Engineering Exposure to Professional Practice Navigating EA, TEQSA, and the Fair Work Act.

William (Bill) McBride [a], and Bernadette Foley [b].
University of Newcastle [a], University of Adelaide [b]
Corresponding Author Email: bill.mcbride@newcastle.edu.au

SESSION C1: Integration of theory and practice in the learning and teaching process

CONTEXT Australian engineering degrees accredited by Engineers Australia at the level of Professional Engineer are required to include the equivalent of 12 weeks of exposure to professional practice. The landscape for this exposure has changed over the past five years with undergraduates finding it increasingly difficult to source the traditional 12 week engineering placement, a changing regulatory environment, and an increased emphasis on constructively aligned learning. This paper presents the salient outcomes from an ACED project funded to explore factors affecting the design of exposure to professional practice activities. It clarifies obligations through the lens of Fair Work Australia, the Higher Education Standards Framework (HESF), and Engineers Australia.

PURPOSE To provide guidance for institutions assessing 'Exposure to Professional Practice' (Industrial Experience) within their engineering curricula against learning objectives, regulatory frameworks and accreditation requirements.

OUTLINE Exposure to Professional Practice (EPP) has been a formal component of Australian engineering tertiary education for many decades. EPP has been a vexed topic across many campuses in recent years as the number of paid (or unpaid) opportunities have reduced due to the variable economic climate. This has led, in some cases, to a disaggregation of EPP and coursework curricula. This could be seen as a lost learning opportunity, which by extension, potentially results in it being perceived as simply an exit requirement for the degree, or at the extreme, a barrier to graduation.

The objectives of EPP within engineering curricula are reviewed as the basis for understanding its value, particularly with regard to increasing the relevance of coursework and aiding transitions to industry. This is used to propose structures and support designed to enhance and assess student learning through EPP.

RESULTS EPP activities can take many shapes and forms. However, EPP activities which occur in industry must be undertaken within the given regulatory environment. For Australian engineering programs, an EPP process map is presented to inform EPP design and the associated use of placement management systems (e.g. in-house, SONIA, InPlace). This map has been designed to align EPP activities with learning outcomes, and therefore may have application outside of Australia.

CONCLUSIONS The design of EPP activities requires consideration and navigation of multiple objectives and requirements. For EPP activities to be effective, integration within the boarder curriculum is essential. The outcomes of the ACED project have enabled guidance material to be developed to support the design of EPP activities.

KEYWORDS WIL, Engineering Industrial Experience, Exposure to Professional Practice

Introduction

Exposure to Professional Practice (EPP) has been a long standing requirement of accredited engineering programs in Australia. The objective of this exposure is to help couple the University delivered theoretical content with contemporary practice experienced across a diverse employment sector. The connection between practice and theory is intended to encourage student engagement with the theoretical content more strongly, providing better graduate outcomes. Further, learning gained through periods of workplace experience enable 'fresh from school' students to transition into the workforce with a stronger work ethic and more realistic employment expectations.

In recent years, economic downturns have reduced the volume of paid placements, and uncertainty with the Fair Work Act have led to a reduction in unpaid placements. A national working party was initiated in 2014 at the AAEE Assistant Deans of Teaching and Learning meeting, to investigate practices across the sector. The Australian Council of Engineering Deans (ACED) later requested this group to assist in re-writing the EPP element of the accreditation document 'G02', and asked the team to develop a set of appropriate EPP learning outcomes. As this work was nearing completion, the Tertiary Education Quality and Standards Agency (TEQSA) released a consultation draft of the eight page Work Integrated Learning (WIL) guidance note (TEQSA, 2017a) for comment and implementation. This was reported at the AAEE2016 conference in a workshop, and discussed at the post conference AD TL meeting. The ACED backed EPP project team then worked to assess the potential impacts and provided feedback to TEQSA. This feedback is now reflected in the latest version of the TEQSA WIL guidance note (TEQSA, 2017a).

This paper provides an overview of the outcomes from the EPP working party, with the salient aspects of the Fair Work Act, the influence of the TEQSA WIL guidance note, and provides initial comments around the references to sections of the Higher Education Standards Framework from the TEQSA WIL note.

Exposure to Professional Practice ≠ Time in Industry

The majority of Australian undergraduate engineering programs have required a 12 week pre-graduation 'exposure to professional practice' for many decades. A number of engineering programs overprescribe/simplify this requirement to require graduands demonstrate 12 weeks of 'time in industry'. This is not the specific requirement by Engineers Australia. EPP is intended to compliment and thread through the educational process, and whilst periods 'in industry' generally contribute to this goal, other mechanisms are cited in the accreditation manual. Examples include 'real world' problems, guest industry lectures, site visits etc. The perceived difficulty with these is one of an accounting issue. What is the equivalent numerical 'value' of a site visit, or a 1 hour guest lecture?

Consider an imaginary engineering faculty, the irregularities arising from one program 'claiming' to have fully embedded EPP and another program claiming zero embedded EPP might easily lead this faculty to ease program management and adopt a blanket approach requiring 12 weeks of 'time in industry' to ensure students in all programs gain adequate EPP. There is no denying that in terms of work readiness, that a substantive period of good quality industrial experience prior to graduation will provide students with a valuable and saleable skill. Whilst this is often cited as the Gold Standard, some experiences are expected to be far better than others.

EPP Learning Outcomes and an Exemplar Learning Journal

The EPP project developed three generic Learning Outcomes, or Competency Elements, to focus student's expectations from EPP, and assist providers in approving/developing EPP experiences. These high level learning outcomes, shown in Table 1, can be met by students at all stages of their study program, and are considered suitable for the diversity of EPP implementations and potential student experiences. These statements are structured in a similar format to the Engineers Australia stage 1 Competency Standards (Engineers Australia, 2013) with the learning outcomes including potential indicators of attainment. These are intended to enable students to focus their reflection on all episodes of exposure to professional practice. Operationally, students would complete an approved EPP activity, and on completion create a descriptive narrative encompassing the experience. Based on that narrative, students would then reflect on the various EPP/EA Competency Elements as appropriate to that experience. This creates an opportunity to request students consider the Degree learning outcomes as part of this reflection process, to encourage deeper program level reflection. A truncated section from the full learning journey document is provided as the concluding page in this paper. This is not presented in expectation for widespread use or deployment, merely as one of a myriad of options to aid students in maximising their personal gain from EPP activities. The format, structure and expectations for the journal are anticipated to be defined by individual providers.

Table 1 – Proposed Learning Journey – Exposure to Professional Practice elements only

REFLECTION AREA	**Exposure to Professional Practice**
COMPETENCY ELEMENT	POTENTIAL INDICATORS OF ATTAINMENT
Exposure to an industrial/technical environment in order to appreciate the various activities associated with engineering practice	Routine, punctuality and maintained work ethic
	Professionalism – integrity, honesty, respect and confidentiality
	Communication with colleagues, experts and laypeople
	Appreciation of the relevance of the engineering curriculum
	Understanding of the influence of professional engineers and the inherent associated responsibility
Observe and undertake tasks in practical aspects of investigation, design and construction of engineering works as a complement to theoretical studies	Understand of the supporting social function that engineers provide.
	Appreciation that every engineering discipline spans a breadth of knowledge beyond the specific curriculum
	Appreciate that a team of people are often required to complete any project
Gain confidence to take up positions that require responsibility, motivation, decision making and communication over other people in the market place	Appreciation of the knowledge gained during studies and the value this adds to you as a prospective employee.

It is the authors' intent, to empower students to create and monitor their own specific learning journey, and in doing so presume that each and every student will present a notionally different aggregation of experiences in demonstration of their 12 weeks (equivalent) of EPP.

EPP activities and suggested aggregation value

Whilst not intending prescription, the Engineers Australia accreditation documentation (currently under revision) will includes a number of activities that EPP might utilise. Some of these activities can be leveraged and generate additional value add through the application of reflective practice. For example, a 1 hour ‘EA’ Continuing Professional Development (CPD) attracting seminar, might provide a student with a demonstrable claim for 4 hours “EPP”, through writing a brief narrative about the presentation and reflecting how that aligns with areas of professional practice and the Stage 1 competencies. Likewise, a ½ day site visit might enable a claim for 1 EPP day through the generation of a narrative and reflection. In these cases, the ‘value’ attributed is expected to be greater than the students expended time.

Each of these activities would constitute a ‘leaf’ in the students learning journey that could be submitted as a portfolio of aggregation for graduation approval. The exact weightings for various activities are left to the individual Universities to develop as appropriate for their situation.

As suggestions, many students are actively engaged in major student led projects, Formula SAE, Robot X, Solar Car challenge, RoboCup, etc. Many of these require student led teams, and therefore a student leader. The student leader in many instances will demonstrate significant levels of the ‘Professional’ attributes aligned with periods of EPP. A narrative and reflection on these episodes should attract due recognition as appropriate for the specific project. Whilst project & team dependant, all members within a team could make an independent claim for hours associated with EPP.

Many programs draw problems from industry and thread these throughout the degree program. Whilst many academics may do this as a natural element of course (unit) design, this is not necessarily factored into a student’s aggregation of EPP time. It is perhaps not uncommon to have complete units presented by industrial conjoints bringing a wealth of inherent EPP and requiring students to complete assessments based directly on industrial problems. In a typical course requiring 140 hours of student effort, taught exclusively by an industry conjoint, is it unrealistic to equate this to 3 weeks of EPP time?

Government regulations

The Fair Work Commission and the Fair Work Act

The Fair Work Commission was initiated in 2009 as part of the Fair Work Act (2009), a government initiative to rationalise and unify oversight bodies and generate a consistent set of guidelines for all Australian workers. The objective of the Act is to provide a balanced framework for cooperative and productive workplace relations. Of relevance to student placements within Higher Education, there are two fact sheets: Unpaid Work (Fair Work Ombudsman, 2017a) and Vocational Placements (Fair Work Ombudsman, 2017b). These fact sheets provide an interpretation of the Act for reference by both Higher Education providers and placement providers.

The Unpaid Work fact sheet provides guidance on where and how a person might complete a short period of unpaid work as demonstration of capacity and/or fitness for duty, but also provides guidance to ensure that this is not exploited. The Vocational Placements fact sheet is aimed at students with an educational requirement to complete a period (or periods) of Work Integrated Learning/Professional Practice as part of their course of study. This document provides an explicit examples for an engineering placements as part of a degree program.

> *“Jayne is in her final year of a mechanical engineering degree and has completed her formal class studies.*
> *As a requirement to graduate, Jayne has to organise professional engineering work experience at a business for 12 weeks. While Jayne has to organise the placement herself, the University has strict criteria about needing to assess an employer to ensure her vocational placement provides the relevant learning environment, and gives final sign-off on the placement. As this arrangement meets the definition of a*

vocational placement under the FW Act, it can be unpaid." (Fair Work Ombudsman, 2017b)

One element that has been misinterpreted within some higher education providers is the productivity element for students on placements. The Unpaid Work fact sheet states:

> *"Although the person may do some productive activities during a placement, they are less likely to be considered an employee if there is no expectation or requirement of productivity in the workplace." (Fair Work Ombudsman, 2017a)*

The misinterpretation has been that students can not undertake an unpaid placement as part of their required EPP, if they complete productive work. Whilst very short periods of work shadowing might be of benefit, longer placements, such as the 12 weeks required by most Universities, a work-shadowing only experience is unlikely to add value to the degree program or meet the objective of EPP.

The authors note that arguments might remain about the potential for exploitation of students. Though, a placement is only considered a vocational placement until the course/program requirement has been met. Therefore, if a program requirement is 12 weeks, work beyond the 12 weeks would not be considered as a vocational placement and, if unpaid, would need to continue to meet the conditions for unpaid work. In engineering the types of experiences sought and the liability/indemnity issues perhaps reduce the potential for exploitation of students.

TEQSA WIL Guidelines

The Tertiary Education Quality and Standards Agency was established in 2011, *"TEQSA regulates and assures the quality of Australia's large, diverse and complex higher education sector"* and *"TEQSA registers and evaluates the performance of higher education providers against the Higher Education Standards Framework - specifically, the Threshold Standards, which all providers must meet in order to enter and remain within Australia's higher education system." (TEQSA, 2017b)*

Through the Threshold Standards and the Australian Qualifications Framework, a significant volume of work has been completed by Higher Education providers in demonstration of compliance. TEQSA guidelines are now a core consideration in the tertiary sector for many decisions and proposals.

In August 2016, TEQSA released their eight page draft guidance note for the inclusion of WIL in programs, notionally for implementation from 1 Jan 2017. This guidance note outlines expected standards for WIL, to ensure that it is constructed as an effective and positive learning experience integrated into the program of study.

In broad terms, the WIL guidance note defines a minimum standard of accountability, and duty of care, for education providers to ensure that a three-way understanding of placement intent exists. The three parties being; the education provider, the experience provider, and the student. Clarity of the student learning outcomes are expected to be provided to all parties to ensure maximum educative value from these placements. The TEQSA WIL guidance note obligates tertiary providers to engage strongly with placement providers and to assure the quality of the placements provided. This engagement spans the duration of any proposed placement to ensure appropriate on-boarding into the workplace, appropriate activities during placement, mid-placement contact (at least monthly if student is undertaking full time EPP) to ensure student wellbeing, and closure at the completion of the placement. This interaction is aimed both at student and EPP providers to ensure a positive trajectory for experience providers, or a block on further placements if they prove inappropriate.

Whilst it is unable to claim as an absolute, it is anticipated that engineering student placements provided at many 'Engineering' companies will already obtain robust inductions and a diverse range of non-trivial activities, meeting the intent of the TEQSA WIL guidance note. However, the rapid rise of 'start up' companies in the engineering space, and where placements are provided by very small businesses, might require a higher level of vigilance from the University with respect to the Higher Education Standards Framework.

From an engineering perspective, the guidance note reinforces the requirements for genuine oversight of EPP activities while a student is on placement. For providers that leave the students vocational industrial placement completely for the student to arrange, a review of their EPP oversight structures may be necessary to remain compliant with TEQSA.

Higher Educations Standards Framework Requirements.

The TEQSA WIL guideline explicitly picks elements of the HESF as requiring specific consideration. These are replicated here for reader convenience and an author interpretation of their impact provided. These interpretations have NOT been tested with TEQSA.

> *"The Standards that are primarily concerned with quality assurance of work-integrated learning delivered through third parties are in Section 5.4 (at Standard 5.4.1). However, the role of work-integrated learning more broadly and the extent of its integration are also related to Learning Outcomes and Assessment (Section 1.4), including, for example, learning outcomes for employment (e.g. Standards 1.4.2c & d). The Standards on Course Design (Section 3.1) are also relevant in so far as workplace learning is adopted and integrated as part of a course of study.*
>
> *Depending on the nature and extent of workplace learning involved, the Standards on Staffing (Section 3.2) may be applicable as well in relation to supervision of students in the workplace. The Standards on Learning Resources and Educational Support (Section 3.3) may equally be applicable, as may those concerned with Credit and Recognition of Prior Learning (Section 1.2) where previous WIL may lead to credit for prior learning.*
>
> *In some workplaces the wellbeing and safety of students (see Section 2.3) may assume particular significance, such as exposure to potentially stressful circumstances in clinical placements. At a more overarching level, the provider's course approval and monitoring processes (Sections 5.1 and 5.3) would be expected to consider WIL."*

Section 1.2 'Credit and Recognition of Prior Learning'. The main elements or this clause are-

- *a) students granted such credit are not disadvantaged in achieving the expected learning outcomes for the course of study or qualification, and*
- *b) the integrity of the course of study and the qualification are maintained.*

Overall, the granting of EPP exemption on the basis of <u>previous to study</u> experience is unlikely in engineering education, as there are very few perceivable instances where sufficient exposure to professional engineering practices could occur prior to study.

A partial case is likely where a student with a prior (non-professional) engineering qualification, though upskilling might be able to present a defendable case. It is anticipated that no campus would currently grant a full exemption from the EPP requirements, but enable the student to claim a limited volume of EPP on the submission of a report documenting activities, and preferable reflecting on how these align with the Stage 1 competencies. A tradesman providing a reflection on their trade experience, through the lens of Stage 1 competencies, after completing a volume of academic study, might warrant three to four weeks of EPP?

Where a qualified professional engineer re-enters the undergraduate arena to change engineering discipline, it is likely defendable to grant complete exemption from additional EPP documentation.

Section 1.4 ‘Learning Outcomes and Assessment’ Sections 1.4.2 c & d

This section deals with the appropriate design of courses. Given the nature of EPP, this clause is unlikely to impact on the operation with engineering degrees. Programs that are reliant on ‘entry to practice’ outcomes from WIL, such as teaching and many allied health programs will need to be cognisant of this section of the HESF.

Section 2.3 ‘Wellbeing and Safety’

This is an area where the HESF elaborates that Higher Education providers must facilitate access to an appropriate range of health services and general student support. If a student is taking part in an off-campus period of EPP, it is clear that they are removed from the provision of care that they might be accustomed to. This is a risk to the University that must be managed, to ensure that the students’ wellbeing and safety are not compromised whilst undertaking periods of EPP in industry. This is an area that some Universities might need to expend additional energy in establishing and monitoring the EPP providers. At a minimum, Universities cannot now allow students to complete long placements without periodic monitoring of wellbeing. A suggested minimum contact interval of once per month whilst on a full time placement was suggested to TEQSA as part the feedback process.

Section 3.1 ‘Course Design’

As applied to EPP, this requires all parties to understand why students are seeking EPP, and what tasks might be appropriate/inappropriate. The definition of specific learning outcomes for EPP and the suggestion herein of the learning journey are one possible element to meet this requirement,

Section 3.2 ‘Staffing’

3.2.3.c states that educators are required to hold a qualification 1 level above the program being taught. This includes courses therein, and therefore can be extended to workplace supervisors of EPP. However this rule has a relaxation to account for professional &/or practical experience. At a high level, a ‘Chartered’ eligible professional engineer is easily defendable. However, many students will gain significant applicable knowledge from periods of activity at a trade or pre-trade level – e.g. working as a trade assistant. This represents the complexity with the engineering EPP space. Clearly as a trade assistant, the appropriate supervision is a tradesperson, who is likely several AQF levels below our final target level.

Section 5.3 ‘Monitoring, Review and Improvement’

Of significance is a statement in the HESF, and within the WIL guideline, for monitoring the EPP placement providers, and specifically using student feedback as part of the monitoring process to potentially block some poorly performing EPP locations. From this, Universities may need to develop additional formal tracking of student feedback on various providers.

Section 5.4 ‘Delivery with Other Parties’

> *Work-integrated learning, placements, other community-based learning and collaborative research training arrangements are quality assured, including assurance of the quality of supervision of student experiences.*

Section 3.3 ‘Learning Resources and Educational Support’ is unlikely to present a significant issue with the all but universal adoption of LMS systems

Section 5.1 ‘Course Approval and Accreditation - No significant impact perceived

Discussion

EPP within engineering programs is a requirement of accredited engineering programs and can be structured in many ways. Where industrial placements are a component of an EPP structure, it is necessary for a provider to understand both Fair Work and TEQSA requirements. The Fair Work Act enables vocational placements to be unpaid and TEQSA stipulate a minimum level of acceptable intervention from the educational providers to assure that these experiences are meaningful.

Where students partake in paid engineering employment, this falls into an employee/employer relationship with no legal obligation from the higher education provider. Where the higher education provider explicitly brokers the employment arrangement or requires that placement for the student to fulfil the obligations of their EPP requirement, the placement would need to be structured to meet defined learning outcomes and the TEQSA requirements.

The TEQSA WIL guidance note specifies the tracking and monitoring of student wellbeing but does not prescribe how this should be achieved. Due to the number and diversity of engineering placements, monitoring of placements will be most readily be accomplished through the adoption of a suitable software platform. Ideally such systems would maintain consistent records for past and present placements. There are several such platforms available to the market from Australia providers, such as SONIA and InPlace. One package is actively being explored by a sub-set of Australian Engineering schools to more specifically meet the needs of the engineering placement process. Processes and concepts will be shared with the broader engineering community to ensure, as far as practical, a unified national process.

TEQSA does declare a higher level of conformance and interaction for institutions that receive funds for the provision of EPP requirement.

Conclusions

This paper has explored the Exposure to Professional Practice within engineering education, which has been a long standing element for graduation. The paper has shown that the Fair Work Act allows for the continuation of this practice and through the Fair Work Ombudsman's publications, that the requirements are explicitly clarified for a fictitious engineering student. Importantly, clarification that unpaid, 'productive' work is lawful under the Fair Work Act for vocational placements was gained.

In addition to the FWA requirements, the more recently released TEQSA WIL guidance note requires providers to assure the wellbeing of students on placements. It is therefore necessary to ensure the suitability of all placements within EPP to meet designed educational outcomes. Through the ACED supported EPP group, detailed feedback was provided to TEQSA which has been incorporated into the recently updated TEQSA WIL Guidance note.

A set of TEQSA mandated learning outcomes have been developed and presented for potential use with exposure to professional practice (EPP), with indicators of attainment akin to those used in the EA Stage 1 competency documents to aid student engagement.

Suggestions for a small subset of 'hour leveraging' activities, currently being used at several Universities, as a means of encouraging students to make use of the EPP opportunities that are on offer, such as site visits and special guest lectures have been presented. It is suggested that dependant on each specific University, the range of activities will be greatly expanded, and 'hour valued' as relevant to local conditions.

The final outcome from the ACED funded work and this paper is a learning journal exemplar. Whilst each institution will consider their own implementation, the intent is to aid students in monitoring their aggregation of professional experience towards broad learning outcomes. It is also intended to enable deeper reflection towards the Stage 1 Competency Standards defined by Engineers Australia.

References

Engineers Australia (2013), Stage 1 Competency Standard for the Professional Engineer, available from **www.engineersaustralia.org.au/About-Us/Accreditation/Accreditation-Overview**.

Engineers Australia (2013), G02 Accreditation Criteria Guidelines, section 3.2.5, available from **https://www.engineersaustralia.org.au/.../G02_Accreditation_Criteria_Guidelines.pdf**

Fair Work Act 2009 (Cth).

Fair Work Ombudsman (2017a), Unpaid Work, Australian Government, available from **www.fairwork.gov.au/unpaidwork**.

Fair Work Ombudsman (2017b), Vocational placements, Australian Government, available from https://www.fairwork.gov.au/pay/unpaid-work/student-placements.

Tertiary Education Quality and Standards Agency (2017a), Guidance Note: Work-Integrated Learning (v1.1), available from **www.teqsa.gov.au/hesf-2015-specific-guidance-notes**.

Tertiary Education Quality and Standards Agency (2017b), About TEQSA, available from **www.teqsa.gov.au/about**.

Acknowledgments

Australian Council of Engineering Deans

Primary, though not exhaustive, contributors to the project:

David Lowe	U.Sydney	Elizabeth Taylor	EA
Bernie Foley	U.Adelaide	Ray Eaton	U.NSW
Karen Whelan	QUT	Liza OMoore	U.Q.
Bouchra Senadji	QUT	Julia Lamborn	Monash
Sally Male	UWA	Graham Jenkins	Griffith
Doug Hargraves	QUT	Peter Sutton	U.Q.
Robin King	ACED	Rodney Vickers	U.Wollongong

Apologies to the many people not cited.

Appendix A - Example of possible student learning journey for recording of their exposure to professional practice

Student Learning Journey Record

Suggested Template for implimentation into a Portfolio System such as SONIA or InPlace

Students are to complete this form, using the indicators of attinment against each stage one competancy as appropriate. For Exposure to Professional Practice, those with the Green stripe are suggested. As a general tracking of progress, all in Yellow. And progress towards degree programs outcomes, Blue. Some campusus have aligned program learning outcomes with EA Stage 1, and therefore the blue section is not required.

Campues Program Learning outcomes - Add as required and specific to your program

REFLECTION AREA	Exposure to Professional Practice	Date of Entry MM/YY : Reason of Entry (Seminar, site visit etc)
COMPETENCY ELEMENT	POTENTIAL INDICATORS OF ATTAINMENT	Self reflection : How am I meeting these at this point in my degree
Exposure to an industrial/technical environment in order to appreciate the various activities associated with engineering in industry	Routine, punctuality and maintained work ethic Professionalism – integrity, honesty, respect and confidentiality Communication with colleagues, experts and laypeoples Apprecation of the relevance of the engineering curriculum Understanding of the influence of professional enigneers and the inhernet associated responsibility	Prepopulate a number of these as examples: *EG Atended a site visit to XXXX Engineering. Enabled better understanding of …..*
Observe and undertake tasks in practical aspects of investigation, design and construction of engineering works as a complement to theoretical studies	Understand of the supporting social function that engineers provide. Appreciation that every engineering discipline spans a breadth of knowledge beyond the specific curriculum Appreciate that a team of people are often required to complete any project	
Gain confidence in your capacity to take up positions that require responsibility, motivation, decision making and communication over other people in the market place	Appreciation of the knowledge gained during studies and the value this adds to you as a prospective employee.	
REFLECTION AREA	**Professional and Personal Attributes**	Date of Entry MM/YY
COMPETENCY ELEMENT	POTENTIAL INDICATORS OF ATTAINMENT	Self reflection : How am I meeting these at this point in my degree
3.1 Ethical conduct and professional accountability	a) Demonstrates commitment to uphold the Engineers Australia - Code of Ethics, and established norms of professional conduct pertinent to the engineering discipline. b) Understands the need for 'due-diligence' in certification, compliance and risk management processes. c) Understands the accountabilities of the professional engineer and the broader engineering team for the safety of other people and for protection of the environment. d) Is aware of the fundamental principles of intellectual property rights and protection.	
3.2 Effective oral and written communication in professional and lay domains.	a) Is proficient in listening, speaking, reading and writing English, including: - comprehending critically and fairly the viewpoints of others; - expressing information effectively and succinctly, issuing instruction, engaging in discussion, presenting arguments and justification, debating and negotiating - to technical and non-technical audiences and using textual, diagrammatic, pictorial and graphical media best suited to the context; - representing an engineering position, or the engineering profession at large to the broader community; - appreciating the impact of body language, personal behaviour and other non-verbal communication processes, as well as the fundamentals of human social behaviour and their cross-cultural differences. b) Prepares high quality engineering documents such as progress and project reports, reports of investigations and feasibility studies, proposals, specifications, design records, drawings, technical descriptions and presentations pertinent to the engineering discipline.	
3.3 Creative, innovative and pro-active demeanour.	a) Applies creative approaches to identify and develop alternative concepts, solutions and procedures, appropriately challenges engineering practices from technical and non-technical viewpoints; identifies new technological opportunities. b) Seeks out new developments in the engineering discipline and specialisations and applies fundamental knowledge and systematic processes to evaluate and report potential. c) Is aware of broader fields of science, engineering, technology and commerce from which new ideas and interfaces may be may drawn and readily engages with professionals from these fields to exchange ideas.	
3.4 Professional use and management of information.	a) Is proficient in locating and utilising information - including accessing, systematically searching, analysing, evaluating and referencing relevant published works and data; is proficient in the use of indexes, bibliographic databases and other search facilities. b) Critically assesses the accuracy, reliability and authenticity of information. c) Is aware of common document identification, tracking and control procedures.	
3.5 Orderly management of self, and professional conduct.	a) Demonstrates commitment to critical self-review and performance evaluation against appropriate criteria as a primary means of tracking personal development needs and achievements. b) Understands the importance of being a member of a professional and intellectual community, learning from its knowledge and standards, and contributing to their maintenance and advancement. c) Demonstrates commitment to life-long learning and professional development. d) Manages time and processes effectively, prioritises competing demands to achieve personal, career and organisational goals and objectives. e) Thinks critically and applies an appropriate balance of logic and intellectual criteria to analysis, judgment and decision making. f) Presents a professional image in all circumstances, including relations with clients, stakeholders, as well as with professional and technical colleagues across wide ranging disciplines.	
	a) Understands the fundamentals of team dynamics and leadership. b) Functions as an effective member or leader of diverse engineering teams, including those with multi- level, multi-disciplinary and multi-cultural dimensions.	

3.6 Effective team membership and team leadership.	c) Earns the trust and confidence of colleagues through competent and timely completion of tasks. d) Recognises the value of alternative and diverse viewpoints, scholarly advice and the importance of professional networking. e) Confidently pursues and discerns expert assistance and professional advice. f) Takes initiative and fulfils the leadership role whilst respecting the agreed roles of others.	
REFLECTION AREA	**Application of Engineering Abilities**	
COMPETENCY ELEMENT	POTENTIAL INDICATORS OF ATTAINMENT	
2.1 Application of established engineering methods to complex engineering problem solving.	a. Identifies, discerns and characterises salient issues, determines and analyses causes and effects, justifies and applies appropriate simplifying assumptions, predicts performance and behaviour, synthesises solution strategies and develops substantiated conclusions. b. Ensures that all aspects of an engineering activity are soundly based on fundamental principles - by diagnosing, and taking appropriate action with data, calculations, results, proposals, processes, practices, and documented information that may be ill-founded, illogical, erroneous, unreliable or unrealistic. c. Competently addresses engineering problems involving uncertainty, ambiguity, imprecise information and wide-ranging and sometimes conflicting technical and non-technical factors. d. Partitions problems, processes or systems into manageable elements for the purposes of analysis, modelling or design and then re-combines to form a whole, with the integrity and performance of the overall system as the paramount consideration. e. Conceptualises alternative engineering approaches and evaluates potential outcomes against appropriate criteria to justify an optimal solution choice. f. Critically reviews and applies relevant standards and codes of practice underpinning the engineering discipline and nominated specialisations. g. Identifies, quantifies, mitigates and manages technical, health, environmental, safety and other contextual risks associated with engineering application in the designated engineering discipline. h. Interprets and ensures compliance with relevant legislative and statutory requirements applicable to the engineering discipline. i. Investigates complex problems using research-based knowledge and research methods.	
2.2 Fluent application of engineering techniques, tools and resources.	a. Proficiently identifies, selects and applies the materials, components, devices, systems, processes, resources, plant and equipment relevant to the engineering discipline. b. Constructs or selects and applies from a qualitative description of a phenomenon, process, system, component or device a mathematical, physical or computational model based on fundamental scientific principles and justifiable simplifying assumptions. c. Determines properties, performance, safe working limits, failure modes, and other inherent parameters of materials, components and systems relevant to the engineering discipline. d. Applies a wide range of engineering tools for analysis, simulation, visualisation, synthesis and design, including assessing the accuracy and limitations of such tools, and validation of their results. e. Applies formal systems engineering methods to address the planning and execution of complex, problem solving and engineering projects. f. Designs and conducts experiments, analyses and interprets result data and formulates reliable conclusions. g. Analyses sources of error in applied models and experiments; eliminates, minimises or compensates for such errors; quantifies significance of errors to any conclusions drawn. h. Safely applies laboratory, test and experimental procedures appropriate to the engineering discipline. i. Understands the need for systematic management of the acquisition, commissioning, operation, upgrade, monitoring and maintenance of engineering plant, facilities, equipment and systems. j. Understands the role of quality management systems, tools and processes within a culture of continuous improvement.	
2.3 Application of systematic engineering synthesis and design processes.	a) Proficiently applies technical knowledge and open ended problem solving skills as well as appropriate tools and resources to design components, elements, systems, plant, facilities and/or processes to satisfy user requirements. b) Addresses broad contextual constraints such as social, cultural, environmental, commercial, legal political and human factors, as well as health, safety and sustainability imperatives as an integral part of the design process. c) Executes and leads a whole systems design cycle approach including tasks such as: - determining client requirements and identifying the impact of relevant contextual factors, including business planning and costing targets; - systematically addressing sustainability criteria; - working within projected development, production and implementation constraints; - eliciting, scoping and documenting the required outcomes of the design task and defining acceptance criteria; - identifying assessing and managing technical, health and safety risks integral to the design process; - writing engineering specifications, that fully satisfy the formal requirements; - ensuring compliance with essential engineering standards and codes of practice; - partitioning the design task into appropriate modular, functional elements; that can be separately addressed and subsequently integrated through defined interfaces; - identifying and analysing possible design approaches and justifying an optimal approach; - developing and completing the design using appropriate engineering principles, tools, and processes; - integrating functional elements to form a coherent design solution; - quantifying the materials, components, systems, equipment, facilities, engineering resources and operating arrangements needed for implementation of the solution; - checking the design solution for each element and the integrated system against the engineering specifications; - devising and documenting tests that will verify performance of the elements and the integrated realisation; - prototyping/implementing the design solution and verifying performance against specification; - documenting, commissioning and reporting the design outcome. d) Is aware of the accountabilities of the professional engineer in relation to the 'design authority' role.	
2.4 Application of systematic	a) Contributes to and/or manages *complex* engineering project activity, as a member and/or as leader of an engineering team. b) Seeks out the requirements and associated resources and realistically assesses the scope, dimensions, scale of effort and indicative costs of a *complex* engineering project. c) Accommodates relevant contextual issues into all phases of engineering project work, including the fundamentals of business planning and financial management	

approaches to the conduct and management of engineering projects.	d) Proficiently applies basic systems engineering and/or project management tools and processes to the planning and execution of project work, targeting the delivery of a significant outcome to a professional standard. e) Is aware of the need to plan and quantify performance over the full life-cycle of a project, managing engineering performance within the overall implementation context. f) Demonstrates commitment to sustainable engineering practices and the achievement of sustainable outcomes in all facets of engineering project work.	
REFLECTION AREA	**Core Knowledge and Skill Base**	
1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	a) Engages with the engineering discipline at a phenomenological level, applying sciences and engineering fundamentals to systematic investigation, interpretation, analysis and innovative solution of *complex* problems and broader aspects of engineering practice.	
1.2 Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	a) Develops and fluently applies relevant investigation analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the engineering discipline.	
1.3 In depth understanding of specialist bodies of knowledge within the engineering discipline.	a) Proficiently applies advanced technical knowledge and skills in at least one specialist practice domain of the engineering discipline.	
1.4 Discernment of knowledge development and research directions within the engineering discipline.	a) Identifies and critically appraises current developments, advanced technologies, emerging issues and interdisciplinary linkages in at least one specialist practice domain of the engineering discipline. b) Interprets and applies selected research literature to inform engineering application in at least one specialist domain of the engineering discipline.	
1.5 Knowledge of contextual factors impacting the engineering discipline.	a) Identifies and understands the interactions between engineering systems and people in the social, cultural, environmental, commercial, legal and political contexts in which they operate, including both the positive role of engineering in sustainable development and the potentially adverse impacts of engineering activity in the engineering discipline. b) Is aware of the founding principles of human factors relevant to the engineering discipline. c) Is aware of the fundamentals of business and enterprise management. d) Identifies the structure, roles and capabilities of the engineering workforce. e) Appreciates the issues associated with international engineering practice and global operating contexts.	
1.6 Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the engineering discipline.	a) Applies systematic principles of engineering design relevant to the engineering discipline. b) Appreciates the basis and relevance of standards and codes of practice, as well as legislative and statutory requirements applicable to the engineering discipline. c) Appreciates the principles of safety engineering, risk management and the health and safety responsibilities of the professional engineer, including legislative requirements applicable to the engineering discipline. d) Appreciates the social, environmental and economic principles of sustainable engineering practice. e) Understands the fundamental principles of engineering project management as a basis for planning, organising and managing resources. f) Appreciates the formal structures and methodologies of systems engineering as a holistic basis for managing complexity and sustainability in engineering practice.	