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**Subject:** Qualification Standard for Master of Engineering: NQF Level 9

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REVISION HISTORY

Appendix A: Consistency of Graduate Attributes with Critical Crossfield Outcomes

APPENDIX B: NQF LEVEL DESCRIPTORS

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DEFINITIONS

**Academic support**: A process that provides additional learning support to students who are not prepared for the normal curriculum; academic support may be provided prior to or in addition to the normal curriculum.

**Accreditation**: Formal recognition awarded to an education or training programme through a quality assurance procedure that ensured it met the criteria laid down for the type of programme.

**Accredited examinations**: Examinations or other forms of assessment that address the outcomes within an accredited programme.

**Accredited programme**: A programme that has been evaluated and recognised by ECSA as meeting stated criteria.

**Accredited qualification**: A qualification awarded on successful completion of an accredited programme.

**Accreditation criteria**: Statements of requirements that must be satisfied by a programme in order to receive accreditation.

**Assessment**: The process of determining the capability or competence of an individual by evaluating performances against standards.

**Assessment criteria**: A set of measurable performance requirements, which indicate that a person meets a specified outcome at the required level.

**Hybrid**: Combines modes of on-line education delivery, with traditional face-to-face class and laboratory activities.

**Branch of engineering**: A generally recognised major subdivision of engineering such as the traditional disciplines of Chemical, Civil or Electrical Engineering or a cross-disciplinary field of comparable breadth, including combinations of engineering fields (e.g. Mechatronics) and the application of engineering in other fields (e.g. Bio-Medical Engineering).
Broadly-defined engineering problems: A class of problems with characteristics as defined in document E-02-PT.

Category: A mode of registration defined in or under the Engineering Profession Act, 46 of 2000, that has a distinctive purpose, characteristic competencies, educational requirements and defined principal routes to registration.

Complementary studies: Studies that cover disciplines other than engineering sciences, natural sciences and mathematics, which are relevant to the practice of engineering and include engineering economics, management, the impact of technology on society, effective communication, the humanities, social sciences and other areas that support an understanding of the world in which engineering is practised.

Complex engineering problems: A class of problems with characteristics as defined in document E-02-PE.

Computing and information technologies: Encompass the use of computers, networking and software to support engineering activity and as an engineering activity itself, is appropriate to the discipline.

Continuous quality improvement: A process based on the concept that improvement of a process is always possible subject to ongoing assessment of the process and measures to maintain and improve quality.

Course: A building block of a programme with defined prerequisites, content and learning objectives with assessment, which if completed successfully provides credit towards a qualification.

Credit: A measure of the volume of learning attached to a course or module calculated according to the procedure defined in the relevant standard for the type of programme; a level may be associated with a number of credits.

Critical: Describes a factor, component, process, issue or decision in an engineering activity from which other consequences follow; an entity or operation that must be successfully
implemented or completed to ensure that a more complex operation or system can function—
failure of the critical entity or operation compromises the whole.

**Dublin Accord:** is an agreement for the mutual agreement of engineering programmes that
provide the educational foundation for professional engineering technicians.

**Education Committee:** The committee established by Council to address all education
matters.

**Educational objective:** A statement of the intended achievement that graduates of a
programme must accomplish, often with emphasis on the early years after graduation.

**Education provider:** A public or private higher education institution or body that conducts
programmes leading to accredited ECSA engineering qualifications of any type.

**Engineering design and synthesis:** constitutes the systematic process of conceiving and
developing materials, components, systems and processes to serve useful purposes. Design
may be procedural, creative or open-ended and requires the application of engineering
sciences, working under constraints, and taking into account economic, health and safety,
social and environmental factors, codes of practice and applicable laws.

**Engineering discipline:** Synonymous with *branch of engineering*

**Engineering education programme:** An educational programme that aims to satisfy
criteria prescribed by the ECSA.

**Engineering fundamentals:** Engineering sciences and natural sciences that embody a
systematic formulation of engineering concepts and principles based on mathematical and
natural sciences to support applications.

**Engineering Management:** the generic management functions of planning, organising,
leading and controlling, applied together with engineering knowledge in contexts including the
management of projects, construction, operations, maintenance, quality, risk, change and
business.
Engineering problem-solving: The process of finding solutions through a conscious and logical approach that relies on the application of engineering knowledge and skills and generic competencies.

Engineering Sciences: have roots in the mathematical and physical sciences, and where applicable, in other natural sciences but extend knowledge and develop models and methods in order to lead to engineering applications and solve engineering problems.

Engineering Speciality: the extension of engineering fundamentals to create theoretical frameworks and bodies of knowledge for engineering practice areas.

Engineering sub-discipline (an engineering speciality): a generally recognised practice area or major subdivision within an engineering discipline, for example, Structural and Geotechnical Engineering within Civil Engineering.

Evaluation: Determination of the compliance of a result with prescribed criteria based on documentation, inspection and the application of judgement supported by reasoning.

External moderation: A moderation process in which the moderator(s) are not in the employ of the provider, they make no input into the programme and they have no prior contact with the students.

Face-face programme: Programme offered where lecturers and students share the same physical space during learning process.

Final Accreditation: Accreditation of a programme that was given notification of termination of accreditation by the Education Committee after the previous interim accreditation.

Graduate: A qualifying learner, irrespective of whether the qualification is a degree or a diploma.

Graduate Attribute: A statement of the learning outcomes that a student must demonstrate at exit-level to qualify for an award of a qualification; these actions indicate the student’s capability to fulfil the educational objectives.
International Engineering Alliance (IEA): is a global organisation, which comprises members from 41 jurisdictions within 29 countries, across seven international agreements. These international agreements govern the recognition of engineering educational qualifications and professional competence. (Numbers can change as new members are admitted).

Interim Accreditation: Accreditation held at a time within the regular cycle stated by the Education Committee in the decision on the findings of the previous regular accreditation.

Knowledge area: A classification of curriculum content into defined types.

Knowledge profile: A description of the knowledge of a graduate in terms of the type and balance of knowledge in defined areas.

Level: A measure of learning demands regarding types of problems, knowledge required, skills and responsibility, which are expressed in terms of level descriptors

Mathematical Sciences: an umbrella term embracing the techniques of mathematics, applied mathematics, numerical analysis, statistics and aspects of computer science cast in an appropriate mathematical formalism.

Moderation: The process of ensuring that assessment of an individual meets the required standard and is consistent, objective and fair.

Module: Synonymous with course.

Natural sciences (formerly basic sciences): These comprise physics (including mechanics), chemistry, Earth sciences and the biological sciences that focus on understanding the physical world as applicable to the engineering context.

Notional Hours: The estimated learning time taken by the ‘average’ student to achieve the specified learning outcomes of the course-unit or programme.

One-higher: Applied to a teacher’s qualifications; means that the teacher has a relevant academic qualification of at least 120 credits that is at a higher level than the qualification being taught or is professionally registered in an appropriate category.
Online Accreditation: Remote Accreditation conducted using video conferencing or other virtual networks.

Online Programme: Education programme offered over any virtual network, predominantly the internet.

Pathway: Defined arrangement of teaching, learning and assessment within a programme that is one way of gaining the award of a qualification.

Programme: A structured, integrated teaching and learning arrangement with a defined purpose and pathway that leads to a qualification.

Practice area – in the educational context: synonymous with a generally recognised engineering speciality.

Practice area – at the professional level: a generally recognised or distinctive area of knowledge and expertise developed by an engineering practitioner through the path of education, training and experience.

Provider: A higher education provider except if the context indicates otherwise.

Provisional Accreditation: Accreditation of a new programme once the programme has been implemented and the first cohort of students have completed 50% of the academic credit requirements towards the programme.

Qualification: The formal recognition of a specified learning achievement that is usually awarded upon successful completion of a programme.

Range statement: A context in which assessment may take place against an outcome and is expressed in terms of situations, activities, tasks, methods and forms of evidence.

Regular Accreditation: Accreditation according to the accreditation cycle.

Self-study report: A provider’s account of how a programme meets each accreditation criterion and all applicable policy requirements while covering all methods of programme delivery and all possible pathways for completion of the degree.
Stage 1: A point in the process of professional or occupational development in engineering at which a person fulfils the educational requirements to register as a candidate in the relevant category.

Standards: Comprise statements of outcomes to be demonstrated and the levels of performance and content baseline requirements in the context of engineering educational programmes.

Sub-discipline: Synonymous with engineering speciality.

Sydney Accord: is an agreement for the mutual recognition of engineering programmes that provide the educational foundation for professional engineering technologists.

Washington Accord: is an agreement for the mutual recognition of engineering programmes that provide the educational foundation for professional engineers.

Well-defined engineering problems: A class of problems with characteristics defined in document E-02-PN.
ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>AC</td>
<td>Accreditation Committee</td>
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<tr>
<td>Adv Cert</td>
<td>Advanced Certificate</td>
</tr>
<tr>
<td>Adv Dip</td>
<td>Advanced Diploma</td>
</tr>
<tr>
<td>Adv Dip Eng</td>
<td>Advanced Diploma in Engineering</td>
</tr>
<tr>
<td>BEng</td>
<td>Bachelor of Engineering</td>
</tr>
<tr>
<td>BSc(Eng)</td>
<td>Bachelor of Science in Engineering</td>
</tr>
<tr>
<td>BEng Tech</td>
<td>Bachelor of Engineering Technology</td>
</tr>
<tr>
<td>BEng Tech (Hons)</td>
<td>Bachelor of Engineering Technology (Hons)</td>
</tr>
<tr>
<td>BTech</td>
<td>Bachelor of Technology</td>
</tr>
<tr>
<td>CHE</td>
<td>Council on Higher Education</td>
</tr>
<tr>
<td>DA</td>
<td>Dublin Accord</td>
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<tr>
<td>Dip Eng</td>
<td>Diploma in Engineering</td>
</tr>
<tr>
<td>Dip Eng Tech</td>
<td>Diploma in Engineering Technology</td>
</tr>
<tr>
<td>EC</td>
<td>Education Committee</td>
</tr>
<tr>
<td>ECSA</td>
<td>Engineering Council of South Africa</td>
</tr>
<tr>
<td>GA</td>
<td>Graduate Attribute</td>
</tr>
<tr>
<td>HCert</td>
<td>Higher Certificate</td>
</tr>
<tr>
<td>HEQC</td>
<td>Higher Education Quality Committee</td>
</tr>
<tr>
<td>HEQSF</td>
<td>Higher Education Qualifications Sub-Framework</td>
</tr>
<tr>
<td>IEA</td>
<td>International Engineering Alliance</td>
</tr>
<tr>
<td>LMS</td>
<td>Learning Management System</td>
</tr>
<tr>
<td>MEng</td>
<td>Master of Engineering</td>
</tr>
<tr>
<td>ND</td>
<td>National Diploma</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>---------</td>
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</tr>
<tr>
<td>NQF</td>
<td>National Qualifications Framework</td>
</tr>
<tr>
<td>PGDip Eng Tech</td>
<td>Post Graduate Diploma in Engineering Technology</td>
</tr>
<tr>
<td>RPSC</td>
<td>Research, Policy and Standards Committee</td>
</tr>
<tr>
<td>SA</td>
<td>Sydney Accord</td>
</tr>
<tr>
<td>SADC</td>
<td>Southern African Development Community</td>
</tr>
<tr>
<td>SAFEQ</td>
<td>Southern African Federation of Engineering Organisations</td>
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<tr>
<td>SAQA</td>
<td>South African Qualifications Authority</td>
</tr>
<tr>
<td>WA</td>
<td>Washington Accord</td>
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BACKGROUND

The illustration below defines the documents that comprise the Engineering Council of South Africa (ECSA) system for accreditation of programmes meeting educational requirements for professional categories. The illustration also locates the current document.

Figure 1: Documents defining the ECSA Accreditation systems

1. STANDARD STATEMENT

The ECSA develops and operates a quality assurance system that leads to the accreditation of a number of engineering education programmes.

2. PURPOSE OF THIS DOCUMENT

This document defines the standard for accredited Master of Engineering-type programmes in terms of programme design criteria, a knowledge profile and a set of graduate attributes.
This standard is referred to in the Accreditation Criteria defined in ECSA document E-03-CRI-P.

3. FIELD
Manufacturing, Engineering and Technology

4. SUBFIELD
Engineering and Related Design

5. NQF EXIT LEVEL
Level 9

6. CREDITS
At least 180 credits. Not less than 120 Credits must be at NQF level 9.

7. ACCEPTABLE TITLES
Master of Engineering

8. ABBREVIATIONS
MEng

9. QUALIFIERS
The qualification must have a disciplinary cross-disciplinary qualifier (discipline, branch, option or endorsement) defined in the provider’s rules for the degree that is reflected on the academic transcript and degree certificate, subject to the following:

9.1 There must be at least one qualifier which contains the word Engineering together with a disciplinary description such as: Agricultural, Aeronautical, Chemical, Civil, Computer, Electrical, Electro-mechanical, Electronic, Environmental, Industrial, Extractive Metallurgical, Information, Materials, Mechanical, Mechatronic, Metallurgical, Mineral(s) Process, Physical Metallurgical and Mining. Qualifiers are not restricted to this list.

9.2 The qualifier(s) must clearly indicate the nature and purpose of the programme.
9.3 The qualifier must be consistent with the fundamental engineering science content on the programme.

9.4 The target market indicated by the qualifier may be a traditional branch of engineering or a substantial industry area.

In the case of a provider offering programmes with the same first-level qualifier and different second level qualifiers but with insufficiently differentiated purpose or content, only one programme should be accredited.

Examples of acceptable designations in accordance with HEQF and HEQSF policy are:
Master of Engineering in Civil Engineering, abbreviated MEng (Civil Engineering)

10. PURPOSE OF THE QUALIFICATION
The Master of Engineering degree prepares a candidate for professional practice, enhances in-depth knowledge and understanding of the principles, specialist and contextual knowledge of a branch of engineering, cultivates a critical awareness of developments at the forefront of the field, develops the capacity to conduct research, and meets the minimum entry requirement for admission to a NQF level 10 Doctoral Degree. This qualification demands a high level of theoretical engagement and intellectual independence.

A provider my elect to offer the Master of Engineering as part of a carefully circulated combination of qualifications that when offered as a structured whole could be determined through a process of accreditation to meet the educational requirements for registration in the category candidate engineer. This pathway is described fully in E-23-P.

A provider adopting this approach for their suite of qualifications on this pathway would need to ensure that the necessary knowledge content areas – specifically mathematics and natural science, and engineering design and synthesis – have been curriculuated in such a way that on completion of this pathway, both the knowledge content areas and the developed Graduate Attributes meet or exceed the requirements of a Bachelor of Engineering qualification.
11. PROGRAMME STRUCTURE

The programme leading to the qualification shall contain a minimum of 180 credits including a research project of no less than 60 credits at NQF Level 9 determined using the method defined in document R-01-POL-PC. Not less than 120 Credits shall be at NQF level 9. Credits shall be distributed in order to create a coherent progression of learning toward the exit level.

11.1 Knowledge Areas in the Programme

The content of the programme when analysed by knowledge area must not fall below the tabled minimum SAQA credits in each knowledge area in table 1.

Knowledge areas are defined in document E-01-POL. The method for calculating credits and allocating to knowledge areas is defined in document E-01-POL.

<table>
<thead>
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<tr>
<td>Mathematics and natural science</td>
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</tr>
<tr>
<td>Engineering Sciences</td>
<td>30</td>
</tr>
<tr>
<td>Engineering design &amp; synthesis</td>
<td>20</td>
</tr>
<tr>
<td>Complementary studies</td>
<td>10</td>
</tr>
<tr>
<td>Engineering research project</td>
<td>60</td>
</tr>
<tr>
<td>Subtotal</td>
<td>150</td>
</tr>
<tr>
<td>For Reallocation</td>
<td>≥ 30</td>
</tr>
<tr>
<td>Total Credits</td>
<td>≥ 180</td>
</tr>
</tbody>
</table>

The reallocation component must be taken up by allocating knowledge to the five knowledge areas to form a coherent, balanced programme.

11.2 Core and Specialist Requirements

The programme must have a coherent core of mathematics, natural science and fundamental engineering sciences that provides a viable platform for research and
development, further studies and lifelong learning. The coherent core must enable development in a traditional discipline or in an emerging field. The coherent core includes fundamental elements. The provider may allow elective credits, subject to the minimum credits in each knowledge area and the graduate attributes being satisfied for all choices.

A programme must contain specialist engineering study at the exit level. Specialist study may lead to elective or compulsory credits. Specialist study may take on many forms including further deepening of a theme in the core, a new sub-discipline, or a specialist topic building on the core. It is recognised that the extent of specialist study is limited in view of the need to provide a substantial coherent core. Specialist study may take the form of compulsory or elective credits.

11.3 Curriculum Content
This standard does not specify detailed curriculum content. The fundamental and specialist engineering science content must be consistent with the designation of the degree.

12. ACCESS TO QUALIFICATION
This standard is specified as a set of graduate attributes and overall distribution of credits. Providers therefore have the freedom to construct programmes geared to different levels of preparedness of learners, including creating articulation pathways from other qualifications.

13 MINIMUM LEARNING ASSUMED TO BE IN PLACE
Designers of this 180 credit programme to meet the graduate attributes and credit requirements defined in this standard assume that entrants are proficient as specified by the provider’s entry requirements. It is assumed that students have completed a suitably structured Bachelor of Engineering Technology Honours or a substantially equivalent qualification or combination of substantially equivalent qualifications.
14. 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. Words and phrases having specific meaning are defined in this document or in ECSA document E-01-POL.

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.

NQF Level Descriptors: Refer to the normative level descriptors for level 9 in Appendix B.

Level Descriptor: Complex engineering problems:

a) require in-depth emerging, fundamental and specialized engineering knowledge; and have one or more of the characteristics:

i) are ill-posed, under- or over specified, or require identification and refinement;

ii) are high-level problems including component parts or sub-problems;

iii) are unfamiliar or involve infrequently encountered issues;

b) and their solutions have one or more of the characteristics:

i) are not obvious, require originality or analysis based on fundamentals;

ii) are outside the scope of standards and codes;

iii) require information from variety of sources that is complex, abstract or incomplete;

iv) involve wide-ranging or conflicting issues: technical, engineering and interested or affected parties.

This qualification also includes conducting and reporting research under supervision, worth at least 60 credits at NQF Level 9, in the form of a research project appropriate to the discipline or field of study, characterised by:

1. the ability to conduct in depth literature searches;

2. the ability to identify, locate and obtain required data;
3. the ability to design and conduct analytic, modelling and experimental investigations;

4. the ability to critically evaluate data and draw conclusions;

5. the ability to investigate the application of new and emerging technologies in their branch of engineering; and

6. the ability to report and communicate findings.

Graduate Attribute 1: Problem solving
Identify, formulate, analyse and solve complex engineering problems.

Level descriptor: See general range statements above, and:

Range statement: Use a wide range of specialist skills to identify, conceptualise, design and implement methods of enquiry to solve complex engineering problems creatively with an understanding of the consequences of any solutions or insights generated within a specialised context

Graduate Attribute 2: Application of scientific and engineering knowledge
Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering speciality to solve complex engineering problems, conceptualise models and enable engagement with, and critique of, current and emerging research and practices.

Level descriptor: Knowledge of mathematics, natural science and engineering sciences is characterised by:

- Knowledge of mathematics using formalism, and oriented toward engineering analysis and modelling; deep knowledge of natural science: both as relevant to the discipline;
- Deep knowledge of a broad range of fundamental principles of an engineering discipline or cross-disciplinary field that is coherently and systematically organised;
- In-depth, theoretically based knowledge in limited specialist area(s), informed by current developments, and emerging issues; and
- The use of mathematics, natural science and engineering sciences in formal
analysis and modelling of engineering situations, for reasoning about and conceptualising complex engineering problems.

**Note:** Problems used for assessment may provide evidence in the application of one, two or all three categories of knowledge listed above. It also requires working across engineering disciplinary boundaries through cross disciplinary literacy and shared fundamental knowledge.

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

**Range Statement:** Design problems used in exit-level assessment must conform to the definition of a complex engineering problem. A major 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 discipline or practice area. Demonstrate the ability to propose interventions at an appropriate level within a system based on an understanding of interdependent relations and address intended and unintended consequences of interventions.

**Graduate Attribute 4: Research, investigations, experiments and data analysis**
Demonstrate competence to design and conduct research, execute detailed technical investigations, implement strategies for the processing and management of information, including the review of current advances in the field, to produce new insights and solve complex engineering problems.

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

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

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

Demonstrate competence to develop, select and apply appropriate and creative techniques, resources, and modern engineering tools, including information technology, prediction and modelling.

**Range Statement:** A range of methods, skills and tools appropriate to the disciplinary designation of the program, with an understanding of the limitations, restrictions, premises, assumptions and constraints, including:

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

**Graduate Attribute 6: Professional and technical communication**

Demonstrate competence to use the resources of academic, professional and occupational discourses to communicate and defend substantial ideas that are products of research, investigation or development in an area of specialisation; and a range of advanced and specialised skills and discourses appropriate to the field, discipline or practice, to communicate to a range of audiences with different levels of knowledge or expertise.

**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 (300-1000
Graduate Attribute 7: Sustainability and the impact of engineering activity Demonstrate critical awareness of the sustainability and impact of engineering activity on the social, industrial and physical environment.

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

Graduate Attribute 8: Individual, team and multidisciplinary working
Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments.

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

Graduate Attribute 9: Independent learning ability
Demonstrate the ability to develop own learning strategies to sustain independent learning and academic and professional development, including effective interaction within the learning or professional group as a means of enhancing learning.

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

Graduate Attribute 10: Engineering professionalism
Demonstrate critical awareness of the need to act professionally, ethically, and with integrity to exercise judgment and take responsibility within own limits of competence and where appropriate to account for leading and initiating processes and implementing systems, ensuring good resource and governance practices.

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

Graduate Attribute 11: Engineering management
Demonstrate knowledge and understanding of engineering management principles and economic decision making.

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

15. INTERNATIONAL COMPARABILITY
This standard has been intentionally written for the combination of the Bachelor of Technology Honours and Master of Engineering (Professional Practice) to meet or exceed the requirements of the European Network for the Accreditation of Engineering Education (ENAE) Second Cycle (i.e. Master’s level) EUR-ACE Framework Standard used for the accreditation of Professional Engineering Programmes in European (Bologna Accord signatory) countries (http://www.enaee.eu).

International comparability of engineering education qualifications is ensured through the Washington and Sydney Accords, all being members of the International Engineering Alliance (IEA).
The standards are comparable with the Washington Accord Graduate Attributes. Comparability of the standard achieved in accredited programmes is audited via a six-yearly Washington Accord review of the Engineering Council of South Africa, the South African signatory to the accord. (See [www.ieagreements.org](http://www.ieagreements.org)).

### 16. INTEGRATED ASSESSMENT

Providers of programmes shall, in the quality assurance process, demonstrate that an effective integrated assessment strategy is used. Clearly identified components of assessment must address summative assessment of the graduate attributes. Evidence should be derived from major work or multiple instances of limited scale work.

### 17. RECOGNITION OF PRIOR LEARNING

Providers may make use of recognition of prior learning (RPL) to demonstrate competence for admission to this programme but must take full responsibility for assessing the graduate attributes. This qualification may be achieved in part through recognition of prior learning processes. Credits achieved by RPL must not exceed 50% of the total credits and must not include credits at the exit level.

### 18. ARTICULATION POSSIBILITIES

A Master’s degree at NQF Level 9 meets the requirements for admission to a Doctoral degree at NQF Level 10. A qualification may not be awarded for early exit from a Master of Engineering degree.

### 19 MODERATION AND REGISTRATION OF ASSESSORS

Providers of programmes must demonstrate in the quality assurance process that an effective moderation process exists to ensure that the assessment system is consistent and fair.

Registration of assessors is delegated by the Higher Education Quality Committee to the Higher Education providers responsible for programmes.
References

1. Policy on Accreditation of Engineering Programmes E-01-POL Available via www.ecsa.co.za
### REVISION HISTORY

<table>
<thead>
<tr>
<th>Revision Number</th>
<th>Revision Date</th>
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<tr>
<td>Revision 1</td>
<td>21 October 2018</td>
<td>Initial Issue</td>
<td>RPS</td>
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<td>Revision 1</td>
<td>29 January 2019</td>
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<td>Revision 2 Draft A</td>
<td>14 August 2020</td>
<td>Realign E-series documents</td>
<td>Work Group</td>
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<td>Rev 2 Draft B</td>
<td>19 August 2020</td>
<td>Review by Education Business Unit</td>
<td>Education BU</td>
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<td>Rev 2</td>
<td>20 August 2020</td>
<td>Review by the Executive</td>
<td>EL Nxumalo</td>
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<tr>
<td>Revision 2 Draft C</td>
<td>18 September 2020</td>
<td>Addition of missing information and appendix B</td>
<td>Task Team</td>
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<tr>
<td>Revision 2</td>
<td>15 October 2020</td>
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<td>RPSC</td>
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The Qualification Standard for:

**Master of Engineering: NQF Level 9**

Revision 2 dated 15 October 2020 and consisting of 30 pages has been reviewed for adequacy by the Business Unit Manager and is approved by the Executive: Research Policy and Standards (RPS).

![Signature]

Business Unit Manager

Date: 17/11/2020

![Signature]

Executive: RPS

Date: 17/11/2020

This definitive version of this policy is available on our website.

**CONTROLLED DISCLOSURE**

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QM-TEM-001 Rev 0 – ECSA Policy/Procedure
### Appendix A: Consistency of Graduate Attributes with Critical Crossfield Outcomes

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<tr>
<th>SAQA Critical Cross-Field Outcomes</th>
<th>Equivalent Graduate Attributes</th>
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<tr>
<td>Identifying and solving problems in which responses display that responsible decisions using critical thinking have been made.</td>
<td>GA 1, 2, 3, 5</td>
</tr>
<tr>
<td>Working effectively with others as a member of a team, group, organisation and community.</td>
<td>GA 8</td>
</tr>
<tr>
<td>Organising and managing oneself and one’s activities responsibly and effectively.</td>
<td>GA 8, GA11</td>
</tr>
<tr>
<td>Collecting, analysing, organising and critically evaluating information.</td>
<td>GA 1, 3, 5</td>
</tr>
<tr>
<td>Communicating effectively using visual, mathematical and/or language skills.</td>
<td>GA 2, 6</td>
</tr>
<tr>
<td>Using science and technology effectively and critically, showing responsibility toward the environment and health of others.</td>
<td>GA 2, 3, 4, 5, 7</td>
</tr>
<tr>
<td>Demonstrating an understanding of the world as a set of Related systems by recognizing that problem contexts do not exist in isolation.</td>
<td>GA 1, 3, 4</td>
</tr>
<tr>
<td>Contributing to the full personal development of each learner 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:</td>
<td></td>
</tr>
<tr>
<td>• reflecting on and exploring a variety of strategies to more effectively learn</td>
<td>GA 9</td>
</tr>
<tr>
<td>• participating as responsible citizens in the life of national and global communities local</td>
<td>GA 10</td>
</tr>
<tr>
<td>• being culturally and aesthetically sensitive across a of contexts range</td>
<td>GA 7</td>
</tr>
<tr>
<td>• exploring education and career opportunities</td>
<td>GA 8</td>
</tr>
<tr>
<td>Developing entrepreneurial opportunities</td>
<td>GA 3</td>
</tr>
</tbody>
</table>
APPENDIX B: NQF LEVEL DESCRIPTORS
The qualification is awarded at level 9 on the National Qualifications Framework (NQF) and therefore meets the following level descriptors:

- **Scope of knowledge**: Demonstrate specialist knowledge to enable engagement with and critique of current research or practices, and an advanced scholarship or research in a particular field, discipline or practice.

- **Knowledge literacy**: Demonstrate an ability to evaluate current processes of knowledge production and to choose an appropriate process of enquiry for the area of study or practice.

- **Method & procedure**: The ability to demonstrate a command of and ability to design, select and apply appropriate and creative methods, techniques, processes or technologies to complex practical and theoretical problems.

- **Problem solving**: Demonstrate the use of a wide range of specialised skills in identifying, conceptualising, designing and implementing methods of enquiry to address complex and challenging problems within a field, discipline or practice; and an understanding of the consequences of any solutions or insights generated within a specialised context.

- **Ethics and professional practice**: The ability to make autonomous ethical decisions which affect knowledge production, or complex organisational or professional issues, an ability to critically contribute to the development of ethical standards in a specific context.

- **Accessing, processing and managing information**: Demonstrate the ability to design and implement a strategy for the processing and management of information, in order to conduct a comprehensive review of leading and current research in an area of specialisation to produce significant insights.

- **Producing and communicating information**: Demonstrate an ability to use the resources of academic and professional or occupational discourses to communicate and defend substantial ideas that are the products of research or development in an area of specialisation; use a range of advanced and specialised skills and discourses appropriate to a field, discipline or practice, to communicate to a range of audiences with different levels of knowledge or expertise.
HIGHER EDUCATION QUALIFICATIONS SUB-FRAMEWORK STANDARDS
DEVELOPMENT: POLICY AND PROCESS

Explanatory Notes

In terms of the National Qualifications Framework (NQF) Act, 67 of 2008, the Council on Higher Education (CHE) is the Quality Council (QC) for Higher Education. The CHE is responsible for quality assurance of higher education qualifications.

Part of the implementation of the Higher Education Qualifications Sub-Framework (HEQSF) is the development of qualification standards. The development of standards is aligned with the nested approach incorporated in the HEQSF. In this approach, the outer layer providing the context for qualification standards comprises the NQF level descriptors developed by the South African Qualifications Authority (SAQA) in agreement with the relevant QC. One of the functions of the QC (in the case of higher education, the CHE) is to ensure that the NQF level descriptors ‘remain current and appropriate’. The development of qualification standards for higher education therefore needs to take the NQF level descriptors, as the outer layer in the nested approach, into account. An ancillary function is to ensure that they ‘remain current and appropriate’ in respect of qualifications awarded by higher education institutions.

A secondary layer for the context in which qualification standards are developed is the HEQSF. This framework specifies the types of qualification that may be awarded and, in some cases, the allowable variants of the qualification type. An example of variants is the provision for two variants of the Master’s degree (including the 'professional' variant).

Another example is the distinction, in the Bachelor’s degree type, between the ‘general’ and ‘professionally-oriented’ variants. The HEQSF also specifies the purpose and characteristics of each qualification type. However, as indicated in the Framework for Qualification Standards in Higher Education (CHE, 2013), neither NQF level descriptors nor the HEQSF are intended to address, or indeed capable of addressing, fully the relationship between generic qualification-type purpose and the specific characteristics of
that qualification type in a particular field of study. One of the tasks of standards
development is to reconcile the broad, generic description of a qualification type according
to the HEQSF and the particular characteristics of qualifications awarded in diverse fields
of study and disciplines, as defined by various descriptors and qualifiers.

Development of qualification standards is guided by the principles, protocols and
methodology outlined in the Framework, approved by the Council in March 2013. The
focus of a standards statement is the relationship between the purpose of the qualification,
the attributes of a graduate that manifest the purpose, and the contexts and conditions for
assessment of those attributes. A standard establishes a threshold. However, on the
grounds that a standard also plays a developmental role, the statement may include, as
appropriate, elaboration of terms specific to the statement, guidelines for achievement of
the graduate attributes, and recommendations for above-threshold practice.