ECSA

ENGINEERING COUNCIL OF SOUTH AFRICA

Qualification Standard for Master of Engineering: NQF Level 9

E-22-PE

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DEFINITIONS

Academic support: A process that provides additional learning support to students who are unprepared 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 ECSA has evaluated and recognised 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 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: Combined 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).

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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 that are relevant to the practice of engineering, including 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: These technologies encompass the use of computers, networking and software to support engineering activity and as engineering activities themselves, are appropriate to the discipline.

Continuous quality improvement: A process based on the concept that improvement of a process is always possible subject to on-going 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

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

Engineering discipline: Synonymous with a 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.

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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: These have roots in the mathematical and physical sciences, and where applicable, in other natural sciences but extend knowledge and develop models and methods 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 subdiscipline (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 moderators are not in the employ of the provider; they have no input into the programme and they have no prior contact with the students.

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

Final accreditation: Accreditation of a programme that had been 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.

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International Engineering Alliance (IEA): A global organisation comprising members from 41 jurisdictions within 29 countries, across seven international agreements. These international agreements govern the recognition of engineering educational qualifications and professional competence.

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 (formally 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.

Online accreditation: Remote accreditation conducted using video conferencing or virtual networks.

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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 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 that 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.

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Stage One: 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: These comprise statements of outcomes to be demonstrated and the levels of performance and content baseline requirements in the context of engineering educational programmes.

Subdiscipline: Synonymous with engineering speciality.

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

Washington Accord: 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.

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ABBREVIATIONS

AC	Accreditation Committee
Adv Cert	Advanced Certificate
Adv Dip	Advanced Diploma
Adv Dip Eng	Advanced Diploma in Engineering
BEng	Bachelor of Engineering
BSc (Eng)	Bachelor of Science in Engineering
BEng Tech	Bachelor of Engineering Technology
BEng Tech (Hons)	Bachelor of Engineering Technology (Hons)
BTech	Bachelor of Technology
CHE	Council on Higher Education
Dip Eng	Diploma in Engineering
Dip Eng Tech	Diploma in Engineering Technology
EC	Education Committee
ECSA	Engineering Council of South Africa
GA	Graduate Attribute
HCert	Higher Certificate
HEQC	Higher Education Quality Committee
HEQSF	Higher Education Qualifications Sub-Framework
LMS	Learning Management System
MEng (Professional)	Master of Engineering
ND	National Diploma
NQF	National Qualifications Framework
PGDip Eng Tech	Post Graduate Diploma in Engineering Technology
RSPC	Research, Policy, and Standards Committee
SADC	Southern African Development Community
SAFEO	Southern African Federation of Engineering Organisations
SAQA	South African Qualifications Authority

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1. 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.

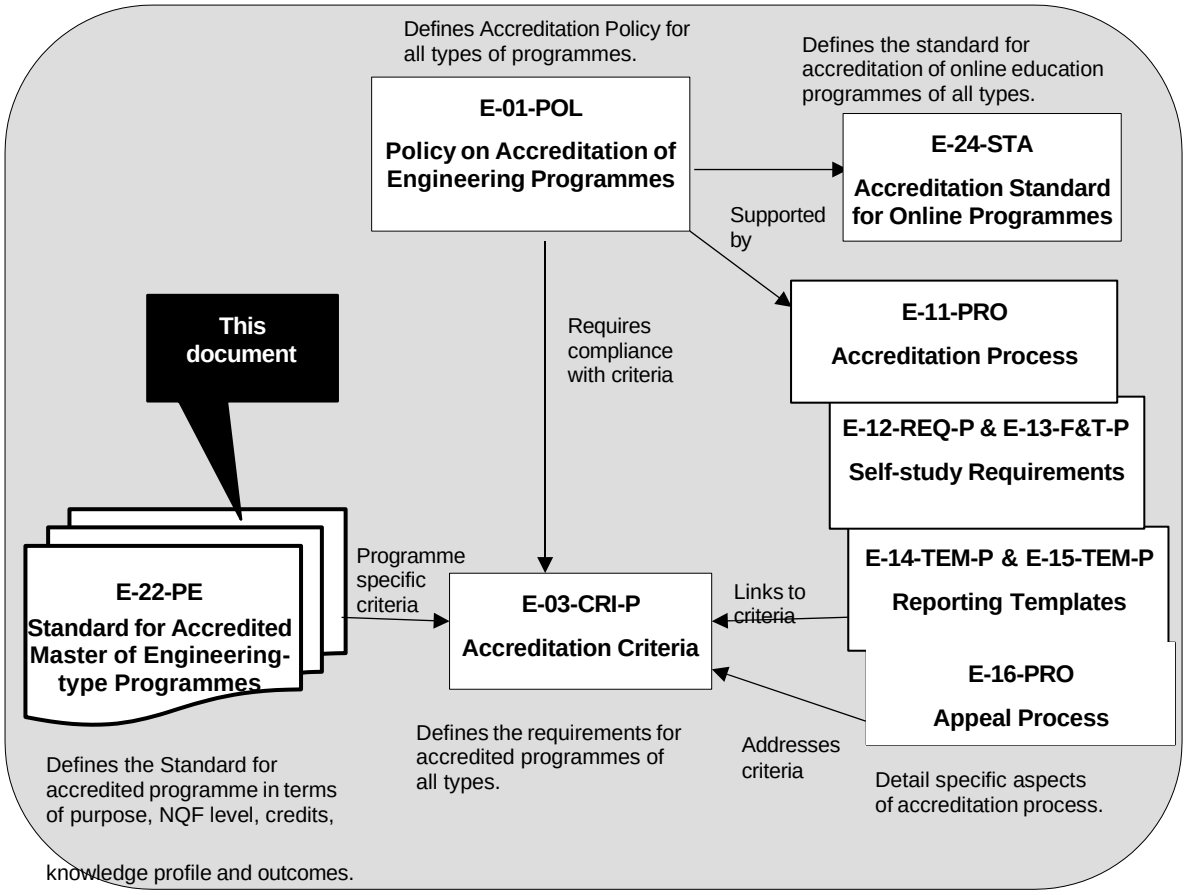

Figure 1: Documents defining the ECSA Accreditation system

2. STANDARD STATEMENT

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

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3. 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**.

4. FIELD

Manufacturing, Engineering and Technology.

5. SUBFIELD

Engineering and Related Design.

6. NQF EXIT LEVEL

Level 9.

7. CREDITS

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

8. ACCEPTABLE TITLE

Master of Engineering.

9. ABBREVIATION

MEng (Professional).

10. QUALIFIERS

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

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(a) There may only be one qualifier that contains 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.

(b) Qualifiers must clearly indicate the nature and purpose of the programme.

(c) Qualifiers must be consistent with the fundamental engineering science content on the programme.

(d) The target market indicated by the qualifier may be a traditional branch of engineering or a substantial industry area. Programmes should not address narrow niche markets.

An examples of an acceptable designation in accordance with HEQF and HEQSF policy is Master of Engineering in Civil Engineering, abbreviated MEng (Civil Engineering).

11. 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.

The recognised purpose of this Master of Engineering degree, accredited as satisfying this standard, is to provide graduates with the following:

(a) Preparation for careers in engineering and related areas, for achieving technical leadership and to contribute to the economy and national development.

(b) 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 and competency in engagement with the world and society in which engineering is practised.

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A provider may elect to offer the Master of Engineering as part of a carefully curriculated combination of qualifications that when offered as a structured whole can 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 its 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 curriculated 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.

12. PROGRAMME STRUCTURE

Subject to the overall requirement for 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**, with not less than 120 credits at NQF level 9, credits must be distributed to create a coherent progression of learning towards the exit-level. Preparatory or remedial courses are not included in the 180 credits.

12.1 Knowledge areas in the programme

When analysed by knowledge area, the programme content must not fall below the minimum SAQA credits in each knowledge area, as displayed in Table 1.

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

Table 1: Minimum curriculum content by knowledge area

Knowledge area	Minimum credits
Mathematical and natural sciences	30
Engineering sciences	30
Design and synthesis	20
Complementary studies	10
Engineering research project	60

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Knowledge area	Minimum credits
Subtotal	*150*
For reallocation	≥30
Total credits	**≥180**

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

12.2 Core and specialist requirements

The programme must have a coherent core of mathematics, natural sciences and engineering fundamentals that provides a viable platform for further studies and lifelong learning. The programme must enable development and practice opportunities for fundamental professional developmental abilities such as self-reflection, judgement, honest ethical behaviour, responsibility and self-efficacy. The coherent core must enable development in a traditional discipline or in an emerging field.

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

12.3 Curriculum content

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

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13. ACCESS TO QUALIFICATION

This standard is specified as a set of Graduate Attributes and overall distribution of credits. Providers therefore have freedom to construct programmes geared to different levels of preparedness of learners, including the following:

- Use of access programmes for learners who do not meet the minimum learning requirements.
- Creating articulation paths from other qualifications.

14. 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 postgraduate diploma in Engineering Technology or a substantially equivalent qualification or combination of substantially equivalent qualifications.

Note: These assumptions do not prescribe prerequisites. Sections 12 and 13 should be read together.

15. 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 and in ECSA document **E-01-POL**.

General range statement: The competencies defined in the 11 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.

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Complex engineering problems

(a) Require a fundamentals-based, first principles analytical approach, use in-depth engineering knowledge and have one or more of the following characteristics:

(i) A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
(ii) Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline, much of which is at the forefront of the discipline.
(iii) 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 in a practice area.
(iv) Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
(v) Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

(b) and have some or all of the following characteristics:

(i) Involve wide-ranging and/or conflicting technical, non-technical issues (such as ethical, sustainability, legal, political, economic, societal) and consideration of future requirements.
(ii) Have no obvious solution and require abstract thinking, creativity and originality in analysis to formulate suitable models.
(iii) Involve infrequently encountered issues or novel problems.
(iv) Address problems not encompassed by standards and codes of practice for professional engineering.
(v) Involve collaboration across engineering disciplines, other fields and/or diverse groups of stakeholders with widely varying needs.
(vi) Address high-level problems with many components or sub-problems that may require a systems approach.

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Graduate Attribute 1: Problem-solving

Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development.

Associated knowledge and attitude profile:

- A systematic, theory-based understanding of the natural sciences applicable to the discipline 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 analysis and modelling applicable to the discipline.
- A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
- Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline, much of which is at the forefront of the discipline.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, computing and engineering fundamentals and an engineering specialisation to develop solutions to complex engineering problems.

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 creative solutions for complex engineering problems and design systems, components or processes to meet identified needs.

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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 in a practice area.

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. 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 complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

Associated knowledge and attitude profile:

- Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

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

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

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Graduate Attribute 5: Use of engineering tools

Demonstrate competence to create, select and apply, and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex 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 analysis and modelling applicable to the discipline.
- Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

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 complex 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.

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Associated knowledge and attitude profile:

- A systematic, theory-based understanding of the natural sciences applicable to the discipline 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 in a practice area.
- Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to 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 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.

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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 selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

Range statement: Operate independently in complex contexts recognising the need for and having the preparation and ability for i) independent and life-long learning, ii) adaptability to

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new and emerging technologies, and iii) critical thinking in the broadest context of technological change.

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

Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant 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.

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Graduate Attribute 11: Project management and finance

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

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

16. INTERNATIONAL COMPARABILITY

International comparability of this whole qualification standard is ensured through the Washington Accord, an agreement for the mutual recognition of professionally oriented bachelor's degrees in engineering. The Graduate Attributes are aligned with the Washington Accord Graduate Attributes. Comparability is audited on a 6-yearly cycle by a visiting Washington Accord team.

17. INTEGRATED ASSESSMENT

Providers of programmes must demonstrate in the quality assurance process that an effective integrated assessment strategy has been 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.

18. RECOGNITION OF PRIOR LEARNING

Providers may use recognition of prior learning (RPL) at intermediate levels but must take full responsibility for assessing the Graduate Attributes. This qualification may be achieved in part through RPL processes. Credits achieved by RPL must not exceed 50% of the total credits and must not include credits at the exit level.

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19. 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.

20. 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.

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REVISION HISTORY

Revision no.	Revision date	Revision details	Approved by
Revision 1	21 October 2018	Initial Issue	RPS
Revision 1	29 October 2019	Approval	RPSC
Revision 2 Draft A	14 August 2020	Realign E-series documents	Working Group
Revision 2 Draft B	19 August 2020	Review by Education Business Unit	Education Business Unit
Revision 2	20 August 2020	Review by the Executive	EL Nxumalo
Revision 2 Draft C	18 September 2020	Addition of missing information and Appendix B	Task Team
Revision 2	15 October 2020	Approval	RPSC
Revision 3 Draft A	15 March 2023	Alignment with Version 2021.1 of IEA GAs and PCs	Working Group
Revision 3 Draft B	10 April 2023	Submission and presentation to the EC for inputs and comments	RDDR and Working Group
Revision 3 Draft C	10 Aug 2023	Review of the draft standard	RDDR BU
Revision 3 Draft D	14 Aug 2023	Review by the Executive	EL Nxumalo
Revision 3	24 Aug 2023	Approval	RPSC
Revision 3	09 Nov 2023	Noting	Council
Revision 3	09 Nov 2023	Minor change to indicate “Meng professional”	Council

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The Qualification Standard for:

Master of Engineering: NQF Level 9

Revision 3 dated 24 August 2023 consisting of 27 pages have been reviewed for adequacy by the Business Unit Manager and is approved by the Executive: Research, Policy and Standards (RPS).

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Business Unit Manager

5 February 2024

Date

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Executive: RPS

2024/02/05

Date

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

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APPENDIX A: 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 and 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 that affect knowledge production or complex organisational or professional issues and 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 processing and managing information, and 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; and use a range of advanced and specialised skills and discourses appropriate to a field, discipline or practice, to communicate with a range of audiences with different levels of knowledge or expertise.

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