FACULTY

OF

ENGINEERING

PROSPECTUS

2026

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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	:	Dr RF Chidzonga*	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
Dr JI Baah — Tel. No. : +27 31 907 7318
Julia@mut.ac.za

Civil Engineering & Surveying
P Bhengu* — Tel No: +27 31 907 7466
bhengup@mut.ac.za

Construction Management & Quantity Surveying
(THIS DEPARTMENT HAS A SEPARATE HANDBOOK)
Mr I Dala — Tel. No.: +27 31 907 7558
Ismail@mut.ac.za

Electrical Engineering
Prof BP Numbi* — Tel. No. : +27 31 907 7221
NumbiB@mut.ac.za

Mechanical Engineering
Dr J Mukuna* — Tel. No +27 31 819 9504
mukunaj@mut.ac.za

1. DEPARTMENT OF CHEMICAL ENGINEERING

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 (CHENDI) Advanced Diploma in Chemical Engineering (ADCHEN)	96854 101988
Access courses: • Chemical Engineering (ACHEMI) • Analytical Chemistry (ANACHE)	

1.1 Diploma in Chemical Engineering (CHENDI)

NQF Level : 6
SAQA Credits : 360
Duration : 3 years

Purpose of the qualification

The qualification's purpose is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practising chemical engineering technician.

This qualification

- Prepares learners for careers in chemical engineering and related areas, for achieving technical leadership, and to contribute to the economy and national development.
- Meets the educational requirement towards registration as a Professional Engineering Technician with the Engineering Council of South Africa (ECSA) and allows graduates to pursue careers in chemical engineering and related fields.
- Provides graduates with 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 practised.
- Enables graduates with an appropriate level of achievement in the qualification to undertake more specialised and intensive learning in further professional development.

Learners achieving this qualification will have a working understanding of the engineering sciences underlying the techniques used, together with financial, commercial, legal, socio-economic, health, safety, and environmental methodologies, procedures, and practices needed to solve typical problems in chemical processes and plant operations.

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 Diploma in Chemical Engineering aims 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.

Professional Chemical Engineering Technicians are characterised 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, construction and activities. They work independently and responsibly within an allocated area or under guidance.

Professional Chemical Engineering Technicians must therefore have a working understanding of the 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 Chemical Engineering Technician typically starts with the attainment of a Diploma in Chemical Engineering qualification. This qualification, in conjunction with relevant work experience, leads to the attainment of the competencies required for registration as a Professional Engineering Technician with the Engineering Council of South Africa (ECSA).

Qualification Rules

The learners will be awarded this qualification if they have 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 the E-02-PN ECSA standard outlined below.

Please note that starting from 2026 graduate attributes will be assessed based on the ECSA E-02-PN Revision 6 standard of August 2023.

ECSA Graduate Attributes

Graduate Attribute 1: Problem Solving

Identify and analyse well-defined engineering problems *reaching substantiated conclusions* using codified methods of analysis specific to their field of activity

Associated knowledge and attitude profile:

- A descriptive, formula-based understanding of the natural sciences applicable in a subdiscipline and awareness of directly relevant social sciences.
- Procedural mathematics, numerical analysis, statistics applicable in a subdiscipline.
- A coherent, procedural formulation of engineering fundamentals required in an accepted subdiscipline.
- Engineering specialist knowledge that provides the body of knowledge for an accepted subdiscipline.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified to wide, practical procedures and practices.

Associated knowledge and attitude profile:

As for Graduate Attribute 1.

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

Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

Associated knowledge and attitude profile:

Knowledge that supports engineering design and operations based on the techniques and procedures of a practice area.

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 subdiscipline or practice area. Appropriate consideration must be given to public health and safety, whole-life cost and net zero carbon, as well as resource, cultural, societal and environmental considerations, as required.

Graduate Attribute 4: Investigations, experiments and data analysis
Demonstrate competence to conduct investigations of well-defined problems; locate and search relevant codes and catalogues; and conduct standard tests and measurements.

Associated knowledge and attitude profile:
Engagement with the current technological literature of the practice area.

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

Graduate Attribute 5: Use of engineering tools
Demonstrate competence to apply appropriate techniques, resources and modern computing, engineering and IT tools to well-defined engineering problems, with an awareness of the limitations.

Associated knowledge and attitude profile:
- Procedural mathematics, numerical analysis, statistics applicable in a subdiscipline.
- Codified practical engineering knowledge in recognised practice area.

Range Statement:
A range of techniques, resources and modern engineering and IT tools appropriate to the disciplinary designation of the programme.

Graduate Attribute 6: Professional and Technical Communication
Demonstrate competence to communicate effectively and inclusively on well-defined engineering activities, both orally and in writing, with the engineering community and society at large, by being able to comprehend the work of others, document own work and give and receive clear instructions.

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 2 000 words, excluding tables, diagrams and appendices), covering material at exit-level. Methods of providing information include the conventional methods of the subdiscipline, for example engineering drawings and subject-specific methods.

Graduate Attribute 7: The engineer and the world
Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

Associated knowledge and attitude profile
- A descriptive, formula-based understanding of the natural sciences applicable in a subdiscipline and awareness of directly relevant social sciences.
- Knowledge that supports engineering design and operations based on the techniques and procedures of a practice area.
- Knowledge of issues and approaches in engineering technician practice, such as public safety and sustainable development.

Range Statement:
The combination of social, workplace (industrial) and physical environmental factors must be appropriate to the subdiscipline or other designation of the qualification. Comprehension of the role of engineering in the world and identified issues in engineering practice in the subdiscipline: 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 and collaborative teamwork
Demonstrate competence to function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

Associated knowledge and attitude profile:
Knowledge of professional ethics, responsibilities and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Range Statement:
Multi-disciplinary 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.

Associated knowledge and attitude profile:
Engagement with the current technological literature of the practice area.

Range Statement:
Operate independently in well-defined contexts recognising the need for and have the ability for independent updating in the face of specialised technical knowledge.

Graduate Attribute 10: Engineering professionalism
Understand and commit to professional ethics and norms of technician practice, including compliance with relevant laws.

Associated knowledge and attitude profile:
As for Graduate Attribute 8.

Range Statement:
Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. An understanding of the need for diversity and inclusion is required.

Graduate Attribute 11: Project management and finance
Demonstrate awareness of engineering management principles.

Range Statement:
Basic techniques from economics and project management applied to one's own work, as a member or leader in a technical team, and to manage projects in multi-disciplinary 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:

- Work-directed theoretical learning

- Problem-based learning
- Project-based learning
- Work-based learning
- Simulated learning.

a. **Admission requirements**

i) National Senior Certificate with rating codes:

English Home Language	4
English First Additional Language	4
Mathematics/Technical Mathematics	4
Physical Science/ Technical 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) An N4 qualification with a minimum of 50% passes in Mathematics and Engineering Science and Grade 12 level English passed with at least NSC level 4 or symbol D (HG).

iv) An appropriate GCE, GCSE, IGCSE, or Cambridge School Certificate with at least five subjects at GCE 'O' level including Mathematics, Science and English, each being passed 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 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.

vi) Students who have successfully completed the Chemical Engineering Access (Bridging) Course are also considered.

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. Two of these are spent full-time at the University, and one year is appropriate Work-Integrated Learning as a learner technician. *All instructional offerings indicated in the next section are compulsory.*

c. **Curriculum Compilation and Prerequisites**

Please note: *The Department will be implementing a new curriculum in 2027. All students who do not pass old curriculum subjects after their second attempt or return to the programme after interrupting their studies will be required to follow the new curriculum.*

DIPLOMA IN CHEMICAL ENGINEERING (CHENDI)								
Code	**Subjects**	**Credits**	**Semester of study**	**Assessment Method**	**NQF Level**	**Prerequisites**	**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	Continuous Assessment	5			
CHTE112	Introduction to Chem Eng Technology 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	5	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, MACH211, ORCH222, CHYC222		
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,	CPDP311	

						CPIN221, ORCH222, CHYC222, MACH211, COSC111		
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, CHPL332, CEEP032, THCE301, CHTE311, CHTE312, CPDP311		
CEIS022	Chem Eng Practice II (P2)	44	6	Continuous assessment	6	CEIS012		GA 8 & GA 12

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 the timetable).
- All subjects are evaluated through a 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, they may apply for an aegrotat test on the prescribed form and attach a doctor's certificate. If this is not done, a "0" mark will be awarded for a missed assessment.
- A pass in the practical component of some courses is a prerequisite for achieving a semester mark or examination admission (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).
- Students who achieved competency in all graduate attributes assessed in a particular subject but failed to pass the course as per general rule G.22.3(f) will need to repeat the subject. However, upon students' request, with the support of a subject lecturer and approval of the HOD, they may retain the mark for the GA assessment component of the course for one year after the GA assessment, provided that the assessment contributes no more than 40% of the final course mark.
- All other rules are per General Rules and Regulations in the Students Handbook.

e. **Work Integrated Learning**

It is the student's responsibility to register for training, which must be done before or on the commencement of the training. Students who experience problems with registration must contact their WIL coordinators or the Head of Department for advice.

Students who do not register their work-integrated learning cannot be monitored or evaluated, and their training will not be recognised.

Students registering for work-integrated learning must collect a WIL manual from the Department of Chemical Engineering. The manual outlines the details of the training procedures. Students are only eligible for graduation after all the necessary reports are completed, submitted and evaluated.

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, an 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 and presentation skills, and report writing skills.

- **Mathematics I (MACH111)**
  The syllabus includes basic algebra and trigonometry, differential and 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, the theory of computers, and an introduction to Excel, word processing, and spreadsheets.

- **Introduction to Chemical Engineering Technology 1 (CHTE112)**
  The syllabus includes what chemical engineering technicians do, chemical processes, and fundamentals of material and energy balances**.**

- **Chemical Engineering Technology II (CHTE212)**
  The syllabus includes the 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, and differential equations.

- **Chemical Engineering Drawing (DRAC212)**
  The syllabus includes isometric projection, conics, and engineering curves, including ellipses; development and intersection of surfaces; and 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 gases, and mixing liquids.

- **Chemical Engineering Technology III - Module 1 (CHTE311)**
  Modules cover fundamental principles of incompressible fluid flow, compressible fluid flow, heat transfer, mass transfer, and their applications.

- **Chemical Engineering Technology III - Module 2 (CHTE312)**
  The syllabus covers basic principles and concepts underpinning operations of units encountered in the chemical and allied industries and their sizing. It 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, flow meters and cooling towers.

- **Thermodynamics: Chemical Engineering III (THCE301)**
  The syllabus includes an introduction, the first law of thermodynamics, heat capacity, the second and third laws of thermodynamics, real gases, thermodynamic relationships, and properties of mixtures.

- **Chemical Engineering Design and Professional Practice (Principles) (CPDP311)**
  The syllabus includes the design process, chemical process selection, environmental protection, chemical process safety, fluid pumping, pumps and piping design procedures, process flow-sheeting, an introduction to the 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, a 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, including distillation, heat exchange, agitation, and mixing of fluids, process equipment cost estimation, a HAZOP study, engineering ethics, and the use of engineering software for material and energy balancing.

- **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, fluidised bed reactor, convective dryer, and study of pressure drop due to friction.

- **Process Instrumentation and Control (PRCO331)**
  The syllabus includes piping and instrumentation diagrams, various instrumentation, controller tuning and stability, control valve sizing, simple and advanced control systems, alarms, safety trips, and interlocks.

- **Thermodynamics: Applied III (THAP331)**
  The syllabus includes reversible non-flow processes, working fluids; application of the first law of thermodynamics in the heat engine cycle, steam plants, 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 data analysis (using Excel).

- **Chem Eng Practice I (CEIS012)**
  The industry practice develops the skills through physically following process streams/lines to produce a process description and diagram, performing process material balances, laboratory analysis, and basic plant problem-solving whilst enhancing the understanding of the environmental, health, and safety management systems.

- **Chem Eng Practice II (CEIS022)**
  The industry practice strengthens the development of some level of competency in performing technical investigations, safety and hazard audits, participating in HAZOP studies and producing process and instrumentation diagrams, applying financial principles to the process, and evaluating a heat/mass transfer equipment design (or performing a heat/mass transfer equipment efficiency study).

1.2 Advanced Diploma in Chemical Engineering (ADCHEN)

NQF Level : 7
SAQA Credits : 142
Duration : 1 year full-time or 2 years part-time.

Purpose of the qualification:

The qualification's purpose is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practising Engineering Technologist. The purpose of this Advanced Diploma in Chemical Engineering is to provide graduates with the following:

a. Preparation for careers in chemical engineering and related areas, for achieving technical leadership, and to contribute to the economy and national development.
b. The educational requirement towards registration as a Professional Engineering Technologist with ECSA, as well as to allow the graduate to pursue careers in engineering and related fields.
c. 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 practised.
d. For graduates with an appropriate level of achievement in the qualification, articulation into further engineering qualifications at NQF Level 8, e.g. Bachelor's Degree, Honours Degree or Postgraduate Diploma in Engineering or other fields and then proceed to master's degree studies.

Learners achieving this qualification will have a systematic theory-based understanding of the engineering sciences underlying the accepted methods and techniques used in chemical processes and plant operations, together with financial, commercial, legal, socio-economic, health, safety, and environmental methodologies, procedures, and practices.

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. An Advanced Diploma in Chemical Engineering aims 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.

Professional Chemical Engineering Technologists are characterised by their ability to apply established and newly developed engineering technologies to solve broadly defined problems and develop components, systems, services, and processes. They provide leadership in applying technology to safety, health, engineering, and commercially effective operations, and possess 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 must therefore have a specialised understanding of the engineering sciences underlying a deep knowledge of specific technologies, together with financial, commercial, legal, social, and economic, as well as health, safety, and environmental matters.

The development process of a Professional Chemical Engineering Technician typically starts with the attainment of an Advanced Diploma in Chemical Engineering qualification. This qualification, in conjunction with relevant work experience, leads to the achievement of the competencies required for registration as a Professional Engineering Technologist with the Engineering Council of South Africa (ECSA).

Qualification Rules

The learners will be awarded this qualification if they have 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.

Please note that starting from 2026 graduate attributes will be assessed based on the ECSA E-05-PT Revision 6 standard of August 2023.

ECSA Graduate Attributes (GAs):

Graduate Attribute 1: Problem solving
Identify, formulate, research literature and analyse broadly defined engineering problems reaching substantiated conclusions using analytical tools appropriate to the discipline or area of specialisation.

Associated knowledge and attitude profile:

- A systematic, theory-based understanding of the natural sciences applicable to the subdiscipline and awareness of relevant social sciences.
- Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed consideration and use of models applicable to the subdiscipline.
- A systematic, theory-based formulation of engineering fundamentals required in an accepted subdiscipline.
- Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for an accepted subdiscipline.

Graduate Attribute 2: Application of scientific and engineering knowledge
Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialisation to defined and applied engineering procedures, processes, systems or methodologies.

Associated knowledge and attitude profile:
As for Graduate Attribute 1.

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

Graduate Attribute 3: Engineering design
Design solutions for broadly defined engineering technology problems and contribute to the design of systems, components or processes to meet identified needs.

Associated knowledge and attitude profile:
Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon and similar concepts, that supports engineering design and operations using the technologies of a practice area.

Range Statement:
Design problems used in exit-level assessment must conform with the definition of a broadly defined engineering problem. A major design problem should be used to provide evidence. The selection of components, systems, engineering works, products or processes to be designed are dependent on the discipline or practice area. Appropriate consideration must be given to public health and safety, whole-life cost and net zero carbon, as well as resource, cultural, societal and environmental considerations, as required.

Graduate Attribute 4: Investigations, experiments and data analysis
locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions.

Associated knowledge and attitude profile:

Engagement with the current technological literature of the discipline and awareness of the power of critical thinking.

*Range Statement**:***

The balance of investigation and experiment should be appropriate to the discipline and the definition of a broadly defined problem. 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.

Graduate Attribute 5: Use of engineering tools

Demonstrate competence to select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to broadly defined engineering problems.

Associated knowledge and attitude profile:

- Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed consideration and use of models applicable to the subdiscipline.
- Knowledge of engineering technologies applicable in the subdiscipline.

Range Statement:

A range of techniques, resources and modern engineering and IT tools appropriate to the disciplinary designation of the programme.

Graduate Attribute 6: Professional and technical communication.

Demonstrate competence to communicate effectively and inclusively on broadly defined engineering activities, both orally and in writing, with the engineering community and society at large, taking into account cultural, language and learning differences.

Range Statement:

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

Graduate Attribute 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

Associated knowledge and attitude profile:

- A systematic, theory-based understanding of the natural sciences applicable to the subdiscipline and awareness of relevant social sciences.
- Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon and similar concepts, that supports engineering design and operations using the technologies of a practice area.
- Knowledge of the role of technology in society and identified issues in applying engineering technology, such as public safety and sustainable development.

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 is required of the role of engineering in the world

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 and collaborative teamwork
Demonstrate competence to function effectively as an individual and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

Associated knowledge and attitude profile:
Knowledge of professional ethics, responsibilities and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Range Statement:
Multi-disciplinary 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.

Associated knowledge and attitude profile:
Engagement with the current technological literature of the discipline and awareness of the power of critical thinking.

*Range Statement**:***
Operate independently in broadly defined contexts recognising the need for and have the ability for i) independent and life-long learning, and ii) critical thinking in the face of new specialist technologies.

Graduate Attribute 10: Engineering professionalism.
Understand and commit to professional ethics and norms of engineering technology practice, including compliance with national and international laws.

Associated knowledge and attitude profile:
As for Graduate Attribute 8.

Range Statement:
Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. An understanding of the need for diversity and inclusion is required.

Graduate Attribute 11: Project management and finance
Demonstrate knowledge and understanding of engineering management principles.

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

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 a related field. Preference will be given to candidates with higher academic achievements in the qualifications presented for admission.
Please note that the intake of new students only takes place in the first semester.

b. **Duration of Programme**

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

c. **Curriculum Compilation and Prerequisites**

ADVANCED DIPLOMA IN CHEMICAL ENGINEERING (ADCHEN)								
Code	**Subjects**	**Credits**	**Semester offered**	**Assessment Method**	**NQF Level**	**Prerequisites**	**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 & CHTE473	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

d. **Teaching, Learning and Assessment**

- All subjects in the programme, 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 the timetable)
- All subjects are evaluated through a 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 the prescribed form and attach a doctor's certificate. If this is not done, a "0" mark will be awarded 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).
- Students who achieved competency in all graduate attributes assessed in a particular subject but failed to pass the course as per general rule G.22.3(f) will need to repeat the subject. However, upon students' request, with the support of a subject lecturer and approval of the HOD, they may retain the mark for the GA assessment component of the course for one year after the GA assessment, provided that the assessment contributes no more than 40% of the final course mark.
- All other rules are per the 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 an exterior surface, heat transfer with a change in phase, molecular diffusion in fluids and solids, prediction of diffusivities in fluids, diffusion through a 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, crystallisation, 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, equipment design, cost estimation, and simulation (Aspen) software use for process design, optimisation, cost estimation, and pinch technology.

- **Production Management (PECI471)**
  The syllabus includes organisational goals and society, planning, control, process and project management, financial management, people management, and innovation management.

- **Chemical Process Control IV (PRCO471)**
  The syllabus includes a process control overview, mathematical modelling principles, linearisation of non-linear equations, the 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 includes an overview of research and its methodologies, literature search, review, citation practices, problem identification, design of experiments, analysis and interpretation of data, presentation of research findings, and writing of research proposals.

ACCESS COURSE: CHEMICAL ENGINEERING/ANALYTICAL CHEMISTRY			
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
ACOCH11	Communications	1 & 2	Examination

ALABC11	Lab Practice	1 & 2	Continuous assessment

1.3 Access Courses:

- **Chemical Engineering (ACHEMI)**
- **Analytical Chemistry (ANACHE)**

Statement of Purpose

The purpose of these courses is to enhance and bridge the candidates' existing skills, knowledge and attitude with the skills, knowledge and attitude required for admission to the Diploma in Chemical Engineering or Diploma in Analytical Chemistry programmes.

a. **Duration of the course**

The duration of the course is six months.

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/Technical Mathematics	3
Physical Science/Technical 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 symbols 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.

d. **Learning, Teaching and Assessment**

- Students are expected to attend all practicals, lectures, and tutorials offered in the course (as per the timetable).
- 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 the prescribed form and attach a doctor's certificate. If this is not done, a "0" mark will be entered for the 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 at least 50%.

- **PLEASE NOTE THAT THIS COURSE <u>MAY NOT</u> BE REPEATED**.

All other examination rules apply, as in the General Rules and Regulations for Students handbook—Rule G22.

e. **Promotion to Higher Level**

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

Course Content

- **Chemistry (ACHEM11)**
  The syllabus includes units of measurement, 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 and draw freehand sketches. It then proceeds to the use of drawing instruments to draw geometrical constructions, orthographic projections, isometric drawings, and sectional drawings.

- **Communications (ACOCH11)**
  The syllabus includes oral communication, vocabulary-building skills, language usage skills, basic reading skills, and business correspondence.

- **Lab Practice (ALABC11)**
  The practicals include using mass and electronic top-loading balances, a gas burner, instruments for measuring volume and temperature, filtration and evaporation equipment, etc.

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 (Applicable to both the 3-year and 4-year Civil Engineering diploma programs)

Graduate Attribute 1: Problem-solving
Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.

Associated knowledge and attitude profile:

- A descriptive, formula-based understanding of the natural sciences applicable in a subdiscipline and awareness of directly relevant social sciences.
- Procedural mathematics, numerical analysis, statistics applicable in a subdiscipline.
- A coherent, procedural formulation of engineering fundamentals required in an accepted subdiscipline.
- Engineering specialist knowledge that provides the body of knowledge for an accepted subdiscipline.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified to wide, practical procedures and practices.

Associated knowledge and attitude profile:

- As for Graduate Attribute 1.

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

Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

Associated knowledge and attitude profile:

- Knowledge that supports engineering design and operations based on the techniques and procedures of a practice area.

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 subdiscipline or practice area. Appropriate consideration must be given to public health and safety, whole-life cost and net zero carbon, as well as resource, cultural, societal and environmental considerations, as required.

Graduate Attribute 4: Investigations, experiments and data analysis

Demonstrate competence to conduct investigations of well-defined problems; locate and search relevant codes and catalogues; and conduct standard tests and measurements.

Associated knowledge and attitude profile:

- Engagement with the current technological literature of the practice area.

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

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 can be produced.

Graduate Attribute 5: Use of engineering tools

Demonstrate competence to apply appropriate techniques, resources and modern computing, engineering and IT tools to well-defined engineering problems, with an awareness of the limitations.

Associated knowledge and attitude profile:

- Procedural mathematics, numerical analysis, statistics applicable in a subdiscipline.
- Codified practical engineering knowledge in recognized practice area.

Range statement: A range of techniques, resources and modern engineering and IT tools appropriate to the disciplinary designation of the programme.

Graduate Attribute 6: Professional and technical communication

Demonstrate competence to communicate effectively and inclusively on well-defined engineering activities, both orally and in writing, with the engineering community and society at large, by being able to comprehend the work of others, document own work and give and receive clear instructions.

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 2 000 words, excluding tables, diagrams and appendices), covering material at exit-level. Methods of providing information include the conventional methods of the subdiscipline, for example engineering drawings and subject- specific methods.

Graduate Attribute 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal framework and the environment.

Associated knowledge and attitude profile:

- A descriptive, formula-based understanding of the natural sciences applicable in a subdiscipline and awareness of directly relevant social sciences.
- Knowledge that supports engineering design and operations based on the techniques and procedures of a practice area.
- Knowledge of issues and approaches in engineering technician practice, such as public safety and sustainable development.

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

Developmental considerations:

- Ability to self-reflect and show contextual awareness of social, workplace and governmental environments through exposure to complex, multi-disciplinary and/or unfamiliar problems.
- Ability to identify and position a design/artefact in the bigger picture and use appropriate judgement (intentionally incorporate multiple perspectives) to obtain a final solution or product.
- Ability to listen and interpret information from a variety of stakeholders to appropriately position identified problems/challenges/opportunities in the relevant context.

Graduate Attribute 8: Individual and collaborative teamwork

Demonstrate competence to function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

Associated knowledge and attitude profile:

- Knowledge of professional ethics, responsibilities and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Range statement: Multi-disciplinary 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.

Developmental considerations:

- Develop the ability to self-reflect and self-evaluate within an interpersonal engagement towards enabling appropriate understanding of self and other team members.
- Develop the ability to listen and interpret different motivations, personalities or workstyles within a team context towards enabling functional team dynamics.
- Knowledge of team cohesion and dynamics, motivational styles, frameworks for conflict and tension resolution and ability to apply these.
- Ability to negotiate and manage time and project components related to interpersonal needs and agendas. Time management also includes understanding the value of time and determining if a task is better (cheaper) achieved by a single person or a team.

Graduate Attribute 9: Independent learning ability

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

Associated knowledge and attitude profile:

- Engagement with the current technological literature of the practice area.

Range statement: Operate independently in well-defined contexts recognizing the need for and have the ability for independent updating in the face of specialized technical knowledge.

Developmental considerations:

- Openness to constructive feedback, awareness of own limitations, ability to cope with the discomfort of uncertainty and having access to a range of approaches, reflective self- evaluation, curiosity and proactive engagement, resilience, confidence to ask for help and draw from a broad range of stakeholders.
- Reflection of self-learning to begin to recognize if what has been covered meets the needs of the activity or task.

Graduate Attribute 10: Engineering professionalism

Understand and commit to professional ethics and norms of technician practice, including compliance with relevant laws.

Associated knowledge and attitude profile:

- As for Graduate Attribute 8.

Range statement: Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. An understanding of the need for diversity and inclusion is required.

Developmental considerations:

- Self-management, professional responsibility and awareness of expertise and limitations, good judgement, process of on-going self-reflection and evaluation.
- Timeous, clear, realistic communication of risks and concerns, feedback on progress.
- Self-efficacy, accepting feedback and consequences and commitment.

Graduate Attribute 11: Project management and finance

Demonstrate awareness of engineering management principles.

Range statement: Basic techniques from economics and project management applied to one's own work, as a member or leader in a technical team, and to manage projects in multi-disciplinary 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:

- Work-directed theoretical learning
- Problem-based learning
- Project-based learning
- Work-based learning
- Simulated learning.

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

2.1.1 **Minimum Admission Requirements**

i) National Senior Certificate with rating codes:

English Home Language	(4)
English First Additional Language	(4)
Mathematics/Technical Mathematics	(4)
Physical Science/ Technical 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						
Diploma CIVDIP	**Subjects**	**Assessment Method**	**NQF Level**	**Pre-requisites**	**Co-requisites**	**Saqa Credits**
Semester 1						
APME101	Applied Mechanics for Civil Engineers	Exam	5			12
CPIL101	Computer Skills I	Exam	5			12
COME101	Construction Methods I	Exam	5			8
DING101	Civil Engineering Drawing 1	Continuous	5			8
MATA101	Mathematics I	Exam	5			12
SUTP101	Surveying: Theory and Practical	Exam	5			12
Semester 2						
COSL102	Communication Skills IA	Exam	5			8
COMA102	Construction Materials I	Exam	5	Construction Methods I		12
DING 102	Civil Engineering Drawing II	Continuous	5	Civil Engineering Drawing 1		8
CEMA102	Civil Engineering Management	Exam	5			8
MATA102	Mathematics II	Exam	5	Mathematics I		12
THOS102	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						
GEEN 201	Geology and Soil Mechanics	Exam	6	Mathematics II, Theory of Structures II, Construction Materials I and Construction Methods I		12

RCMD201	Reinforced Concrete & Masonry Design III	Continuous	6	Theory of Structures II, Drawing II, Mathematics II and Construction Materials I		12
TREN 201	Transportation Eng.	Exam	6	Civil Engineering Drawing II, Surveying T/P, Mathematics II and Construction Materials I		8
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
DOCU202	Documentation for Civil Engineers	Continuous	6			8
Semester 4						
CIVD 202	Civil engineering design	Continuous	6	Completion of S3		16
GEOT 202	Geotechnical Eng.	Exam	6	Geology and Soil Mechanics		12
STUA 202	Structural Analysis	Exam	6	Theory of Structures II and Mathematics II		12
SSTM 202	Structural Steel & Timber Design III	Continuous	6	Theory of Structures II & Civil Eng., Drawing II		12
EWPD 202	Earthworks and Pavement Design	Exam	6	Transportation Eng.		12
WENG 202	Water Engineering II	Exam	6	Water Engineering I Introduction to Environmental Engineering		12
	Work Readiness Program	Continuous	6			
In-service Training						
CVEP301	Civil Engineering Pract. I		5	All S1 and S2 modules		40
CVEP302	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 was fully phased-in by the 1st semester of 2023, with some of the modules from the old programs phased out by the end of 2024. Any similar modules from the old programs to the new program will be credited.

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	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:**

i) National Senior Certificate with rating codes:

English Home Language	(4)
English First Additional Language	(4)
Mathematics/Technical Mathematics	(4)
Physical Science/ Technical Science	(4)

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

iii) Pass all Pre-Tech subjects with a minimum of 50%

iv) National Senior Certificate/Standard 10 / Matric Certificate with a minimum

Maths	D (HG)
Physical Science	D (HG)
English	E (SG)

v) 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

vi) 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**

Diploma (CISEND)	Subjects	Assessment Method	NQF Level	C/O	Semester/ Year	Prerequisites	Co requisites	SAQA Credits
YEAR 1								
	First Semester							
COML101	Computer Skills I	Exam	5	C	S1			12
CMET101	Construction Methods I	Exam	5	C	S1			10
DRNG101	Survey Drawing I	Continuous	5	C	S1			10
MATE101	Mathematics I	Exam	5	C	S1			12
SURY101	Surveying I	Exam	5	C	S1			12
PHSC101	Physics I	Exam	5	C	S1			10
	Second Semester							
COLL102	English Communication Skills I	Exam	5	C	S2			8
GEOG102	Geography I	Exam	5	C	S2			5
MATE102	Mathematics II	Exam	5	C	S2	Mathematics I		12
PHOT102	Photogrammetry II	Exam	5	C	S2	Surveying I & Mathematics I		12
SURY102	Surveying II	Exam	5	C	S2	Surveying I		12

SURD102	Survey Drawing II	Continuous	5	C	S2	Drawing I		10
YEAR 2								
	First Semester							
COLL201	English Communication Skills II	Exam	6	C	S3	English Communication Skills I		2,5
COSU201	Control Surveying III	Exam	6	C	S3	Surveying II		15
LEGP201	Legal Principles I	Exam	6	C	S3	- -		10
STTT201	Statistics I	Exam	6	C	S3	Mathematics II		12
PHOT201	Photogrammetry III	Exam	6	C	S3	Photogrammetry II		12
MCIV201	Management (Civil) I	Exam	6	C	S3	-		10
	Second Semester							
ADER202	Adjustment of Errors III	Exam	6	C	S4	Statistics I, Mathematics II, Surveying II		12
CASU202	Cadastral Surveying III	Exam	6	C	S4	Survey Drawing II, Surveying II, Legal Principles I		12
COAP202	Computer Applications III	Exam	6	C	S4	Computer Skills I, Surveying II		12
GEIS202	Geographic Information Systems III	Continuous	6	C	S4	CO-REQUISITE: Computer Applications III		12
SURY202	Surveying III	Exam	6	C	S4	Surveying II		15
COLL202	English Communication Skills III	Exam	6	C	S4	English Communication Skills II		2,5
SUPR000	Work Readiness Program	Continuous		C	S4	-		
YEAR 4								
	First Semester							
SUPR301	Survey Practice I (WIL)	Continuous	5	C		Full S1 & S2 Modules		60
	Second Semester							
SUPR302	Survey Practice II (WIL)	Continuous	5	C		Survey Practice I		60
							Total	**372**

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.

2.2.4 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.**

2.2.5 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 SAGC 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)

iv) N3 certificate and a minimum E (SG) symbol in English

v)

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:

i) 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.
ii) Apply analytical and practical techniques and knowledge related to the specific disciplines of civil engineering/ surveying.
iii) 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.
iv) Communicate in a professional manner using the language, concepts, models, techniques and equipment encountered in the engineering/ surveying working environment.
v) Apply mathematical techniques and interpret results of mathematical calculations to assist in the solving of engineering/ surveying problems.
vi) Use basic scientific and technological principles in an engineering/surveying applied context.
vii) Analyse the overall functioning and purpose of a particular organisation.
viii) Organise and give directions to the work of self and others.
ix) Work as part of a team or independently as required by the work environment.
x) 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

2.4.3 Subjects, Curriculum Compilation, Course Codes

Diploma (ECP) CIVECP	Subjects	*C/O	Semester /Year	NQF Level	Pre-requisites	Co-requisites	
BASC000	Basic Science I	C		4			
CLIT000	Computer Literacy I	C		4			
LSSS000	Life Skills and Study Skills	C		4			
DWIN000	Drawing	C		4			
MATH000	Mathematics	C		4			
CKIL000	Communication Skills I	C		4			
ENGC000	Engineering Calculations	C		4	Mathematics		
ESCI000	Engineering Science I	C		4	Basic Science I		
CAPL000	Computer Applications I	C		4	Computer Literacy I		
DRIG000	Drawing002	C		4	Drawing001 and Basic Science I		
APPM101	Applied Mechanics for Civil Engineers	C	S1	5	Engineering Science I		12
COIL101	Computer Skills I	C	S1	5	Computer Applications I		12
COSM101	Construction Methods I	C	S1	5			8

DRWN101	Civil Engineering Drawing 1	C	S1	5	Drawing 001/002 and Basic Science I		8
MATC101	Mathematics I	C	S1	5	Mathematics		12
STPR101	Surveying: Theory and Practical	C	S1	5			12
ECON102	Communication Skills IA	C	S2	5	Communication Skills		8
CONM102	Construction Materials I	C	S2	5	Construction Methods		12
DRWN102	Civil Engineering Drawing II	C	S2	5	Civil Engineering Drawing I		8
CENM102	Civil Engineering Management	C	S2	5			8
MATC102	Mathematics II	C	S2	5	Mathematics I		12
THST102	Theory of Structures II	C	S2	5	Applied Mechanics I and Mathematics I		12
ENPC102	Engineer practice and communication (Engineer in Society and Professional Ethics)	C	S2	5			8
GEOE201	Geology and Soil Mechanics	C	S3	6	Mathematics II, Construction Materials I, Construction Methods I and Theory of Structures II		12
RECM201	Reinforced Concrete & Masonry Design III	C	S3	6	Theory of Structures II, Drawing II, Mathematics II and Construction Materials	Structural Analysis II	12
TRAN201	Transportation Eng.	C	S3	6	Drawing II, Surveying T/P, Mathematics II and Construction Materials I		8
WANG201	Water Engineering I	C	S3	6	Theory of Structures II and Mathematics II		12
ENVE1O2	Introduction to Environmental Engineering	C	S3	6	Mathematics II and Civil Engineering Management	-	8
CEST201	Engineering Statistics	C	S3	6	Mathematics II		12
DOCM202	Documentation for Civil Engineers	C	3	6			8
CEDE 202	Civil engineering design	C	S4	6	Completion of S3		16

GEOE202	Geotechnical Eng.	C	S4	6	Geology and Soil Mechanics		12
SANL202	Structural Analysis	C	S4	6	Theory of Structures II and Mathematics II		12
STST202	Structural Steel & Timber Design III	C	S4	6	Theory of Structures II & C E Drawing II		12
TRAN202	Earthworks and Pavement Design	C	S4	6	Transportation Eng.		12
	Work Readiness Programme		S4	6			
WANG202	Water Engineering II	C	S4	6	Water Engineering I Introduction to Environmental Engineering		12
CVCP301	Civil Engineering Pract. I	C		5	All S1 & S2 modules		40
CVCP302	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 was fully phased-in by the 1st semester of 2023, with some of the modules from the old programs phased out by the end of 2024. Any similar modules from the old programs to the new program will be credited.

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
APPM101	APME101	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
COIL101	CPIL101	Computer Skills I	The syllabus includes: hardware; software; data communications; computer applications; Windows; theory of computer and introduction to excel, word processing and spreadsheets.
COSM101	COME101	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.
DRWN101	DING101	Civil Engineering Drawing 1	The syllabus includes: Reinforced Concrete, Structural Steelwork, and Surveying.
MATC101	MATA101	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.

ECOM102	COSL102	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.
CONM102	COMA102	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.
DRWN102	DING102	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.
MATC102	MATA102	Mathematics II	The syllabus includes: further differential and integral calculus with applications; matrix algebra; linear programming; statistics and differential equations.
THST102	THOS102	Theory of Structures I	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.
ENPC102	EPAC102	Engineer practice and communication (Enginee in Society and Professior Ethics)	The syllabus includes: The world of work, developing employability skills, developing employability skills, skills inventory, professional writing, interviews, industry presentations, discipline-specific topics.
GEOE201	GEEN201	Geology and Soil Mechanics	The syllabus includes: The study of soil in terms of densities, moisture contents, liquid limits, soli classification, identifying the type of material to be used during construction
RECM201	RCMD201	Reinforced Concrete & Masonry Design III	The syllabus includes: Loading & resistance (partials 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)
TRAN201	TREN201	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.
WANG201	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.
ENVE102	ENVE201	Introduction to Environmental Engineerin	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
CEST201	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
DOCM202	DOCU202	Documentation for Civil Engineers	The syllabus includes: The study of Quantities, Estimating, Specifications and General Conditions of Contract.
CEDE 202	CIVD 202	Civil engineering design	This module involve the provision of solution to basic civil engineering problems through design projects and its presentation.
GEOE202	GEOT202	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	STUA 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.
STST202	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 defection); practical (timber test).
TRAN202	EWPD 202	Earthworks and Pavemer 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.
WANG202	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.

2.1.1 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:

2.1.2 Examination Regulations

Refer to General Handbook Rule: 22

2.1.3 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.

2.1.4 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
Construction Materials I	Water Engineering II
Theory of Structures II	Geotechnical Engineering
Structural Analysis II	Reinforced Concrete and Masonry Design III
Drawing II	Structural Steel and Timber Design III
Water Engineering I	Earthworks and Pavement Design
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.**

2.2 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:

2.2.1 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/Technical Mathematics	Physical Science/Technical 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

2.2.2 Subjects, Curriculum Compilation, Course Codes

Diploma (ECP) CISENE	Subjects	Assessment Method	NQF Level	C/O	Semester/ Year	Prerequisite	Co requisites	SAQA Credits
YEAR 1								
First Semester								
BCIE001	Basic Science	Exam	4		S1			
COLI001	Computer Literacy	Continuous			S1			
IECS001	Introduction to English Communication Skills		4		S1			
BADR001	Basic Drawing	Continuous	4		S1			
BAMA001	Basic Mathematics		4		S1			
Second Semester								

MATH002	Mathematics	Exam	4		S2	Basic Mathematics		
SURD002	Survey Drawing	Continuous	4		S2	Basic Drawing		
SUPH002	Survey Physics	Exam	4		S2	Basic Science		
INGE002	Introduction to Geomatics		4		S2	--- ---		
COSU002	Computation in Surveying		4		S2	Computer Literacy		
							Sub- Total.	
YEAR 2								
First Semester								
CMPK101	Computer Skills I	Exam	5	C	S1	Computation in Surveying		12
CONM101	Construction Methods I	Exam	5	C	S1	--- ---		10
DANG101	Survey Drawing I	Continuous	5	C	S1	Survey Drawing		10
MAMT101	Mathematics I	Exam	5	C	S1	Mathematics		12
SRVY101	Surveying I	Exam	5	C	S1	Introduction to Geomatics		12
PSCS101	Physics I	Exam	5	C	S1	Survey Physics		10
							Sub-Total	**66**
Second Semester								
ECMK102	English Communication Skills I	Exam	5	C	S2	Introduction to English Communication Skills		8
GEGR102	Geography I	Exam	5	C	S2	--- ---		5
MAMT102	Mathematics II	Exam	5	C	S2	Mathematics I		12
PHTO102	Photogrammetry II	Exam	5	C	S2	Surveying I & Mathematics I		12
SRVY102	Surveying II	Exam	5	C	S2	Surveying I		12
SDRW102	Survey Drawing II	Continuous	5	C	S2	Drawing I		10
							Sub-Total.	**59**
YEAR 3								
First Semester								
ECMK201	English Communication Skills II	Exam	6	C	S3	English Communication Skills I		2,5
CSRV201	Control Surveying III	Exam	6	C	S3	Surveying II		15
LGLP201	Legal Principles I	Exam	6	C	S3	--- ---		10
STSS201	Statistics I	Exam	6	C	S3	Mathematics II		12
PHTO201	Photogrammetry III	Exam	6	C	S3	Photogrammetry II		12
MCVL201	Management (Civil) I	Exam	6	C	S3	---		10
							Sub-Total.	**61.5**
Second Semester								
ADJE202	Adjustment of Errors III	Exam	6	C	S4	Statistics I, Mathematics II, Surveying II		12

CADS202	Cadastral Surveying III	Exam	6	C	S4	Survey Drawing II, Surveying II, Legal Principles I		12
CMAP202	Computer Applications III	Exam	6	C	S4	Computer Skills I, Surveying II		12
GINS202	Geographic Information Systems III	Continuous	6	C	S4	CO--- REQUISITE: Computer Applications III		12
SRVY202	Surveying III	Exam	6	C	S4	Surveying II		15
EMCK301	English Communication Skills III	Exam	6	C	S4	English Communication Skills II		2,5
SUPR000	Work Readiness Program	Continuous		C	S4	—		
							Sub-Total	65.5
YEAR 4								
First Semester								
SPRA301	Survey Practice I (WIL)	Continuous	5	C		All S1 & S2 Modules		60
Second Semester								
SPRA302	Survey Practice II (WIL)	Continuous	5	C		Survey Practice I		60
							Sub-Total.	**120**
							Total	

2.2.3 **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.

- **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

- **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.

- **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.

2.1.1 **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.

2.1.2 **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:

2.1.3 **Examination Regulations**

Refer to General Handbook Rule: 22

2.1.4 **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.

2.1.5 **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.**

4. DEPARTMENT OF ELECTRICAL ENGINEERING

4.1 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 an 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)

4.1.1. Minimum Admission Requirements (3-year Diploma)

- National Senior Certificate with rating codes:

English Home Language	(4)
or	
English First Additional Language	(4)
Mathematics/Technical Mathematics	(4)
Physical Science/Technical Physics	(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 50% pass in N4 Engineering Science, Mathematics 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 Fundamentals: 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 for 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

4.1.2. 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 successful completion of **P1**.
- Electrical Engineering Practice (P1 or P2) must be registered on the date the training commences.

4.1.3. 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 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 **(ELDIPA)** and Mechatronics Engineering **(ELDIME)**.
iv) 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 the electives as compulsory subjects for the chosen stream. All specialization subjects are compulsory for graduation.
v) The offering of specialization subjects in each stream may alternate between semesters.
vi) The effective commencement date of this curriculum was the First Semester of 2021.
vii) The twelve (12) ECSA GAs are assessed in exit levels subjects, Table 1. If a student fails a Graduate Attribute (GA) assessment in any exit-level subject, he/she automatically fails the subject.
viii) Note that the indicated graduate attributes statements are in accordance with ECSA E-02-PN Revision 5 of September 2020. This standard will be used to assess student cohorts enrolled in the programme before 2025. The students enrolled in the programme in or after 2025, as well as repeating students, will be assessed based on the ECSA E-02-PN Revision 6 standard of August 2023,(See https://www.ecsa.co.za/ECSADocuments/Shared%20Documents/E-02-PN%20%20Qualification%20Standard%20for%20Diploma%20in%20Engineering%20NQF%20Level%206-signed.pdf for more information).
ix) Students need to achieve a sub-minimum mark of 50% in the Practical to be granted DP. Otherwise, they automatically fail the subject.
x) A revised curriculum for the Diploma in Electrical Engineering is expected from 2028; students are advised to consult the department for guidance on how this may affect them.

GA1-Problem-solving
GA2-Application of scientific and engineering knowledge.
GA3-Engineering Design.
GA4-Investigation.
GA5-Use of engineering tools
GA6-Professional and Technical communication.
GA7-The engineer and the world
GA8-Individual and collaborative teamwork
GA9-Independent learning.
GA10-Engineering professionalism.
GA11-Project management and finance.
GA12-Workplace practice

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

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

Software Design III	6	12	C			**GA11**
Power Electronics III	6	12	E			**GA1**
Electrical Machines III	6	12	E			**GA5**
Electrical Distribution III	6	12	E			**GA4**
Electrical Protections III	6	12	E			**GA2**
Radio Engineering III	6	12	E			**GA2**
Signal Processing III	6	12	E			**GA5**
Electronics III	6	12	E			**GA1**
Microwave Communications III	6	12	E			**GA4**
Control Systems III	6	12	E			**GA2**
Automation III	6	12	E			**GA5**
Robotics III	6	12	E			**GA4**
WIL (P1)	6	44		**GA9, GA10, GA12**	**GA9, GA10, GA12**	
WIL (P2)	6	48				**GA9, GA10, GA12**

4.1.4 Diploma in Electrical Engineering course summary (ELENDI)

Diploma in Electrical Engineering (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
Work Readiness Program	Work Readiness Program	Work Readiness Program	Work Readiness Program

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

Diploma in Electrical Engineering (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	EX	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 Physics 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 Computer 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	
PRJC201	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 Electrical Eng III Digital Comms II Mechatronics III Process Instr 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 Digital Communication II Process Instr 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 Mechatronics III Process Instr 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) (ELEP301) 44
Electrical Engineering Practice II (P2) (ELEP302) 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. 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

CSKI101	**Communication Skills I**
	Offered by the 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 the 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% Practical's 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**
	The 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.
MATTM201	**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**
	The 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: S**imulation, 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 an 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:** Introduction to electrical machines; Fundamental principles of AC electrical machines; Three-phase transformers; Three-phase synchronous machines; Three phase induction machines.
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, and Generation of multiple solutions. Analysis and selection of the 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:** Power generation and variable load; Introduction to transmission line: Circuit analysis; Electricity tariffs and Power factor correction; Underground cables; AC distribution systems; Distributed energy systems.
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, PNPN 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 the time domain, Discrete-time signals in the 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 25% Test 2 25% Assignments 25% Practicals 25% **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 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 the impact of waste on company productivity, Understand the 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 an 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/Technical Mathematics	(4)
Physical Science/Technical 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 50% pass in N4 Engineering Science, Mathematics 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 Fundamentals: 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 for 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 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 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

i) The Diploma will be issued on completion of 30 credits from ECP's 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.

ii) Attendance of P0 (a work readiness program) is compulsory and is used as 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 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.

iv) 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)**.

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 the 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) Note that the indicated graduate attributes statements are in accordance with ECSA E-02-PN Revision 5 of September 2020. This standard will be used to assess student cohorts enrolled in the programme before 2025. The students enrolled in the programme in or after 2025, as well as repeating students, will be assessed based on the ECSA E-02-PN Revision 6 standard of August 2023, (See https://www.ecsa.co.za/ECSADocuments/Shared%20Documents/E-02-PN%20%20Qualification%20Standard%20for%20Diploma%20in%20Engineering%20NQF%20Level%206-signed.pdf for more information).

xi) Students need to achieve a sub-minimum mark of 50% in the Practical to be granted DP. Otherwise, they automatically fail the subject.

xi) A revised curriculum for the Diploma in Electrical Engineering is expected from 2028; students are advised to consult the department for guidance on how this may affect them.

Table 2. ECSA Graduate Attributes Table at the Expose, Develop and Assessment Stages

Subjects	NQF Level	Credits	Core/ Elective	Exposure	Development	Assessment
SEMESTER I						
Mathematics I	5	12	C	**GA1, GA9**		
Physics I	5	12	C		**GA2, GA4**	
Communication Skills I	5	5	C	**GA6, GA8**		
Computer Skills I	5	5	C	**GA5, GA9**		
Electrical Engineering I	5	10	C	**GA1, GA5**		
Electronics I	5	10	C	**GA1, GA5**		
Digital Systems I	5	10	C	**GA3, GA5**		
SEMESTER II						
Mathematics II	5	12	C		**GA1, GA9**	
Electrical Engineering II	5	10	C		**GA1, GA9**	
Electronics II	5	10	C		**GA1, GA5**	
Digital Systems II	5	10	C		**GA3, GA5**	
Projects I	5	10	C	**GA3, GA7**		
Electrical Machines II	5	10	E		**GA5,**	
Electronic Communication II	5	10	E		**GA2**	
Process Instrumentation II	5	10	E		**GA4**	
Strengths of Materials II	5	10	E		**GA5,**	
SEMESTER III						
Digital Systems III	6	12	C		**GA3, GA5**	
Mathematics III	6	12	C		**GA1, GA9**	
Projects II	5	10	C		**GA3, GA7**	
Software Design II	6	12	C		**GA5,**	
Control Systems II	6	12	C		**GA4, GA5**	

Electrical Engineering III	6	12	E		**GA1, GA5**	
Digital Communications II	6	12	E		**GA2**	
Process Instrumentation III	6	12	E			**GA4**
Mechatronics III	6	12	E		**GA5,**	
SEMESTER IV						
Design Projects III	6	12	C			**GA3, GA6, GA7,GA8**
Software Design III	6	12	C			**GA11**
Power Electronics III	6	12	E			**GA1**
Electrical Machines III	6	12	E			**GA5**
Electrical Distribution III	6	12	E			**GA4**
Electrical Protections III	6	12	E			**GA2**
Radio Engineering III	6	12	E			**GA2**
Signal Processing III	6	12	E			**GA5**
Electronics III	6	12	E			**GA1**
Microwave Communications III	6	12	E			**GA4**
Control Systems III	6	12	E			**GA2**
Automation III	6	12	E			**GA5**
Robotics III	6	12	E			**GA4**
WIL (P1)	6	44		**GA9, GA10, GA12**	**GA9, GA10, GA12**	
WIL (P2)	6	48				**GA9, GA10,GA12**

GA1-Problem-solving
GA2-Application of scientific and engineering knowledge.
GA3-Engineering Design.
GA4-Investigation.
GA5-Use of engineering tools
GA6-Professional and Technical communication.
GA7-The engineer and the world
GA8-Individual and collaborative teamwork
GA9-Independent learning.
GA10-Engineering professionalism.
GA11-Project management and finance.
GA12-Workplace practice.

4.2.4 Electrical Engineering Diploma course summary (ELENEC)

Diploma: Electrical Engineering: (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 Systems Engineering (ELECPS)	**Electronics and Telecommunication Engineering (ELECET)**	**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
Work Readiness Program	Work Readiness Program	Work Readiness Program	Work Readiness Program

4.2.5 Subjects, Curriculum Compilation, Course Codes

Diploma in Electrical Engineering **(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 1		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 2		Foundation/2	CA	4	3	Drawing	
					Total Weighting	**30**		
COMK101	Communication Skills I	C	S1	EX	5	5	Communication Skills	
CKIL101	Computer Skills I	C	S1	CA	5	5	Computer Applications I	
MATS101	Mathematics I	C	S1	EX	5	12	Engineering Calculations	
ELEE101	Electrical Engineering I	C	S1	EX	5	10	Engineering Science I	
ELET101	Electronics I	C	S1	EX	5	10	Engineering Science I	
DIGS101	Digital Systems I	C	S1	EX	5	10	Engineering Science I	
PHCS101	Physics I	C	S1	EX	5	12	Engineering Science I	
					Total S1 Weighting	**64**		
MATS102	Mathematics II	C	S2	EX	5	12	Mathematics I	
ELEE102	Electrical Engineering II	C	S2	EX	5	10	Electrical Eng. I Mathematics I Physics I	
DIGS102	Digital Systems II	C	S2	EX	5	10	Digital Systems I	
PRJT102	Project I	C	S2	CA	5	10	Electrical Eng. I Electronics I Communication Skills I Computer Skills I	
ELET102	Electronics II	C	S2	EX	5	10	Electronics I Electrical Eng I	
ELEM102	Electrical Machines II	E	S2	EX	5	10	Electrical Eng. I Physics I	Mathematics II
ELEC102	Electronic Communication II	E	S2	EX	5	10	Electronics I Digital Systems I Physics I	
PROI201	Process Instrumentation II	E	S2	EX	5	10	Electrical Eng. I Physics I	
STMA102	Strength of Materials II **(ME)**	E	S2	EX	5	10	Physics I Mathematics I	
	Total S2 Weighting					**62**		
MATS201	Mathematics III	C	S3	EX	6	12	Mathematics II	
DIGS201	Digital Systems III	C	S3	EX	6	12	Digital Systems II	
SFTD201	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	
CONS201	Control Systems II	C	S3	EX	6	12	Mathematics II	Mathematics III
EENG202	Electrical Engineering III	E	S3	EX	6	12	Electrical Eng. II Mathematics II	
DICM202	Digital Communications II	E	S3	EX	6	12	Electronic Comm. II	Mathematics III
PROI202	Process Instrumentation III	E	S3	EX	6	12	Process Instr. II	Mathematics 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 Electrical Eng III Digital Comms II Mechatronics III Process Instr III	
ELED202	Electrical Distribution III	E	S4	EX	6	12	Electrical Eng. 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	
ELEM201	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	Electrical Distribution 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 Digital Communication II Process Instr III	
MWCM202	Microwave Communication III	E	S4	EX	6	12	Mathematics III Digital Communication II	
CONS202	Control Systems III	E	S4	EX	6	12	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 Mechatronics III Process Instr 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) (EEPR301) 44
Electrical Engineering Practice II (P2)(EEPR302) 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	**Communication Skills I**
	Offered by the 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 the 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 System 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, and 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**
	The 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
PRJT201	**Projects II**
	The 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: S**imulation, Prototype development, PCB design, Report writing, Preparatory design proposal document
CONS201	**Control Systems II**
	Formative assessment • Tutorials, Classroom small-group work, WhatsApp group discussion forum, Student self-assessment through an 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

ELEM201	**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:** Introduction to electrical machines; Fundamental principles of AC electrical machines; Three-phase transformers; Three-phase synchronous machines; Three phase induction machines.
DICM202	**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.
PROI201	**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
DPRJ202	**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, and Generation of multiple solutions. Analysis and selection of the most appropriate solution, Testing and implementation of the chosen solution, Feasibility study, Project implementation – design, simulation, construction, testing and documentation, and Project oral presentation.
EENG202	**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.
ELED202	**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:** Power generation and variable load; Introduction to transmission line: Circuit analysis; Electricity tariffs and Power factor correction; Underground cables; AC distribution systems; Distributed energy systems.
SFTD202	**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
PWEL202	**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.
ELCP202	**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
RAEN201	**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
ELTR202	**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, PNPN Devices, Linear-Digital ICs, Op-Amp Applications – Amplifiers, Filters, Multi-stage amplifiers

SIGP202	**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 the time domain, Discrete-time signals in the frequency domain, The z-Transform
MWCM202	**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.
PROI202	**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
CONS202	**Control Systems 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:** Modelling 1st, 2nd Order systems, Stability, Laplace-Domain Analysis, Frequency-Domain techniques, Feedback compensation, PID Controller Tuning, Case study: SISO system Compensation Simulation.
ROBT202	**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.
ATMT202	**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 the impact of waste on company productivity, Understand the 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 the student has graduated.
- Registration of additional modules after completing the suite of modules in the stream is subject to the 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)
or	
Technical Mathematics	(3)
Physical Science	(3)
or	
Technical 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.
- Students who have 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 assessment will automatically fail the assessment.
- A minimum of 80% attendance of all lectures is compulsory per institutional rules.
- The National Diploma was discontinued in 2018 and its last registration was in 2023. Affected students will have to move to the Diploma program and comply with all requirements thereof.

5. 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.

5.1 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, characterized 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 and competence in Mechanical Engineering and the graduate attributes defined below.

ECSA Graduate Attributes

Graduate Attribute 1: Problem-solving

Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.

Associated knowledge and attitude profile:

- A descriptive, formula-based understanding of the natural sciences applicable in a subdiscipline and awareness of directly relevant social sciences.
- Procedural mathematics, numerical analysis, statistics applicable in a subdiscipline.
- A coherent, procedural formulation of engineering fundamentals required in an accepted subdiscipline.
- Engineering specialist knowledge that provides the body of knowledge for an accepted subdiscipline.

Graduate Attribute 2: Application of scientific and engineering knowledge
Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified to wide, practical procedures and practices.

Associated knowledge and attitude profile:

- As for Graduate Attribute 1.

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

Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

Associated knowledge and attitude profile:

- Knowledge that supports engineering design and operations based on the techniques and procedures of a practice area.

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 subdiscipline or practice area. Appropriate consideration must be given to public health and safety, whole-life cost and net zero carbon, as well as resource, cultural, societal and environmental considerations, as required.

Graduate Attribute 4: Investigations, experiments and data analysis

Demonstrate competence to conduct investigations of well-defined problems; locate and search relevant codes and catalogues; and conduct standard tests and measurements.

Associated knowledge and attitude profile:

- Engagement with the current technological literature of the practice area.

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

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 can be produced.

Graduate Attribute 5: Use of engineering tools

Demonstrate competence to apply appropriate techniques, resources and modern computing, engineering and IT tools to well-defined engineering problems, with an awareness of the limitations.

Associated knowledge and attitude profile:

- Procedural mathematics, numerical analysis, statistics applicable in a subdiscipline.
- Codified practical engineering knowledge in recognized practice area.

Range statement: A range of techniques, resources and modern engineering and IT tools appropriate to the disciplinary designation of the programme.

Graduate Attribute 6: Professional and technical communication

Demonstrate competence to communicate effectively and inclusively on well-defined engineering activities, both orally and in writing, with the engineering community and society at large, by being able to comprehend the work of others, document own work and give and receive clear instructions.

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 2 000 words, excluding tables, diagrams and appendices), covering material at exit-level. Methods of providing information include the conventional methods of the subdiscipline, for example engineering drawings and subject- specific methods.

Graduate Attribute 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

Associated knowledge and attitude profile:

- A descriptive, formula-based understanding of the natural sciences applicable in a subdiscipline and awareness of directly relevant social sciences.
- Knowledge that supports engineering design and operations based on the techniques and procedures of a practice area.
- Knowledge of issues and approaches in engineering technician practice, such as public safety and sustainable development.

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

Developmental considerations:

- Ability to self-reflect and show contextual awareness of social, workplace and governmental environments through exposure to complex, multi-disciplinary and/or unfamiliar problems.

- Ability to identify and position a design/artefact in the bigger picture and use appropriate judgement (intentionally incorporate multiple perspectives) to obtain a final solution or product.

- Ability to listen and interpret information from a variety of stakeholders to appropriately position identified problems/challenges/opportunities in the relevant context.

Graduate Attribute 8: Individual and collaborative teamwork

Demonstrate competence to function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

Associated knowledge and attitude profile:

- Knowledge of professional ethics, responsibilities and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Range statement: Multi-disciplinary 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.

Developmental considerations:

- Develop the ability to self-reflect and self-evaluate within an interpersonal engagement towards enabling appropriate understanding of self and other team members.
- Develop the ability to listen and interpret different motivations, personalities or workstyles within a team context towards enabling functional team dynamics.
- Knowledge of team cohesion and dynamics, motivational styles, frameworks for conflict and tension resolution and ability to apply these.
- Ability to negotiate and manage time and project components related to interpersonal needs and agendas. Time management also includes understanding the value of time and determining if a task is better (cheaper) achieved by a single person or a team.

Graduate Attribute 9: Independent learning ability

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

Associated knowledge and attitude profile:

- Engagement with the current technological literature of the practice area.

Range statement: Operate independently in well-defined contexts recognizing the need for and have the ability for independent updating in the face of specialized technical knowledge.

Developmental considerations:

- Openness to constructive feedback, awareness of own limitations, ability to cope with the discomfort of uncertainty and having access to a range of approaches, reflective self- evaluation, curiosity and proactive engagement, resilience, confidence to ask for help and draw from a broad range of stakeholders.
- Reflection of self-learning to begin to recognize if what has been covered meets the needs of the activity or task.

Graduate Attribute 10: Engineering professionalism

Understand and commit to professional ethics and norms of technician practice, including compliance with relevant laws.

Associated knowledge and attitude profile:

- As for Graduate Attribute 8.

Range statement: Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. An understanding of the need for diversity and inclusion is required.

Developmental considerations:

- Self-management, professional responsibility and awareness of expertise and limitations, good judgement, process of on-going self-reflection and evaluation.
- Timeous, clear, realistic communication of risks and concerns, feedback on progress.
- Self-efficacy, accepting feedback and consequences and commitment.

Graduate Attribute 11: Project management and finance

Demonstrate awareness of engineering management principles.

Range statement: Basic techniques from economics and project management applied to one's own work, as a member or leader in a technical team, and to manage projects in multi-disciplinary 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:

- Work-directed theoretical learning
- Problem-based learning
- Project-based learning
- Work-based learning
- Simulated learning.

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

a. Admission Requirements

National Senior Certificate (Grade 12) with rating codes:

English Home Language	(4)
or English First Additional Language	(4)
Mathematics/Technical Mathematics	(4)
Physical Science/ Technical Science	(4)
Technical Drawing or equivalent (	(4)

Additional recommended school subject: Mechanical Technology

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

ii. An appropriate N4 certificate with a minimum of four subjects passed at 50% each including Mathematics, Technical Drawing or Mechanical Draughting N4 (50%) or Plating and Structural Steel Drawing N4 (50%) and Engineering Science and Grade 12 level English passed with at least symbol D (SG)

iii. 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.

iv. **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!

v. **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

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.

a. 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 recognized. 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.

b. 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	Communication Skills I	C	Y1(S1)	Examination	5	7	
CPSK101	Computer Skills I	C	Y1(S1)	Examination	5	7	
ELEC101	Electrotechnology I	C	Y1(S1)	Examination	5	12	
MATI101	Mathematics I	C	Y1(S1)	Examination	5	12	
MEED101	Mech. Engineering Drg. I	C	Y1(S1)	Continuous	5	12	
MEME101	Mech. Manuf. Eng. I	C	Y1(S1)	Examination	5	12	
MECH101	Mechanics I	C	Y1(S1)	Examination	5	12	
FLME102	Fluid Mechanics II	C	Y1(S2)	Examination	5	12	Mechanics I & Mathematics I
MATI102	Mathematics II	C	Y1(S2)	Examination	5	12	Mathematics I
COAD102	Comp. Aided Draught I	C	Y1(S2)	Continuous	5	12	Mechanical Engineering Drawing I and Computer Skills
STOM102	Strength of Materials II	C	Y1(S2)	Examination	5	12	Mechanics I & Mathematics I
THER102	Thermodynamics II	C	Y1(S2)	Examination	5	12	Mathematics I
MEOM102	Mechanics of Machines II	C	Y1(S2)	Examination	5	12	Mechanics I & Mathematics I
MEDS201	Mech. Eng. Design II	C	Y2(S1)	Examination	6	12	Mech. Eng. Drawing I Strength of Mechanics II
FLME201	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 Machines II
STOM201	Strength of Materials III	C	Y2(S1)	Examination	6	12	Strength of Materials II
THER201	Thermodynamics III	C	Y2(S1)	Examination	6	12	Thermodynamics II
MTHM102	Mathematics III	C	Y2 (S1)	Examination	6	12	Mathematics II
APSM202	Applied Strength of Materials III	C	Y2(S2)	Examination	6	12	Strength of Materials III
MAEN202	Maintenance Eng. I	C	Y2(S2)	Examination	5	12	Mathematics I, Mech. Manufacturing Eng. I
HYDM202	Hydraulic Machines III	C	Y2(S2)	Examination	6	12	Fluid Mechanics III
STPL202	Steam Plant III	C	Y2(S2)	Examination	6	12	Thermodynamics III
THMA202	Theory of Machines III	C	Y2(S2)	Examination	6	12	Mechanics of Machines III & Mathematics II

MEDS202	Mech. Eng. Design III	C	Y2(S2)	Examination	6	12	Mech. Eng. Design II & Computer Aided Drg. I
WORKRP0	Mech. Eng. Practice 0, P0	*C*	*Y2 (S2)*	Attendance	5	6	
MEPR301	Mech. Eng. Practice I, P1	*C*	*Y3 (S1)*	WIL Logbook	5	40	CSKL101, MATI101 MEED101, MECH101, WORKRP0
MEPR302	Mech. Eng. Practice II, P2	*C*	*Y3 (S2)*	WIL Logbook	6	44	MEDES21, Mechanical Eng. Pract. I
C=Compulsory; E=Electives							

d. 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	Motor Vehicle Eng. I	E	Y1 (S2)	Continuous	5	12	
MEME102	Mech. Manuf. Eng. II	E	Y1 (S2)	Continuous	5	12	Mech. Manuf. Eng. I
MEME201	Mech. Manuf. Eng. III	E	Y2 (S3)	Continuous	6	12	Mech. Manuf. Eng. II
MASK102	Management Skills I	E	Y1 (S2)	Examination	5	12	Communication Studies I
MACD202	Machine Design III	E	Y2 (S2)	Continuous	6	12	Mech. Eng. Design III
ELEC201	Electrotechnology II	E	Y2(S1)	Examination	5	12	Electrotechnology I
EMAS102	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.

e. **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.)

f. **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.

Timetable Clashes (Refer to Rule G.16 in the General Handbook) Students may not register for any subjects that result in a timetable clash.

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

It consists of P1 (6 months) and P2 (6 months) 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, characterized 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

Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.

Associated knowledge and attitude profile:

- A descriptive, formula-based understanding of the natural sciences applicable in a subdiscipline and awareness of directly relevant social sciences.
- Procedural mathematics, numerical analysis, statistics applicable in a subdiscipline.
- A coherent, procedural formulation of engineering fundamentals required in an accepted subdiscipline.
- Engineering specialist knowledge that provides the body of knowledge for an accepted subdiscipline.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified to wide, practical procedures and practices.

Associated knowledge and attitude profile:

- As for Graduate Attribute 1.

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

Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

Associated knowledge and attitude profile:

- Knowledge that supports engineering design and operations based on the techniques and procedures of a practice area.

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 subdiscipline or practice area. Appropriate consideration must be given to public health and safety, whole-life cost and net zero carbon, as well as resource, cultural, societal and environmental considerations, as required.

Graduate Attribute 4: Investigations, experiments and data analysis

Demonstrate competence to conduct investigations of well-defined problems; locate and search relevant codes and catalogues; and conduct standard tests and measurements.

Associated knowledge and attitude profile:

- Engagement with the current technological literature of the practice area.

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

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 can be produced.

Graduate Attribute 5: Use of engineering tools

Demonstrate competence to apply appropriate techniques, resources and modern computing, engineering and IT tools to well-defined engineering problems, with an awareness of the limitations.

Associated knowledge and attitude profile:

- Procedural mathematics, numerical analysis, statistics applicable in a subdiscipline.
- Codified practical engineering knowledge in recognized practice area.

Range statement: A range of techniques, resources and modern engineering and IT tools appropriate to the disciplinary designation of the programme.

Graduate Attribute 6: Professional and technical communication

Demonstrate competence to communicate effectively and inclusively on well-defined engineering activities, both orally and in writing, with the engineering community and society at large, by being able to comprehend the work of others, document own work and give and receive clear instructions.

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 2 000 words, excluding tables, diagrams and appendices), covering material at exit-level. Methods of providing information include the conventional methods of the subdiscipline, for example engineering drawings and subject- specific methods.

Graduate Attribute 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

Associated knowledge and attitude profile:

- A descriptive, formula-based understanding of the natural sciences applicable in a subdiscipline and awareness of directly relevant social sciences.
- Knowledge that supports engineering design and operations based on the techniques and procedures of a practice area.
- Knowledge of issues and approaches in engineering technician practice, such as public safety and sustainable development.

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

Developmental considerations:

- Ability to self-reflect and show contextual awareness of social, workplace and governmental environments through exposure to complex, multi-disciplinary and/or unfamiliar problems.
- Ability to identify and position a design/artefact in the bigger picture and use appropriate judgement (intentionally incorporate multiple perspectives) to obtain a final solution or product.
- Ability to listen and interpret information from a variety of stakeholders to appropriately position identified problems/challenges/opportunities in the relevant context.

Graduate Attribute 8: Individual and collaborative teamwork

Demonstrate competence to function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

Associated knowledge and attitude profile:

- Knowledge of professional ethics, responsibilities and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Range statement: Multi-disciplinary 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.

Developmental considerations:

- Develop the ability to self-reflect and self-evaluate within an interpersonal engagement towards enabling appropriate understanding of self and other team members.

- Develop the ability to listen and interpret different motivations, personalities or workstyles within a team context towards enabling functional team dynamics.
- Knowledge of team cohesion and dynamics, motivational styles, frameworks for conflict and tension resolution and ability to apply these.
- Ability to negotiate and manage time and project components related to interpersonal needs and agendas. Time management also includes understanding the value of time and determining if a task is better (cheaper) achieved by a single person or a team.

Graduate Attribute 9: Independent learning ability

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

Associated knowledge and attitude profile:

- Engagement with the current technological literature of the practice area.

Range statement: Operate independently in well-defined contexts recognizing the need for and have the ability for independent updating in the face of specialized technical knowledge.

Developmental considerations:

- Openness to constructive feedback, awareness of own limitations, ability to cope with the discomfort of uncertainty and having access to a range of approaches, reflective self- evaluation, curiosity and proactive engagement, resilience, confidence to ask for help and draw from a broad range of stakeholders.
- Reflection of self-learning to begin to recognize if what has been covered meets the needs of the activity or task.

Graduate Attribute 10: Engineering professionalism

Understand and commit to professional ethics and norms of technician practice, including compliance with relevant laws.

Associated knowledge and attitude profile:

- As for Graduate Attribute 8.

Range statement: Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. An understanding of the need for diversity and inclusion is required.

Developmental considerations:

- Self-management, professional responsibility and awareness of expertise and limitations, good judgement, process of on-going self-reflection and evaluation.
- Timeous, clear, realistic communication of risks and concerns, feedback on progress.
- Self-efficacy, accepting feedback and consequences and commitment.

Graduate Attribute 11: Project management and finance

Demonstrate awareness of engineering management principles.

Range statement: Basic techniques from economics and project management applied to one's own work, as a member or leader in a technical team, and to manage projects in multi-disciplinary 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:

- Work-directed theoretical learning
- Problem-based learning
- Project-based learning
- Work-based learning
- Simulated learning.

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

a. Admission Requirements

National Senior Certificate (Grade 12) with rating codes:
English Home Language (4)

or
English First Additional Language (4)
Mathematics/Technical Mathematics (4)
Physical Science/ Technical Science (4)
Technical Drawing or equivalent (4)

Additional recommended school subject: Mechanical Technology

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

i) An appropriate N4 certificate with a minimum of four subjects passed at 50% each including Mathematics, Technical Drawing or Mechanical Draughting N4 (50%) or Plating and Structural Steel Drawing N4 (50%) and Engineering Science and Grade 12 level English passed with at least symbol D (SG)

ii) 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.

iii) **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

Subjects, Curriculum Compilation, Course Codes

Code	Subjects	*C/E	Semester /Year	Assessment Method	NQF Level	Credit	Pre-requisites
BASC000	Basic Science I	C	Y1 (S1)	Examination	5		
CMLI000	Computer Literacy I	C	Y1 (S1)	Examination	5		
LSAS000	Life Skills and Study Skills	C	Y1 (S1)	Examination	5		
DING000	Drawing	C	Y1 (S1)	Examination	5		
MATI000	Mathematics	C	Y1 (S1)	Examination	5		
COMS000	Communication Skills	C	Y1 (S2)	Examination	5		Life Skills and Study Skills (LIFE001)
ENCA000	Engineering Calculations	C	Y1 (S2)	Examination	5		Mathematics (MATS001)
ENSC000	Engineering Science I	C	Y1 (S2)	Examination	5		Basic Science I (BASC000)
CAPP000	Computer Applications I	C	Y1 (S2	Examination	5		Computer Literacy I (CMLI000)
DWNG000	Drawing I	C	Y1 (S2)	Examination	5		Drawing I (DRAW001)
CTIO101	Communication Studies I	C	Y2 (S1)	Examination	5	7	Communication Skills (COMS001)
CMPS101	Computer Skills I	C	Y2 (S1)	Examination	5	7	Computer Applications I
ELTR101	Electrotechnology I	C	Y2 (S1)	Examination	5	12	Engineering Calculations Engineering Science I
MTMA101	Mathematics I	C	Y2 (S1)	Examination	5	12	Engineering Calculations
MEND101	Mech. Eng. Drawing I	C	Y2 (S1)	Continuous	5	12	Drawing I (DRAW002)
MMAE101	Mech. Manuf. Eng. I	C	Y2 (S1)	Examination	5	12	Drawing I (DRAW002)
MCHA101	Mechanics I	C	Y2 (S1)	Examination	5	12	Engineering Calculations Engineering Science I
FLUM102	Fluid Mechanics II	C	Y2 (S2)	Examination	5	12	Mechanics I & Mathematics I
MTMA102	Mathematics II	C	Y2 (S2)	Examination	5	12	Mathematics I
CAID102	Comp. Aided Draught. I	C	Y2 (S2)	Continuous	5	12	Mechanical Engineering Drawing I Computer Skills I
SOMA102	Strength of Materials II	C	Y2 (S2)	Examination	5	12	Mechanics I & Mathematics I
TERM102	Thermodynamics II	C	Y2 (S2)	Examination	5	12	Mathematics I
MOMA102	Mechanics of Machines II	C	Y2 (S2)	Examination	5	12	Mechanics I & Mathematics I
FLUM201	Fluid Mechanics III	C	Y3 (S1)	Examination	6	12	Fluid Mechanics II

MOMA201	Mech. Of Machines III	C	Y3 (S1)	Examination	6	12	Mechanics of Machines II
SOMA201	Strength of Materials III	C	Y3 (S1)	Examination	6	12	Strength of Materials II
TERM201	Thermodynamics III	C	Y3 (S1)	Examination	6	12	Thermodynamics II
MTMA201	Mathematics III	C	Y3 (S1)	Examination	6	12	Mathematics II
MNGD201	Mech. Eng. Design II	C	Y3 (S1)	Examination	6	12	Mech. Eng. Drawing I, CAD Strength of Materials II
MNGD202	Mech. Eng. Design III	C	Y3 (S2)	Examination	6	12	Mech. Eng. Design II & Computer Aided Drw. I
ASMA202	Applied Strength of Mat. III	C	Y3 (S2)	Examination	6	12	Strength of Materials III
MAIN202	Maintenance Eng. I	C	Y3 (S2)	Examination	5	12	Mathematics I,Mech. Manufacturing Eng. I
HMAC202	Hydraulic Machines III	C	Y3 (S2)	Examination	6	12	Fluid Mechanics III
STMP202	Steam Plant III	C	Y3 (S2)	Examination	6	12	Thermodynamics III
TMAC202	Theory of Machines III	C	Y3 (S2)	Examination	6	12	Mechanics of Machines III & Mathematics II
WORKRP0	Mech. Eng. Practice 0, P0	C	Y3 (S2)	Attendance	5	6	
MECP301	Mech. Eng. Practice I, PI	C	Y4 (S1)	WIL Logbook	5	40	MTMA101, CTIO101 MCHA101, MEND101, WORKRP0,
MECP302	Mech. Eng. Practice II, PII	C	Y4 (S2)	WIL Logbook	6	44	MNGD201,Mechanical Eng. Pract I
C=Compulsory; E=Electives							

c. 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.

d. Subjects, Curriculum Compilation, Course Codes

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

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. For Timetable Clashes (Refer to Rule G.16 in the General Handbook)
Students may not register for any subjects that result in a timetable clash.

j. 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 recognized. 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 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.

i) **Admission Requirements**

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.
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.

g. **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 , Fits and Limits
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, Simple Stresses & Theories of failure, Combined Stresses,
Mechanics of Machine II	General dynamics. Vehicle dynamics, hoists and haulages, power transmission (belts, clutches, chain drives, gearboxes), brakes, simple harmonic motion
Computer Draughting I Aided	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), Design process steps/cycle
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 II	Pipes & pipe joints design, Pipe insulation (cold & hot fluid pipes), Permanent joints (riveted & Welded Joint design), Threaded Fasteners Joint design, keys & splines, couplings. Cotter & Knuckle joints, Pulley and belt design, Clutch design; Design project assignment based on the components covered.
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, transforms Linear differential equations with constant coefficients, Laplace
S4 Semester 4	
Mechanical Engineering Design III	Shaft Design (Solid, hollow, stepped and cranked shafts), Gear design (spur, helical and bevel), Bearing Design, Brake Design (Shoe brakes, Band brakes, differential brakes), Spring Design (coil and leaf spring design); Design project based on the components covered

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 2nd 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

5.3 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, research literature and analyse broadly defined engineering problems reaching substantiated conclusions using analytical tools appropriate to the discipline or area of specialization.

Associated knowledge and attitude profile:

- A systematic, theory-based understanding of the natural sciences applicable to the subdiscipline and awareness of relevant social sciences.
- Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed consideration and use of models applicable to the subdiscipline.
- A systematic, theory-based formulation of engineering fundamentals required in an accepted subdiscipline.
- Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for an accepted subdiscipline.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization to defined and applied engineering procedures, processes, systems or methodologies.

Associated knowledge and attitude profile:

- As for Graduate Attribute 1.

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

Design solutions for broadly defined engineering technology problems and contribute to the design of systems, components or processes to meet identified needs.

Associated knowledge and attitude profile:

- Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon and similar concepts, that supports engineering design and operations using the technologies of a practice area.

Range statement: Design problems used in exit-level assessment must conform with the definition of a broadly defined engineering problem. A major design problem should be used to provide evidence. The selection of components, systems, engineering works, products or processes to be designed are dependent on the discipline or practice area. Appropriate consideration must be given to public health and safety, whole-life cost and net zero carbon, as well as resource, cultural, societal and environmental considerations, as required.

Graduate Attribute 4: Investigations, experiments and data analysis
Demonstrate competence to conduct investigations of broadly defined engineering problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions.

Associated knowledge and attitude profile:

- Engagement with the current technological literature of the discipline and awareness of the power of critical thinking.

Range statement: The balance of investigation and experiment should be appropriate to the discipline and the definition of a broadly defined problem. 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 can be produced.

Graduate Attribute 5: Use of engineering tools

Demonstrate competence to select and apply and recognize limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to broadly defined engineering problems.

Associated knowledge and attitude profile:

- Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed consideration and use of models applicable to the subdiscipline.
- Knowledge of engineering technologies applicable in the subdiscipline.

Range statement: A range of techniques, resources and modern engineering and IT tools appropriate to the disciplinary designation of the programme.

Graduate Attribute 6: Professional and technical communication

Demonstrate competence to communicate effectively and inclusively on broadly defined engineering activities, both orally and in writing, with the engineering community and society at large, taking into account cultural, language and learning differences.

Range statement: Material to be communicated is in an academic or simulated professional context. Audiences range from engineering peers, management and lay persons, using appropriate academic or professional discourse. Written reports range from short (300 to 1 000 words, plus tables diagrams) to long (10 000 to 15 000 words, plus tables, diagrams and appendices), covering material at exit-level. Methods of providing information include the conventional methods of the discipline, for example engineering drawings and design documentation, as well as subject-specific methods.

Graduate Attribute 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

Associated knowledge and attitude profile:

- A systematic, theory-based understanding of the natural sciences applicable to the subdiscipline and awareness of relevant social sciences.
- Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources,

net zero carbon and similar concepts, that supports engineering design and operations using the technologies of a practice area.
- Knowledge of the role of technology in society and identified issues in applying engineering technology, such as public safety and sustainable development.

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 is required of the role of engineering in the world 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.

Developmental considerations:

- Ability to self-reflect and show contextual awareness of social, workplace and governmental environments through exposure to complex, multi-disciplinary and/or unfamiliar problems.
- Ability to identify and position a design/artefact in the bigger picture and use appropriate judgement (intentionally incorporate multiple perspectives) to obtain a final solution or product.
- Ability to listen and interpret information from a variety of stakeholders to appropriately position identified problems/challenges/opportunities in the relevant context.

Graduate Attribute 8: Individual and collaborative teamwork

Demonstrate competence to function effectively as an individual and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

Associated knowledge and attitude profile:

- Knowledge of professional ethics, responsibilities and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Range statement: Multi-disciplinary 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.

Developmental considerations:

- Develop the ability to self-reflect and self-evaluate within an interpersonal engagement towards enabling appropriate understanding of self and other team members.
- Develop the ability to listen and interpret different motivations, personalities or workstyles within a team context towards enabling functional team dynamics.
- Knowledge of team cohesion and dynamics, motivational styles, frameworks for conflict and tension resolution and the ability to apply these.
- Ability to negotiate and manage time and project components related to interpersonal needs and agendas. Time management also includes understanding the value of time and determining if a task is better (cheaper) achieved by a single person or a team.

Graduate Attribute 9: Independent learning ability
Demonstrate competence to engage in independent learning through well-developed learning skills.

Associated knowledge and attitude profile:

- Engagement with the current technological literature of the discipline and awareness of the power of critical thinking.

Range statement: Operate independently in broadly defined contexts recognizing the need for and have the ability for i) independent and life-long learning, and ii) critical thinking in the face of new specialist technologies.

Developmental considerations:

- Openness to constructive feedback, awareness of own limitations, ability to cope with the discomfort of uncertainty and having access to a range of approaches, reflective self- evaluation, curiosity and proactive engagement, resilience, confidence to ask for help and draw from a broad range of stakeholders.

- Reflection of self-learning to begin to recognise if what has been covered meets the needs of the activity or task.

Graduate Attribute 10: Engineering professionalism

Understand and commit to professional ethics and norms of engineering technology practice, including compliance with national and international laws.

Associated knowledge and attitude profile:

- As for Graduate Attribute 8.

Range statement: Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. An understanding of the need for diversity and inclusion is required.

Developmental considerations:

- Self-management, professional responsibility and awareness of expertise and limitations, good judgement, process of on-going self-reflection and evaluation.
- Timeous, clear, realistic communication of risks and concerns and feedback on progress.
- Self-efficacy, accepting feedback and consequences and commitment.

Graduate Attribute 11: Project management and finance

Demonstrate knowledge and understanding of engineering management principles.

Range statement: Basic techniques from economics and project management applied to one's own work, as a

a. Examination Regulations

Refer to the General Handbook Rule: G22

b. Assessments

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

c. 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.

d. 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	
Design Project IV	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 & 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 System Analysis & Risk Assessment; Occupational Health and Safety Act 85 of 1993 and Regulations; Solid waste management, Air pollution Control; Wastewater management.

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, 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.