

GRADUATE COMPETENCY PROFILES

The following table provides profiles of graduates of three types of tertiary education engineering programmes.

	Attribute	Professional Engineer (Washington Accord)	Engineering Technologist (Sydney Accord)	Engineering Technician (Dublin Accord)	Explanatory notes
	Technical Foundations				
1.	Academic Education	Educational depth and breadth	Four year BE degree	Three year BEng Tech degree	Two year DipEng (Level 6 on NQF)
2.	Knowledge of Engineering Sciences	Understands and can apply the mathematical and engineering sciences relevant to:	One or more of the broad, general engineering disciplines e.g. mechanical, civil or electrical	One or more practice areas within a specific engineering discipline e.g. construction, manufacturing or roading	One or more specialised fields of engineering activity e.g. aircraft maintenance, civil contracting or HVAC
3.	Analysis and Problem Solving	Able to formulate and solve models which predict the behaviour of part or all of:	<i>Complex engineering systems using first principles of the fundamental engineering sciences and mathematics</i>	<i>Broadly defined engineering systems using analytical tools appropriate to their discipline or area of specialisation</i>	<i>Well defined engineering systems using codified methods of analysis specific to their field of engineering activity</i>
4.	Design and Synthesis	Able to synthesise and demonstrate the suitability and efficacy of solutions to part or all of:	<i>Complex engineering problems</i>	<i>Broadly defined engineering problems</i>	<i>Well defined engineering problems</i>
5.	Investigation and Research	Able to recognise when further information is needed and be able to find it by:	Identifying, evaluating and drawing conclusions from all pertinent sources of information. Designing and carrying out experiments	Locating, searching and selecting relevant data from codes, data bases and literature. Designing and carrying out experiments	Locating and searching relevant codes and catalogues. Carrying out standard tests
6.	Risk Management	Understands the accepted methods of dealing with uncertainty (such as safety factors) and the limitations of applicability of methods of design and analysis by being able to:	Identify, evaluate and manage physical risks in <i>complex engineering problems</i>	Identify, evaluate and manage physical risks in <i>broadly defined engineering problems</i>	Identify, evaluate and manage physical risks in <i>well defined engineering problems</i> <i>Confines risk management to the management of physical risk. Risks to be dealt with include both known and unforeseen risks</i>

	Personal Foundations					
7.	Team work	Function effectively in a team by being able to:	Work cooperatively with the capability to lead or manage a team	Work cooperatively and understand team dynamics	Work cooperatively and understand team dynamics	
8.	Communication	Communicate clearly by being able to:	Comprehend and produce effective reports and design documentation, summarise information, make effective oral presentations and to give and receive clear oral instructions	Comprehend and produce effective reports and design documentation, make effective oral presentations and to give and receive clear oral instructions	Interpret reports and design documentation; effectively document their own work; and give and receive clear instructions	
	Supporting Knowledge					
9.	The Engineer and Society	Be aware of the role of engineers and their responsibility to society by:	Demonstrating understanding of the <i>general responsibilities</i> of a professional engineer	Demonstrating understanding of the <i>general responsibilities</i> of an engineering technologist	Demonstrating understanding of the <i>general responsibilities</i> of an engineering technician	<i>There is no level statement in these definitions except that inherent in the word 'professional', 'technician' etc because the extent of responsibility required is defined by the work being done</i>
10.	Management and financial	Understands, selects and applies:	appropriate project and business management principles and tools to <i>complex engineering problems</i>	appropriate project management and costing methods to <i>broadly defined engineering problems</i>	appropriate project management and costing methods to <i>well defined engineering problems</i>	
11.	Practical Knowledge	Demonstrates competency in the practical art of engineering in their area of specialisation by:	Being able to show in design an understanding of the practical methods for the construction and maintenance of engineering products and being able to use modern calculation and design tools competently for <i>complex engineering problems</i>	Being able to interpret the general designs of others to provide detailed, practical designs for construction/production and/or management of construction or maintenance and being able to apply appropriate techniques, resources and current engineering tools for <i>broadly defined engineering problems</i>	Being able to apply appropriate techniques, resources and current engineering tools to well-defined engineering activities with an awareness of their limitations	<i>In the case of software engineering 'construction' does not necessarily mean physical construction</i>

Definitions:

Complex engineering problems means engineering problems which cannot be resolved without in-depth engineering knowledge and having some or all of the following characteristics:

- Involve wide-ranging or conflicting technical, engineering and other issues
- Have no obvious solution and require originality in analysis
- Involve infrequently encountered issues
- Are outside problems encompassed by standards and codes of practice for professional engineering
- Involve diverse groups of stakeholders with widely varying needs
- Have significant consequences in a range of contexts

Broadly defined engineering problems means engineering problems having some or all of the following characteristics:

- Can be solved by application of well-proven analysis techniques
- Are parts of, or systems within complex engineering problems
- Involve a variety of factors which may impose conflicting constraints
- Belong to families of familiar problems which are solved in well-accepted ways
- May be partially outside those encompassed by standards or codes of practice
- Involve several groups of stakeholders with differing and occasionally conflicting needs
- Have consequences which are important locally, but may extend more widely

Well defined engineering problems means engineering problems having some or all of the following characteristics:

- Can be solved in standardised ways
- Are discrete components of engineering systems
- Involve several issues, but with few of these exerting conflicting constraints
- Are frequently encountered and thus familiar to most practitioners in the practice area
- Are encompassed by standards and/or documented codes of practice
- Involve a limited range of stakeholders with differing needs
- Have consequences which are locally important and not far-reaching
- Can be resolved using limited theoretical knowledge but normally requires extensive practical knowledge

General responsibilities of an engineer include:

- Social responsibilities including ethics, health and safety and other legislation
- Cultural responsibilities including, in New Zealand, the Treaty of Waitangi
- Environmental responsibilities including the need for sustainable development and design and legislative responsibilities
- Life long learning