waves and sound, electric current, magnetism, radio-activity. Practical physics.
MTMT102	Mathematics II
	Formative assessment - Tutorials. Summative assessment - Three class tests and Examination Major Test 1 40% Major Test 2 40% Minor Test 20% Overview of Syllabus: Revision of differentiation (Mathematics I). Differentiation of functions with more than one variable. Further integration. Numerical methods. First-order ordinary differential equations. Matrices (Gauss elimination).
ELEN102	Electrical Engineering II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination

	Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Alternating Current and Voltage generation, AC RLC circuit components and Phasors, AC Circuit Theorems, Power in AC Circuits, Series and parallel RLC resonant circuits, Introduction to Three Phase systems.
DISY102	Digital Systems II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Latches, Flip flops and Timers, Counters, Shift Registers, Memory and Storage, Digital Signal Interfacing and Processing, Introduction to Microcontrollers.
PROJ102	Projects I
	Course is assessed through continuous assessment. Final Mark (FM) = 25% x Simulation + 25% x Constructed project + 30% measurement and presentation + 20% final Document Overview of Syllabus: PCB Design using Proteus, Simulation using Proteus, Assembling the project, Testing and Debugging, Report.
ECTR102	Electronics II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: DC Power supplies, BJT DC biasing, BJT AC analysis, FET Biasing, Operational Amplifiers
ELMA102	Electrical Machines II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: D.C. Generators, D.C. Motors, Single Phase Transformers, Single Phase induction machines.
ELCO102	Electronic Communication II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Fundamental Concepts of Transmission and Reception, Frequency and Amplitude Modulation Systems, Communication Techniques, Transmitter and Receiver Measurements
STRE102	Strength of Materials II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination

	Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Introduction (Review of statics), axial loading, torsion, pure bending, beams, shearing, stress, transformations, principal stresses and columns.
MATM201	Mathematics III
	Formative assessment • Tutorials. Summative assessment • Three class tests and Examination Major Test 1 40% Major Test 2 40% Minor Test 20% Overview of Syllabus: First-order ordinary differential equations. Higher-order differential equations. Laplace transforms. Infinite series. Fourier series. Matrix analysis. Probability and statistics. Elements of analytic geometry in 2D and 2D space.
DISY201	Digital Systems III
	Formative assessment • Tutorials, Homework, quizzes, Practical Evaluation Summative assessment • Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 20% Practicals 30% Overview of Syllabus: Introduction to Embedded C Programming, Introduction to MPLAB-X, PIC architecture, PIC Programming in C Language, PIC I/O Port Programming, Serial Port Programming in C Language, LCD and Keyboard interfacing, Introduction to ADC and DAC.
SFDE201	Software Design II
	Formative assessment • Tutorials, Homework, quizzes, Practical Evaluation Summative assessment • Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Tutorials 25% Practicals 25% Overview of Syllabus: C++ programming structure, I/O streams and Classes, Control Structures, Arrays and strings, User Defined functions, Data abstraction and inheritance, Exception handling, Recursions
PRJT201	Projects II
	Course is assessed through continuous assessment. The weightings of the assessment are as follows: Final Mark (FM) = 33% x Simulation + 33% x breadboard prototype + 34% x Constructed project. Overview of Syllabus: Simulation, Prototype development, PCB design, Report writing, Preparatory design proposal document.
COSY021	Control Systems II
	Formative assessment • Tutorials, Classroom small-group work, WhatsApp group discussion forum, Student self-assessment through e-learning platform. Summative assessment • Two class tests, Project assignment, Practical Evaluation, Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Introduction to Control Systems; Modelling of Control Systems in Frequency Domain using Laplace Transforms; Time Response of First and Second-order Control Systems; Reduction of Multiple Subsystems; Steady-State Errors; State-Space Representation of dynamic systems.

ELMA201	Electrical Machines III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Three phase transformers, Three phase induction machines, Synchronous machines Alternators), Synchronous machines (Motors)
DIGC202	Digital Communications II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Probability and Random Processes: Probability distributions, Random variables, Random processes, Statistical averages, Correlation, Digital Modulation Techniques: Signal space analysis, BPSK, QPSK, QAM, Digital Demodulation & Detection Techniques: Correlator-demodulator, Maximum likelihood detection (MLD) in additive white Gaussian noise (AWGN), bit error rate (BER) performance, Channel Encoder/Decoder: Linear block codes, Cyclic codes, Convolutional codes, Viterbi algorithm, Information Theory: Source Entropy, Huffman Coding, Channel Capacity.
PINS201	Process Instrumentation II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Control valves & pumps, Control instruments, Continuous control, Sequential control, Instrumentation documentation.
MECH201	Mechatronics III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Introduction to Mechatronics, Transducers, Analogue Signal Conditioning, Actuating Systems, System Interfacing and Data Acquisition, Programmable Logic Controller
DPRO201	Design Projects III
	This subject is assessed through continuous assessment. The course components mark weightings will be determined as follows: - Proposal Document (GA7) = 20% - Project Presentation (GA6) = 20% - Final Document (GA8) = 30% - Project Artefact (GA3) = 30% Overview of Syllabus: Introduction to the Engineering Design Process, Problem definition, Literature review, Generation of multiple solutions. Analysis and selection of most appropriate solution, Testing and implementation, Feasibility study, Project implementation – design, simulation, construction, testing and documentation, Project oral presentation.
ELEN202	Electrical Engineering III
	Formative assessment

	- Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Applications of Complex Numbers in Phasor notations, 3-Phase AC Systems Analysis, Electrical Power Measurement and analysis in 3-Phase AC Systems, Per-unit System, Introduction to AC Power Flow Analysis, Electric Lighting Systems.
ELDI202	Electrical Distribution III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Introduction to generation, Variable loads on power stations, Economics of power generation and Tariffs, Power factor improvement, Supply systems, Mechanical and Electrical design of overhead lines, Performance of transmission lines, Underground cables.
SFDE202	Software Design III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Practical's 50% Overview of Syllabus: Installing a Local Web Server, Installing PHP, MySQL and Apache, PHP Syntax and Functions, Working with PHP in Websites, Creating Databases and working With MySQL, Security in PHP
PWRE202	Power Electronics III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Introduction to power electronics, Power electronics switches, AC to DC converters, DC to DC converters, DC to AC converters, AC to AC converters, Introduction to drives.
EPRO202	Electrical Protection III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Three phase Theory Revision, Introduction to Electrical protection, Symmetrical fault calculations, Instrument transformers, Unsymmetrical fault calculations, Switchgears; circuit breakers, protective relays, fuses, switches, Protection of alternator and transformers, Protection of bus-bars, Overvoltage protection.
RADE201	Radio Engineering III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Electromagnetic waves, Radio propagation techniques and Antennas, Introduction to Radar Systems, Introduction to Cellular networks and Frequencies management, Introduction to Mobile Networks

ECTR202	Electronics III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignment/Project 10% Practicals 50% Overview of Syllabus: Feedback and Oscillator Circuits, Voltage Regulators –SMPS, Two-Terminal Devices, PNP Devices, Linear-Digital ICs, Op-Amp Applications – Amplifiers, Filters, Multi-stage amplifiers
SIPR202	Signal Processing III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Signals and signal processing systems, Discrete time systems in time domain, Discrete time signals in frequency domain, The z Transform
MCR202	Microwave Communication III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: A Review of Electromagnetic Theories and Frequencies Management, Transmission Line Theory, Transmission Lines and Waveguides, Microwave Network Analysis, Impedance Matching and Tuning, Power Dividers, Mixers and Directional Couplers, Microwave Filters, Digital Line-of-Sight Microwave Radio Links.
PINS202	Process Instrumentation III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Automatic Process Control, Control Systems & Instrumentation, Analytical & Renewable Energy Sensors, Boilers, Heat Exchangers & Distillation Columns, Safety & Environmental Control, Industry 4.0
COSY202	Control Systems III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Modelling 1st, 2nd Order systems, Stability, Laplace-Domain Analysis, Frequency-Domain techniques, Feedback compensation, PID Controller Tuning, Case study: SISO system Compensation Simulation.
ROBO202	Robotics III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Robotics overview, Basic mechanics, Robot locomotion principles, Robot environmental interaction (Sensor and actuators), Power sources for robots, Robot Brains, Embedded robotics - systems design process.

AUTM202	Automation III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 10% Practicals 50% Overview of Syllabus: Automation Fundamentals, Automation Justification and Productivity Concepts, Computer Numerical Control (CNC), Introduction to Industrial Robots, Programmable Logic Controllers (PLCs), Programming PLCs, Manufacturing Systems, Industrial Networks and SCADA Systems.
ELDI00	Work Readiness Program
	Overview of Syllabus: Integrate an understanding of the experiential learning process, Identify their own skills Conduct Job Searches, Compile a CV and Cover Letter, Prepare adequately for interviews, Understand his/her role in the workplace: Increase efficiency (Productivity), Identify waste in the workplace, Understand impact of waste on company productivity, Understand importance of planning in the workplace, Understand problem identification and solving, Understand concepts of Quality, Cost and Delivery, Understand Plan Do, Check, Action (PDCA) cycle.

4.1.9 Additional Regulation and Rules

- A learner is not allowed to register for an offering unless the pre-requisite subject(s) have been passed.
- If for any reason, a learner is found to be registered for any subject without the pre-requisite, the learner will automatically be de-registered in that subject.
- Learners may not register for any S4 level subject unless all subjects have been passed at the S1 and S2 level.
- A learner is only allowed to register across two consecutive levels, e.g. S1 & S2 or S2 & S3 or S3 & S4. It is not allowed to register across S1 & S3 or S2 & S4. If for any reason, a learner is found to be registered for any subject without the pre-requisite, the learner will be de-registered immediately.

4.2 Diploma in Electrical Engineering (4 Year Programme)

NQF Level	:	6
SAQA Credit	:	390
Duration	:	4 years
Qualification Code	:	ELENEC

(4-year Diploma) (Extended Curriculum Program)

A 4-year Extended Curriculum Programme (ECP) is designed to provide structured support for underprepared learners. It ensures that sufficient support is provided during the initial year of study while guaranteeing the same exit standards as the 3-year programme.

The first year is generic to Electrical, Civil and Mechanical Engineering. In the second year, the first semester of study, the learner joins the S1 level of the chosen field, i.e. Electrical, Civil or Mechanical Engineering. After acquiring the required skills and knowledge from year 1, the learner follows the same programme as the 3-year Diploma Programme.

Purpose and Rationale of the Qualification

A qualifying learner will be competent to apply technical knowledge, engineering principles and problem-solving techniques in the field of Electrical Engineering by operating within the relevant standards and codes in collaboration with other members of the engineering team.

The qualified person will be able to register with the Engineering Council of South Africa (ECSA) as a Technician-in-Training in the field of Electrical Engineering.

Qualification Rules

The qualification will be awarded to a learner who has provided evidence to the satisfaction of the assessors that the stated competence of the qualification, as detailed in the specified outcomes, has been achieved, either through education and training in a single provider's learning programme or through experience that complies with the stated specified outcomes.

Exit Level Outcomes

A learner who successfully completes this qualification will be able to:

- Practice Electrical Engineering activities and applications at the level expected of a Professional Technician (Engineering)
- Manage Electrical Engineering activities and applications at the level expected of a Professional Technician (Engineering)

4.2.1. Minimum Admission Requirements (4-year Diploma)

- National Senior Certificate with rating codes:
English Home Language (4)
(or)
English First Additional Language (4)
Mathematics (4)
Physical Science (4)
- Senior Certificate or equivalent with a minimum subject-related symbol as follows:
Physical Science C (SG) / D (HG)
Mathematics C (SG) / D (HG)
English C (SG) / D (HG)
- A minimum of 60% pass in N4 Engineering Science, Maths and two other electrical subjects, plus a Matric Certificate or equivalent with English (50% pass).
- NCV Level 4 with a minimum of 50% pass in the following subjects: 3 Fundamental: English, Mathematics (not Maths Literacy) and Life Orientation. A minimum of 60% in Physical Science and any two Electrical-related subjects, preferably Electrical Principles & Practice and Electronic Control & Digital Electronics.
- An appropriate GCE, GCSE, IGCSE or Cambridge School Certificate with at least five subjects at GCE 'O' level including Mathematics, Science and English that has been passed with an A, B or C symbol. Three of the five subjects must have been passed at the same examination sitting. This applies to learners from SADC countries.
- N5 and/or N6 – Not considered for registration purposes or credit/exemption purposes.

Please take note of the following:

- Selection will be based on merit and availability of space.

- **Meeting the minimum requirements does not, in any way, guarantee admission.**

Students with technical College qualifications can apply to be considered for the granting of exemptions according to the Recognition of Prior Learning (RPL) as listed below if they have passed with a minimum of 50% in every subject.

Technical/FET College Subjects	University Exempted Subjects
Communication N4 and N5	Communication Skills I
Computer Principles N4 and N5	Computer Skills I
Mathematics N4 and N5	Mathematics I
Industrial Electronics N4 and N5	Electronics I
Digital Electronics N4 and N5	Digital Systems I
Electrotechnics N4 and N5	Electrical Engineering I
Engineering Science N4 and N5	Physics I
Strength of Materials and Structures N4 and N5	Strength of Materials II

4.2.2. Duration of Study

Three years consisting of Four Semesters (S1, S2, S3 & S4) of formal time (full-time study at the University) over a minimum **two years**, and two semesters (P1 & P2) of experiential time (in-service training) undertaken at an accredited training provider/employer over **one year**, in accordance with a prescribed syllabus, and subject to the University's evaluation and approval.

- Electrical Engineering Practice I (P1) may be done after successful completion of **all S1, S2, S3 and S4** subjects.
- Electrical Engineering Practice II (P2) must be done after successful completion of **P1**.
- Electrical Engineering Practice (P1 or P2) must be registered on the date the training commences.

4.2.3. Curriculum Compilation and Pre-Requisites

- The Diploma will be issued on completion of 30 credits from ECP Year 1 and 268 credits of formal time taken from the S1 to S4 offerings below, and 92 credits of experiential time, for a total of 390 credits.
- Attendance of P0 (a work readiness program) is compulsory and is used as eligibility criterion for placement for Work Intergraded Learning.
- A learner doing P1 registers for Electrical Engineering Practice I, and one doing P2 registers for Electrical Engineering Practice II. **Registration must be done on the date of commencement.** Upon completion of two semesters of experiential training, in accordance with the guidelines laid down in the logbook, will generate a credit of 92.
- There are four specialisation streams i.e. Power Systems Engineering (**ELECPS**), Electronics and Telecommunication Engineering (**ELECET**), Process Automation and Control Engineering (**ELECPA**) and Mechatronics Engineering (**ELECME**).
- Students select their area of specialization during the S2 level enrollment. After registration for S2, no further changes of streams are allowed. For curriculum compilation, the department will consider electives as compulsory subjects for the chosen stream. All specialization subjects are compulsory for graduation.

- vi) The offering of specialization subjects in each stream may alternate between semesters.
- vii) The effective commencement date of this curriculum was the First Semester of 2021.
- viii) The twelve (12) ECSA GAs are assessed in exit levels subjects.
- ix) If a student fails a Graduate Attribute (GA) assessment in any exit level subject, he/she automatically fails the subject.
- x) Students need to achieve a sub-minimum mark of 50% in the Practical to be granted DP. Otherwise, they automatically fail the subject.

Subjects	NQF Level	Credits	Core/ Elective	Assessment Method	Exposure	Development	Assessment
SEMESTER 1							
					EXPOSED	DEVELOPED	ASSESSED
Mathematics I	5	12	C	EXAM	GA1, GA9		
Physics I	5	12	C	EXAM		GA2, GA4	
Communication Skills I	5	5	C	EXAM	GA6, GA8		
Computer Skills I	5	5	C	EXAM	GA5, GA9		
Electrical Engineering I	5	10	C	EXAM	GA1, GA5		
Electronics I	5	10	C	EXAM	GA1, GA5		
Digital Systems I	5	10	C	EXAM	GA3, GA5		
SEMESTER 2							
Mathematics II	5	12	C	EXAM		GA1, GA9	
Electrical Engineering II	5	10	C	EXAM		GA1, GA9	
Electronics II	5	10	C	EXAM		GA1, GA5	
Digital Systems II	5	10	C	EXAM		GA3, GA5	
Projects I	5	10	C	CONT	GA3, GA7		
Electrical Machines II	5	10	E	EXAM		GA5,	
Electronic Communication II	5	10	E	EXAM		GA2	
Process Instrumentation II	5	10	E	EXAM		GA4	
Strengths of Materials II	5	10	E	EXAM		GA5,	
SEMESTER 3							
Digital Systems III	6	12	C	EXAM		GA3, GA5	
Mathematics III	6	12	C	EXAM		GA1, GA9	
Projects II	5	10	C	CONT		GA3, GA7	
Software Design II	6	12	C	EXAM		GA5,	
Control Systems II	6	12	C	EXAM		GA4, GA5	
Electrical Engineering III	6	12	E	EXAM		GA1, GA5	
Digital Communications II	6	12	E	EXAM		GA2	
Process Instrumentation III	6	12	E	EXAM			GA4
Mechatronics III	6	12	E	EXAM		GA5,	
SEMESTER 4							
Design Projects III	6	12	C	CONT			GA3, GA6, GA7, GA8
Software Design III	6	12	C	EXAM			GA11

Power Electronics III	6	12	E	EXAM			GA1
Electrical Machines III	6	12	E	EXAM			GA5
Electrical Distribution III	6	12	E	EXAM			GA4
Electrical Protections III	6	12	E	EXAM			GA2
Radio Engineering III	6	12	E	EXAM			GA2
Signal Processing III	6	12	E	EXAM			GA5
Electronics III (Elective)	6	12	E	EXAM			GA1
Microwave Communications III	6	12	E	EXAM			GA4
Control Systems III	6	12	E	EXAM			GA2
Automation III	6	12	E	EXAM			GA5
Robotics III	6	12	E	EXAM			GA4
WIL (P1)	6	44			GA9, GA12	GA10, GA9, GA12	
WIL (P2)	6	48					GA9, GA10, GA12

GA1-Problem solving
GA2-Application of scientific and engineering knowledge
GA3-Engineering Design
GA4-Investigation
GA5-Engineering methods, and tools, including information technology
GA6-Professional and Technical communication
GA7-Impact of Engineering activity
GA8-Individual and teamwork
GA9-Independent learning
GA10-Engineering professionalism
GA11-Engineering management
GA12-Workplace practice

4.2.4 Electrical Engineering Diploma course summary (ELENEC)

Diploma: Electrical Engineering: (96856)(4 Years)	
Foundation I	Foundation II
Basic Science I	Communication Skills
Computer Literacy I	Engineering Calculations
Life Skills and Study Skills	Engineering Science I
Drawing	Computer Applications I
Mathematics	Drawing I
S1 Subjects	
Communication Skills I	
Computer Skills I	
Mathematics I	
Electrical Engineering I	
Electronics I	
Digital Systems I	
Physics I	
S2 Subjects	

Power Engineering Systems (ELECPS)	Electronics Telecommunication Engineering (ELECET) and	Process Automation and Control Engineering (ELECPA)	Mechatronics Engineering (ELECME)
Digital Systems II	Digital Systems II	Digital Systems II	Digital Systems II
Electronics II	Electronics II	Electronics II	Electronics II
Electrical Engineering II	Electrical Engineering II	Electrical Engineering II	Electrical Engineering II
Mathematics II	Mathematics II	Mathematics II	Mathematics II
Projects I	Projects I	Projects I	Projects I
Electrical Machines II	Electronic Communication II	Process Instrumentation II	Strengths of Materials II
S3 Subjects			
Digital Systems III	Digital Systems III	Digital Systems III	Digital Systems III
Mathematics III	Mathematics III	Mathematics III	Mathematics III
Projects II	Projects II	Projects II	Projects II
Software Design II	Software Design II	Software Design II	Software Design II
Electrical Engineering III	Digital Communications II	Process Instrumentation III	Mechatronics III
Control Systems II	Control Systems II	Control Systems II	Control Systems II
S4 Subjects			
Design Projects III	Design Projects III	Design Projects III	Design Projects III
Software Design III	Software Design III	Software Design III	Software Design III
Electrical Machines III	Electronics III	Electronics III	Power Electronics III
Power Electronics III	Microwave Communications III	Automation III	Automation III
Electrical Distributions III	Radio Engineering III	Control Systems III	Control Systems III
Electrical Protections III	Signal Processing III	Signal Processing III	Robotics III

4.2.5 Subjects, Curriculum Compilation, Course Codes

Diploma in Electrical Engineering (96856) (4 Years)								
Code	Subjects	*C/O/E	Semester /Year	Assessment Method	NQF Level	SAQA Credit	Pre-requisites	Co-requisites
BASI000	Basic Science I		Foundation/1	EX	4	3		
COLI000	Computer Literacy I		Foundation/1	CA	4	3		
LSSS000	Life Skills and Study Skills		Foundation/1	CA	4	3		
DRAW000	Drawing		Foundation/1	CA	4	3		
MATT000	Mathematics		Foundation/1	EX	4	3		
COSK000	Communication Skills		Foundation/2	CA	4	3	Life Skills and Study Skills	
ECAL000	Engineering Calculations		Foundation/2	EX	4	3	Mathematics	
ENGS000	Engineering Science I		Foundation/2	EX	4	3	Basic Science I	
COAP000	Computer Applications I		Foundation/2	CA	4	3	Computer Literacy I	
DRWN000	Drawing I		Foundation/2	CA	4	3	Drawing	

Total Weighting							30		
COMK101	Communication Skills I	C	S1	CA	5	5	5	Communication Skills	
CKIL101	Computer Skills I	C	S1	CA	5	5	5	Computer Applications I	
MATS101	Mathematics I	C	S1	EX	5	12	12	Engineering Calculations	
ELEE101	Electrical Engineering I	C	S1	EX	5	10	10	Engineering Science I	
ELET101	Electronics I	C	S1	EX	5	10	10	Engineering Science I	
DIGS101	Digital Systems I	C	S1	EX	5	10	10	Engineering Science I	
PHCS101	Physics I	C	S1	EX	5	12	12	Engineering Science I	
Total S1 Weighting							64		
MATS102	Mathematics II	C	S2	EX	5	12	12	Mathematics I	
ELEE102	Electrical Engineering II	C	S2	EX	5	10	10	Electrical Eng. I Mathematics I	
DIGS102	Digital Systems II	C	S2	EX	5	10	10	Digital Systems I	
PRJT102	Project I	C	S2	CA	5	10	10	Electrical Eng. I Electronics I Communication Skills I	
ELET102	Electronics II	C	S2	EX	5	10	10	Electronics I Electrical Eng I	
ELEM102	Electrical Machines II	E	S2	EX	5	10	10	Electrical Eng. I Physics I	Mathe matics II
ELEC102	Electronic Communication II	E	S2	EX	5	10	10	Electronics I Digital Systems I Physics I	
PRIN128	Process Instrumentation II	E	S2	EX	5	10	10	Electrical Eng. I Physics I	
STMA102	Strength of Materials II (ME)	E	S2	EX	5	10	10	Physics I Mathematics I	
Total S2 Weighting							62		
MATS201	Mathematics III	C	S3	EX	6	12	12	Mathematics II	
DIGS201	Digital Systems III	C	S3	EX	6	12	12	Digital Systems II	
SFTD201	Software Design II	C	S3	EX	6	12	12	Digital Systems II	
PROJ128	Projects II	C	S3	CA	5	10	10	Projects I Electronics II Electrical Engineering II	
CONS201	Control Systems II	C	S3	EX	6	12	12	Mathematics II	Mathe matics III
EENG202	Electrical Engineering III	E	S3	EX	6	12	12	Electrical Eng. II Mathematics II	
DICM202	Digital Communications II	E	S3	EX	6	12	12	Electronic Comm. II	Mathe matics III

PROI202	Process Instrumentation III	E	S3	EX	6	12	Process Instr. II	Mathe matics III
MECE201	Mechatronics III (ME)	E	S3	EX	6	12	Strength of Materials II Electronics II Digital Systems II	
Total S3 Weighting						70		
DPRJ202	Design Project III	C	S4	CA	6	12	Projects II Digital Systems III Maths III	
ELED202	Electrical Distribution III	E	S4	EX	6	12	Electrical Eng. III	Electric al Engine ering III
SFTD202	Software Design III	C	S4	EX	6	12	Software Design II	
PWEL202	Power Electronics III	E	S4	EX	6	12	Electronics II Electrical Eng. II Mathematics III	
ELEM138	Electrical Machines III	E	S4	EX	6	12	Electrical Mach. II Electrical Eng. III	
ELCP202	Electrical Protection III	E	S4	EX	6	12	Electrical Eng. III Mathematics II	Electric al Distribu tion III
RAEN201	Radio Engineering III	E	S4	EX	6	12	Digital Communication II	
ELTR202	Electronics III	E	S4	EX	6	12	Electronics II Mathematics III	
SIGP202	Signal Processing III	E	S4	EX	6	12	Mathematics III	
MWCM202	Microwave Communication III	E	S4	EX	6	12	Mathematics III Digital Communication II	
CONS202	Control Systems III	E	S4	EX	6	10	Control Systems II Mathematics III	
ROBT202	Robotics III	E	S4	EX	6	12	Control Systems II Mechatronics III Mathematics III Digital Systems III	
ATMT202	Automation III	E	S4	EX	6	12	Control Systems II Mathematics III Digital Systems III	
ELEC000	Work Readiness Program	C	S4	CA	NA	NA		
Total S4 Weighting						72		
*C= Compulsory; O= Optional; E=Electives ; EX-Examination; CA-Continuous Assessment								

4.2.6 Examination Regulations

Refer to the General Handbook Rule: G22

4.2.7 Work Integrated Learning (In-Service Training- 92 Credits)

Electrical Engineering Practice I (P1) 44

Electrical Engineering Practice II (P2) 48

Learners who acquired any form of work experience and wish for this experience to be considered for P1/P2 training will need to comply with the institution's RPL Policy (Refer to RPL Policy clause 4.2). Such applicants may be admitted to diploma qualifications through one of the purposes of RPL namely, access, exemption, accreditation and advancement.

4.2.8 Course Content

COMK101	Electrical English Communication Skills I
	Offered by Service Department Communication theory, non-verbal communication (body language), oral presentations, interviews, developing leadership and participation skills. Technical reports and correspondence.
CKIL101	Computer Skills I
	Offered by Service Department Learners have to acquire theory and practical skills and knowledge. Theory knowledge to be learned is Personal Computer Basics, Managing Computer Contents, Display Devices, Internet Privacy and Security, Connectors and Adapters, Network Basics, Multimedia Devices, Processors and Memory, Data Storage Devices, Network Security Overview and Safety. Practical skills to be acquired are Operating systems and Application Software Microsoft Office 365 which includes Microsoft Word, Microsoft Excel, MS PowerPoint and MS Teams. Introduction to MATLAB and Simulink
MATS101	Mathematics I
	Formative assessment - Tutorials. Summative assessment - Three class tests, and Examination Major Test 1 40% Major Test 2 40% Minor Test 20% Overview of Syllabus: Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration.
ELEE101	Electrical Engineering I
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 35% Test 2 35% Tutorials 10% Practicals 20% Overview of Syllabus: Electrical and Mechanical Quantities, Basic Electrical Components, DC theory and Network Analysis, Electromagnetism and Magnetic circuits, Inductance and Capacitance, Basic AC theory.
ELET101	Electronics I
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Practical Assignments, Examination Test 1 25% Test 2 25% Tutorials 25% Practicals 25% Overview of Syllabus: Oscilloscope, Semiconductor theory and atomic structure, PN Diodes and their applications Bipolar junction transistors, Operational Amplifiers
DIGS101	Digital Systems I
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Introduction to Digital Systems, Logic gates, Boolean Algebra and Logic Simplification, Combination Logic Analysis, Functions of Combinational Logic, Number Systems: -operation and Codes.
PHCS101	Physics I
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical and mini-project), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25%

	Overview of Syllabus: Remedial mathematics, basic units, vectors and scalars, kinetics, mechanics, momentum, moments, work, energy and power, pressure, density, heat, optics, waves and sound, electric current, magnetism, radioactivity. Practical physics.
MATS102	Mathematics II
	Formative assessment - Tutorials. Summative assessment - Three class tests and Examination Major Test 1 40% Major Test 2 40% Minor Test 20% Overview of Syllabus: Revision of differentiation (Mathematics I). Differentiation of functions with more than one variable. Further integration. Numerical methods. First-order ordinary differential equations. Matrices (Gauss elimination).
ELEE102	Electrical Engineering II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Alternating Current and Voltage generation, AC RLC circuit components and Phasors, AC Circuit Theorems, Power in AC Circuits, Series and parallel RLC resonant circuits, Introduction to Three Phase systems.
DIGS102	Digital Systems II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Latches, Flip flops and Timers, Counters, Shift Registers, Memory and Storage, Digital Signal Interfacing and Processing, Introduction to Microcontrollers.
PRJT102	Projects I
	Course is assessed through continuous assessment. Final Mark (FM) = 25% x Simulation + 25% x Constructed project + 30% measurement and presentation + 20% final Document Overview of Syllabus: PCB Design using Proteus, Simulation using Proteus, Assemble the project, Test and Debug, Report.
ELET102	Electronics II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: DC Power supplies, BJT DC biasing, BJT AC analysis, FET Biasing, Operational Amplifiers
ELEM102	Electrical Machines II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: D.C. Generators, D.C. Motors, Single Phase Transformers, Single Phase induction machines
ELEC102	Electronic Communication II
	Formative assessment Tutorials, Homework, quizzes, Practical Evaluation

	Summative assessment Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Fundamental Concepts of Transmission and Reception, Frequency and Amplitude Modulation Systems, Communication Techniques, Transmitter and Receiver Measurements
STMA102	Strength of Materials II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Introduction (Review of statics), axial loading, torsion, pure bending, beams, shearing, stress, transformations, principal stresses, and columns.
MATS201	Mathematics III
	Formative assessment - Tutorials. Summative assessment - Three class tests and Examination. Major Test 1 40% Major Test 2 40% Minor Test 20% Overview of Syllabus: First-order ordinary differential equations. Higher-order differential equations. Laplace transforms. Infinite series. Fourier series. Matrix analysis. Probability and statistics. Elements of analytic geometry in 2D and 2D space.
DIGS201	Digital Systems III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 20% Practicals 30% Overview of Syllabus: Introduction to Embedded C Programming, Introduction to MPLAB-X, PIC architecture, PIC Programming in C Language, PIC I/O Port Programming, Serial Port Programming in C Language, LCD and Keyboard interfacing, Introduction to ADC and DAC
SFTD201	Software Design II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Tutorials 25% Practicals 25% Overview of Syllabus: C++ programming structure, I/O streams and Classes, Control Structures, Arrays and strings, User Defined functions, Data abstraction and inheritance, Exception handling, Recursions
PROJ128	Projects II
	Course is assessed through continuous assessment. The weightings of the assessment are as follows: Final Mark (FM) = 33% x Simulation + 33% x breadboard prototype + 34% x Constructed project. Overview of Syllabus: Simulation, Prototype development, PCB design, Report writing, Preparatory design proposal document
COSY128	Control Systems II
	Formative assessment - Tutorials, Classroom small-group work, WhatsApp group discussion forum, Student self-assessment through e-learning platform. Summative assessment - Two class tests, Project assignment, Practical Evaluation, Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus:

	Introduction to Control Systems; Modelling of Control Systems in Frequency Domain using Laplace Transforms; Time Response of First and Second-order Control Systems; Reduction of Multiple Subsystems; Steady-State Errors; State-Space Representation of dynamic systems
ELEM138	Electrical Machines III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Three phase transformers, Three phase induction machines, Synchronous machines (Alternators), Synchronous machines (Motors)
DICO128	Digital Communications II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Probability and Random Processes: Probability distributions, Random variables, Random processes, Statistical averages, Correlation, Digital Modulation Techniques: Signal space analysis, BPSK, QPSK, QAM, Digital Demodulation & Detection Techniques: Correlator-demodulator, Maximum likelihood detection (MLD) in additive white Gaussian noise (AWGN), bit error rate (BER) performance, Channel Encoder/Decoder: Linear block codes, Cyclic codes, Convolutional codes, Viterbi algorithm, Information Theory: Source Entropy, Huffman Coding, Channel Capacity.
PRIN128	Process Instrumentation II
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Control valves & pumps, Control instruments, Continuous control, Sequential control, Instrumentation documentation.
MECE201	Mechatronics III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Assignments 25% Practicals 25% Overview of Syllabus: Introduction to Mechatronics, Transducers, Analogue Signal Conditioning, Actuating Systems, System Interfacing and Data Acquisition, Programmable Logic Controller
DEPR0138	Design Projects III
	This subject is assessed through continuous assessment. : The course components mark weightings will be determined as follows: - Proposal Document (GA7) = 20% - Project Presentation (GA6) = 20% - Final Document (GA8) = 30% - Project Artefact (GA3) = 30% Overview of Syllabus: Introduction to the Engineering Design Process, Problem definition, Literature review, Generation of multiple solutions. Analysis and selection of most appropriate solution, Testing and implementation of chosen solution, Feasibility study, Project implementation – design, simulation, construction, testing and documentation, Project oral presentation.
ELEN138	Electrical Engineering III
	Formative assessment Tutorials, Homework, quizzes, Practical Evaluation

	Summative assessment Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Applications of Complex Numbers in Phasor notations, 3-Phase AC Systems Analysis, Electrical Power Measurement and analysis in 3-Phase AC Systems, Per-unit System, Introduction to AC Power Flow Analysis, Electric Lighting Systems.
ELDI138	Electrical Distribution III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Introduction to generation, Variable loads on power stations, Economics of power generation and Tariffs, Power factor improvement, Supply systems, Mechanical and Electrical design of overhead lines, Performance of transmission lines, Underground cables.
SOFD038	Software Design III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 25% Test 2 25% Practical's 50% Overview of Syllabus: Installing a Local Web Server, Installing PHP, MySQL and Apache, PHP Syntax and Functions, Working with PHP in Websites, Creating Databases and working With MySQL, Security in PHP
POEL138	Power Electronics III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Introduction to power electronics, Power electronics switches, AC to DC converters, DC to DC converters, DC to AC converters, AC to AC converters, Introduction to drives.
ELPR138	Electrical Protection III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Three phase Theory Revision, Introduction to Electrical protection, Symmetrical fault calculations, Instrument transformers, Unsymmetrical fault calculations, Switchgears; circuit breakers, protective relays, fuses, switches, Protection of alternator and transformers, Protection of bus-bars, Overvoltage protection
RADE138	Radio Engineering III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Electromagnetic waves, Radio propagation techniques and Antennas, Introduction to Radar Systems, Introduction to Cellular networks and Frequencies management, Introduction to Mobile Networks
ELET138	Electronics III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignment/Project 10% Practicals 50%

	Overview of Syllabus: Feedback and Oscillator Circuits, Voltage Regulators –SMPS, Two-Terminal Devices, PNP Devices, Linear-Digital ICs, Op-Amp Applications – Amplifiers, Filters, Multi-stage amplifiers
SIPR138	Signal Processing III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Signals and signal processing systems, Discrete time systems in time domain, Discrete time signals in frequency domain, The z-Transform
MICE138	Microwave Communication III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: A Review of Electromagnetic Theories and Frequencies Management, Transmission Line Theory, Transmission Lines and Waveguides, Microwave Network Analysis, Impedance Matching and Tuning, Power Dividers, Mixers and Directional Couplers, Microwave Filters, Digital Line-of-Sight Microwave Radio Links.
PRIN138	Process Instrumentation III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Automatic Process Control, Control Systems & Instrumentation, Analytical & Renewable Energy Sensors, Boilers, Heat Exchangers & Distillation Columns, Safety & Environmental Control, Industry 4.0
COSY138	Control Systems III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Modelling 1st, 2nd Order systems, Stability, Laplace-Domain Analysis, Frequency-Domain techniques, Feedback compensation, PID Controller Tuning, Case study: SISO system Compensation Simulation.
ROBT238	Robotics III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Robotics overview, Basic mechanics, Robot locomotion principles, Robot environmental interaction (Sensor and actuators), Power sources for robots, Robot Brains, Embedded robotics - systems design process.
PTAT038	Automation III
	Formative assessment - Tutorials, Homework, quizzes, Practical Evaluation Summative assessment - Two class tests, Assignments (Theoretical), Examination Test 1 20% Test 2 20% Assignments 10% Practicals 50% Overview of Syllabus: Automation Fundamentals, Automation Justification and Productivity Concepts, Computer Numerical Control (CNC), Introduction to Industrial Robots, Programmable Logic Controllers (PLCs), Programming PLCs, Manufacturing Systems, Industrial Networks and SCADA Systems.

ELEC000	Work Readiness Program
	Overview of Syllabus: Integrate an understanding of the experiential learning process, Identify their own skills Conduct Job Searches, Compile a CV and Cover Letter, Prepare adequately for interviews, Understand his/her role in the workplace: Increase efficiency (Productivity), Identify waste in the workplace, Understand impact of waste on company productivity, Understand importance of planning in the workplace, Understand problem identification and solving, Understand concepts of Quality, Cost and Delivery, Understand Plan Do, Check, Action (PDCA) cycle.

4.2.9 Additional Regulation and Rules

- A learner is not allowed to register for an offering unless the pre-requisite subject(s) have been passed.
- If, for any reason, a learner is found to be registered for any subject without the pre-requisite, the learner will automatically be de-registered in that subject.
- Learners may not register for any S4 level subject unless all subjects have been passed at the S1 and S2 level.
- A learner is only allowed to register across two consecutive levels, e.g. S1 & S2 or S2 & S3 or S3 & S4. It is not allowed to register across S1 & S3 or S2 & S4. If, for any reason, a learner is found to be registered for any subject without the pre-requisite, the learner will be de-registered immediately.
- Switching streams after selection in S2 will only be allowed once student has graduated.
- Registration of additional modules after completing the suite of modules in the stream is subject to University regulatory framework.

4.3 Pre-Technician Programme

The course is a bridging programme which prepares learners for entry to the Diploma in Electrical Engineering.

4.3.1 Entry Requirements

- i) National Senior Certificate with rating codes:

English Home Language	(3)
(or)	
English First Additional Language	(3)
Mathematics	(3)
Physical Science	(3)
- ii) Senior Certificate or equivalent with a minimum subject-related symbol as follows:

Physical Science	D (SG) / E (HG)
Mathematics	D (SG) / E (HG)
English	D (SG) / E (HG)

Please take note of the following:

- Selection may be based on merit and availability of space.
- Meeting the minimum requirements does not, in any way, guarantee admission.

4.3.2 Diploma Entry Requirements

Learners who pass the Pre-Technician programme will gain access into the Diploma Programme subject to the learner passing all subjects in this programme.

4.3.3 Repeating Pre-Technician Programme

This programme may not be repeated.

4.3.4 Examination Regulations

Refer to the General Handbook Rule: G22

4.3.5 Subjects, Curriculum Compilation, Course Codes

Pre-Technician Programme: Electrical Engineering		
Code	Subjects	Assessment Method
AMATE11	Electrical Engineering Mathematics	Examination
ACOME11	English Communication	Examination
AINLO11	Introduction to Logic Systems	Examination
APREN11	Principles of Electrical Engineering	Examination
ABASE11	Basic Electronics	Examination
AINTR11	Introduction to Computers	Continuous
AEPRA11	Engineering Project	Continuous
All Subjects are compulsory		

4.4 Departmental Regulations

Reference, together with departmental regulations, will be made to all institutional rules in the "General Regulations for Students".

- Students who are found to be contravening the minimum requirements after registration, for any reason, will be de-registered immediately. The departmental decision on registration matters is final.
- Student who has failed Pre-Tech in any other department will not be allowed to register in the Department of Electrical Engineering.
- Students who are guilty of plagiarism in any assessments will automatically fail the assessment.
- A minimum of 80% attendance of all lectures is compulsory per institutional rules.

4. DEPARTMENT OF MECHANICAL ENGINEERING

The National Diploma programmes were phased out in 2018 and replaced with the Diploma programmes. The returning students will be requested to migrate to the new qualification.

The department rules are aligned with the Mangosuthu University of Technology's General Handbook Rules.

4.1 Qualification name: Diploma in Mechanical Engineering (MEENDI)

HEQSF Qualification Type : 63

SAQA Qualification ID : 72293

CESM Code : 081501

SAQA Credits : Minimum 360

NQF Level: 6

Duration: 3 years

Rationale for the Qualification

The Engineering profession contributes to the technological, socio-economic, built environment and environmental infrastructure of the country, facilitating socio-economic growth and sustainability. The Diploma in Engineering Technology in Mechanical Engineering is primarily vocational, or industry oriented, characterised by underpinning theoretical knowledge and general principles and the application thereof to real situations or technology transfer. The qualification provides learners with a sound knowledge base in a field of Mechanical Engineering in response to the needs of the community, as well as local, regional, and national industry by producing competent graduates.

Statement of Purpose

The primary purpose of the diploma in Mechanical Engineering is to develop focused knowledge and skills as well as experience in a work-related context. The Diploma equips graduates with the knowledge base, theory, skills, and methodology of Mechanical Engineering as a foundation for further training and experience towards becoming a competent engineering technician. This foundation is achieved through a thorough grounding in mathematics and natural sciences specific to Mechanical Engineering, engineering sciences, engineering design and the ability to apply established methods. Engineering knowledge is complemented by methods for understanding of the impacts of engineering solutions on people and the environment.

A student will be awarded with the qualification and will be able to register as a professional technician with the Engineering Council of South Africa (ECSA) when he/she has demonstrated the knowledge in Mechanical Engineering and the graduate attributes defined below.

ECSA Graduate Attributes

Graduate Attribute 1: Problem Solving

Apply engineering principles to systematically diagnose and solve well-defined engineering problems.

Level Descriptor: Well-defined engineering problems:

- Can be solved mainly by practical engineering knowledge, underpinned by related theory;
and have one or more of the characteristics:
- are largely defined but may require clarification;
- are discrete, focused tasks within engineering systems;

- d. are routine, frequently encountered, may be unfamiliar but in familiar context;
and have one or more of the characteristics:
- e. can be solved in standardized or prescribed ways;
- f. are encompassed by standards, codes and documented procedures; requires authorization to work outside limits;
- g. information is concrete and largely complete, but requires checking and possible supplementation;
- h. involve several issues but few of these imposing conflicting constraints and a limited range of interested and affected parties.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, and engineering sciences to applied engineering procedures, processes, systems and methodologies to solve well-defined engineering problems.

Range Statement: Knowledge of mathematics, natural science and engineering science is characterized by:

- 8. A coherent range of fundamental principles in mathematics and natural science underlying a sub-discipline or recognized practice area.
- 9. A coherent range of fundamental principles in engineering science and technology underlying an engineering sub-discipline or recognized practice area.
- 10. A codified practical knowledge in recognized practice area.
- 11. The use of mathematics, natural sciences, and engineering sciences, supported by established mathematical formulas, codified engineering analysis, methods and procedures to solve well-defined engineering problems.

Graduate Attribute 3: Engineering Design

Perform procedural design of components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation.

Range Statement: Design problems used in assessment must conform to the definition of well-defined engineering problems:

- 1. A design project should be used to provide evidence of compliance with this outcome.
- 2. The problem would be typical of those in which the graduate would participate in an employment situation shortly after graduation.
- 3. The selection of components, systems, engineering works, products or processes to be designed is dependent on the sub-discipline.
- 4. A design project should include one or more of the following impacts: social, economic, legal, health, safety, and environmental.

Graduate Attribute 4: Investigation

Conduct investigations of well-defined problems through locating and searching relevant codes and catalogues, conducting standard tests, experiments, and measurements.

Range Statement: The balance of investigation should be appropriate to the discipline. An investigation should be typical of those in which the graduate would participate in an employment situation shortly after graduation.

Note: An investigation differs from a design in that the objective is to produce knowledge and understanding of a phenomenon.

Graduate Attribute 5: Engineering methods, skills, tools, including Information Technology

Use appropriate techniques, resources, and modern engineering tools including information technology for the solution of well-defined engineering problems, with an awareness of the limitations, restrictions, premises, assumptions, and constraints.

Range Statement: A range of methods, skills, and tools appropriate to the discipline of the program including:

1. Sub-discipline specific tools, processes, or procedures.
2. Computer packages for computation, simulation, and information handling.
3. Computers and networks and information infrastructures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork.
4. Basic techniques from economics, management, and health, safety and environmental protection.

Graduate Attribute 6: Professional and Technical Communication

Communicate effectively, both orally and in writing within an engineering context.

Range Statement: Material to be communicated is in a simulated professional context:

1. Audiences are engineering peers, academic personnel and related engineering persons using appropriate formats.
2. Written reports range from short (minimum 300 words) to long (a minimum of 2000 words excluding tables, diagrams and appendices), covering material at the exit level.
3. Methods of providing information include the conventional methods of the discipline, for example engineering drawings, physical models, and bills of quantities as well as subject-specific methods.

Graduate Attribute 7: Impact of Engineering Activity

Demonstrate knowledge and understanding of the impact of engineering activity on the society, economy, industrial and physical environment, and address issues by defined procedures.

Range Statement: The combination of social, workplace (industrial) and physical environmental factors must be appropriate to the sub-discipline of the qualification. Evidence may include case studies typical of the technical practice situations in which the graduate is likely to participate.

Issues and impacts to be addressed:

1. Are encompassed by standards and documented codes of practice.
2. Involve a limited range of stakeholders with differing needs.
3. Have consequences that are locally important and are not far reaching.
4. Are well-defined and discrete and part of an engineering system.

Graduate Attribute 8: Individual and Teamwork

Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a technical team and to manage projects.

Range Statement:

1. The ability to manage a project should be demonstrated in the form of the project indicated in Graduate Attribute 3 (GA 3).
2. Tasks are discipline specific and within the technical competence of the graduate.
3. Projects could include laboratories, business plans, design, etc.

4. Management principles include:

- a. Planning: set objectives, select strategies, implement strategies, and review achievement.
- b. Organising: set operational model, identify, and assign tasks, identify inputs, delegate responsibility and authority.
- c. Leading: give directions, set example, communicate, motivate.
- d. Controlling: monitor performance, check against standards, identify variations and take remedial action.

Graduate Attribute 9: Independent Learning

Engage in independent and life-long learning through well-developed learning skills.

Range Statement: The learning context is well-structured with some unfamiliar elements.

Graduate Attribute 10: Engineering Professionalism

Understand and commit to professional ethics, responsibilities and norms of engineering technical practice.

Range Statement: Evidence includes case studies, memorandum of agreement, code of conduct, membership of professional societies, etc typical of engineering practice situations in which the graduate is likely to participate.

Graduate Attribute 11: Engineering management

Demonstrate knowledge and understanding of engineering management principles.

Range Statement: Basic techniques from project management applied to one's own work, as a member and leader in a technical team, and to manage projects in multidisciplinary environments.

Graduate Attribute 12: Workplace practices

Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved.

Note: The purpose of work-integrated learning is to enable the learner to connect academic learning with workplace practice.

Range Statement: Tasks to demonstrate this outcome may be performed in one or more of the following curriculum types:

19. Work-directed theoretical learning: in which theoretical forms of knowledge are introduced and sequences in ways that meet both academic criteria and are applicable and relevant to the career-specific components.
20. Problem-based learning: where students work in small self-directed groups to define, carry out and reflect on a task which is usually a real-life problem.
21. Project-based learning: that brings together intellectual enquiry, real world problems and student engagement in meaningful work.
22. Workplace learning: where students are placed in a professional practice or simulated environment within a training programme.
23. Simulated learning.

a. **Admission Requirements**

- i) National Senior Certificate (Grade 12) with rating codes:
English Home Language (4)
or English First Additional Language (4)
Mathematics (4)
Physical Science (4)
Technical Drawing or equivalent (4)
Additional recommended school subject: Mechanical Technology
- ii) Senior Certificate or equivalent with a minimum symbol D (HG) or C (SG) in Mathematics, Physical Science, English and Technical Drawing. Additional recommended school subject: Mechanical Technology
- iii) Pass in all Pre-Tech subjects (6 subjects) with a minimum of 50% for each
- iv) An appropriate N3 certificate with a minimum of four subjects passed at 50% each including Mathematics, Technical Drawing and Engineering Science and Grade 12 level English passed with at least symbol D (SG)
- v) An appropriate GCE, GCSE, IGCSE, or Cambridge School Certificate with at least five subjects at GCE 'O' level including Mathematics, Physics, Chemistry, English, and Technical Drawing, each being passed with an A, B or C symbol. Three of the five subjects must have been passed at the same examination sitting
- vi) **NCV Admission Requirements**
NCV Level 4 with a minimum of 50% pass in the following subjects:
Three fundamental subjects which must include English and Mathematics and a minimum of 60% in the three compulsory subjects from the **Engineering and Related Design** programme plus **Mechanical Draughting and Technology** plus **Physical Science**.

**NB: It is important to note that each student will be assessed on merit.
All admissions are based on a selection process only!**

• **Transfer from Technical / FET Colleges**

Students having passed subjects as listed below (with a minimum of 50% each) will be granted exemptions according to the Recognition of Prior Learning.

Technical/FET College Subjects	University Exempted Subjects
Communication N4	Communication Studies I
Mathematics N4 and N5	Mathematics I
Mechanotechnics N5	Mechanics I
Mechanotechnics N6	Mechanics of Machines II
Power Machines N6	Thermodynamics II
Strength of Materials N6	Strength of Materials II
Mech Eng Drawing & Design N5	Mech Eng Drawing I
Mech Eng Drawing & Design N6	Mech Eng Design II

It is important to note that each student will be assessed on merit.

Applications for credits and exemptions must be submitted to the Head of Department before the registration date.

b. Duration of Study

The duration of the course is three years comprising two years academic studies at the University and one year Work Integrated Learning (Experiential Learning) in industry undertaken at an appropriate training provider, in accordance with a prescribed programme as stated in a logbook. Logbooks for Work Integrated Learning will be issued to students at the commencement of their training. Students who do not register for their Work Integrated Learning cannot be monitored and evaluated, resulting in the training not being recognised. It is the student's responsibility to register for the training which must be done prior to commencement of training. A student can only register P1 after attending S4. Students who did not complete all the S4 courses must first get permission from the HOD to register for P1.

c. Curriculum Compilation

The curriculum compilation for the Diploma in Mechanical Engineering is as follows:

Subjects, Curriculum Compilation, Course Codes

Code	Subjects	*C/E	Year / Semester	Assessment Method	NQF Level	Credits	Pre-requisites
CSKL101 COMM311	Communication Studies I	C	Y1(S1)	Examination	5	7	
CPSK101 COSME01	Computer Skills I	C	Y1(S1)	Examination	5	7	
ELEC101 ELTR011	Electrotechnology I	C	Y1(S1)	Examination	5	12	
MAT1101 MATME01	Mathematics I	C	Y1(S1)	Examination	5	12	
MEED101 MEDR011	Mech. Engineering Dwg. I	C	Y1(S1)	Continuous	5	12	
MEME101 MMEN011	Mech. Manuf. Eng. I	C	Y1(S1)	Examination	5	12	
MECH101 MECA011	Mechanics I	C	Y1(S1)	Examination	5	12	
FLME102 FLUM121	Fluid Mechanics II	C	Y1(S2)	Examination	5	12	Mechanics I & Mathematics I
MAT1102 MATME02	Mathematics II	C	Y1(S2)	Examination	5	12	Mathematics I
COAD102 CADR011	Comp. Aided Draught I	C	Y1(S2)	Continuous	5	12	Mechanical Engineering Drawing I and Computer Skills
STOM102 STRE121	Strength of Materials II	C	Y1(S2)	Examination	5	12	Mechanics I & Mathematics I
THER102 TEMO021	Thermodynamics II	C	Y1(S2)	Examination	5	12	Mechanics I & Mathematics I
MEOM102 MECM121	Mechanics of Machines II	C	Y1(S2)	Examination	5	12	Mechanics I & Mathematics I
MEDS201 MEDE021	Mech. Eng. Design II	C	Y2(S1)	Examination	6	12	Mech. Eng. Drawing I Strength of Mechanics II
FLME201 FLUM331	Fluid Mechanics III	C	Y2(S1)	Examination	6	12	Fluid Mechanics II
MEOM201	Mechanics of Machines III	C	Y2(S1)	Examination	6	12	Mechanics of

MECM331							Machines II
STOM201 STRE331	Strength of Materials III	C	Y2(S1)	Examination	6	12	Strength of Materials II
THER201 TEMO231	Thermodynamics III	C	Y2(S1)	Examination	6	12	Thermodynamics II
MTHM102 MATME03	Mathematics III	C	Y2 (S1)	Examination	6	12	Mathematics II
APSM202 APSM031	Applied Strength of Materials III	C	Y2(S2)	Examination	6	12	Strength of Materials III
MAEN202 MAEN011	Maintenance Eng. I	C	Y2(S2)	Examination	5	12	Mathematics I, Mech. Manufacturing Eng. I
HYDM202 HYMA031	Hydraulic Machines III	C	Y2(S2)	Examination	6	12	Fluid Mechanics III
STPL202 STPL031	Steam Plant III	C	Y2(S2)	Examination	6	12	Thermodynamics III
THMA202 THEM031	Theory of Machines III	C	Y2(S2)	Examination	6	12	Mechanics of Machines III & Mathematics II
MEDS202 MEDE131	Mech. Eng. Design III	C	Y2(S2)	Examination	6	12	Mech. Eng. Design II & Computer Aided Drw. I
WORKRP0 MEPR001	Mech. Eng. Practice 0, P0	C	Y2 (S2)	Attendance	5	6	
MEPR301 MEPR011	Mech. Eng. Practice I, P1	C	Y3 (S1)	WIL Logbook	5	40	CSKL101, MATI101 MEED101, MECH101, WORKRP0
MEPR302 MEPR021	Mech. Eng. Practice II, P2	C	Y3 (S2)	WIL Logbook	6	44	MEDES21, Mechanical Eng. Pract I
C=Compulsory; E=Electives							

b. **Elective Subjects:**

The following subjects are offered to sufficient students wanting to do the subject. They are conducted after hours, at an extra cost, and they carry a full credit value.

Subjects, Curriculum Compilation, Course Codes

Code	Subjects	*C/E	Year / Semester	Assessment Method	NQF Level	Credit	Pre-requisites
MOVE102 MOVE111	Motor Vehicle Eng. I	E	Y1 (S2)	Continuous	5	12	
MEME102 MMEN021	Mech. Manuf. Eng. II	E	Y1 (S2)	Continuous	5	12	Mech. Manuf. Eng. I
MEME201 MMEN031	Mech. Manuf. Eng. III	E	Y2 (S3)	Continuous	6	12	Mech. Manuf. Eng. II
MASK102 MASKM01	Management Skills I	E	Y1 (S2)	Examination	5	12	Communication Studies I
MACD202 MACH031	Machine Design III	E	Y2 (S2)	Continuous	6	12	Mech. Eng. Design III
ELEC201 ELTR121	Electrotechnology II	E	Y2(S1)	Examination	5	12	Electrotechnology I
EMAS102 EMSC011	Engineering Materials & Science I	E	Y1 (S2)	Examination	5	12	Mech. Manuf. Eng. I
C=Compulsory; E=Electives							

- e. **Examination Regulations**
Refer to the General Handbook Rule: G22.
- f. **Assessments**
A candidate will undergo two distinct assessments in the diploma programme: academic assessment and graduate attributes assessment.
- g. **Pass Requirements**
To pass a subject the candidate must obtain a final mark of 50% or more in the academic assessment and must satisfy the requirements of the graduate attribute development and/ or assessment concurrently.
- h. **Pre-requisite**
A pre-requisite for an academic pass is that a candidate should have a minimum of 40% in the examination mark, otherwise he/she fails (even if the course mark and exam mark together total 50% or more.)
- i. **Practicals**
The attendance of all practical classes is compulsory. Failure to attend practicals will result in the candidate not obtaining a course mark for that subject and may not meet the requirements of graduate attribute.
- j. **Timetable Clashes** (Refer to Rule G.16 in the General Handbook)
Students may not register for any subjects that result in a timetable clash.
- k. **Work Integrated Learning (WIL)**
It consists of P1 (6 month) and P2 (6 month) and it is the student's responsibility to register his/her training. This must be done before or on commencement of the training. Students who do not register their work integrated learning cannot be monitored nor evaluated and their training will not be recognised. Student must obtain his/her logbook from the Department of Mechanical Engineering before the commencement of their training. Students are only eligible for graduation after completion, submission and acceptance of all the required reports.

5.2 **Diploma in Mechanical Engineering -Extended Curriculum (MEENEC)**

Qualification name: Diploma in Mechanical Engineering (MEENC)

HEQSF Qualification Type :	63	SAQA Qualification ID:	72293
CESM Code :	081501	SAQA Credits :	Minimum 360
NQF Level	: 6		
Duration	: 4 years		

Diploma in Mechanical Engineering (4-Year Programme)

The minimum study period for the Diploma: Engineering: Mechanical is usually three years. However, students are usually under-prepared and complete the programme in 4, 5 or 6 years. A 4-year programme (also known as an Extended Curriculum programme) has been designed to provide structured support to students over a period of four years. A range of additional interventions are offered to students who are accepted in this programme. This programme has been a response to the well-known inequalities in South African society and to cater for varying levels of student preparedness. It ensures that sufficient support is provided during the initial years of

study while guaranteeing the same exit standards as the 3-year programme.

The 4-year programme addresses gaps and disparities in students' educational and life experience so that they can be better equipped to manage the Diploma programme. It also provides students with broad educational and life skills, including Mathematics, language literacy and subject knowledge. While students are mostly tutored separately in small classes in their first year, they undertake their studies and lectures as integral members of the Diploma student group.

This programme in Mechanical Engineering is further unique and designed in such a way that after the first semester, students may transfer to similar programmes in Civil Engineering or Electrical Engineering without sacrificing time or quality of training.

Rationale for the Qualification

The Engineering profession contributes to the technological, socio-economic, built environment and environmental infrastructure of the country, facilitating socio-economic growth and sustainability. The Diploma in Engineering Technology in Mechanical Engineering is primarily vocational, or industry oriented, characterised by underpinning theoretical knowledge and general principles and the application thereof to real situations or technology transfer. The qualification provides learners with a sound knowledge base in a field of Mechanical Engineering in response to the needs of the community, as well as local, regional and national industry by producing competent graduates.

Statement of Purpose

The primary purpose of the diploma in Mechanical Engineering is to develop focused knowledge and skills as well as experience in a work-related context. The Diploma equips graduates with the knowledge base, theory, skills and methodology of Mechanical Engineering as a foundation for further training and experience towards becoming a competent engineering technician. This foundation is achieved through a thorough grounding in mathematics and natural sciences specific to Mechanical Engineering, engineering sciences, engineering design and the ability to apply established methods. Engineering knowledge is complemented by methods for understanding of the impacts of engineering solutions on people and the environment.

A student will be awarded with the qualification and will be able to register as a professional technician with the Engineering Council of South Africa (ECSA) when he/she has demonstrated the knowledge in Mechanical Engineering and the graduate attributes defined below

ECSA Graduate Attributes

Graduate Attribute 1: Problem Solving

Apply engineering principles to systematically diagnose and solve well-defined engineering problems.

Level Descriptor: Well-defined engineering problems:

- a. Can be solved mainly by practical engineering knowledge, underpinned by related theory;

and have one or more of the characteristics:

- b. are largely defined but may require clarification;
- c. are discrete, focused tasks within engineering systems;
- d. are routine, frequently encountered, may be unfamiliar but in familiar context;

and have one or more of the characteristics:

- e. can be solved in standardized or prescribed ways;
- f. are encompassed by standards, codes and documented procedures; requires authorization to work outside limits;
- g. information is concrete and largely complete, but requires checking and possible supplementation;
- h. involve several issues but few of these imposing conflicting constraints and a limited range of interested and affected parties

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science and engineering sciences to applied engineering procedures, processes, systems and methodologies to solve well-defined engineering problems.

Range Statement: Knowledge of mathematics, natural science and engineering science is characterized by:

1. A coherent range of fundamental principles in mathematics and natural science underlying a sub-discipline or recognized practice area.
2. A coherent range of fundamental principles in engineering science and technology underlying an engineering sub-discipline or recognized practice area.
3. A codified practical knowledge in recognized practice area.
4. The use of mathematics, natural sciences, and engineering sciences, supported by established mathematical formulas, codified engineering analysis, methods and procedures to solve well-defined engineering problems.

Graduate Attribute 3: Engineering Design

Perform procedural design of components, systems, works, products, or processes to meet desired needs normally within applicable standards, codes of practice and legislation.

Range Statement: Design problems used in assessment must conform to the definition of well-defined engineering problems:

1. A design project should be used to provide evidence of compliance with this outcome.
2. The problem would be typical of those in which the graduate would participate in an employment situation shortly after graduation.
3. The selection of components, systems, engineering works, products, or processes to be designed is dependent on the sub-discipline.
4. A design project should include one or more of the following impacts: social, economic, legal, health, safety, and environmental.

Graduate Attribute 4: Investigation

Conduct investigations of well-defined problems through locating and searching relevant codes and catalogues, conducting standard tests, experiments and measurements.

Range Statement: The balance of investigation should be appropriate to the discipline. An investigation should be typical of those in which the graduate would participate in an employment situation shortly after graduation.

Note: An investigation differs from a design in that the objective is to produce knowledge and understanding of a phenomenon.

Graduate Attribute 5: Engineering methods, skills, tools, including Information Technology

Use appropriate techniques, resources, and modern engineering tools including information technology for the solution of well-defined engineering problems, with an awareness of the limitations, restrictions, premises, assumptions, and constraints.

Range Statement: A range of methods, skills and tools appropriate to the discipline of the program including:

1. Sub-discipline specific tools, processes, or procedures.
2. Computer packages for computation, simulation, and information handling.
3. Computers and networks and information infrastructures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork.
4. Basic techniques from economics, management, and health, safety and environmental protection.

Graduate Attribute 6: Professional and Technical Communication

Communicate effectively, both orally and in writing within an engineering context.

Range Statement: Material to be communicated is in a simulated professional context:

1. Audiences are engineering peers, academic personnel and related engineering persons using appropriate formats.
2. Written reports range from short (minimum 300 words) to long (a minimum of 2000 words excluding tables, diagrams, and appendices), covering material at the exit level.
3. Methods of providing information include the conventional methods of the discipline, for example engineering drawings, physical models, and bills of quantities as well as subject-specific methods.

Graduate Attribute 7: Impact of Engineering Activity

Demonstrate knowledge and understanding of the impact of engineering activity on the society, economy, industrial and physical environment, and address issues by defined procedures.

Range Statement: The combination of social, workplace (industrial) and physical environmental factors must be appropriate to the sub-discipline of the qualification. Evidence may include case studies typical of the technical practice situations in which the graduate is likely to participate.

Issues and impacts to be addressed:

1. Are encompassed by standards and documented codes of practice.
2. Involve a limited range of stakeholders with differing needs.
3. Have consequences that are locally important and are not far reaching.
4. Are well-defined and discrete and part of an engineering system.

Graduate Attribute 8: Individual and Teamwork

Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a technical team and to manage projects.

Range Statement:

- The ability to manage a project should be demonstrated in the form of the project indicated in Graduate Attribute 3 (GA 3).
- Tasks are discipline specific and within the technical competence of the graduate.
- Projects could include laboratories, business plans, design, etc.
- Management principles include:
 - Planning: set objectives, select strategies, implement strategies and review achievement.

- Organising: set operational model, identify and assign tasks, identify inputs, delegate responsibility and authority.
- Leading: give directions, set example, communicate, motivate.
- Controlling: monitor performance, check against standards, identify variations and take remedial action.

Graduate Attribute 9: Independent Learning

Engage in independent and life-long learning through well-developed learning skills.

Range Statement: The learning context is well-structured with some unfamiliar elements.

Graduate Attribute 10: Engineering Professionalism

Understand and commit to professional ethics, responsibilities and norms of engineering technical practice.

Range Statement: Evidence includes case studies, memorandum of agreement, code of conduct, membership of professional societies, etc typical of engineering practice situations in which the graduate is likely to participate.

Graduate Attribute 11: Engineering management

Demonstrate knowledge and understanding of engineering management principles.

Range Statement: Basic techniques from project management applied to one's own work, as a member and leader in a technical team, and to manage projects in multidisciplinary environments.

Graduate Attribute 12: Workplace practices

Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved.

Note: The purpose of work-integrated learning is to enable the learner to connect academic learning with workplace practice.

Range Statement: Tasks to demonstrate this outcome may be performed in one or more of the following curriculum types:

1. Work-directed theoretical learning: in which theoretical forms of knowledge are introduced and sequences in ways that meet both academic criteria and are applicable and relevant to the career-specific components.
2. Problem-based learning: where students work in small self-directed groups to define, carry out and reflect on a task which is usually a real-life problem.
3. Project-based learning: that brings together intellectual enquiry, real world problems and student engagement in meaningful work.
4. Workplace learning: where students are placed in a professional practice or simulated environment within a training programme.
5. Simulated learning.

a. Admission Requirements

- i) National Senior Certificate (Grade 12) with rating codes:
 English Home Language (4)
 or English First Additional Language (4)

Mathematics (4)
 Physical Science (4)
 Technical Drawing or equivalent (4)
 Additional recommended school subject: Mechanical Technology

- ii) Senior Certificate or equivalent with a minimum symbol D (HG) or C (SG) in Mathematics, Physical Science, English and Technical Drawing. Additional recommended school subject: Mechanical Technology
- iii) An appropriate N3 certificate with a minimum of four subjects passed at 50% each including Mathematics, Technical Drawing and Engineering Science and Grade 12 level English passed with at least symbol D (SG)
- v) An appropriate GCE, GCSE, IGCSE, or Cambridge School Certificate with at least five subjects at GCE 'O' level including Mathematics, Physics, Chemistry, English and Technical Drawing, each being passed with an A, B or C symbol. Three of the five subjects must have been passed at the same examination sitting
- vi) **NCV Admission Requirements**
 NCV Level 4 with a minimum of 50% pass in the following subjects:
 Three fundamental subjects which must include English and Mathematics and a minimum of 60% in the three compulsory subjects from the **Engineering and Related Design** programme plus **Physical Science**.

NB: It is important to note that each student will be assessed on merit.

ADMISSION IS BASED ON A SELECTION PROCESS ONLY!!!

- b. **Duration of Study**
 4 years full time

c. Subjects, Curriculum Compilation, Course Codes

Code	Subjects	*C/ E	Semester /Year	Assessment Method	NQF Level	Credit	Pre-requisites
BASC000 BASC001	Basic Science I	C	Y1 (S1)	Examination	5		
CMLI000 COMP001	Computer Literacy I	C	Y1 (S1)	Examination	5		
LSAS000 LIFE001	Life Skills and Study Skills	C	Y1 (S1)	Examination	5		
DING000 DRAW001	Drawing	C	Y1 (S1)	Examination	5		
MATI000 MATS001	Mathematics	C	Y1 (S1)	Examination	5		
COMS000 COMS001	Communication Skills	C	Y1 (S2)	Examination	5		Life Skills and Study Skills (LIFE001)

ENCA000 ENCA001	Engineering Calculations	C	Y1 (S2)	Examination	5		Mathematics (MATS001)
ENSC000 ENSC001	Engineering Science I	C	Y1 (S2)	Examination	5		Basic Science I (BASC000)
CAPP000 COAP001	Computer Applications I	C	Y1 (S2)	Examination	5		Computer Literacy I (CMLI000)
DWNG000 DRAW002	Drawing I	C	Y1 (S2)	Examination	5		Drawing I (DRAW001)
CTIO101 COMM118	Communication Studies I	C	Y2 (S1)	Examination	5	7	Communication Skills (COMS001)
CMPS101 COSME18	Computer Skills I	C	Y2 (S1)	Examination	5	7	Computer Applications I
ELTR101 ELTR118	Electrotechnology I	C	Y2 (S1)	Examination	5	12	Engineering Calculations Engineering Science I
MTMA101 MATME18	Mathematics I	C	Y2 (S1)	Examination	5	12	Engineering Calculations
MEND101 MEDR118	Mech. Eng. Drawing I	C	Y2 (S1)	Continuous	5	12	Drawing I (DRAW002)
MMAE101 MMEN118	Mech. Manuf. Eng. I	C	Y2 (S1)	Examination	5	12	Drawing I (DRAW002)
MCHA101 MECA118	Mechanics I	C	Y2 (S1)	Examination	5	12	Engineering Calculations Engineering Science I
FLUM102 FLUM128	Fluid Mechanics II	C	Y2 (S2)	Examination	5	12	Mechanics I & Mathematics I
MTMA102 MATME28	Mathematics II	C	Y2 (S2)	Examination	5	12	Mathematics I
CAID102 CADR118	Comp. Aided Draught. I	C	Y2 (S2)	Continuous	5	12	Mechanical Engineering Drawing I Computer Skills I
SOMA102 STRE128	Strength of Materials II	C	Y2 (S2)	Examination	5	12	Mechanics I & Mathematics I
TERM102 TEMO128	Thermodynamics II	C	Y2 (S2)	Examination	5	12	Mechanics I & Mathematics I
MOMA102 MECM128	Mechanics of Machines II	C	Y2 (S2)	Examination	5	12	Mechanics I & Mathematics I
FLUM201 FLUM138	Fluid Mechanics III	C	Y3 (S1)	Examination	6	12	Fluid Mechanics II
MOMA201 MECM138	Mech. Of Machines III	C	Y3 (S1)	Examination	6	12	Mechanics of Machines II
SOMA201 STRE138	Strength of Materials III	C	Y3 (S1)	Examination	6	12	Strength of Materials II
TERM201 TEMO138	Thermodynamics III	C	Y3 (S1)	Examination	6	12	Thermodynamics II
MTMA201 MATME38	Mathematics III	C	Y3 (S1)	Examination	6	12	Mathematics II
MNGD201 MEDE128	Mech. Eng. Design II	C	Y3 (S1)	Examination	6	12	Mech. Eng. Drawing I, Strength of Materials II
MNGD202 MEDE138	Mech. Eng. Design III	C	Y3 (S2)	Examination	6	12	Mech. Eng. Design II & Computer Aided Drw. I
ASMA202 APSM138	Applied Strength of Mat. III	C	Y3 (S2)	Examination	6	12	Strength of Materials III
MAIN202 MAEN118	Maintenance Eng. I	C	Y3 (S2)	Examination	5	12	Mathematics I, Mech. Manufacturing Eng. I

HMAC202 HYMA138	Hydraulic Machines III	C	Y3 (S2)	Examination	6	12	Fluid Mechanics III
STMP202 STPL138	Steam Plant III	C	Y3 (S2)	Examination	6	12	Thermodynamics III
TMAC202 THEM138	Theory of Machines III	C	Y3 (S2)	Examination	6	12	Mechanics of Machines III & Mathematics II
WORKRP0 MEPR018	Mech. Eng. Practice 0, P0	C	Y3 (S2)	Attendance	5	6	
MECP301 MEPR118	Mech. Eng. Practice I, PI	C	Y4 (S1)	WIL Logbook	5	40	MTMA101, CTIO101 MCHA101, MEND101, WORKRP0,
MECP302 MEPR128	Mech. Eng. Practice II, PII	C	Y4 (S2)	WIL Logbook	6	44	MNGD201, Mechanical Eng. Pract I
C=Compulsory; E=Electives							

b. **Additional, Optional Subjects:**

The following subjects are offered to sufficient students wanting to do the subject. They are conducted after hours, at an extra cost, and they carry a full credit value.

Subjects, Curriculum Compilation, Course Codes

Code	Subjects	*C/E	Year / Semester	Assessment Method	NQF Level	Credits	Pre-requisites
MVEE102 MOVE118	Motor Vehicle Eng. I	E	Y2 (S2)	Continuous	5	12	
MMAE102 MMEN128	Mech. Manuf. Eng. II	E	Y2 (S2)	Continuous	5	12	Mech. Manuf. Eng. I
MMAE201 MMEN138	Mech. Manuf. Eng. III	E	Y3 (S1)	Continuous	6	12	Mech. Manuf. Eng. II
MANS201 MASKM18	Management Skills I	E	Y2 (S2)	Examination	5	12	Communication Studies I
ENMS102 EMSC118	Engineering Materials & Science I	E	Y2 (S2)	Examination	5	12	Mech. Manuf. Eng. I
MDSN202 MACH138	Machine Design III	E	Y3 (S2)	Continuous	6	12	Mech. Eng. Design III
ELTR201 ELTR128	Electrotechnology II	E	Y3 (S1)	Examination	5	12	Electrotechnology I
C=Compulsory; E=Electives							

e. **Examination Regulations**

Refer to the General Handbook Rule: G22.

f. **Assessments**

A candidate will undergo two distinct assessments in the diploma programme: academic assessment and graduate attributes assessment.

g. **Pass Requirements**

To pass a subject the candidate must obtain a final mark of 50% or more in the academic assessment and must satisfy the requirements of the graduate attribute development and/ or assessment concurrently.

h. **Pre-requisite**

A pre-requisite for an academic pass is that a candidate should have a minimum of 40% in the examination mark, otherwise he/she fails (even if the course mark and exam mark together total 50% or more.)

i. **Practicals**

The attendance of all practical classes is compulsory. Failure to attend practicals will result in the candidate not obtaining a course mark for that subject and may not meet the requirements of graduate attribute.

j. **Timetable Clashes (Refer to Rule G.16 in the General Handbook)**

Students may not register for any subjects that result in a timetable clash.

k. **Work Integrated Learning (WIL)**

It consists of P1 (6 month) and P2 (6 month) and it is the student's responsibility to register his/her training. This must be done before or on commencement of the training. Students who do not register their work integrated learning cannot be monitored nor evaluated and their training will not be recognised. Student must obtain his/her logbook from the Department of Mechanical Engineering before the commencement of their training. Students are only eligible for graduation after completion, submission, and acceptance of all the required reports.

5.3 Access Course: Mechanical Engineering (Pre-Tech course)

The course is a diploma-specific bridging course which prepares students for entry to the Diploma in Mechanical Engineering.

a. **Admission Requirements**

i) National Senior Certificate with rating codes:

English Home Language (3)

or English First Additional Language (3)

Mathematics (3)

Physical Science (3)

ii) Satisfactory achievement rating code (4) in their Home Language;

A minimum of 130 total credits; with a maximum of 60 credits with "Partial Achievement", at NQF Level 4 with a minimum of 50% pass in English, Mathematics and Physical Science

iii) Grade 12 Certificate or equivalent, including passes in

Mathematics D (SG) / E (HG)

Physical Science D (SG) / E (HG)

English D (SG) / E (HG)

iv) A full N3 certificate (4 subjects including Mathematics and Physical Science with a minimum 50% pass for each) and Grade 12 English symbol D (SG)

v) An appropriate GCE, GCSE, IGCSE or Cambridge School certificate must have passed five approved ordinary level subjects including English Language, provided three subjects have been passed at the same examination sitting. Only symbols A, B or C are accepted as passes.

vi) **NCV Admission Requirements**

NCV Level 4 with a minimum of 50% pass in the following subjects:

Three fundamental subjects which must include English and Mathematics and a minimum of 60% in the three compulsory subjects from the **Engineering and Related Design** programme plus Physical Science.

ADMISSION IS BASED ON A SELECTION PROCESS!!!

b. **Duration of Study**

Study will be for a period of six months.

c. **Subjects, Curriculum Compilation, Course Codes**

Code	Subjects	*C/E	Semester /Year	Assessment Method	NQF Level	Pre-requisites
ACOMM11	Communication	C	PRETECH	Examination	5	
ADRAM11	Drawing	C	PRETECH	Continuous	5	
AMATM11	Mathematics	C	PRETECH	Examination	5	
APITE11	Industrial Technology	C	PRETECH	Continuous	5	
AINME11	Introduction to Mechanics	C	PRETECH	Examination	5	
ABASC11	Basic Engineering Sc.	C	PRETECH	Examination	5	
C=Compulsory; E=Electives						

d. **Examination Regulations**

Refer to Part One: Rule 1.22

e. **Pass Requirements**

Students must pass ALL six subjects at 50% each during a single examination session, for promotion to the S1 level. This course may not be repeated.

f. **Practicals**

Students are expected to attend all practical sessions offered in the course.

g. Pre-Technician students are not excluded from writing examinations if their course mark is below 40%, i.e. all students will gain entry to the examination regardless of their course mark.

h. **Repeating Pre-Technician Course**

This course may not be repeated.

COURSE CURRICULUM

Subject Code	Subject includes
S1, semester 1	
Mechanics I	Vectors, resultants and equilibrants, determining unknown forces on a system of coplanar concurrent forces, moments, friction and centres of gravity, linear motion with uniform acceleration, motion in a vertical plane, angular motion, work and power, momentum, impulse and Newton's laws, potential and kinetic energy, centrifugal and centripetal force, simple lifting machines
Mechanical Engineering Drawing I	Orthographic projection: first and third angle, isometric drawing, interpenetration and developments, sectioning and assembly drawing, auxiliary drawing, introduction to CAD (AutoCAD 2016), 2D drawing

	commands in AutoCAD
Mechanical Manufacturing Engineering I	Safety and safety legislation, identification on materials and their property, ferrous, non-ferrous, non-metals, synthetic and composite materials, application and manufacturing of various materials. Measuring equipment: micrometers, vernier and protractors, hand, and machine tools: lathe, shaper, pedestal grinder. Drilling machine, fly press, welding
Electrotechnology 1	General concept of atomic theory, electric current, electricity basics, electric resistance, electric circuits, electromagnetism, induction capacitors, measuring instruments, storage cells
Mathematics I	Basic algebra and trigonometry, differential calculus with applications, integral calculus with applications, statistics, complex numbers, and hyperbolic functions
Computer Skills and Programming I	Hardware, software, data communications, computer applications, theory of computer and introductions to office suite which include MS Word, MS Excel, MS Power Point, network overview and security, data storage, introduction to programming
Communication Studies I	Academic writing skills, communication theory, meetings, public speaking & presentations, technical report writing and correspondence
S2 Semester 2	
Fluid Mechanics II	Fluid properties, pressure in fluids, hydrostatic forces, buoyancy, hydrostatic machines, fluid flow, flow measurement, flow through pipelines (Darcy and Chezy formula, minor losses)
Strength of Materials II	Simple plain trusses, simple stress and strain, thin cylinders, shafts and rigid couplings, close – coiled helical springs, geometric properties of beam sections, bending moment and shear force
Mechanics of Machine II	General dynamics. Vehicle dynamics, hoists and haulages, power transmission (belts, clutches, chain drives, gearboxes), brakes, simple harmonic motion
Computer Aided Draughting I	AUTOCAD (drawing with precision, creating and editing objects, Dimensioning, working with text, hatching, blocks & X-refs, plotting) INTRODUCTION TO INVENTOR (creating base features, sketched secondary features, creating pick and place, features, work features, model and display manipulation, advanced features and duplication tools, assembly environment, manipulating the assembly, display, assembly tools, drawing basics)
Thermodynamics II	Thermodynamics laws & systems, gases and single-phase systems, steam and two-phase systems, steam plant, combustion.
Mathematics II	Exponential Equations, Hyperbolic functions, Differentiation, Inverse Trigonometric functions, inverse hyperbolic functions, Partial Differentiation, Integration, Numerical Methods, First Order Differential equations
S3 Semester 3	
Mechanics of Machines III	Simple mechanisms, velocity and acceleration in mechanisms, toothed gearing, gear trains (including epicyclic arrangements), balancing of rotating masses.
Mechanical Engineering	Design process steps/cycle, Fits and Limits, Simple Stresses & Theories of

Design II	failure, Combined Stresses, Pipe & joint design, riveted joint design, Welded Joint design, Screwed/Fasteners Joint design, keys & splines, couplings.
Strength of Materials III	Space trusses, second moment of area, bending stresses, eccentric load on short columns and loaded beams, temperature stresses, strain energy due to direct stress, fatigue, basic two dimensional stress analysis
Thermodynamics III	Steady flow energy equation, Gas and steam nozzles, air reciprocating compressors, heat engine and refrigerators, Ideal gas cycle, I.C Engine and engine Trial, refrigeration cycles.
Fluid Mechanics III	Pipe friction, flow under varying head, and introduction to pumps, piping systems, channel flow, viscous flow, and vortices. forces exerted by a moving fluid, transmission of power by pipelines
Mathematics III	Fourier Series, Linear differential equations with constant coefficients, Laplace transforms
S4 Semester 4	
Mechanical Engineering Design III	Shaft Design, Gear design, Clutch Design, Bearing Design, Cotter and Knuckle joint Design, Brake Design, Pressure vessel Design, Spring Design, Belt drive Design
Steam Plant III	Power generation, Ideal Rankine cycle, Reheat and regenerative cycles, condensers and cooling towers, steam and gas turbines, Heat transfer: conduction, convection, radiation, Psychometrics
Hydraulic Machines III	Centrifugal pump design and performance, pumps in systems: series and parallel, positive displacement pumps, impulse water turbines, reaction water turbines.
Theory of Machines III	Turning moment/crank effort diagrams, analytical analysis of cam motion, balancing of reciprocating and rotating masses, free vibrations & introduction to 2 nd order differential equations
Maintenance Engineering, I	Maintenance function, maintenance strategies, assets register, reliability centred maintenance (RCM), failure modes and effect analysis (FMEM), maintenance documentation, backlog management, life cycle costing, turning maintenance into profit centre,
Applied Strength of Materials III	Deflection of beams, complex strain, 3-D strain & strain gauges, strains in thin-walled vessels subjected to fluid pressure, thick cylinders subjected to an internal pressure, transformation of internal stresses: complex stress systems, buckling, struts & slender columns
Electives subjects	
Engineering Materials & Science I	Introduction to the Structure of Matter, Atomic Structure, Crystal Structure, Imperfections in the Atomic Arrangement, Mechanical Properties & Testing, Strengthening Mechanisms in Metals, Solidifications and Dispersion Strengthening, Corrosion & Wear
Machine Design III	Review of component designs of power transmission mechanisms, manufacturing methods, assembly and joining methods, practical maintenance of the machine, Project Report (Project Proposals, Literature Review, Methodology, Results and presentation, Discussion, conclusions and Recommendations, Oral presentations, Submission of the write up
Management Skills I -Mech Eng	Introduction to Management, Business Leadership/Management, Productivity & Work Study, The Economic Structure, Basic Accounting, Engineering Contracts, Technical Report Writing Skills

Motor Vehicle Engineering I	Engine outlay and cycles, cylinder head and valves, cylinder block, crankshafts, piston, rings and connecting rods, lubrication circuit, Cooling system, Fuel system, Starting circuit, Ignition circuit, Gearboxes, Clutch, Differentials, Body structure, Suspension, Braking systems, Tyres
Mechanical Manufacturing Engineering II	Manufacturing Overview, Safety & Work holding devices, Quality standards, Measurement and Tolerances, Metal joining methods, non –traditional Machining, Bulk Metal Deformation, Powder Metallurgy, Plastic Moulding processes
Mechanical Manufacturing Engineering III	Automation and Control Technologies, Material Handling Systems and Identification Technologies, Computer Numerical Control of Machines (CNC), Manufacturing Operations and Production Concepts, Rapid Prototyping, Flexible Manufacturing Systems (FMS) and Assembly Lines, Industrial Robotics, CAD/CAM,
Electrotechnology II	A.C voltage generation, electrical measurements, AC circuits, Power in AC circuits, Resonance in AC circuit, Complex numbers Three phase system, Transformer, DC current machines and motors

5.4 Qualification name: Advanced Diploma in Mechanical Engineering (ADMECHEN)

SAQA Qualification ID : 119525

CESM Code 081501

NQF Level : 7

SAQA Credits : Minimum 120

Rationale for the Qualification

The Engineering profession contributes to the technological, socio-economic, built environment and environmental infrastructure of the country, facilitating socio-economic growth and sustainability. The Advanced Diploma in Engineering Technology in Mechanical Engineering is primarily vocational, or industry oriented, characterized by underpinning theoretical knowledge and general principles and the application thereof to real situations or technology transfer. The qualification provides students with a sound knowledge base in a field of Mechanical Engineering in response to the needs of the community, as well as local, regional, and national industry by producing competent graduates.

A range of additional interventions are offered to students who are accepted in this programme. Such interventions include counselling and mentorship programmes. The Advanced Diploma programme has been a response to the well-known inequalities in South African society and to cater for varying levels of student preparedness. It ensures that sufficient support is provided during the initial years of study while guaranteeing expected graduate attributes.

The Advanced Diploma programme closes the gaps and disparities in students' educational and life experience so that they can be better equipped to contribute the economy. It also provides students with broad educational and life skills, including Mathematics, mechanical engineering subject specific knowledge. While students are mostly tutored

separately in small groups, they undertake their studies and lectures as integral members of the Advanced Diploma student group.

The Advanced Diploma programme in Mechanical Engineering is designed in such a way that after completing the programme, a student can progress to a bachelor's in engineering technology Honours programme.

Statement of Purpose

The Advanced Diploma in Mechanical Engineering is intended for mechanical engineering practitioners who, on achieving this qualification, will be able to apply management, analytical and practical engineering techniques, and knowledge to conduct operations and solve problems in a mechanical engineering working environment in the areas of design, manufacturing, maintenance, environmental engineering and automation and control.

The Advanced Diploma in Mechanical Engineering is aligned with ECSA prescribed standards, and the graduate must be able to demonstrate competence in the Graduate Attributes (GAs) 1 to 11.

The graduate attributes are designed to meet the educational requirement towards registration as a Candidate or Professional Engineering Technician with the Engineering Council of South Africa and acceptance as a candidate to write the examinations for Certificated Engineers.

ECSA Graduate Attributes

The graduate attributes defined below are stated generically and may be assessed in various engineering disciplinary or cross-disciplinary contexts in a provider-based or simulated practice environment.

General Range Statement: The competencies defined in the eleven graduate attributes may be demonstrated in a university-based, simulated workplace context. Competencies stated generically may be assessed in various engineering disciplinary or cross-disciplinary contexts.

Graduate Attribute 1: Problem solving

Identify, formulate, analyze and solve broadly-defined engineering problems

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural sciences, engineering fundamentals and an engineering speciality to solve broadly-defined engineering problems.

Range Statement: Mathematics, natural science and engineering sciences are applied in formal analysis and modelling of engineering situations, and for reasoning about and conceptualizing engineering problems.

Graduate Attribute 3: Engineering design

Perform creative, procedural, and non-procedural design and synthesis of components, systems, engineering works, products or processes.

Range Statement: Design problems used in exit-level assessment must conform to the definition of a broadly-defined engineering problem.

1. A major design problem should be used to provide evidence.
2. The selection of components, systems, engineering works, products or processes to be designed are dependent on the discipline or practice area.

Graduate Attribute 4: Investigations, experiments, and data analysis

Demonstrate competence to design and conduct investigations and experiments.

Range Statement: The balance of investigation and experiment should be appropriate to the discipline. Research methodology is to be applied in research or an investigation where the student engages with selected knowledge in the research literature of the discipline.

Note: An investigation differs from a design in that the objective is to produce knowledge and understanding of a phenomenon and a recommended course of action rather than specifying how an artifact could be produced.

Graduate Attribute 5: Engineering methods, skills, and tools, including information technology

Demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology.

Range Statement: A range of methods, skills, and tools appropriate to the disciplinary designation of the program including:

1. Discipline-specific tools, processes or procedures;
2. Computer packages for computation, modelling, simulation, and information handling;
3. Computers and networks and information infrastructures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork.

Graduate Attribute 6: Professional and technical communication

Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.

Range Statement: Material to be communicated is in an academic or simulated professional context.

1. Audiences range from engineering peers, management, and lay persons, using appropriate academic or professional discourse.
2. Written reports range from short (300-1000 words plus tables diagrams) to long (10 000 to 15 000 words plus tables, diagrams, and appendices), covering material at exit-level.
3. Methods of providing information include the conventional methods of the discipline, for example engineering drawings, as well as subject-specific methods

Graduate Attribute 7: Sustainability and impact of engineering activity

Demonstrate critical awareness of the sustainability and impact of engineering activity on the social, industrial, and physical environment.

Range Statement: The combination of social, workplace (industrial) and physical environmental factors must be appropriate to the discipline or other designation of the qualification. Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: health, safety and environmental protection; risk assessment and management and the impacts of engineering activity: economic, social, cultural, environmental and sustainability.

Graduate Attribute 8: Individual, team and multidisciplinary working

Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments.

Range Statement: Multidisciplinary tasks require co-operation across at least one disciplinary boundary. Co-

operating disciplines may be engineering disciplines with different fundamental bases other than that of the programme or may be outside engineering.

Graduate Attribute 9: Independent learning ability

Demonstrate competence to engage in independent learning through well-developed learning skills.

Range Statement: Operate independently in complex, ill-defined contexts requiring personal responsibility and initiative, accurately self-evaluate and take responsibility for learning requirements; be aware of social and ethical implications of applying knowledge in particular contexts.

Graduate Attribute 10: Engineering professionalism

Demonstrate critical awareness of the need to act professionally and ethically and to exercise judgment and take responsibility within own limits of competence.

Range Statement: Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. Ethics and the professional responsibility of an engineer and the contextual knowledge specified in the range statement of Graduate Attribute 7 is generally applicable here.

Graduate Attribute 11: Engineering management

Demonstrate knowledge and understanding of engineering management principles and economic decision-making.

Range Statement: Basic techniques from economics, business management; project management applied to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Admission Requirements

The admission to the proposed programme is subject to the MUT's general academic admission rules and the specific requirements of the Faculty of Engineering. In addition, students must be in possession of:

- National Diploma in Mechanical Engineering (NQF Level 6)
- Diploma in Mechanical Engineering (NQF Level 6)
- An appropriate National Diploma in Mechanical Engineering equivalent to NQF Level 6
- A cognate qualification in mechanical engineering equivalent to NQF level 6 – foreign qualifications approved by SAQA

- ***Please note, the intake of new students only takes place in the first semester.***

Duration of Study

The minimum study period for the Advanced Diploma in Mechanical Engineering is one-year full time or two years part time.

Curriculum Compilation

The curriculum compilation for Advanced Diploma in Mechanical Engineering is as follows:

SUBJECT CODE	MODULE TITLE	S1/S2 /Y	NQF LEVEL	ASSESSMENTS E/C	CREDITS	COMPULSORY/ELECTIVE	Pre-requisites
DEPR 470	Design Project IV	Y	7	Continuous	28	C	
MTHM471	Mathematics IV,	S1	7	Examination	12	C	
THER 471	Thermodynamics IV,	S1	7	Examination	12	C	
FLUM471	Fluids IV,	S1	7	Examination	12	C	
MEVI 471	Mechanical vibration,	S1	7	Examination	12	C	
ENPM 471	Engineering Business and Project management	S1	7	Examination	8	C	
TURB472	Turbomachinery,	S2	7	Examination	12	C	Fluid Mechanics IV
STAN 472	Stress Analysis,	S2	7	Examination	12	C	
AUCO 472	Automatic Control	S2	7	Examination	12	C	
RACO 472	Refrigeration and air conditioning	S2	7	Examination	12	C	Thermodynamics IV
EENG 472	Environmental engineering	S2	7	Examination	12	C	

Examination Regulations

Refer to the General Handbook Rule: G22.

i. Assessments

A candidate will undergo two distinct assessments in the Advanced diploma programme: academic assessment and graduate attributes assessment.

ii. Pass Requirements

To pass a subject the candidate must obtain a final mark of 50% or more in the academic assessment and must satisfy the requirements of the graduate attribute development and/ or assessment concurrently.

iii. Practicals

The attendance of all practical classes is compulsory. Failure to attend practicals will result in the candidate not obtaining a course mark for that subject.

COURSE CURRICULUM

Subject Code	Subject includes
Annual	
	The Literature Review; Design Project Methodology; Design Project Calculations; Results and Discussion; Design Project / Manufacturing drawings and Formatting and Formalities
Semester 1	
Mathematics IV	Multiple Integrals; Partial Differential Equations; Vector Calculus
Thermodynamics IV	One Dimensional Steady State Heat Conduction; Multi-dimensional Steady State Heat Conduction; Unsteady State Heat Conduction; Convection; Heat Exchangers; Boiling and Condensation; Radiation Heat Transfer and Mass Transfer
Fluid IV	Flow in Pipe Networks; Boundary Layers; External flow over bodies and Fluid Friction; Dimensional Analysis and Similarity; Compressible Flow
Mechanical Vibration	Single degree of freedom of systems (SDOF): Free Vibration; Forced Vibration; Application of forced SDOF Systems

	Multi degree of freedom of systems (MDOF)
Eng. Business & Project Management	Engineering Project Management; Project Life Cycle and Phases; Project Planning and Scheduling; Project Costing; Organizational Structures; Entrepreneurship; Marketing Plan; Organizational and financial Plan; Business Transportation and Logistics
Semester 2	
Refrigeration & Air-conditioning	Heat Transfer; Refrigeration and air conditioning applications; Cycle Diagrams; Multi-Stage Vapour Compression Refrigeration Systems; Vapour Absorption Refrigeration Systems; Refrigeration Plant Components; Psychometrics; Air conditioning systems; Air conditioning equipment, components, and controls; Heat load calculations.
Turbo Machines	Basic Concepts of Turbo Machines; Basic Equations and dimensional analysis; Centrifugal compressors and fans; Axial flow compressors and fans; Axial flow steam and gas turbines; Radial flow gas turbines.
Stress Analysis	Mechanical Properties of Metals; Cracking in Metals; Fracture Mechanics; Finite Element Method (FEM) and Finite Element Analysis (FEA)
Automatic Control	Principles of control systems; Control Loop Block Diagrams; Two Position and PID Control Systems (Controllers; Actuators; Sensors & Programming).
Environmental Engineering	Industry Approaches to Waste Management; Cost of Environmental Management; Environmental Risk Assessment; Occupational Health and Safety Act 85 of 1993 and Regulations

IMPORTANT NOTICE

The department rules must be read in conjunction with the Mangosuthu University of Technology's General Handbook Rules

INDEMNITY CLAUSE

Mangosuthu University of Technology is not liable to the learner or any third party for any demands, loss of life or amenities caused in whatever manner to the learner at the workplace where the Work Integrated Learning takes place. Despite the aforementioned, it is the responsibility of the learner to inform Mangosuthu University of Technology in writing of an unsafe or unhealthy conditions in the workplace where the student is receiving the training. Whilst every effort will be made to help students in securing placement for Work Integrated Learning the University does not guarantee such placements.

