Alternative Engineering Pathways Professional Forum 24-25 November 2014 Background Paper

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Contents

Introduction

The purpose of this paper is to provide background information to support discussion at the Alternative Engineering Pathways Professional Forum. Included is a summary of the various pieces of work being conducted by agencies within TEC such as the Engineering Education to Employment (E2E) project, Techlink Pathways Project (TPP), and other work initiated by IPENZ. The report contains an overview of what existing pathways into the NZDE and BEngTech programmes are available, and explores some key issues related to effective bridging education for providers. A further report will summarise the outcome of the Forum and include student experiences with engineering pathways based on learner interviews.

Alternative Engineering Pathways Professional Forum

Ako Aotearoa has been contracted by the Tertiary Education Commission (TEC), under the auspices of the *Engineering – Education 2 Employment* (E2E) initiative, to facilitate a discussion about enhancing pathways into engineering. Specifically, we want to explore with providers ways that will enable more students to participate successfully in the New Zealand Diploma in Engineering (NZDE) and the Bachelor of Engineering Technology (BEngTech). Overall, we are interested in identifying effective alternative pathways that may allow students with potential but lacking specific entry requirements to bridge into these programmes successfully, and how programme structure/design can support success for these learners.

Key questions to be addressed

There are a number of key questions to be addressed within this scope of work:

1. How to increase the number of engineering technology students particularly by providing more flexible access for students that are not fully prepared for engineering technology study (e.g. insufficient maths and physics credits)?
2. Are the current alternative programme or study options for students effective in preparing them for engineering technology study?
3. Can we build on current best practice in bridging and foundation study provision within the sector to support the aim of attracting and retaining more students to engineering technology study?
4. Are the current credit requirements for entry to the qualifications fit for purpose? Do the entry requirements mean that students are adequately prepared or are they an unnecessary barrier to progression?

What are we trying to accomplish?

Figure 1 Diagram representing the aim of this initiative.

Assumptions underpinning this work

There exists a significant group of potential learners who wish to pursue and are generally capable of diploma and degree-level engineering study, but who do not meet specific course and credit prerequisites. These learners require a short, focused pathway that will provide them with the knowledge and skills equivalent to these prerequisites, allowing them to succeed in engineering study. We note that other work being undertaken by the TEC and stakeholders is designed to promote the range of opportunities in engineering for potential students.

The necessary prerequisites that would be the focus of these pathways are not those related to generic degree-level study (which are covered through existing qualifications), but specific additional requirements for engineering study. Essentially, these are sufficient mathematics and physics credits at an appropriate level.

Existing alternative pathways used by providers can inform the development of good practice advice. The Forum will seek information from current providers on their various pathways with an aim to build on the good practice currently in the system for successful completion of the engineering technology programmes.

Overall context for this work

The focus of this paper is on alternative engineering pathways. However, this is a small subset of the much wider scope of work undertaken by the Tertiary Education Commission's *Engineering – Education 2 Employment* programme. This consists of a series of linked initiatives intended to increase the number of learners enrolling in engineering study. These initiatives can be grouped into strands encompassing marketing and promotion for the engineering profession, building employer engagement, and addressing educational delivery.

As part of the *educational delivery* strand, the TEC wishes to explore how to preserve and/or re-open pathways to engineering study for students who have not structured their secondary education choices with an engineering career in mind. Although some of these students may have the necessary course and credit prerequisites to enter engineering qualifications, others may have only some of these (for example, they may have the mathematics prerequisites but not physics prerequisites).

Although there are existing qualifications and programmes that prepare learners for degree-level study in general, the Tertiary Education Commission believes that there is a gap with regard to learners who are capable of studying engineering but whose earlier subject choices did not give them specific prerequisites. These learners do not need a full tertiary study preparation qualification, and being required to undertake such as qualification is likely to be a significant disincentive to pursuing engineering study. Instead, what is required is a short, focused 'package' of learning that addresses these prerequisites.

Although a scan of relevant qualifications indicates that most providers have various alternative pathways for those who do not have engineering-specific prerequisites, these seem to be inconsistent from provider-to-provider and it is unclear to what extent these are effective for learners in supporting successful later study.

Current initiatives to increase numbers and support pathways

There have been a number of recent initiatives that support the overall aim of increasing the number of students and support pathways into engineering-related programmes of study.

Tertiary Education Commission (TEC)
TEC commissioned a report titled "Growing the pipeline of work-ready engineering graduates" (TEC, 2013) to provide an overview and analysis of initiatives and issues in growing the number of work ready engineering graduates. The report was in response to the Budget 2012 allocation of an additional $42m over 4 years to maintain the quality of engineering provision and increase the number of engineering graduates with a target of an additional 500 graduates per year from 2017. An additional $9.3m over four years was allocated in Budget 2013.

The report finds a number of key ways to recruit new students including: the importance of linking with secondary schools to raise awareness of what the provider has to offer; that the discussion needs to be with students early enough in their school progression to ensure that students realise the importance of choosing STEM subjects. Methods cited include using open days, and school visits using past pupils to share their experiences of engineering study. The report notes the barriers to entry including students not taking maths and science subjects at school, that students entering first year engineering programmes are generally not well grounded in maths and there is a disconnect between maths learned at school and the requirements of tertiary study in engineering programmes.

Other factors cited include the lack of information and awareness at schools of non-university options, and lack of understanding by teachers of engineering-related options and career possibilities, and public perceptions of engineering as a career. Many of the points noted for recruitment and retention have been picked up by later initiatives such as increasing connectedness with secondary schools, promotion and marketing, and connecting with industry. The report has resulted in initiatives such as the Engineering Education to Employment E2E programme and the Ministry of Education has developed its *Vocational Pathways* initiative. It is noted that a number of providers have developed remedial maths and science bridging courses for students lacking sufficient credits to meet entry criteria. These will be detailed later in this report.

Engineering Education to Employment (E2E) Programme
Minister for Tertiary Education, Skills and Employment Steven Joyce launched the Engineering Education to Employment (E2E) programme in July 2014 (Joyce, 2014) with the aim to increase the number of students enrolling in the NZDE and BEngTech at institutes of technology and polytechnics.

The Engineering E2E programme has three key work-streams: Promotion to raise awareness of the E2E programme and market research to help promote and delivery of engineering study; Employers events focussed on engaging industry and employers; and Education through the Education Advisory Group (EAG) to improve education pathways through: a marketing campaign to promote careers for engineering technicians; greater support for students through scholarships and bridging programmes; creating incentives for collaboration between industry and providers; and a national plan to increase connectedness between tertiary and secondary education sectors.

A core component of the Engineering E2E programme focuses on making sure that students enrolling in engineering qualifications have the background in science, technology, engineering and maths subjects needed for them to succeed. This will involve building on current initiatives to increase the availability of bridging courses and other support structures at tertiary level and provide some possible alternative pathways. The Engineering E2E team also commissioned a research report Engineering Barriers and Responses that demonstrates some of the challenges that exist in encouraging students to study engineering technology at ITPs (Research First, 2014; TEC, 2014b).

Techlink

Techlink is an initiative supported by IPENZ and Technology Education New Zealand (TENZ). Techlink is a website dedicated to technology teachers, students and all those with an interest in technology education in New Zealand. Techlink showcases examples of contemporary teaching and learning in Technology from early childhood through to vocational pathways into industry. The Techlink Pathways Project (TPP) in collaboration with the ITP Metro Group, builds on the 2010 NEEP report (IPENZ, 2010) that highlighted the need for pathways for senior secondary students and tertiary students seeking engineering-related qualifications by supporting student pathways from years 11-12 into tertiary study for engineering technology careers.

IPENZ through the TPP identified three inter-related barriers to be overcome to achieve greater participation (IPENZ-Metro Group, 2014): **Awareness issues** such as employers awareness of the role and value of the engineering tech qualifications and lack of awareness within schools and wider community about the qualifications and career options available. **Alignment issues** such as the mis-alignment between school subject choice and the requirements to support better transitions to NZDE and BEngTech study; barriers to entering the engineering profession and support for Maori, Pasifika and Women participation. **Attitude and beliefs** such as societal perceptions around declining STEM literacies in school leavers, the relative status of technical and professional roles in employment and of the relative value and desirability of ITP and university qualifications. (McGregor, 2014).

Futureintech

The IPENZ and Callaghan Innovation website offers excellent advice for students seeking information on engineering-related study and career options. The Futureintech website promotes careers in technology, engineering and science for school students, schools and industry. The website includes information on study pathways, how to find programmes, case studies of engineering projects and videos of graduates working in the engineering and technology industries.

Current bridging programmes

A review of the provider websites has revealed the following information with links to relevant bridging and foundation programmes. There may be others that are not obvious (such as unfunded remedial maths and science classes). However, this is a general overview for the purposes of the forum discussion. It is also noted that participants at the forum have been asked to present their own information on pathway options which will add to the material below.

Provider	BEngTech	NZDE	Bridging programmes
AUT University	Y#		AUT Foundation Engineering
Bay of Plenty Polytechnic		Y	BOPP Engineering foundation maths bridging
CPIT	Y	Y	CPIT General Engineering Cert foundation certificates
Competenz		NZDEP	NZDE is a prerequisite for the NZDEP
MIT	Y	Y	foundation engineering generic bridging
NMIT		Y	Summer maths and English/Physics course for international students
NZ Institute of Highway Tech		Y	certificate in engineering technology
NorthTec		Y	no specific bridging course but advanced maths papers available.
The Open Polytechnic	Y*	Y	Intro course certificate in maths
Otago Polytechnic	Y	Y	bridging cert to eng diploma bridging cert to eng degree
Queens Academic Group		Y	No foundation course
SIT		Y	No specific foundation NZDE programme
UCOL		Y	foundation programmes
Unitec	Y	Y	foundation programmes
Weltec	Y	Y	foundation (engineering) summer maths
Wintec	Y	Y	certificate in technology
WITT	Y	Y	certificate in engineering technology

*The Open Polytechnic delivers the University of Southern Queensland Bachelor of Engineering Technology by distance education weblink .

#AUT University offers a 3 year BEngTech with 5 majors (Mechanical, Electrical, Electronic, Network and Communications, and Computer Mobile Systems Engineering) weblink

Summary of bridging and foundation pathways from the websites of providers

AUT University offers a one-year Certificate in Science and Technology (Level 4, 120 credits) as a pre-degree foundation engineering study option to prepare students with a grounding in maths, engineering science and academic literacy.

BOPP offers a Certificate in Engineering (Level 3, 120 credits) in addition to a maths bridging programme to pathway to NZDE.

CPIT offers a Certificate in General Engineering (Level 3, 78 credits) and a range of generic foundation certificates (levels 1-5) for progression to higher study.

Manukau IT offers a range of foundation pathway certificates at levels 2 and 3 plus a Certificate in Pre-degree Studies (Engineering) (Level 4, 120 credits)

NMIT offers a Summer Maths training scheme (Level 4, 20 credits) in addition to an English Language/Physics course (14 weeks) for international students seeking entry into the NZDE (Civil).

NZIHT offers a Certificate in Engineering Technology (Level 4, 60 credits) as an introductory maths programme for diploma study. This can be undertaken part-time by mixed mode delivery.

NorthTec offers a number of foundation courses in preparation for further study but no specific bridging course to NZDE. However they offer advanced maths courses as this is the key issue for their students who are mostly part-time students working fulltime in local industry.

The Open Polytechnic offers an Introduction to Engineering Design (Level 5, 15 credits) course related specifically to CAD, and a Certificate in Mathematics (Level 3, 45 credits).

Otago Polytechnic offers a Certificate in Foundation Studies (Level 3, 60 credits) as a F2F bridging programme to an engineering diploma and a Certificate in Foundation Studies (Level 4, 60 credits) as a bridging programme to an engineering degree, as an online programme available throughout New Zealand.

Queens Group does not have a specific foundation programme as most of the students are international students, enrolling directly onto the NZDE.

SIT does not offering a specific bridge to the NZDE (which it has only started this year).

UCOL offers a range of generic foundation programmes.

UNITEC offers a range of generic foundation and university preparation programmes. UNITEC are moving to a summer school programme for maths and considering a transition certificate programme.

WelTec offers a summer maths programme for students intending to study engineering as well as Certificate in Foundations (Engineering) (Level 3, 60 credits and Level 4, 60 credits) programmes to specifically bridge to engineering diploma and BEngTech programmes (similar to Otago Polytechnic).

Wintec offers a Certificate in Technology (Level 4, 120 credits) programme as a bridge to higher level study in engineering and related subjects.

Western Institute of Technology at Taranaki (WITT) offers a Certificate in Engineering Technology (Level 4, 60 credits) programme as a bridge to the NZDE.

Key issues for providers of engineering technology programmes

The following section notes some of the key issues that providers will be currently responding to or need to consider for future programme design and delivery.

Flexible pathways

Secondary school-tertiary pathways

There appears to be questions about the gap between the preparation of students at secondary school and the knowledge and skills necessary for engineering study in the first year of diploma or degree study in engineering. The engineering-specific maths and physics that students need to progress to engineering technology programmes are not necessarily the study options chosen by students at secondary school. Therefore, some students will not be adequately prepared for engineering study and are at risk of being lost from the pathway. Note, that Canterbury University offers Yr 13 school students advanced maths courses for those students intending to enrol in engineering at the University to supplement school study.

The secondary/tertiary interface is where relationship-building is needed to raise awareness and subject options that are important for students seeking a pathway in engineering-related study. It is clear that many students in NZ secondary system are largely unaware of options for engineering pathways, and that this lack of awareness is at the heart of the problem (as noted earlier by IPENZ). Initiatives such as the MOE Vocational Pathways, and the E2E project should address some of these issues.

Foundation and bridging pathways

Most providers have developed bridging and foundation courses to address the gap in knowledge and skill sets required for engineering study. However, there is no consistent strategy by providers in this regard and there are policy issues that need to be considered, such as an option to provide TEC-funded short courses (such as summer maths, or maths bootcamp courses) to encourage student participation. Some providers offer generic foundation programmes which are designed to meet TEC funding regulations. However, much of the content may be superfluous to the needs of learners to quickly bridge on to diploma and degree programmes, and full-year programmes (or semester programmes) add considerably to the cost of the study for students.

It should be noted here that a significant proportion of students enrolling on the NZDE/BEngTech programmes are more mature students that may have been out of formal education for some time. For these students some providers have bridging maths and physics courses. In discussion with students to date, such short courses are very beneficial to these mature students as a refresher to previous knowledge which may have dissipated over time.

The option for providers to offer alternative pathways to gaining the maths/physics requirements for successful study of NZDE/BEngTech will be attractive and enabling for many students. This could also include more enabling cross credit arrangements from foundation/bridging courses for papers in maths and physics that students can carry over to NZDE and BEngTech programmes. Another option is for providers to incorporate the maths and physics required for pre-entry into the programme

structure during their studies (similar to a “just in time” inventory strategy for the production process) as an additional support available for learners. Online study options are also a way to engage a greater number of students (see the *curriculum* section below).

Providers may look at more enabling ways to encourage students with trades backgrounds, that are not able to progress to NZDE due to poor maths ability, and provide options to enable these students to gain adequate maths abilities to progress to the NZDE. Informal feedback suggests that few students from trades backgrounds progress to NZDE/BEngTech study. However, providing these pathways to able students will assist the overall objective of increasing students graduates if it could be achieved.

The maths boot-camps and summer school options are an obvious response to the need for a short, focussed and intensive maths course to meet minimum requirements for successful completion.

Student learning context

Motivational issues

It has been noted that some students will not progress into engineering diploma/degree programmes based on lack of capability and/or poor work-ethic. What can be done to assist these students that appear to be less motivated to succeed, but are capable of completing an engineering technology qualification if given the right support and environment? Students that are interested in engineering related studies are more likely to engage in the learning if it is contextualised and relevant to their intended study.

It is very clear from talking with a range of students that pre-qualification foundation and bridging courses have been very successful at both motivating students and also giving them the belief that they can progress to higher level qualifications and succeed with a good grounding in maths and physics.

Building on successful foundation and bridging programmes

It is clear that there are a number of students that would not have succeeded in engineering-related qualifications without the benefit of targeted engineering-specific foundation courses. There appears to be anecdotal evidence that the number of students requiring foundation programmes has grown over recent years, and there is also a rise in the number of international students requiring foundation study. In one case at a Metro ITP, 45% of applicants for the NZDE for 2015 do not meet the entry criteria and will require a summer maths bridging programme.

Options to increase participation from minority groups

What specific additional initiatives for Maori and Pasifika students are available to enable their success on engineering technology programmes? What initiatives can be taken by providers to encourage more women into engineering technology study? A number of articles on ways to encourage students into engineering are noted in the bibliography (see Berliner, 2014; Graff, 2014; Mead, 2013; Haughton, 2014).

Summary of emerging issues from student interviews

A number of students were interviewed prior to the release of this report. Due to the timing around exams some students will be interviewed following the Forum. Students that had been through a foundation programme prior to current study had generally been outside of formal education for a significant period. Some were required to take a foundation course and others volunteered to refresh past study. All indicated that it was the right decision for them to undertake the foundation course. Some students had withdrawn from previous degree study and wished to start on a better basis. All students found it a very positive bridge to higher study and recommended the foundation course highly. Some students cited the lack of maturity as a school leaver which meant that academic study was more difficult at a younger age.

Collaboration

The Engineering E2E programme has the support of TEC, IPENZ, ITPs and Business NZ. This initiative provides an excellent opportunity to improve the access to and effectiveness of pathways to engineering technology programmes. There are a number of ways that collaboration between the various participants within the pipeline of building graduate numbers in engineering technology can be of value and enable better access, more effective preparation and achieve greater retention and success for students.

Collaboration between secondary schools and tertiary providers

What opportunities are there for greater collaboration between secondary schools and engineering technology providers? Is there a disconnect between local schools and ITPs about what the ITPs offers for engineering and related programmes? For example, many secondary schools lack the facilities for metal-work at school but that these facilities may be available at the local ITP. Therefore there is scope for greater partnership between schools and ITPs in this type of cooperation, which will also provide a pathway for students and build on secondary/tertiary partnership programmes such as the STAR funded programmes.

There is a need for the tertiary providers to be working collaboratively together to provide a platform for discussion with secondary educators. It will be important to provide a sustainable plan for the longer term to encourage support from secondary schools to buy in to the prospect as a continuing pathway for students.

Collaboration between engineering technology education providers

A number of articles and papers note the issue of keeping students engaged in engineering-related study, particularly those students that do not succeed in a BEng Hons degree at university. There are a number of societal issues that become barriers to students' transition from University to ITP such as life commitments, leaving friends, family commitments etc. that may prevent students from transitioning to non-university study. Therefore are there some incentives to enable a better transition for students that would otherwise be lost to the industry?

It seems that many students are choosing engineering as an option (e.g. B.Eng Hons at universities), but that those that miss out on enrolment are not encouraged to attend ITPs for BEngTech study

opportunities. Partly this is due to the competitive funding model but also to do with the parity of esteem between choosing a university option above an ITP option and the desire for students to maintain ties with friends staying at the university (Research First, 2014). There is also clearly a generational/societal issue of parents and students wishing to gain a university qualification. Perhaps some incentive is needed to retain these students in engineering-related study in a non-university provider.

Collaboration between industry and providers

It is clear that there is a need to build on good examples of industry collaboration as well as the need for greater communication with industry about qualifications (e.g. industry knows the NZDE more than the BEngTech as they are familiar with the old NZCE and are still getting used to the BEngTech as a relatively new qualification). It is noted that there would not be many BEngTech graduates in the workforce at this stage but that this number will grow significantly in coming years.

There are good opportunities to build on initiatives such as sector groups like Competenz and NZBED that are trying to get employers to "own" the issue of a lack of interest in the engineering industry, and although some good work is going on, there is still a complacency within employers for the scope of the problem of supply meeting future demand (particularly in places like Auckland and Christchurch).

One option is to attract more NZDE/NZDEP/BEngTech apprenticeships as an investment by engineering firms in the industry as a way of getting students into the industry at a relatively low cost. Such a scheme will naturally attract students weary of high fees and loans and provide a more certain career path post-graduation. Students spoken to that are on cadetships have indicated the benefit of part-time study and fulltime work as a win-win option for them.

Curriculum

Targeted Review of Qualifications (TRoQ)

A number of providers have spoken about the fact that their provider foundation programmes will be reviewed as part of the NZQA foundation and bridging qualifications TRoQ process. The Governance Group for the review of foundation and bridging qualifications recommends four NZ certificate programmes with specific pathways to industry-specific training and qualifications (levels 1-4). Note that such specific bridging programmes are being taught currently as local qualifications in some providers. This is an opportunity to have a more nationwide pathway to engineering technology programmes when the NZ certificates become a government funding requirement. As long as the programme structure allows for industry-specific flexibility (rather than a generic foundation programme), then this should be a benefit to providers of engineering technology programmes. There is also a good opportunity with the TRoQ process to have a consistent pathway programme delivered across the Country.

Current entry requirements

Are the current entry requirements to the NZDE and BEngTech fit for purpose? Do they need to be reviewed to allow more students to progress onto the programmes? For example, how much maths

and physics is actually needed prior to entry and is this a barrier to study in the industry? Is there a better measure for successful completion of engineering technology study than achievement in maths and physics units?

Are there alternative ways to plug the gap in maths/science knowledge for students that do not meet entry requirements (e.g. short, focussed programmes such as a "maths boot camp")? Does the current programme structure and design need to be reviewed to support students with potential but lacking specific entry requirements to succeed in the programmes? As noted above can additional support for maths and physics study be built into the programme structure rather than as an entry requirement?

Online learning opportunities

Can NZ providers collaborate to offer online courses that contribute credit to engineering technology qualifications? (Nutt, 2014) This paper suggests that online resources shared NZ-wide would be enabling for students in smaller centres (and working students), to complete NZDE and BEngTech programmes. The online material would include filmed lectures and also YouTube-type material for bridging maths and physics papers. The advantage is that it may be studied remotely and students can get the fundamental requirements in a non-threatening way through home PCs etc. With cooperation across the country students could also complete project and lab work at facilities (such as a local ITP) in completing their studies.

The Khan Academy https://www.khanacademy.org/ gives an example of the benefit of online learning for basic maths and physics subjects that could be studied at home or on mobile devices.

Government policy and funding

What are the relevant policy changes that would contribute to the goal of increased access, more effective preparation, greater retention and success of learners resulting in 500 more engineering technician graduates in 2017?

Funding of short courses

Do the current funding arrangements for providers enable growth of sufficient places in engineering technology programmes to ensure 500 additional graduates by 2017? Current funding rules do not encourage short, focussed, bridging pathways of study of the type required for maths and science foundation studies. For example summer maths programmes are fees-based for students, and given that they are timed for the holiday period mean that students would be unable to work during this period of study.

Given the priority government places on STEM subjects and qualifications, a case may be made for flexibility to enable short course funding for courses leading to engineering technology programmes. This would require a change to the student achievement component (SAC) funding rules. Currently the rules around provision of training schemes may limit a providers' ability to offer flexibility to individual student needs as training schemes are required to be approved by NZQA for eligibility. A more flexible approval system, if possible, would assist providers in offering the type of bridging course to increase access, retention and success.

Appendix 1 Useful websites and links

Ako Aotearoa website: https://akoaotearoa.ac.nz/

Careers NZ website: http://www.careers.govt.nz/

Competenz website: http://www.competenz.org.nz/

Engineering Education to Employment (E2E) website: http://www.engineeringe2e.org.nz/

Futureintech website: http://www.futureintech.org.nz/

Futureintech advice for bridging courses: http://www.futureintech.org.nz/bridging-courses.cfm

Futureintech Engineering pathways: http://www.futureintech.org.nz/engineering-pathways.cfm

IPENZ website: http://www.ipenz.org.nz/ipenz/

Metro Group website: http://www.metros.ac.nz/

Ministry of Education: Vocational Pathways website vocational pathways

NZBED website: http://www.nzbed.org.nz/

NZDEP ITO providers: http://www.nzbed.org.nz/nzdep/how-to-enrol/

Techlink Home Webpage: http://www.techlink.org.nz/index.cfm

Techlink Pathways Project website: http://www.futureintech.org.nz/enews/schools/story.cfm?ID=27

Technology Education NZ (TENZ): http://www.tenz.org.nz/

Appendix 2 Qualifications within scope of the forum discussion

New Zealand Diploma in Engineering (Level 6) (240 credits)

The NZDE includes generic engineering knowledge and specific content relevant to the Civil Engineering, Electrical Engineering and Mechanical Engineering disciplines. The Entry requirement for the programme is a minimum total of 48 NCEA credits at level 2 in four subjects including at least 12 credits in mathematics, or equivalent qualifications, trades training and/or demonstrated skills and experience.

NZ Diploma in Engineering Practice (NZDEP) (Level 6) (120 credits)

The New Zealand Diploma in Engineering Practice (NZDEP) with strands in civil, electrical and mechanical engineering is a structured, work based, competency qualification that is assessed on the job through an Industry Training Organisation (ITO). With a NZDEP students can develop practical skills as an engineering technician - building on their academic knowledge and enhancing their prospects and making them more valuable to their employer.

Entry requirements: The New Zealand Diploma in Engineering Practice (NZDEP) will only be awarded to candidates who have also completed a New Zealand Diploma in Engineering (NZDE) or an equivalent qualification approved by the New Zealand Board for Engineering Diplomas (For a good summary of NZBED see the 2013 Annual Report (Crossen, 2013). Therefore this qualification has a specific pathway and requires NZDE (or approved equivalent) as a prerequisite.

Bachelor of Engineering Technology (BEngTech) (Level 7) (360 credits)

The Bachelor of Engineering Technology (BEngTech) is a three year programme of compulsory and elective courses with strands in Mechanical Engineering, Electrical Engineering and Civil Engineering. There is a consortium of six Institutes of Technology and Polytechnics (ITPs) the Metro Group of ITPs offer the BEngTech qualification with various majors available. Electrotech Engineering, Computer Engineering and Mechatronics are available at select ITPs within this group.

Entry requirements: A minimum of 42 credits at NCEA (Level 3); made up from a minimum of 14 credits (Level 3) in maths (algebra/calculus); plus a minimum of 14 credits (Level 3) in physics; plus 14 credits (Level 3) in another subject area on the National Qualifications Framework; plus Student must have 8 literacy credits (Level 2 or higher) in English or Te Reo Maori (4 credits reading and 4 credits in writing).

Note that **AUT University** offers a separate Bachelor of Engineering Technology (BEngTech) (Level 7) (360 credits) with strands in Mechanical Engineering; Network and Communication Engineering, Electronic Engineering, Electrical Engineering, Computer and Mobile Systems Engineering. Entry requirements are University Entrance, NCEA 14 credits at Level 3 in any one of Mathematics, Calculus or Statistics and Minimum of 14 level 2 credits in Physics, or Cambridge International Exam A level in Maths and Physics.

The **Open Polytechnic** offers the Bachelor of Engineering Technology by distance education in collaboration with the University of Southern Queensland. There are majors in Civil Engineering, Electrical and Electronic Engineering and Mechanical Engineering. Entry criteria are a minimum of 42 credits at Level 3 or higher on the NQF or NCEA of which at least 14 credits shall be NCEA mathematics at Level 3 or higher, 'B' Bursary mathematics or equivalent, having studied mathematics with calculus to year 13 level.

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