Qualification details

Title	New Zealand Diploma in Engineering with strands in Civil Engineering, Electrical Engineering, Electronic Engineering, Mechanical Engineering and Fire Engineering		
Version	2	**Qualification type**	**Diploma**
Level	6	**Credits**	**240**
NZSCED	039999 Engineering and Related Technologies > Other Engineering and Related Technologies > Engineering and Related Technologies not elsewhere classified		
Qualification developer	New Zealand Board for Engineering Diplomas (NZBED)		
Next review	December 2019		
Approval date	August 2018		
Strategic purpose statement	The purpose of this qualification is to provide the engineering industry with engineering technicians specialised in civil, electrical, electronic, mechanical or fire engineering. Graduates will be capable of operating at a technician level scope of practice as outlined by the Dublin Accord (International Engineering Alliance, 2002).		
Outcome Statement	**Graduate profile**	**Graduates of this qualification will be able to**: • competently perform technical operations to the standards, ethical and professional responsibilities required by the engineering profession[1] • work collaboratively within team environments to provide a comprehensive engineering service in the relevant specialist area • apply the principles of the Treaty of Waitangi, the Resource Management Act and Health & Safety in Employment Act while carrying out engineering activities. **Civil Engineering strand graduates** will also be able to: • apply engineering theory to practice working within *well-defined* engineering problems* relevant to their specialist field of civil engineering • use their engineering knowledge to make informed problem solving decisions in civil engineering and to implement these decisions • identify, evaluate and manage risks within *well-defined** engineering problems relevant to the field of civil	

[1] As per the Dublin Accord 2002

		engineering **Electrical Engineering strand graduates** will also be able to: • apply engineering theory to practice working within *well-defined* engineering problems* relevant to their specialist field of electrical engineering • use their engineering knowledge to make informed problem solving decisions in electrical engineering and to implement these decisions • identify, evaluate and manage risks within *well-defined** engineering problems relevant to the field of electrical engineering **Electronic Engineering strand graduates** will also be able to: • apply engineering theory to practice working within *well-defined* engineering problems* relevant to their specialist field of electronic engineering • use their engineering knowledge to make informed problem solving decisions in electronic engineering and to implement these decisions • identify, evaluate and manage risks within *well-defined** engineering problems relevant to the field of electronic engineering **Mechanical Engineering strand graduates** will also be able to: • apply engineering theory to practice working within *well-defined*engineering problems* relevant to their specialist field of mechanical engineering • use their engineering knowledge to make informed problem solving decisions in mechanical engineering and to implement these decisions • identify, evaluate and manage risks within *well-defined** engineering problems relevant to their field of mechanical engineering **Fire Engineering strand graduates** will also be able to: • apply engineering theory to practice working within *well-defined* engineering problems* relevant to their specialist field of fire engineering • use their engineering knowledge to make informed problem solving decisions in fire engineering and to implement these decisions • identify, evaluate and manage risks within *well-defined** engineering problems relevant to their field of fire engineering **Well-defined engineering problems* can be solved in standardised ways, are frequently encountered and hence familiar to most practitioners in the specialist area, have consequences that are locally important but not far-reaching and can be resolved using limited theoretical knowledge but normally require extensive practical knowledge.

Education pathway	Graduates of the New Zealand Diploma in Engineering (NZDE) will be able to study towards a technologist degree such as a Bachelor of Engineering Technology, or a professional engineering qualification such as a Bachelor of Engineering. For those employed within the industry, the New Zealand Diploma in Engineering Practice [Ref: 1714] (NZDEP) builds upon the academic learning gained in the NZDE, and can enable graduates to become a certified Engineering Technician and gain Associate Membership of the Institution of Professional Engineering of NZ (IPENZ) and/or apply to the Engineering Associate Registration Board to become a registered engineering associate.
Employment pathway	Graduates of the New Zealand Diploma in Engineering will be able to gain employment as engineering technicians in workplaces that have a technical/engineering basis relevant to their specialist engineering strand (civil, electrical, electronic, mechanical or fire). For the civil engineering strand, roles include working on roads, buildings and utilities; for the electrical engineering strand, roles include working in power and building services infrastructure; for electronic engineering strand, roles include working in telecommunications and electronics manufacturing; for the mechanical engineering strand, roles include the design, manufacture and maintenance of tools, engines, machines and systems; for the fire engineering strand, roles include working on the design, construction and management of fire safety in buildings, design and installation of fire safety systems and working on the regulatory process (including ongoing compliance).

Qualification specifications

Qualification award	Education providers accredited to deliver an approved programme of study leading to the qualification will be able to award the qualification. A student may enrol in courses at any institution with accreditation to deliver an approved programme. The student shall be awarded the diploma by the accredited institution at which they have been awarded the majority of the Level 5 and Level 6 credits. The certificate will display the logo of the New Zealand Qualifications Framework (NZQF) and the accredited Tertiary Education Organisation (TEO). If the TEO delivers the NZBED approved programme then the NZBED logo will be displayed. The certificate is annotated as **New Zealand Diploma in Engineering with strand (Discipline).**
Evidence requirements for assuring consistency	All TEOs either arranging training or delivering programmes that lead to the award of the qualification are required to participate in a consistency process.

	This will involve reviewing evidence associated with graduate's achievement of outcomes, and agreeing acceptable thresholds for qualification outcome achievement, and areas for improvement. To demonstrate how graduates are achieving the qualification graduate profile outcomes, TEOs are required to produce their own evidence in a high level report. Evidence will include the following: - Employer surveys to determine if graduates of the qualification meet graduate profile outcomes - Evidence of effective processes to ensure programmes continue to meet current industry needs - A range of workplace evidence demonstrating that graduates meet the graduate profile outcomes - Reports from industry (i.e. moderation) on outcomes on the Capstone Engineering Project(s) - Portfolio of evidence against qualification outcomes and attributes of an Engineering Technician that align with Dublin Accord (International Engineering Alliance, 2002). - Any other relevant evidence as appropriate Further information on the consistency process can be found on the NZQA website.
Minimum standard of achievement and standards for grade endorsements	Achievement of all outcomes. There are no grade endorsements for this qualification.
Other requirements for the qualification (including regulatory body or legislative requirements)	Entry requirements are recommended to be: • NCEA Level 2, **and** • a minimum total of 48 credits at Level 2 in four subjects including at least 12 credits in mathematics (preferably from algebra, calculus and/or trigonometry Achievement Standards) • equivalent qualifications (e.g. International Baccalaureate or Cambridge), **or** • equivalent credits from appropriate trades training and/or demonstrated skills and experience • minimum of 10 literacy credits at Level 1 or higher (for those who achieved NCEA Level 2 before 2013). In addition to meeting the minimum entry criteria, those applicants for whom English is a second language (including International students) must meet IELTS overall Band Score (Academic) of 6.0, with no individual score less than 5.5, or equivalent.

General conditions for the programme leading to the qualification

General conditions for programme	One of the outcomes of the National Engineering Education Plan Report (NEEP Report, IPENZ:2010) was the formation of the New Zealand Board for Engineering Diplomas (NZBED) as a single governance group to guide and manage the educational quality of the unified diploma system *"to ensure engineering education for technicians at Level 6 meets the needs of industry, students and other tertiary providers offering higher level engineering qualifications"* It is preferred that all providers of this qualification align with the NZBED approved programme to enable consistency as required by the NEEP report. To manage the educational quality of this programme, the NZBED has formed a Quality Assurance Committee. http://www.engineer.org.nz/about/ Programmes of Study leading to this qualification must align with the Dublin Accord (International Engineering Alliance 2002) to produce a graduate that can work as an Engineering Technician. The role of Engineering Technicians involves them in: - implementation of proven techniques and procedures to the solution of practical problems. - carrying a measure of supervisory and technical responsibility - being competent to exercise creative aptitudes and skills within their defined fields, initially under the guidance of engineering practitioners with appropriate experience. - contributing to the design, development and manufacture, commissioning, operation and maintenance of products, equipment, processes and services. - applying safe systems of work. TEOs delivering a programme leading to this qualification and wishing to align to the Dublin Accord must obtain accreditation from the IPENZ Accreditation Board that delivery resources, capability, expertise and methodology is satisfactory for Dublin Accord requirements. In line with the International Engineering Alliance (IEA) 2013, programmes of study leading to this qualification must also foster personal, interpersonal and cognitive capability attributes through their curriculum and delivery approach which should align with the Technician Attributes of Individual & Team Work, and Communication. ***Examples of personal capabilities:*** Self-awareness & regulation Decisiveness Commitment ***Examples of interpersonal capabilities:*** Influencing within a team

	Empathy ***Examples of cognitive capabilities:*** Determination of fit for purpose Strategy and flexibility Responsiveness There is a requirement that a programme of study leading to the qualification will contain significant application of practical skill in both delivery and assessment, and focus on solving practical problems. Students are required to manage a significant Capstone Project within an engineering context relevant to their specialist field. This project will be from a given specification and will include preliminary design and planning and will need to be completed. Recognition of Prior Learning and Assessment of Prior learning is enabled for up to 50% of the qualification. NZBED will be involved in the provider accreditation and programme approval process for providers, alongside NZQA.

Conditions relating to the Graduate profile

Qualification outcomes		**Conditions**
1	Competently perform technical operations to the standards, ethical and professional responsibilities required by the engineering profession. 45 credits	Learning and assessment must include: • the fundamentals of engineering: e.g. statics, dynamics, hydrostatics, electricity, and heat energy and transfer • using mathematics (algebra, trigonometry and calculus) to solve engineering problems • technical research skills, oral, written, and pictorial skills to communicate and present research findings • project management and administration in an engineering context relevant to specialist area • the preliminary design, planning, and completion of an engineering project from a given specification
2	Work collaboratively within team environments to provide a comprehensive engineering service in the relevant specialist area. 20 credits	
3	Apply the principles of the Treaty of Waitangi, the Resource Management Act and Health & Safety in Employment Act while carrying out engineering activities. 10 credits	
4	**Civil Engineering strand** Apply engineering theory to practice working within *well-defined engineering problems* relevant to their specialist field	Learning and assessment must include: Knowledge required for all works: to design, construct and quality manage earthworks, roads, bridges, buildings, drainage and piped utilities:

	of civil engineering. 80 credits	• rock and soil formations, investigation and interpretation for development of soil properties and their inclusion in design and construction • properties and uses of concrete, metals, timber and new materials in civil engineering • production of engineering drawings and principles of surveying sufficient to communicate design and set out works for construction • road works, road materials, construction practices, drainage, surfacing and maintenance. • design and construction of urban engineering, including piped and channelled water, wastewater utilities and principles of subdivision design Further specialisation within the field of Civil Engineering can be enabled by the approval of programmes and topics that provide a cohesive relationship to Civil Engineering which develop the graduate and is evidenced by stakeholder support.
5	Use their engineering knowledge to make informed problem solving decisions in civil engineering and to implement these decisions. 45 credits	
6	Identify, evaluate and manage risks within *well-defined* engineering problems relevant to the field of civil engineering. 40 credits	
7	**Electrical Engineering strand** Apply engineering theory to practice working within *well-defined engineering problems* relevant to their specialist field of electrical engineering. 80 credits	Learning and assessment must include: Knowledge required for engineering of power systems, building services and electrical services; • fundamental principles of electricity and safe use of electrical measuring equipment, safe working practices and electrical regulations • engineering drawing and simulation packages, electronic switching, fault diagnostic processes • principles of power supplies, circuit theorems, digital electronics and analogue electronics • architecture, structure, components and models of the internet and computer networks and LAN componentry • three-phase circuit theory, for AC circuits, electrical distribution and metering, power system protection, electrical and building reticulation systems • theory for the design, use and control of transformers and motors (AC, DC and FHP) • PLC logic controller hardware concepts and programmable logic controller software and systems Specialisations in this strand are: • ***Power, Building Services, Instrumentation and Control*** For the ***Power*** specialisation, learning and assessment should include: • New Zealand power system: generation, transmission, distribution. Power transformers, generator synchronisation, earthing, switchgear and basic SLD design and fault testing For the ***Building Services*** specialisation, learning and assessment should include:
8	Use their engineering knowledge to make informed problem solving decisions in electrical engineering and to implement these decisions. 45 credits	
9	Identify, evaluate and manage risks within *well-defined* engineering problems relevant to the field of electrical engineering. 40 credits	

		• maintenance strategies, planning and scheduling and improvement strategy/plan • illumination technology for retail/commercial and industrial buildings • building electrical and automation services, earthing systems in buildings, environmental control methods and security systems For the ***Instrumentation and Control*** specialisation, learning and assessment should include: • maintenance strategies, planning and scheduling and improvement strategy/plan • advanced use of PLCs, industrial data communication systems, control systems as relevant to PLC, HMI/SCADA Further specialisation within the field of Electrical Engineering can be enabled by the approval of programmes and topics that provide a cohesive relationship to Electrical Engineering which develop the graduate and is evidenced by stakeholder support.
10	**Electronics Engineering strand** Apply engineering theory to practice working within *well-defined engineering problems* relevant to their specialist field of electrical engineering. 80 credits	Learning and assessment must include: Knowledge required for design, installing and maintenance for telecommunications and electronic manufacture and servicing; • fundamental principles of electricity and safe use of electrical measuring equipment, safe working practices and electrical regulations • engineering drawing and simulation packages, electronic switching, fault diagnostic processes • principles of power supplies, circuit theorems, digital electronics and analogue electronics • architecture, structure, components and models of the internet and computer networks and LAN componentry • computer programming software tools and constructs are applied to written engineering applications/specifications • design and production process of electronic printed circuit board assembly and testing methods • software solutions and development for engineering applications using RAD (rapid application development) techniques Specialisations in this strand are: • ***Electronics, Computer Networking, or Data Communications*** For the ***Electronics*** specialisation, learning and should include: • microcontroller hardware technology – software solution for given specification • electronic filters, operational amplifiers, ADC, DAC and switching regulators • microcontroller hardware, microcontroller development
11	Use their engineering knowledge to make informed problem solving decisions in electrical engineering and to implement these decisions. 45 credits	
12	Identify, evaluate and manage risks within *well-defined* engineering problems relevant to the field of electrical engineering. 40 credits	

		tools, software solutions to a written specification • design and analysis of analogue circuits, circuit performance • small signal transistor design, power semiconductor devices, operational amplifier circuits and waveform generation For the ***Computer Networking*** specialisation, learning and assessment should include: • personal computer hardware and software design concepts • switching technologies, routers, routing and switching technologies • construction and configuration of large scale and complex networks across multiple LANs • configuration of WAN technologies and network services, VoIP For the ***Data Communication*** specialisation, learning and assessment should include: • configuration of WAN technologies and network services • construction of large scale and complex networks across multiple LANs • telecommunication systems and data networks, common modulation techniques and radio system design Further specialisation within the field of Electronic Engineering can be enabled by the approval of programmes and topics that provide a cohesive relationship to Electronic Engineering which develop the graduate and is evidenced by stakeholder support.
13	**Mechanical Engineering strand** Apply engineering theory to practice working within *well-defined engineering problems* relevant to their specialist field of mechanical engineering. 80 credits	Learning and assessment must include: Knowledge for the design, manufacture and maintenance of tools, engines, machines and systems: • safety and skill using workshop machines that are common in manufacturing processes • CAD draughting including production of 3D models of parts and assemblies and output final drawings • The theory of mechanics – analysis of forces, moments, torque, stresses, energy in mechanical systems • science for materials and material processes common to NZ engineering • thermodynamics and heat exchange • fluid mechanic for: hydrostatic and hydrodynamic fluid applications Specialisations in this strand are: • ***Mechanics, Services, Metallurgy*** *or* ***Production.*** For the ***Mechanics*** specialisation learning and assessment should include:
14	Use their engineering knowledge to make informed problem solving decisions in mechanical engineering and to implement these decisions. 45 credits	
15	Identify, evaluate and manage risks within *well-defined* engineering problems relevant to their field of mechanical	

	engineering. 40 credits	• Strength of materials, calculations for complex states of stress and strain, deflection, fatigue, stress concentration • Common mechanical manufacturing processes • Electrical and electronic theory of DC, AC and components and calculations The ***Services*** specialisation learning and assessment should include: • electrical and electronic theory of DC, AC and components and calculations • water-based systems for heating, chilled and condenser water • design and documentation air handling systems The ***Metallurgy*** specialisation learning and assessment should include: • common mechanical manufacturing processes • strength of materials, calculations for complex states of stress and strain, deflection, fatigue, stress concentrations • strengths of materials in complicated engineering applications (steel, timber, concrete) • processing technology for corrosion and powder metallurgy The ***Production*** specialisation learning and assessment should include: • common mechanical manufacturing processes • NZ and international quality standards, quality systems, reliability and asset management • production engineering operations management and strategies; waste management • planning and control techniques and principles Further specialisation within the field of Mechanical Engineering can be enabled by the approval of programmes and topics that provide a cohesive relationship to Mechanical Engineering which develop the graduate and is evidenced by stakeholder support.
16	**Fire Engineering strand** Apply engineering theory to practice working within *well-defined engineering problems* relevant to their specialist field of fire engineering. 80 credits	Learning and assessment must include: Knowledge of engineering design, properties of materials, fire dynamics, fire engineering science, fire risk analysis, and fire protection systems: • science of materials common to New Zealand fire engineering • thermodynamics and heat exchange • fluid mechanic applications and hydraulics • engineering design practice: acceptable solution fire safety design and verification methods • fire dynamics, principles of combustion and methods of
17	Use their engineering knowledge to make informed problem solving decisions in	

	fire engineering and to implement these decisions. 45 credits	extinguishment • means of escape and design principles • risk assessment and hazard analysis • fire protection services – active and passive Further specialisation within the field of Fire Engineering can be enabled by the approval of programmes and topics that provide a cohesive relationship to Fire Engineering which develop the graduate and is evidenced by stakeholder support.
18	Identify, evaluate and manage risks within *well-defined* engineering problems relevant to their field of fire engineering. 40 credits	

Transition information

Replacement information	This qualification replaced the New Zealand Diploma in Engineering [Ref: 112950]. The last date for assessment of the replaced qualification is 31/10/2019.
Version information	Version 2 of this qualification was published in August 2018 to include the Fire Engineering Strand.