

**SECTION A1: THE BUILT ENVIRONMENT PROGRAMMES**

**1. QUALIFICATIONS OFFERED BY THE BUILT ENVIRONMENT**

Please go back to the Faculty's main page for an indication of programmes offered.

**2. CRITICAL CROSS-FIELD OUTCOMES**

The programmes have the following critical cross-field outcomes:

- Identify and solve problems that display responsible decisions, using critical and creative thinking.
- Work effectively with others as a member of a team, group, organisation and community.
- Organise and manage one's activities responsibly and effectively.
- Collect, analyse, organise and critically evaluate information.
- Communicate effectively, using visual, mathematical and/or language skills in the modes of oral and/or written persuasion.
- Use science and technology effectively and critically, showing responsibility towards the environment and health of others.
- Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.
- Contribute to the full personal development of each student and the social and economic development of society at large, by making it an underlying intention of the programme of learning to make an individual aware of:
  - Reflecting on and exploring a variety of strategies to learn more effectively.
  - Participating as responsible citizens in the life of local, national and global communities.
  - Being culturally and aesthetically sensitive across a range of contexts.
  - Exploring education and career opportunities.
  - Developing entrepreneurial opportunities.

**SECTION A2: ENGINEERING PROGRAMMES**

**1. QUALIFICATIONS OFFERED IN ENGINEERING**

Please turn back to the contents (page 5) for an indication of programmes offered.

**2. GENERIC STIPULATIONS WITH REGARDS TO THE HIGHER CERTIFICATE IN ENGINEERING:**

**2.1 The purpose of the programme:**

The qualification is primarily vocational or occupational in nature. The qualification also serves to provide students with the basic introductory knowledge, cognitive and conceptual tools and practical skills for further higher education studies in their chosen field of study. The knowledge emphasises general principles and application. This qualification signifies that the student has attained a basic level of higher education knowledge and competence in a particular field or occupation and is capable of applying such knowledge and competence in an occupation or role in the workplace.

**2.2 Graduate attributes of the programme:**

- **Graduate attribute 1: Problem-solving**  
Apply engineering principles to systematically diagnose and solve narrowly-defined engineering problems.
- **Graduate attribute 2: Application of scientific and engineering knowledge**  
Apply knowledge of mathematics, natural science and engineering sciences to wide practical procedures and practices to solve narrowly-defined engineering problems.
- **Graduate attribute 3: Engineering design**  
Perform procedural design of narrowly-defined components or processes to meet desired needs within applicable standards, codes of practice and legislation.



- **Graduate attribute 4: Investigation**  
Conduct tests, experiments and measurements of narrowly-defined engineering problems by applying relevant codes and manufacturer guidelines.
- **Graduate attribute 5: Engineering methods, skills, tools, including information technology**  
Use appropriate established techniques, resources, and modern engineering tools including information technology for the solution of narrowly-defined engineering problems, with an awareness of the limitations.
- **Graduate attribute 6: Professional and Technical Communication**  
Communicate effectively, both orally and in writing within an engineering context.
- **Graduate attribute 7: Impact of Engineering Activity**  
Demonstrate knowledge and understanding of the impact of engineering activity on society and the environment.

### 3. GENERIC STIPULATIONS WITH REGARDS TO THE BACHELOR OF ENGINEERING TECHNOLOGY AND THE DIPLOMA IN ELECTRICAL ENGINEERING

#### 3.1 The purpose of the programme:

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

Specifically, the purpose of educational programmes designed to meet this qualification are to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineering technologist or certificated engineer. This qualification provides -

- Preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development;
- The educational base required for registration as a Technician with ECSA (refer to qualification rules - *only applicable to the diploma programme*).
- The educational base required for registration as a Professional Engineering Technologist and/or Certificated Engineer with ECSA (refer to qualification rules - *only applicable to the bachelor of engineering technology programmes*).
- Entry to NQF Level 7 programmes, e.g. bachelor of engineering programmes and then to proceed to honours, postgraduate diploma and master's programmes (*only applicable to the diploma programme*).
- Entry to NQF Level 8 programmes, e.g. honours, postgraduate diploma and bachelor of engineering programmes and then to proceed to master's programmes (*only applicable to the bachelor of engineering technology programmes*).
- For certificated engineers, this provides the education base for achieving proficiency in mining/factory plant and marine operations and occupational health and safety.

Engineering students completing this qualification will demonstrate competence in all the graduate attributes contained in this standard.

#### 3.2 Graduate attributes of the programme:

- **Graduate attribute 1: Problem-solving**  
Apply engineering principles to systematically diagnose and solve broadly-defined engineering problems.
- **Graduate attribute 2: Application of scientific and engineering knowledge**  
Apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve broadly-defined engineering problems.



- **Graduate attribute 3: Engineering design**  
Perform procedural and non-procedural design of broadly defined components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation.
- **Graduate attribute 4: Investigation**  
Conduct investigations of broadly-defined problems through locating, searching and selecting relevant data from codes, data bases and literature, designing and conducting experiments, analysing and interpreting results to provide valid conclusions.
- **Graduate attribute 5: Engineering methods, skills, tools, including information technology**  
Use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of broadly-defined engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.
- **Graduate attribute 6: Professional and Technical Communication**  
Communicate effectively, both orally and in writing, with engineering audiences and the affected parties.
- **Graduate attribute 7: Impact of Engineering Activity**  
Demonstrate knowledge and understanding of the impact of engineering activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation.
- **Graduate attribute 8: Individual and Teamwork**  
Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects.
- **Graduate attribute 9: Independent Learning**  
Engage in independent and life-long learning through well-developed learning skills.
- **Graduate attribute 10: Engineering Professionalism**  
Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering technology practice.

#### 4. GENERIC STIPULATIONS WITH REGARD TO THE NATIONAL DIPLOMA: ENGINEERING (refer to registered qualification standard SAQA ID: 49744)

##### 4.1 The purpose of the programme:

*To train technicians in the field of engineering who will meet the criteria for registration as a Professional Engineering Technician at the Engineering Council of South Africa (ECSA). An undergraduate student achieving a qualification will be skilled and competent to solve well-defined problems and to apply the principles of engineering by using both the theoretical and practical knowledge and proven techniques in the execution of technical tasks as per the ethical and professional standards required by the engineering profession in the industry.*

##### 4.2 Generic exit-level outcomes of the programme

- **Exit-level outcomes 1: Problem-solving**  
Apply engineering principles to systematically diagnose and solve well-defined engineering problems.
- **Exit-level outcomes 2: Application of scientific and engineering knowledge**  
Demonstrate the application of mathematical, scientific and engineering knowledge in an engineering environment.
- **Exit-level outcomes 3: Engineering design**  
Perform procedural design of well-defined components, systems, works, products or processes to meet desired needs in accordance with applicable standards, codes of practice and legislation.
- **Exit-level outcomes 4: Communication**  
Communicate technical, supervisory and general management information effectively, both orally and in writing, by using appropriate language and terminology, structure, style and graphical support.
- **Exit-level outcomes 5: Engineering management**  
Apply self-management principles and concepts to the development of projects and/or operations in an engineering environment.
- **Exit-level outcomes 6: Application of complementary knowledge**  
Demonstrate a critical awareness of the impact of engineering activity on the social, industrial and physical environment, and of the need to act professionally within own limits of competence.



## 5. GENERIC STIPULATIONS WITH REGARDS TO THE BACCALAUREUS TECHNOLOGIAE: ENGINEERING (Refer to registered qualification standard SAQA ID: 49509)

### 5.1 The purpose of the programme:

To develop the necessary knowledge, understanding and skills required for a student's further learning towards becoming a competent practicing engineering technologist. It is intended to subsequently empower a candidate engineering technologist to demonstrate the capability of applying required knowledge, understanding, skills, attitudes and values in the different work environments in South Africa. It is also designed to add value to the qualifying student in terms of enrichment of the person, status and recognition.

### 5.2 Generic exit-level outcomes of the programme:

- **Exit-level outcomes 1: Problem-solving**  
Apply engineering principles to systematically diagnose and solve broadly defined engineering problems.
- **Exit-level outcomes 2: Application of scientific and engineering knowledge**  
Demonstrate the application of mathematical, scientific and engineering knowledge in an engineering environment.
- **Exit-level outcomes 3: Engineering design**  
Perform procedural and non-procedural design of broadly defined components, systems, works, products or processes to meet desired needs in accordance with applicable standards, codes of practice and legislation.
- **Exit-level outcomes 4: Communication**  
Communicate technical, supervisory and general management information effectively, both orally and in writing, by using appropriate language and terminology, structure, style and graphical support.
- **Exit-level outcomes 5: Engineering management**  
Apply engineering management principles and concepts to engineering activities.
- **Exit-level outcomes 6: Project development**  
Identify, analyse, conduct and manage a project.
- **Exit-level outcomes 7: Application of complementary knowledge**  
Demonstrate a critical awareness of the impact of engineering activity on the social, industrial and physical environment, and of the need to act professionally within own limits of competence.

## 6. CRITICAL CROSS-FIELD OUTCOMES

### 6.1 The National Diploma and the Baccalaureus Technologiae: Engineering have the following critical cross-field outcomes:

- Identify and solve problems that display responsible decisions, using critical and creative thinking.
- Work effectively with others as a member of a team, group, organisation and community.
- Organise and manage one's activities responsibly and effectively.
- Collect, analyse, organise and critically evaluate information.
- Communicate effectively, using visual, mathematical and/or language skills in the modes of oral and/or written persuasion.
- Use science and technology effectively and critically, showing responsibility towards the environment and health of others.
- Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.
- Contributing to the full personal development of each student and the social and economic development of society at large, by making it an underlying intention of the programme of learning to make an individual aware of:
  - Reflecting on and exploring a variety of strategies to learn more effectively.
  - Participating as responsible citizens in the life of local, national and global communities.
  - Being culturally and aesthetically sensitive across a range of contexts.
  - Exploring education and career opportunities.
  - Develop entrepreneurial opportunities.



**7. REGISTRATION WITH ECSA**  
**Successful registration with the Engineering Council of South Africa (ECSA) is based on two pillars:**

**Stage 1**

Accredited Academic Qualification obtained from registered academic providers. This University is a registered provider with the Department of Higher Education and Training. All engineering programmes were taken through a rigorous accreditation process during 2009 to obtain their accreditation status. The National Diploma includes a Work-Integrated Learning component in industry through appropriate cooperative agreements with specific companies in the industrial and service sectors in South Africa. Each programme-specific accreditation status will be published under each programmes information.

**Stage 2**

Industrial experience of three years for diploma students (candidate technicians), and three years for degree students (candidate technologists), under the supervision of an ECSA-registered professional in the workplace, after the completion of the academic qualification. Students may register with ECSA as candidate technicians after they have qualified for the National Diploma or as Candidate Technologists.

After a student has successfully completed these two stages in his/her career, he/she may apply for professional registration at ECSA. Registration with ECSA gives the qualification international status and recognition in other countries through the current Sydney (Technologists) and Dublin (Technicians) Accords after they have qualified for the Baccalaureus Technologiae: Engineering.

**SECTION A3: GOVERNMENT CERTIFICATE OF COMPETENCY (GCC)**

**1.1 GENERAL STIPULATIONS AND REGULATIONS**

**1.1.1 Certificates of competency:**

The following instructions, rules and syllabi for the GCC examinations are framed in terms of the Minerals Act Regulation 28.6 in force in terms of regulation 28.6 of the Mine Health and Safety Act, 1996 (Act No 29 of 1996).

1.1.1.1 The following Certificates of Competency are issued by the Department of Mineral and Energy Affairs:

- (a) Certificate of Competency as Mechanical Engineer for Factories;
- (b) Certificate of Competency as Electrical Engineer for Factories;
- (c) Certificate of Competency as Mechanical Engineer for Mines and Works; and
- (d) Certificate of Competency as Electrical Engineer for Mines and Works.

1.1.1.2 Written examinations for each of these certificates are conducted in June and November by the Department of Higher Education and Training in collaboration with the Commission of Examiners of the Department of Mineral and Energy and the Department of Labour.

**1.1.2 Qualifying examinations:**

To qualify for a Certificate of Competency as a Certificated Mechanical or Electrical Engineer for Mines and Works, the following subjects must be passed by persons accepted as candidates:

- (a) Plant Engineering; and
- (b) Legal Knowledge (Health and Safety Act, 1993 (Act No. 85 of 1993) and other Regulations).

To qualify for a Certificate of Competency, candidates must obtain at least 50% in each of the subjects stipulated above. Candidates need not pass both subjects at the same examination sitting, but the second subject must be passed within three years or six consecutive examination sittings after passing the first, otherwise both subjects must be re-written. However, if a candidate obtains 75% or more of the full marks in a subject, he/she will be permanently exempted from re-writing that subject. An appropriate Certificate of Competency will be forwarded to candidates who have passed the subjects required to qualify for such a certificate.



### 1.1.3 Acceptance of candidates for a GCC for Factories, Mines and Works as a Certificated Mechanical or Electrical Engineer:

No person will be allowed to enter for the qualifying examination unless he/she has been accepted as a candidate by the Commission of Examiners, and no credit will be given for a pass in the subjects mentioned above prior to such acceptance. An applicant shall not be accepted as a candidate by the Commission of Examiners unless he/she has submitted proof that he/she has reached the age of 23 years, is of sober and general good conduct and that he/she is in possession of qualifications and experience in engineering as follows:

#### 1.1.3.1 Route 1: Bachelor of Science (BSc) degree:

A BSc degree in mechanical or electrical engineering recognised by the Commission of Examiners and at least two years' appropriate practical postgraduate experience in the maintenance and operations of mechanical and electrical machinery, satisfactory to the Commission of Examiners, and of which at least one year at a time has been in the RSA; **or**

#### 1.1.3.2 Route 2: National Diploma in Engineering:

A recognised National Diploma in Electrical or Mechanical Engineering plus at least two years' experience subsequent to the issuing of such a diploma in the maintenance and operations of mechanical or electrical machinery, as the case may be, which is satisfactory to the Commission of Examiners, and of which at least one year has been at a mine/factory in the RSA. The university of technology must subsequently certify that a candidate for the Government Certificate of Competency, having followed this route, has -

- (a) completed a curriculum that covers the syllabus for Plant Engineering; and
- (b) acquired a National Diploma (Engineering: Electrical or Engineering: Mechanical) and passed the following prerequisite subjects with at least 50%:
  - i. **National Diploma: Engineering: Electrical with the following subjects:**  
Mechanics I or Physics I, Mechanical Engineering Drawing I, Mechanical Technology II and III, Strength of Materials II and III.
  - ii. **National Diploma: Engineering: Mechanical with the following subjects:**  
Electrotechnology I, II and III.
- (c) received the required experiential training; and
- (d) has completed a curriculum (as indicated below).

### Students who completed the N Dip: Engineering: Electrical

After the completion of all the requirements for the diploma, candidates must register (as secondary registration) with the Department of Mechanical Engineering, Mechatronics and Industrial Design for six extra Mechanical Engineering subjects under qualification code NDME05. With all these subjects completed, the candidate will meet all the academic requirements for a Government Certificate of Competency (GCC).

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
<b>First year (first semester)</b>			
MDR101T	Mechanical Engineering Drawing I	(0,068)	
MHC101T	Mechanics I	(0,068)	
<b>First year (second semester)</b>			
MET211T	Mechanical Technology II*	(0,083)	Mechanics I
SMT211T	Strength of Materials II	(0,083)	Mathematics I and Mechanics I
<b>Second year (first semester)</b>			
MET331T	Mechanical Technology III*	(0,083)	Communication Skills I Mechanical Technology II
SMT331T	Strength of Materials III	(0,083)	Communication Skills I Strength of Materials II



\* Mechanical Technology I and II are not part of the formal curriculum for Mechanical Engineering. However, these subjects are offered on the eMalahleni Campus for GCC purposes.

### Students who completed the N Dip: Engineering: Mechanical

After the completion of all the requirements for the diploma, candidates must register (as secondary registration) with the Department of Electrical Engineering for three extra Electrical Engineering subjects under qualification code NDEE12. With all these subjects completed, the candidate will meet all the academic requirements for a Government Certificate of Competency (GCC).

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
<b>First year (first semester)</b>			
ETT101T	Electrotechnology I	(0.100)	
<b>First year (second semester)</b>			
ETT211T	Electrotechnology II	(0.100)	Electrotechnology I
<b>Second year (first semester)</b>			
ETT321T	Electrotechnology III	(0.100)	Electrotechnology II

\* Electrotechnology III is not part of the formal curriculum for Mechanical Engineering. However, this subject is offered on the eMalahleni Campus for GCC purposes.

#### 1.1.3.3 **Route 3: Baccalaureus Technologiae degree in Engineering:**

Enrolled for the Baccalaureus Technologiae degree at a University of Technology granted permission by the Commission of Examiners with the undertaking from such university of technology to monitor and control the required experiential training after completion of such degree.

#### 1.1.3.4 **Route 4: National N Diploma in Engineering:**

A N Diploma course (TVET colleges) in engineering (mechanical or electrical, as the case may be). The completion of such course shall include passing all the subjects with a mark of at least 50%. Such person shall also serve an apprenticeship in an appropriate trade and gain experience in the maintenance and operations of mechanical or electrical machinery, as the case may be. Such experience, of which at least one year has been at a mine in the RSA, shall be satisfactory to the Commission of Examiners.

The Department of Higher Education and Training will structure a curriculum to cover the electrical and mechanical course according to the requirements of the Plant Engineering syllabus. After completion of the prescribed course, the Department of Higher Education and Training will be required to certify that a candidate for the Government Certificate of Competency, having followed the technical college/TVET college route, has –

- (a) completed a curriculum that covers the syllabus for Plant Engineering; and
- (b) acquired a National N Certificate/National N Diploma on the N6 Level, with a mark per subject of at least 50%.

The Commission of Examiners will consider other qualifications and experience on merit.

A person who has been accepted by the Commission of Examiners as a candidate and has not obtained a Certificate of Competency in seven (7) years from the date of acceptance must re-apply to the Commission for acceptance.

#### 1.1.4 **Programme offering by the Faculty of Engineering and the Built Environment for presenting the Government Certificate of Competency (GCC):**

To enable applicants to enhance their respective careers as a Certificated Engineer in either factories or mines and works, the applicant must choose what the basis of his certificate would be. The choice is either mechanical engineering or electrical engineering. As soon as the applicant decides what the basis qualification will be, he/she then selects the appropriate options below, namely:

- National Diploma: Engineering: Electrical (NDEE03/12), with orientation to Power Engineering (as stipulated in subject orientation guide). There is no more specialisation with added mechanical subjects (see section 1.1.3).



- National Diploma: Engineering: Mechanical (NDME05) with added electrical subjects (see section 1.1.3).

### **1.1.5 Preparation for sitting for the National Examination with DHET/DOL/DME:**

#### **1.1.5.1 Examination centre:**

The Tshwane University of Technology is an approved examination centre for the national examination for the two subjects that form part of the Government Certificate of Competency (GCC).

#### **1.1.5.2 Preparatory course (SLP):**

The Faculty of Engineering and the Built Environment developed a short learning programme (SLP) to guide and prepare applicants for the national examinations for the two subjects, Plant Engineering and Legal Knowledge (Health and Safety Act, 1993 (Act No. 85 of 1993) and other Regulations). This course will be presented over a year and is structured with components of distance education and contact education and learning strategies. Applicants can obtain more information at the Office of the Dean and the departments of Electrical and Mechanical Engineering, Mechatronics and Industrial Design at the beginning of year.

#### **1.1.5.3 Writing of national examination:**

Candidates will be prepared to sit for the national examinations during November. Depending on the candidates' progress, they will be allowed to sit for the examinations during the June session to prepare and train them for the experience of sitting for these national examinations.

