Engineering Council of Namibia

your local networking partner in engineering

STANDARDS FOR PROFESSIONAL BACHELOR DEGREES IN ENGINEERING

B.SC. (ENG) and B.ENG

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1. OVERVIEW

This document defines the outcomes expected of Professional Bachelor Degree programmes in engineering and sets the minimum educational standards that are needed for registration with the Engineering Council of Namibia in the category of **Professional Engineer**. It is expected that curricula developers will use this document as a blueprint to produce engineering curricula that are aligned with professional standards in Namibia, while taking into consideration other requirements that are within their institutional autonomy.

Professional Bachelor Degrees such as **Bachelor of Science in Engineering (B.Sc.(Eng)** and **Bachelor of Engineering (B.Eng)** that are referred to in this document conform to characteristics that define such degrees at **Level 8** of the National Qualifications Framework (NQF) of Namibia. In addition to meeting the minimum credit requirements of the NQF, this document specifies a minimum of **560 NQF Credits** for a Professional Bachelor Degree in engineering. This has been done to ensure conformity with the requirements of the Washington Accord, to which the Engineering Council of Namibia wishes to be a signatory.

This document is divided into six chapters. In addition to chapter 1, chapter 2 states the minimum required outcomes of an accredited degree programme in engineering. Chapter 3 defines the minimum learning assumed at entry to these programmes and chapter 4 defines the level of certification and the minimum curriculum content for the various knowledge areas that are expected to be covered in an undergraduate engineering degree programme. Chapter 5 provides indicative requirements for designation of a degree programme in a disciplinary or cross-disciplinary field for purposes of accreditation by the Namibia Qualifications Authority **(NQA)** and the Engineering Council of Namibia. Chapter 6 states the required competencies or exit level outcomes of a graduate engineer. It is envisaged that degree programmes developed using these specifications will be fully accreditable. Furthermore, a holder of a Professional Bachelor degree that meets the requirements set out in this document may lead to registration with the Engineering Council of Namibia as a **Professional Engineer (PE).**

2. PURPOSE OF ACCREDITED ENGINEERING PROGRAMMES

Engineering is a profession that serves the needs of society and the economy. Programmes leading to the Professional Bachelor Degrees in engineering are designed to contribute towards meeting this need by developing engineering competence. Therefore, the purpose of engineering programmes accredited as satisfying these standards is to provide:

(a) Graduates with a thorough grounding in mathematics, basic sciences, engineering sciences, engineering modelling and engineering design, together with the abilities and skills required for further learning towards becoming competent practicing engineers;
(b) Graduates who are prepared for careers in engineering and related areas, and who can achieve technical and managerial leadership and be able to make a contribution to the economy and national development;
(c) Graduates who possess the educational requirements towards registration as Professional Engineers with the Engineering Council of Namibia;
(d) Graduates with an appropriate level of achievement in the programme and the ability to proceed for further studies at postgraduate level.

3. MINIMUM LEARNING ASSUMED TO BE IN PLACE

The minimum learning that is assumed to be in place for entry into a Professional Bachelor Degree in Engineering is:

A Higher Namibia Senior School Certificate (HNSSC) with Mathematics, Physical Science and English, all passed with at least a 3 symbol or an equivalent certificate.

It is further understood that providers may choose to offer Pre-university, Access or Foundation programmes to enable learners who do not possess the minimum learning stated above to improve their basic knowledge in the stated subjects.

4. CERTIFICATION LEVEL AND MINIMUM PROGRAMME CONTENT

Section 4.1 defines the general requirements of a Professional Bachelor degree and section 4.2 defines an NQF Credit. Section 4.3 states the basis for the total programme credits. The minimum programme content by knowledge area is defined in section 4.4.

4.1 Requirements for a Professional Bachelor Degree

A Professional Bachelor Degree in engineering must:

(a) Build to a level of conceptual sophistication, specialized knowledge and intellectual autonomy similar to that of a Bachelor Honours Degree.
(b) Include a terminal project in the form of a major design exercise, building project, manufacturing undertaking or other practice-based exercise that is systematically supervised by a senior member of the teaching staff with the intension of demonstrating the graduate's readiness for employment in the professional or occupational field of the qualification.
(c) Require performance in accordance with a regulatory framework administered by a regulatory or professional body, which must act in such a way as to accommodate institutional autonomy.
(d) Be offered at **NQF Level 8.**

4.2 NQF Credit Value

4.2.1 One NQF Credit represents ten (10) hours of Notional Learning Time. Learning Time is an estimation of the time it takes a learner to achieve the performance requirements of a given award.

4.2.2 According to the Namibian NQF, Learning Time should include all relevant learning activities that contribute to the attainment of the outcomes of learning. Such activities should include:

(a) Formal, directed learning including classes, training sessions, coaching, seminars and tutorials
(b) Practical work in laboratories or other locations
(c) Information retrieval, e.g. from libraries or from the Internet
(d) Self-directed study, such as private study, revision, remedial work
(e) Work-based activities that lead to formal assessment
(f) Practice aimed at gaining, applying and refining skills
(g) Undertaking all forms of assessment (examinations, tests, quizzes etc)
(h) Counselling, mentoring and personal reflection.

4.2.3 A Notional Hour is therefore made up of a combination of 'Learning Time' (individual private time in the learning process) and 'Delivery Time' or 'Contact Hours' (lecture hours, teaching time in classrooms, training sessions, coaching, seminars, guided tutorials and other lecturer-learner contact).

4.3 Minimum Credit Values per Programme

4.3.1 A Professional Bachelor Degree in engineering shall consist of a minimum of **560 NQF Credits** accumulated from Level 4 up to at least Level 8.

4.3.2 The total number of contributing credits must contain a minimum of **140 NQF Credits** at least at Level 8. Of these, at least **30** NQF Credits must be research related.

4.3.3 Preparatory, remedial or bridging courses may be part of a programme; however, they cannot contribute towards the total credits if they are below Level 4. The maximum number of contributing credits from Level 4 is limited to **40** NQF Credits.

4.3.4 Since one NQF Credit equals 10 Notional Hours, a full programme should offer at least 5600 Notional Hours. In an eight-semester programme, this is equivalent to an average of 700 Notional Hours or 70 NQF Credits per semester.

4.3.5 In courses which consist largely of lectures, tutorials, laboratory contact time, tests, examinations and private study, the contact time may be expressed as a percentage of total notional activity time based on institutional experience.

4.3.6 In courses which have significant student activity but low contact time such as major designs, the credit value should be calculated by expressing the notional activity for the course as a fraction of the total notional contact for a full-time semester and assigning credits in proportion. For example, a final design course which occupies 50% of the total notional activity within a semester but accounts for only 5% of the actual contact time is allocated 50% of 70 credits = 35 credits.

4.4 Indicative Minimum Programme Content

Table 1 specifies the minimum credit content within the programme in the six specified knowledge areas. The minimum values specified are set at levels which will accommodate programmes during the transition to these outcomes-based criteria. These values will be reviewed as experience is gained.

Table 1: Minimum Curriculum Content by Knowledge Area

KNOWLEDGE AREA	MINIMUM NQF CREDITS
Mathematics	56
Basic Sciences	56
Engineering Sciences and Principles	168
Engineering Design and Synthesis	67
Computing and Information Technology	45
Complementary Studies	56 but not more than 100
SUBTOTAL (minimum)	**448**
Discretionary Studies	112 (maximum)
TOTAL	**560**

5. DESIGNATION OF DEGREE BY DISCIPLINE AND USE OF QUALIFIERS

5.1 Currently, the Engineering Council of Namibia will assist the NQA with the accreditation of programmes in the following engineering disciplines: Aeronautical, Agricultural, Chemical, Civil, Electrical, Electronic, Industrial, Marine, Metallurgical, Mechanical and Mining. Cross-disciplinary designations may also be included. These disciplines may be expanded as the Engineering Council of Namibia so desires.

5.2 Qualifications obtained from accredited programmes must contain the word ‘Engineering’ as well as a disciplinary or cross-disciplinary qualifier defined in the provider’s rules for the degree and reflected on the academic transcript and degree certificate.

5.3 A programme must have a coherent core of mathematics, basic sciences and fundamental engineering sciences that provide a viable platform for further independent study. The platform must enable development in a traditional discipline or in an emerging field.

5.4 Appendix 1 provides the definitions of the Knowledge Areas as set out in Table 1.

5.5 Appendix 2 provides an indicative guide to fundamental engineering science content in subject areas for various designated programmes. A programme may contain specialist engineering study in at least one sub-discipline of the designated discipline at the exit level if and when the stakeholders so desire.

5.6 Appendix 3 sets out an indicative method of how a credit can be calculated.

5.7 Appendix 4 provides a description of the Bachelor of Science in Engineering (B.Sc.Eng) and Bachelor of Engineering (B.Eng) degrees.

5.8 Appendix 5 sets out the NQF Level Descriptors from Level 10 to Level 1.

6. REQUIRED COMPETENCIES AT EXIT LEVEL

According to the National Qualifications Framework (NQF), a Professional Bachelor Degree represents substantial attainment of a body of outcomes of learning greater than and in advance of an ordinary Bachelor Degree. Professional Bachelor Degrees normally contain a substantial element of 'learning by doing' and often focus on preparation for entry into a professional field of practice, such as Engineering.

The required Competencies or Exit Level Outcomes of a graduate with a registered Professional Bachelor Degree in Engineering are defined in sections 6.1 to 6.10.

6.1 Engineering Problem Solving

The graduate engineer should be competent to identify, assess, formulate and solve convergent and divergent engineering problems in a creative and innovative manner. In particular, the graduate should be able to:

(a) Analyse and define the problem, and identify criteria for acceptable solution;
(b) Identify necessary information and applicable skills relevant to the problem;
(c) Formulate possible approaches to solving the engineering problem;
(d) Evaluate possible solutions and select the best solution;
(e) Formulate and present the solution in an appropriate form.

6.2 Application of Fundamental and Engineering Knowledge

The graduate engineer should be competent to apply knowledge of mathematics, basic science and engineering sciences from first principles to solve engineering problems involving the following performances:

6.2.1 Bring mathematical, numerical analysis and statistical knowledge and methods to bear on engineering problems by using an appropriate mix of:
- (a) Formal analysis and modelling of engineering components, systems or processes;
- (b) Communicating concepts, ideas and theories with the aid of mathematics;
- (c) Reasoning about and conceptualising engineering components, systems or processes using mathematical concepts;
- (d) Dealing with uncertainty and risk through the use of probability and statistics.

6.2.2 Use physical laws and knowledge of the physical world as a foundation for the engineering sciences and the solution of engineering problems by an appropriate mix of:
- (a) Formal analysis and modelling of engineering components, systems or processes using principles and knowledge of the basic sciences;
- (b) Reasoning about and conceptualising engineering problems, components, systems or processes using principles of the basic sciences.

6.2.3 Use the techniques, principles and laws of engineering science at a fundamental level and in at least one specialist area to:
- (a) Identify and solve open-ended engineering problems;

(b) Identify and pursue engineering applications;
(c) Work across engineering disciplinary boundaries through cross-disciplinary literacy and shared fundamental knowledge.

6.3 Engineering Design and Synthesis

The graduate engineer should be competent to perform creative, procedural and non-procedural design and synthesis of components, systems, works, products or processes and demonstrate ability to:

6.3.1 Identify and formulate the design problem to satisfy user needs, applicable standards, codes of practice and legislation;
6.3.2 Plan and manage the design process by being able to focus on important issues and recognise and deal with constraints;
6.3.3 Acquire and evaluate the requisite knowledge, information and resources, apply correct principles, evaluate and use design tools;
6.3.4 Perform design tasks including analysis, quantitative modelling and optimisation;
6.3.5 Evaluate alternatives and preferred solutions and exercise judgement, test implementability and perform techno-economic analysis;
6.3.6 Assess the impact and benefits of the design on social, legal, health, safety and environmental dimensions;
6.3.7 Effectively communicate the design logic and information.

6.4 Investigations, Experiments and Data Analysis

The graduate engineer should be competent to apply appropriate research methods to a given research problem and:

6.4.1 Plan and conduct investigations and experiments using appropriate equipment;
6.4.2 Analyse, interpret and derive information from data.

6.5 Engineering Methods, Skills, Tools and Information Technology

The graduate engineer should be competent to:

6.5.1 Use appropriate engineering methods, skills and tools and assess the results they yield;
6.5.2 Use computer packages for computation, design, modelling, simulation and information handling, involving:
 (a) Assessment of the applicability and limitations of the packages;
 (b) Proper application and operation of the packages;
 (c) Critical testing and assessment of the end-results produced by the packages.
6.5.3 Use computers, networks and information infrastructures for accessing, processing, managing and storing information to enhance personal productivity and teamwork;
6.5.4 Provide relevant information to assist in creating computer applications as required by the discipline;
6.5.5 Bring basic techniques and knowledge to bear on engineering practice from economics, business management, health, safety and environmental protection.

6.6 Professional and General Communication

Have a good command of written and spoken English.

The graduate engineer should be competent to:

6.6.1 Communicate effectively, both orally and in writing, with engineering audiences and the community at large, using appropriate structure, style and graphical support;

6.6.2 Apply methods of providing information for use by others involved in engineering activity.

6.7 Impact of Engineering Activity on Society and the Environment

The graduate engineer should be competent to assess the impact of engineering activity on society and the environment and bring into engineering analysis and design considerations of:

6.7.1 The impact of technology on society;

6.7.2 Ergonomics for a given society;

6.7.3 Impacts on the physical environment;

6.7.3 The personal, social and cultural values of those affected by engineering activity.

6.8 Team and Multidisciplinary Working

The graduate engineer should be competent to work effectively as an individual, in teams and in multi-disciplinary environments. In particular:

6.8.1 The graduate should demonstrate effective individual work by:

- (a) Identifying and focusing on objectives
- (b) Working strategically
- (c) Executing tasks effectively
- (d) Delivering completed wok on time.

6.8.2 The graduate should demonstrate effective team work by:

- (a) Making individual contribution to team activity
- (b) Performing critical functions and delivering work on time
- (c) Enhancing work of fellow team members while benefiting from their support
- (d) Communicating effectively with team members.

6.8.3 The graduate should demonstrate ability to work in a multidisciplinary environment by:

- (a) Acquiring a working knowledge of co-workers' discipline
- (b) Using a systems approach to tackle engineering problems
- (c) Communicating across disciplinary boundaries.

6.9 Independent Learning Ability

The graduate engineer should demonstrate competence to engage in independent learning through well developed learning skills and understand:

6.9.1 The requirements to maintain continued competence and to keep abreast with up-to-date tools, techniques and new developments in engineering and technology.

6.9.2 The need to access, comprehend and apply knowledge acquired outside formal instruction.

6.10 Professional Ethics and Practice

The graduate engineer should be:

6.10.1 Aware of the need to act professionally and ethically and to take responsibility within own limits of competence.

6.10.2 Competent to exercise judgement commensurate with knowledge and experience.

6.10.3 Aware of the need to limit decision making to areas of current competence.

6.10.4 Knowledgeable of the system of professional development.

REFERENCES:

(1) Regulations Setting-up the National Qualifications Framework for Namibia: Government Notice No. 125 of August 2006.

(2) Whole Qualification Standard for Bachelor of Science in Engineering (BSc (Eng)) and Bachelor of Engineering (BEng): The Engineering Council of South Africa, Document PE-61, Rev 2, 26th July 2004.

APPENDIX 1

DEFINITION OF KNOWLEDGE AREAS

1. Mathematics

This is an umbrella term embracing the techniques of mathematics, numerical analysis and statistics cast in an appropriate mathematical formulation.

2. Basic Sciences

Physics (including mechanics), chemistry, earth sciences and the biological sciences that focus on understanding the physical world, as applicable in each engineering disciplinary context.

3. Engineering Sciences and Principles

These are rooted in the applied mathematics and applied physical sciences, and where applicable, in other basic sciences, but extend knowledge and develop models and methods in order to lead to engineering applications and solve engineering problems.

4. Engineering Design and Synthesis

The creative, iterative and often open-ended process of conceiving and developing components, systems and processes. Design requires the integration of engineering, basic and mathematical sciences, working under constraints, taking into account economic, health and safety, social and environmental factors, codes of practice and applicable laws.

5. Computing and Information Technology

The use of computers, networking and software to support engineering activity, and as an engineering activity in itself, as appropriate to the discipline.

6. Complementary Studies

Those disciplines outside of engineering sciences, basic sciences and mathematics which:

- Are essential to the practice of engineering, including engineering economics, the impact of technology on society and effective communication; and
- Broaden the student's perspective in the humanities and social sciences in order to understand the world in which engineering is practised.

7. Discretionary Studies

These include any **cross**-discipline supportive courses drawn from engineering sciences, basic sciences or mathematics.

For example a student of mechanical engineering may opt to study the course "Electrical Machines and Drives" as a supportive course, although this is not compulsory in his/her discipline.

APPENDIX 2

Indicative Fundamental Engineering Science and Principles Content for Designated Disciplines

DISCIPLINE / COURSE	Aeronautical	Agricultural	Chemical	Civil	Electronic	Electrical	Industrial	Mechanical	Mechatronics	Metallurgical (Extraction)	Metallurgical (Physical)	Mining
Aerodynamics & Aircraft structures	□											
Chemical Reactor Theory			□									
Computer Engineering					□	□			□			
Dynamics	□	□				□	□	□	□			
Electric Circuits					□	□			□			
Electric Power					□	□			□			□
Electromagnetic Circuits					□							
Electronics					□	□			□			
Feedback systems/Control			□		□	□			□	□		
Flight Dynamics & Propulsion Systems	□											
Fluid Mechanics	□	□	□	□				□	□			□
Heat Transfer	□		□					□		□	□	
Human Factors		□					□					
Hydraulics		□		□								□
Instrumentation/Measurement	□				□	□		□	□	□		
Kinetics (Metallurgical)			□							□		
Linear Systems			□		□							
Manufacturing Technology							□				□	
Mass Transfer			□							□		
Material Processes			□				□			□		
Materials	□	□	□	□	□	□	□	□	□	□	□	□
Momentum transfer										□		
Operations Technology	□						□					
Particulate Systems		□	□							□		
Separation Processes		□	□							□		□
Signals and Signal Processing					□							
Soil Mechanics		□		□								□
Solid Mechanics	□	□		□		□	□	□			□	□
Strength of Material	□	□	□	□		□	□	□			□	□
Structural Analysis	□			□								
Surveying				□								□
Thermodynamics	□	□	□			□		□	□	□	□	□
Mining Methods & Mine Machinery												□
Technical Valuation &Financial Valuation												□

APPENDIX 3

CALCULATION OF NQF CREDITS AND ALLOCATION TO KNOWLEDGE AREA

The method of calculation assumes that certain activities are scheduled on a regular weekly basis while others can only be quantified as a total activity over the duration of a course or module. This calculation makes the following assumptions:

1. Classroom or other scheduled contact activity generates notional hours of the student's own time for each hour of scheduled contact. The total is given by a multiplier (see third column of table below) applied to the contact time.
2. One week of full time activity accounts for assessments in a semester.
3. Assigned work generates only the notional hours judged to be necessary for completion of the work and is not multiplied.
4. This method is only a **guideline** and may not necessary apply to all situations.

Define the following for each course or module:

Type of Activity	Time Unit in hours	Contact time multiplier
L = number of lectures per week	T_L = duration of a lecture period	M_L=total work per lecture period
T = number of tutorial per week	T_T = duration of a tutorial period	M_T=total work per tutorial period
P = total practical periods	T_P = duration of an institution-based practical period	M_P=total work per practical period
X = total other contact periods	T_X = duration of other period	M_X=total work per other period
A = total assignment non-contact hours	T_A = 1 hour	
D = total no of days of workplace-based learning	T_D = duration of work-based learning per day	M_D=total workplace-based learning per period.
W = number of weeks the course lasts (actual + 2 week per semester for assessment, if applicable to the course or module)		

The credit for the course is calculated using the formula:

$$C = \{W(LT_L M_L + TT_T M_T) + PT_P M_P + XT_X M_X + AT_A + DT_D M_D\}/10$$

The resulting credit for a course or value may be divided between more than one knowledge area. In allocating the credit for a course to multiple knowledge areas, only new knowledge or skills in a particular area may be counted. Knowledge and skills developed in other courses and used in the course in question shall not be counted. Such knowledge is classified by the nature of the area in which it is applied. In summary, no knowledge is counted more than once as being new.

M_D may differ for different activities e.g. the factor for work-based learning component in which the learner develops skills which integrate theoretical knowledge with actual practice in a working environment will differ from the factor for a related assignment and project work which enhances learner understanding of the work environment and/or new learning.

X includes all other contact activities such as assessment.

All learning that is assigned credits must satisfy the following criteria:

- The competencies to be achieved and contributions to knowledge areas are clearly defined and documented.
- The learning is quality assured by the provider.
- A student's performance is assessed against defined outcomes.
- Evidence of the assessment process is presented in the accreditation evaluation.

APPENDIX 4

The Bachelor of Science (Engineering) and Bachelor of Engineering Degrees

1. The **Bachelor of Science in Engineering** (**B.Sc. Eng**) is a traditional academic engineering degree that prepares students to be professional engineers. The **Bachelor of Engineering** (**B.Eng**) is also an academic engineering degree that prepares students to be professional engineers. The B.Eng degree became popular only in the 1970s when it was offered by universities that included a requirement for undertaking some practical engineering work outside the university premises. This is accomplished through Supervised Industrial Attachment, which is carried out by students during their vacation periods.

2. The Bachelor of Science in Engineering degree and the Bachelor of Engineering degree are both **professional engineering degrees** offered by accredited universities in countries that are signatories to the Washington Accord as well as many others which are not. The programme usually runs for four academic years (eight semesters) for students who enter the programme after completing high school at A level or at HIGCSE level. In the Namibian context, the National Qualifications Framework requires Professional Bachelor Degrees to be offered at **NQF Level 8**.

3. Accreditation of engineering academic programmes [B.Sc. Eng & B.Eng] is a key foundation for the practice of engineering at the professional level in each of the countries or territories covered by the **Washington Accord**. Namibia is not a signatory to the Accord, but it is the wishes of the Engineering Council of Namibia that Namibia will become a signatory in the future.

4. The signatories of the Accord agree that the criteria, policies and procedures used by the signatories in accrediting engineering academic programmes are comparable; that the accreditation decisions rendered by one signatory are acceptable to the other signatories, and that those signatories will so indicate by publishing statements to that effect in an appropriate manner; to identify, and to encourage the implementation of best practice, as agreed from time to time amongst the signatories, **for the academic preparation of engineers intending to practice at the professional engineer's level**.

5. However, it must be emphasised that a degrees with the name "**Bachelor of Science in Engineering (B.Sc. Eng) or Bachelor of Engineering (B.Eng)"** does not necessarily comply with the ECN's requirements as set out in the Standards for Professional Degrees in Engineering. It is not the name of the degree that is the qualifying criteria for registration, but rather, the CONTENT covered by the degree.

APPENDIX 5

LEVEL DESCRIPTORS FOR THE NATIONAL QUALIFICATIONS FRAMEWORK

Level	Descriptor
10	Comprehensive, systematic and in-depth mastery of a discipline/field's knowledge, research, analytical and/or creative requirements. Able to contribute ideas and to debate at the cutting edge of an area of specialisation. Highest level of research capabilities and/or in the creation of new knowledge, art or work. Provide through publication and/or presentation an original contribution to knowledge through research or scholarship, as judged by independent experts and peers applying international standards.
9	Comprehensive and systematic knowledge in a discipline or field with specialist knowledge in an area at the forefront of that discipline or field. Capacity for self-directed study and the ability to work independently. Planning and carrying out of a substantial piece of original research or scholarship to internationally recognised standards and involving a high order of skill in analysis and critical evaluation. Identification, analysis and proposed responses to real world or complex issues and problems drawing systematically and creatively on the principles, theories and methodologies of a particular discipline. Advanced information retrieval, processing, analytical, synthesising and independent evaluation of quantitative and qualitative data. Able to present and communicate academic or professional work effectively, catering for a wide range of specialist and non specialist audiences and/or in diverse genres.
8	Deepened, comprehensive and systematic expertise in a particular discipline. Developed research capacity using a coherent and critical understanding of the principles, theories and methodologies of a particular discipline. Selects research methods, techniques and technologies appropriate to a particular problem. Efficient and effective information retrieval and processing skills, involving critical analysis and independent evaluation of quantitative and qualitative data. Engages with current research and scholarly or professional literature. Able to present and communicate academic or professional work effectively, catering for a wide range of audiences and/or in diverse genres.
7	Knowledge of a major discipline with areas of specialisation in depth. Analysis, transformation and evaluation of abstract data and concepts in the creation of appropriate responses to resolve given or contextual abstract problems. Carry out processes that require a command of highly specialised technical or scholastic and basic research skills across a major discipline and which involve the full range of procedures in a major discipline. Application in complex, variable and specialised contexts. Planning, resourcing and managing processes within broad parameters and functions with complete accountability for determining, achieving and evaluating personal and/or group outcomes.
6	Demonstrates focussed knowledge and skills in a particular field using general principles and application and/or some specialised knowledge with depth in more than one area. Analysis, reformatting and evaluation of a wide range of information used in the formulation of appropriate responses to resolve both concrete and abstract problems. Carry out processes that require a command of wide-ranging highly specialised technical or scholastic skills and/or which involve a wide choice of standard and non-standard procedures, often in non-standard

Level	Descriptor
	combinations, often in highly variable routine and non-routine contexts. Manages processes within broad parameters for defined activities. Complete accountability for determining and achieving personal and/or group outcomes.
5	Broad, general knowledge based on general principle in a specific area with substantial depth in some aspects. Analytical interpretation of a wide range of data and the determination of appropriate methods and procedures in response to a range of concrete problems with some theoretical elements. Carry out processes that require a wide range of specialised technical or scholastic skills involving a wide choice of standard and non-standard procedures. Employed in a variety of routine and non-routine contexts. Self-directed and sometimes directive activity within broad general guidelines or functions. Full responsibility for the nature, quantity and quality of outcomes, with possible responsibility for the achievement of group outcome.
4	Employing a broad knowledge base incorporating some theoretical concepts or in-depth applied knowledge and skills in a specific area. Analytical interpretation of information. Making informed judgement and offers a range of sometimes innovative responses to concrete but often unfamiliar problems. Carry out processes that require a wide range of technical or scholastic skills and/or that offer a considerable choice of procedures. Often employed in a variety of familiar and unfamiliar contexts. Applied in self-directed activity under broad guidance and evaluation. Complete responsibility for quantity and quality of output, with possible responsibility for the quantity and quality of the output of others.
3	Employing some relevant theoretical knowledge and interpretation of available information. Uses discretion and judgement over a range of known responses to familiar problems. Carry out processes that require a range of well-developed skills and offer a significant choice of procedures within a range of familiar contexts. Applied in directed activity with some autonomy. Under general supervision and quality checking, though with significant responsibility for the quantity and quality of output, with possible responsibility for the output of others.
2	Employs basic operational knowledge using readily available information. Uses known solutions to familiar problems with little generation of new ideas. Carry out processes that are moderate in range, are established and familiar and offer a clear choice of routine responses. Applied in directed activity under general supervision and quality control. Some responsibility for quantity and quality, with possible responsibility for guiding others.
1	Employs recall and a narrow range of knowledge and cognitive skills. No generation of new ideas. Carry out processes that are limited in range, repetitive and familiar, and employed within closely defined contexts. Applied in directed activity under close supervision with no responsibility for the work or learning of others.