

International Engineering Alliance – Education Accords

Graduate Outcomes Exemplar Statements

As ratified at IEA Biennial meetings Kyoto June 2009

- **Washington Accord – 4+ year Professional Engineer programs**
- **Sydney Accord – 3+ years Engineering Technologist programs**
- **Dublin Accord – 2+ years Engineering Associate programs**

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Accord programme profiles

The following tables provide profiles of graduates of three types of tertiary education engineering programmes. See below for definitions of complex engineering problems, broadly-defined engineering problems and well-defined engineering problems.

Knowledge profile

A Washington Accord programme provides:	A Sydney Accord programme provides:	A Dublin Accord programme provides:
A systematic, theory-based understanding of the natural sciences applicable to the engineering discipline focussed on by the programme	A systematic, theory-based understanding of the natural sciences applicable to the sub-discipline focussed on by the programme	A descriptive, formula-based understanding of the natural sciences applicable in the sub-discipline focussed on by the programme
Conceptually-based mathematics , numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline	Conceptually-based mathematics , numerical analysis, statistics and aspects of computer and information science to support analysis and use of models applicable to the sub-discipline	Procedural mathematics , numerical analysis, statistics applicable in a sub-discipline
A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline	A systematic, theory-based formulation of engineering fundamentals required in an accepted sub-discipline	A coherent procedural formulation of engineering fundamentals required in an accepted sub-discipline
Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for an accepted sub-discipline	Engineering specialist knowledge that provides the body of knowledge for an accepted sub-discipline
Knowledge that supports engineering design in a practice area	Knowledge that supports engineering design using the technologies of a practice area	<input type="checkbox"/> Knowledge that supports engineering design based on the techniques and procedures of a practice area
Knowledge of engineering practice (technology) in the practice areas in the engineering discipline	Knowledge of engineering technologies applicable in the sub-discipline	Codified practical engineering knowledge in recognised practice area.
Comprehension of the role of engineering in society and identifies issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability;	Comprehension of the role of technology in society and identifies issues in applying engineering technology: ethics and impacts: economic, social, environmental and sustainability	Knowledge of issues and approaches in engineering technician practice: ethics, financial, cultural, environmental and sustainability impacts
Engagement with selected knowledge in the research literature of the discipline	Engagement with the technological literature of the discipline	
<i>A programme that builds this type of knowledge and develops the attributes listed below is typically achieved in 4 to 5 years of study, depending on the level of students at entry.</i>	<i>A programme that builds this type of knowledge and develops the attributes listed below is typically achieved in 3 to 4 years of study, depending on the level of students at entry.</i>	<i>A programme that builds this type of knowledge and develops the attributes listed below is typically achieved in 2 to 3 years of study, depending on the level of students at entry.</i>

Graduate Attribute profiles

	Attribute	Differentiating Characteristic	... for Washington Accord Graduate	... for Sydney Accord Graduate	... for Dublin Accord Graduate
1.	Engineering Knowledge	Breadth and depth of education and type of knowledge, both theoretical and practical	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to defined and applied engineering procedures, processes, systems or methodologies.	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to wide practical procedures and practices.
2.	Problem Analysis	Complexity of analysis	Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.	Identify, formulate, research literature and analyse broadly-defined engineering problems reaching substantiated conclusions using analytical tools appropriate to their discipline or area of specialisation.	Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.
3.	Design/development of solutions	Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified	Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	Design solutions for broadly-defined engineering technology problems and contribute to the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
4.	Investigation	Breadth and depth of investigation and experimentation	Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.	Conduct investigations of broadly-defined problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions.	Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements.

5.	Modern Tool Usage	Level of understanding of the appropriateness of the tool	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.	Select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to broadly-defined engineering activities, with an understanding of the limitations.	Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering activities, with an awareness of the limitations.
6.	The Engineer and Society	Level of knowledge and responsibility	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.	Demonstrate understanding of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technology practice.	Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice.
7.	Environment and Sustainability	Type of solutions.	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.	Understand the impact of engineering technology solutions in societal and environmental context and demonstrate knowledge of and need for sustainable development.	Understand the impact of engineering technician solutions in societal and environmental context and demonstrate knowledge of and need for sustainable development.
8.	Ethics	Understanding and level of practice	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.	Understand and commit to professional ethics and responsibilities and norms of engineering technology practice.	Understand and commit to professional ethics and responsibilities and norms of technician practice.
9.	Individual and Team work	Role in and diversity of team	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.	Function effectively as an individual, and as a member or leader in diverse technical teams.	Function effectively as an individual, and as a member in diverse technical teams.

10	Communication	Level of communication according to type of activities performed	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	Communicate effectively on broadly-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions	Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions
11	Project Management and Finance	Level of management required for differing types of activity Note: needs level Statement.	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects in multidisciplinary environments	Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a technical team and to manage projects in multidisciplinary environments
12	Life long learning	Preparation for and depth of continuing learning.	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	Recognize the need for, and have the ability to engage in independent and life-long learning in specialist technologies.	Recognize the need for, and have the ability to engage in independent updating in the context of specialized technical knowledge.

Common Range and Contextual Definitions

Range of Problem Solving

Attribute		Complex Problems	Broadly-defined Problems	Well-defined Problems
1	Preamble	Engineering problems which cannot be resolved without in-depth engineering knowledge, much of which is at, or informed by, the forefront of the professional discipline, and having some or all of the following characteristics:	Engineering problems which cannot be pursued without a coherent and detailed knowledge of defined aspects of a professional discipline with a strong emphasis on the application of developed technology, and having the following characteristics	Engineering problems having some or all of the following characteristics:
2	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues	Involve a variety of factors which may impose conflicting constraints	Involve several issues, but with few of these exerting conflicting constraints
3	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models	Can be solved by application of well-proven analysis techniques	Can be solved in standardised ways
4	Depth of knowledge required	Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and that supports a fundamentals-based first principles analytical approach	Requires a detailed knowledge of principles and applied procedures and methodologies in defined aspects of a professional discipline with a strong emphasis on the application of developed technology and the attainment of know-how, often within a multidisciplinary engineering environment	Can be resolved using limited theoretical knowledge but normally requires extensive practical knowledge
5	Familiarity of issues	Involve infrequently encountered issues	Belong to families of familiar problems which are solved in well-accepted ways	Are frequently encountered and thus familiar to most practitioners in the practice area
6	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering	May be partially outside those encompassed by standards or codes of practice	Are encompassed by standards and/or documented codes of practice
7	Extent of stakeholder involvement and level of conflicting requirements	Involve diverse groups of stakeholders with widely varying needs	Involve several groups of stakeholders with differing and occasionally conflicting needs	Involve a limited range of stakeholders with differing needs
8	Consequences	Have significant consequences in a range of contexts	Have consequences which are important locally, but may extend more widely	Have consequences which are locally important and not far-reaching
9	Interdependence	Are high level problems including many component parts or sub-problems	Are parts of, or systems within complex engineering problems	Are discrete components

Range of Engineering Activities

Attribute		Complex Activities	Broadly-defined Activities	Well-defined Activities
1	Preamble	Complex activities means (engineering) activities or projects that have some or all of the following characteristics:	Broadly defined activities means (engineering) activities or projects that have some or all of the following characteristics:	Well-defined activities means (engineering) activities or projects that have some or all of the following characteristics:
2	Range of resources	Involve the use of diverse resources (and for this purpose resources includes people, money, equipment, materials, information and technologies)	Involve a variety of resources (and for this purposes resources includes people, money, equipment, materials, information and technologies)	Involve a limited range of resources (and for this purpose resources includes people, money, equipment, materials, information and technologies)
3	Level of interactions	Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues	Require resolution of occasional interactions between technical, engineering and other issues, of which few are conflicting	Require resolution of interactions between limited technical and engineering issues with little or no impact of wider issues
4	Innovation	Involve creative use engineering principles and research-based knowledge in novel ways	Involve the use of new materials, techniques or processes in non-standard ways	Involve the use of existing materials techniques, or processes in modified or new ways
5	Consequences to society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation	Have reasonably predictable consequences that are most important locally, but may extend more widely	Have consequences that are locally important and not far-reaching
6	Familiarity	Can extend beyond previous experiences by applying principles-based approaches	Require a knowledge of normal operating procedures and processes	Require a knowledge of practical procedures and practices for widely-applied operations and processes