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4: Seoul Accord Graduate Attributes

ITP New Zealand Degree Accreditation

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Table of Contents

1. Introduction

This document is part of a series of seven documents that make up the ITP Degree Accreditation Document Set. These include:

1. Administrative Guidelines
2. Application Guidelines
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4. **Seoul Accord Graduate Attributes** *(this document)*
5. Submission Forms
6. The ACS and ITPNZ Degree Accreditation Body of Knowledge
7. The ITP Professional Knowledge Curriculum

This document outlines the Graduate Attributes as defined in the Seoul Accord and is globally consistent across the Seoul Accord countries.

The role of professionals who innovate, design, implement and maintain computers, computing systems, and computing applications has become essential to both the economic development of, and the provision of services to, society. Typical computing activities require several roles that are named and recognized in different ways in many jurisdictions.[1] These roles, with a degree of overlap among them, are defined by their respective distinctive competencies.

The development of a computing professional is a continuous learning process. The first stage may be the attainment of an accredited educational qualification, the graduate stage. The second stage, following a period of training and experience, may lead to professional registration, licensure, or some other professional recognition, depending on the country or jurisdiction. In addition, computing professionals are expected to engage in life-long learning in order to maintain and enhance competency throughout their working lives.

Because of the universally essential nature of computer applications and the mobility of professionals across jurisdictional boundaries due to globalization, there is a real need to identify academic programmes that adequately prepare graduates for entry into a computing profession based on generally recognized knowledge and abilities across country and other jurisdictional boundaries. Toward this end, the Seoul Accord is established as a mechanism for recognizing the equivalence of accredited educational qualifications in the development of computing professionals. The Seoul Accord provides for mutual recognition of graduates of accredited programmes[2] among the signatories of the accord. This accord is based on the principle of equivalence of educational preparation for entry to a computing profession, rather than on exact correspondence of content and outcomes of accredited

[1] The term *computing* is used in this document as a discipline in a broad sense, and it includes many other general terms such as *informatics, computing and IT-related,* and *information and communication technology* that may be used elsewhere. It is recognized that different terminology is used in different countries, and that specific titles or designations may have differing legal empowerment or restrictions within individual jurisdictions.

[2] The term *programme* is used in this document to indicate the academic qualification that prepares a graduate for entry into a computing profession. Other terms for the same thing, such as *course*, may be used in some educational systems.

programmes. This document, Seoul Accord Graduate Attributes (SAGA), presents the accord signatories' consensus on the generally-accepted attributes of graduates for programmes included in the accord.

Section 2 of this document provides background, scope, limitations, and the contextual interpretation for the graduate attributes (presented in Section 5). Section 3 provides a number of definitions that form a common basis for understanding the general applicability of the attributes. General range statements are presented in Section 4, and the graduate attributes themselves are listed in Section 5.

2. Background For The Graduate Attributes

2.1. Purpose of Graduate Attributes

The graduate attributes are intended to define the scope and standards for programmes that are recognized by the Seoul Accord, as well as to assist accord signatories and provisional members in developing outcomes-based accreditation criteria for use in their respective jurisdictions. Also, the graduate attributes guide bodies that are currently developing their accreditation systems with a goal of seeking to become signatories of the accord.

Graduate attributes form a set of individually-assessable outcomes that are indicative of a graduate's potential competency. The graduate attributes are exemplars of the attributes expected of a graduate from an accredited programme. Each attribute is a succinct statement of an expected capability, qualified, if necessary, by a range indication appropriate to the type of programme. The attributes identify the characteristics of graduates of all computing programmes that fall within the scope of the Seoul Accord. A signatory may identify additional attributes that differentiate specific programmes accredited by the signatory.

2.2. Limitation of Graduate Attributes

Each signatory defines the criteria against which computing educational programmes are evaluated for accreditation. The accord is based on the principle of equivalent qualification. That is, programmes are not expected to have identical outcomes or content, but rather are expected to produce graduates who are prepared to enter professional careers in computing. The graduate attributes provide a point of reference for accreditation bodies to describe the outcomes of an equivalent qualification. The graduate attributes do not represent "international standards" for accreditation.

2.3. Scope and Organization of Graduate Attributes

In defining the attributes, it is useful to distinguish among various types of post-secondary educational preparation. In conformance with corresponding terminologies employed by the International Educational Accords[3], the graduate attributes contrast the differences among the educational preparation for what will be called the computing professional, the computing technologist, and the computing technician. Each of these categories is unique in the range of problem solving skills and professional competency, and the categories are generally typified by successively less formal educational requirements. For each attribute name, characteristics or abilities relative to the attribute that should be obtained through formal education or training are listed for each of the roles of computing professional, computing technologist, and computing technician. The scope of the Seoul Accord encompasses only those academic programmes that are accredited by accord signatories as preparing graduates for roles as computing professionals.

Each of the attribute statements is formulated for the professional, technologist, and technician using a common stem, with varying additions appropriate to each educational track. For example, for the Knowledge for Solving Computing Problems attribute:

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[3] The International Educational Accords are comprised of the Washington Accord, Sydney Accord, and Dublin Accord (see http://www.washingtonaccord.org/)

- Common Stem: Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization …
- Computing Professional Range: … to the abstraction and conceptualization of computing models from defined problems and requirements.
- Computing Technologist Range: … to defined and applied computing procedures, processes, systems, or methodologies.
- Computing Technician Range: … to a wide variety of practical procedures and practices.

The resulting statements are shown below for this example:

… for Seoul Accord (Computing Professional) graduate	… for Computing Technologist graduate	… for Computing Technician graduate
Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to defined and applied computing procedures, processes, systems, or methodologies.	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to a wide variety of practical procedures and practices.

The range qualifier in several attribute statements uses the notions of complex computing problems, broadly-defined computing problems, and well-defined computing problems or the notions of complex activities, broadly-defined activities, and well-defined activities. These designators for different levels of problem complexity and professional activity are defined in Section 4, and the full set of graduate attribute definitions is given in Section 5.

2.4. Contextual Interpretation

The graduate attributes are stated generically and are applicable to all computing disciplines. In interpreting the statements within a disciplinary context, each individual statement may be amplified and given particular emphasis, but in doing so its substance must not be altered and its individual elements must not be ignored.

3. Definitions Associated With The Graduate Attributes

The **practice area** of a computing professional, computing technologist, or computing technician is defined both by the area of computing knowledge and skills, and by the nature of the activities performed.

A **computing problem** in any domain is one that can be solved by the application of computing knowledge, skills, and generic competencies.

Solution means an effective proposal for resolving a problem, taking into account all relevant technical, legal, social, cultural, economic, and environmental issues and respecting the need for sustainability.

4. Common Range And Contextual Definitions Associated With The Graduate Attributes

4.1. Range of Problem Solving

	Characteristic	A **Complex Computing Problem** is a computing problem having some or all of the following characteristics:	A **Broadly-defined Computing Problem** is a computing problem having some or all of the following characteristics:	A **Well-defined Computing Problem** is a computing problem having some or all of the following characteristics:
1	Range of conflicting requirements	Involves wide-ranging or conflicting technical, computing, and other issues	Involves a variety of factors, which may impose conflicting constraints	Involves several issues, but with few of these exerting conflicting constraints
2	Depth of analysis required	Has no obvious solution, and requires conceptual thinking and innovative analysis to formulate suitable abstract models	Can be solved by application of well-proven analysis techniques	Can be solved in standardised ways
3	Depth of knowledge required	A solution requires the use of in-depth computing or domain knowledge and an analytical approach that is based on well-founded principles	A solution requires knowledge of principles, and applied procedures or methodologies	Can be resolved using limited theoretical knowledge, but normally requires substantial practical knowledge
4	Familiarity of issues	Involves infrequently-encountered issues	Belongs to families of familiar problems, which are solved in well-accepted ways; context may be unfamiliar	Is frequently encountered and thus familiar to most practitioners in the field; context may be unfamiliar
5	Level of problem	Is outside problems encompassed by standards and standard practice for professional computing	May be partially outside those encompassed by standards or standard practice	Is encompassed by standards and/or documented procedures of practice

6	Extent of stakeholder involvement and level of conflicting requirements	Involves diverse groups of stakeholders with widely varying needs	Involves several groups of stakeholders with differing and occasionally conflicting needs	Involves a limited range of stakeholders with differing needs
7	Consequences	Has significant consequences in a range of contexts	Has consequences that are important locally, but may extend to a broader context	Has consequences that are important locally, and usually are not far-reaching
8	Interdependence	Is a high-level problem possibly including many component parts or sub-problems	Is part of, or systems within, a complex computing problem	Is a discrete component of a computing system
9	Requirement identification	Identification of a requirement or the cause of a problem is ill defined or unknown	Identification of a requirement or the cause of a problem is possible from a set of known options	A requirement or the cause of a problem can be determined by well-established ways

4.2. Range of Computing Activities

	Characteristic	A **Complex Computing Activity** is a computing activity or project that has some or all of the following characteristics:	A **Broadly-defined Computing Activity** is a computing activity or projects that has some or all of the following characteristics:	A **Well-defined Computing Activity** is a computing activity or project that has some or all of the following characteristics:
1	Range of resources (people, money, equipment, materials, information, and technologies)	Involves the use of diverse resources	Involves a variety of resources	Involves a limited range of resources
2	Level of interactions	Requires resolution of significant problems arising from interactions among wide-ranging or conflicting technical, computing, contextual, or other issues	Requires resolution of occasional interactions among technical, computing, contextual, and other issues, of which few are conflicting	Requires resolution of interactions between limited technical and computing issues, with little or no impact from broader issues
3	Innovation	Involves creative use of knowledge of computing or domain principles in novel ways	Involves the use of new resources, techniques, or computing processes in innovative ways	Involves the use of existing resources techniques, or computing processes in new ways
4	Consequences to society and the environment	Has significant consequences in a range of contexts	Has consequences that are most important locally, but may extend more widely	Has consequences that are locally important and not far-reaching
5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches	Requires a knowledge of normal operating procedures and processes	Requires a knowledge of practical procedures and practices for widely applied operations and processes

5. Graduate Attributes

The following table provides profiles of graduates of three types of postsecondary educational computing programmes. See Section 4 for definitions of *complex*, *broadly-defined*, and *well-defined* computing problems and activities. Note that the Seoul Accord applies only to the Computing Professional graduate, and that the columns for Computing Technologist and Computing Technician are included for comparative and clarification purposes only.

		Differentiating Characteristic	**… for Seoul Accord (Computing Professional) Graduate**	**… for Computing Technologist Graduate**	**… for Computing Technician Graduate**
1	**Academic Education**	Educational depth and breadth	Completion of an accredited programme of study designed to prepare graduates as computing professionals	Completion of a programme of study typically of shorter duration than for professional preparation	Completion of a programme of study typically of shorter duration than for technologist preparation
2	**Knowledge for Solving Computing Problems**	Breadth and depth of education and type of knowledge, both theoretical and practical	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to defined and applied computing procedures, processes, systems, or methodologies	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to a wide variety of practical procedures and practices

3	**Problem Analysis**	Complexity of analysis	Identify and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines	Identify, formulate, research literature, and solve *broadly-defined* computing problems reaching substantiated conclusions using analytical tools appropriate to the discipline or area of specialization	Identify and solve *well-defined* computing problems reaching substantiated conclusions using codified methods of analysis specific to the field of activity
4	**Design/ Development of Solutions**	Breadth and uniqueness of computing problems, i.e., the extent to which problems are original and to which solutions have previously been identified or codified	Design and evaluate solutions for *complex* computing problems, and design and evaluate systems, components, or processes that meet specified needs	Design solutions for *broadly-defined* computing 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* computing 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
5	**Modern Tool Usage**	Level and appropriateness of the tool to the type of activities performed	Create, select, or adapt and then apply appropriate techniques, resources, and modern computing tools to *complex* computing activities, with an understanding of the limitations	Select and apply appropriate techniques, resources, and modern computing tools to *broadly-defined* computing activities, with an understanding of the limitations	Apply appropriate techniques, resources, and modern computing tools to *well-defined* computing activities, with an awareness of the limitations

6	**Individual and Team Work**	Role in, and diversity of, the team	Function effectively as an individual and as a member or leader of a team 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
7	**Communication**	Level of communicatio n according to type of activities performed	Communicate effectively with the computing community about *complex* computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions	Communicate effectively with the computing community and with society at large about *broadly-defined* computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions	Communicate effectively with the computing community and with society at large about *well-defined* computing activities by being able to comprehend the work of others, document one's own work, and give and understand clear instructions
8	**Computing Professionalism and Society**	No differentiation in this characteristic except level of practice	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to computing technologist practice	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to computing technician practice

9	**Ethics**	No differentiation in this characteristic except level of practice	Understand and commit to professional ethics, responsibilities, and norms of professional computing practice	Understand and commit to professional ethics, responsibilities, and norms of computing technologist practice	Understand and commit to professional ethics, responsibilities, and norms of computing technician practice
10	**Life-long Learning**	No differentiation in this characteristic except level of practice	Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional	Recognize the need, and have the ability, to engage in independent learning for continual development as a computing technologist	Recognize the need, and have the ability, to engage in independent learning for continual development as a computing technician

6. Conclusion

Judgments on the standards of academic qualifications are often subjective. Only in the formal accreditation process is evidence judged against defined criteria. These criteria have become increasingly aligned through international accords, driven by globalisation of computing practice and the accompanying mobility of computing graduates and professionals. The Graduate Attributes listed here comprise a definition by the Seoul Accord of a set of outcomes that typify potential competency and performance on the part of graduates of computing programmes within the scope of the accord. The Graduate Attributes will undoubtedly be refined as the computing discipline and the criteria of the accord signatories evolve.

7. Acknowledgement

This document is an adaptation of a similar document that is used for the Washington Accord, Sydney Accord, and Dublin Accord for engineering, engineering technology, and engineering technician (see http://www.washingtonaccord.org/). The work of the developers of the engineering attributes is gratefully acknowledged as the basis for this document.

Appendix 1: Seoul Accord And ITP Accreditation Requirements

Academic Education	Completion of an accredited programme of study designed to prepare graduates as computing professionals
	The programme must be a NZQF Level 7 Bachelor Degree, or NZQF Level 8 Bachelors Degree with Honours (Section 3.2.3, ITP Accreditation - Document 2 Application Guidelines). The programme should address at least one ICT skill at SFIA level 3 or above in a specific area related to the intended career role (Accreditation requirement Section 3.2.3 (h), ITP Accreditation - Document 2 Application Guidelines). At least half the programme content should be dedicated to coverage of the knowledge and skills required for meeting the ICT-related graduate attributes of the programme (Accreditation requirement Section 3.2.3 (a), ITP Accreditation - Document 2 Application Guidelines). At least one sixth of the required knowledge and skills will be at advanced (generally third year) level (Accreditation requirement Section 3.2.3 (f), ITP Accreditation - Document 2 Application Guidelines). The programme will include a capstone unit in the final year to allow an assessment of the programme objectives, or other appropriate mechanism (Accreditation requirement Section 3.2.3 (c), ITP Accreditation - Document 2 Application Guidelines). The programme will provide a structured learning experience to facilitate a smooth transition to professional practice or further study in the discipline (Accreditation requirement Section 3.2.3 (d), ITP Accreditation - Document 2 Application Guidelines). The structure of a programme should clearly promote a graded transition of learning experiences from a more directed beginning to a more independent learning approach in the final year (Accreditation requirement Section 3.2.3 (g), ITP Accreditation - Document 2 Application Guidelines).

Knowledge for Solving Computing Problems	Apply knowledge of computing fundamentals, knowledge of a computing specialisation, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements
	A graduate would be expected to have ((Accreditation requirement Section 3.2.3 (b), ITP Accreditation - Document 2 Application Guidelines): • **Core Body of Knowledge** : Knowledge shared by all ICT programmes, encompassing (i) ICT problem solving; (ii) Professional knowledge; (iii) Technology building; (iv) Technology resources; (v) Services management; and (vi) Outcomes management. • **ICT Role Specific Knowledge:** Knowledge that is specific to a particular degree programme or ICT discipline, and that is necessary to undertake the intended ICT roles(s); • **Complementary knowledge:** Knowledge that broadens a student's education, enhances employability and prepares graduates for ICT careers in the global economy, and to be of service to society and the local community. Complementary knowledge can include knowledge from business, science, engineering, mathematics, etc. **The Core Body of Knowledge** encompasses: ***(i) ICT problem solving*** This requires knowledge of how to use modelling methods and processes to understand problems, handle abstraction and design solutions. ***(ii) Professional knowledge*** This area includes: • Ethics • Professionalism • Teamwork concepts and issues • Interpersonal communication • Societal issues/Legal issues/Privacy • History and status of discipline ***(iii) Technology building*** This area includes: • Programming • Human-computer interaction • Systems development • Systems acquisition ***(iv) Technology resources*** This area includes: • Hardware and software fundamentals • Data and information management

- Networking

(v) Services management

This area includes:

- Service management
- Security management

(vi) Outcomes management

This area includes:

- IT governance
- IT project management
- Change management
- Security policy

Role Specific Knowledge prepares students for career roles in a particular ICT discipline and SFIA skill. Examples of ICT disciplines include, but are not limited to: Software Engineering, Information Systems, Computer Science and Computer Engineering.

Role-specific knowledge developed by a degree programme should:

- build on the foundational knowledge identified in the Core Body of Knowledge as appropriate;
- share a common focus, providing breadth of treatment within an identified ICT discipline or focus area, and not be a mere collection of unrelated ICT subjects; and
- facilitate the development of intended skills.

Role-specific knowledge will include advanced knowledge that builds on basic knowledge defined in the Core Body of Knowledge. For example a programme that leads to roles such as a Business Analyst (Information Systems) may include an advanced treatment of database systems for application in a business context. This would typically be at a more advanced level than that of the simple data storage and retrieval requirements defined in the Core Body of Knowledge.

In many cases, discipline knowledge will be developed that is not directly identified in the Core Body of Knowledge. For example, knowledge of computer graphics is not required by all ICT professionals, but is likely to be important to those working in computational science or simulation and visualisation.

Demonstrating a Common Focus and Breadth of Treatment

Knowledge developed in a degree programme should constitute that required for a well-defined ICT discipline and SFIA skill. There should be an appropriate breadth of treatment.

Where possible, a recognised body of knowledge for a given discipline should be

	used to demonstrate the common focus and breadth of treatment for a given programme. In those cases where there is no recognised Body of Knowledge for a given discipline and SFIA skill, a custom body of knowledge can be developed. However, doing so is necessarily more complicated and must be justified in supporting accreditation documentation. Developing the custom body of knowledge must be done in strict consultation with an Industry Advisory Panel whose members represent the focus area, and who are potential employers of programme graduates. It is essential to demonstrate that the custom body of knowledge facilitates the holistic development of intended skills and career roles. **Demonstrating Depth of Treatment** Accreditation requirements specify the number of ICT subjects that are required at an advanced level. To demonstrate that a subject is advanced, the subject must (Accreditation requirement Section 3.2.3 (f), ITP Accreditation - Document 2 Application Guidelines): • require pre-requisite knowledge from at least one other subject, the content of which is contained within the body of knowledge • use assessments that demonstrate cognition at the Application Level (Level 3) or higher in Bloom's Taxonomy; however, they should also require elements of analysis, evaluation and synthesis (Levels 4, 5 and 6) of the taxonomy.

Problem Analysis	Identify and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines
	This area requires knowledge of how to use modelling methods and processes to understand problems, handle abstraction and design solutions. This knowledge area is somewhat different in type from the other knowledge areas, as it is seen as an underlying base for all of them. The ability to handle both abstraction and design solutions has been recognised as a fundamental requirement in computing disciplines over a long period (Dahlbom and Mathiassen, 1997; Kramer, 2007; Turner, 1991). There is an expectation that students will be progressively exposed to complex computing problems throughout their programme. Advanced units of study, capstone unit(s) and/or work integrated learning (WIL) would be appropriate venues to demonstrate the student’s ability in addressing complex computing problems (see (Accreditation requirement Section 3.2.3 (d), ITP Accreditation - Document 2 Application Guidelines).

<table>
<tr><td rowspan="2">Design/ Development of Solutions</td><td>Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs</td></tr>
<tr><td>A graduate would be expected to have (Accreditation requirement Section 3.2.3 (b), ITP Accreditation - Document 2 Application Guidelines):

Core Body of Knowledge : Knowledge shared by all ICT programmes, encompassing (i) ICT problem solving; (ii) Professional knowledge; (iii) Technology building; (iv) Technology Resources; (v) Services management; and (vi) Outcomes management.
ICT Role Specific Knowledge: Knowledge that is specific to a particular degree programme or ICT discipline, and that is necessary to undertake the intended ICT roles(s);
Complementary knowledge: Knowledge that broadens a student's education, enhances employability and prepares graduates for ICT careers in the global economy, and to be of service to society and the local community. Complementary knowledge can include knowledge from business, science, engineering, mathematics, etc.

The application of this knowledge to design and develop solutions for complex computing solutions would be demonstrated by:

The programme should address at least one ICT skill at SFIA level 3 or above in a specific area related to the intended career role (Accreditation requirement Section 3.2.3 (h), ITP Accreditation - Document 2 Application Guidelines).
At least half the programme content should be dedicated to coverage of the knowledge and skills required for meeting the ICT-related graduate attributes of the programme(Accreditation requirement Section 3.2.3 (a), ITP Accreditation - Document 2 Application Guidelines).
At least one sixth of the required knowledge and skills will be at advanced (generally third year) level (Accreditation requirement Section 3.2.3 (f), ITP Accreditation - Document 2 Application Guidelines).
The programme includes a capstone unit in the final year to allow an assessment of the programme objectives (Accreditation requirement Section 3.2.3 (c), ITP Accreditation - Document 2 Application Guidelines).
The programme provides a structured learning experience to facilitate a smooth transition to professional practice or further study in the discipline (Accreditation requirement Section 3.2.3 (d), ITP Accreditation - Document 2 Application Guidelines).
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<table>
<tr><td rowspan="2">Modern Tool Usage</td><td>Create, select, or adapt and then apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations</td></tr>
<tr><td>The methods and tools that are used for handling abstraction could vary a great deal with the specific ICT discipline, from circuit diagrams to data modelling tools to business process modelling.

It is important to recognise this area because it captures some of the creativity and</td></tr>
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	innovation that is required of computing professionals, and the excitement that is present in their jobs. Recognising this component also assists in identifying what is unique about ICT and what differentiates it from other disciplines. In no other discipline is there such an emphasis on developing artefacts (e.g., computer and information systems) which are so abstract and complex and where modelling tools and methods are so essential. The systems that ICT professionals deal with cannot be seen or handled in the same simple and direct manner as products of other practical disciplines (e.g., buildings, bridges, chairs, drugs). Consequently, highly developed problem solving skills and the need for methods to handle abstraction and modelling are absolutely vital. The expectation that graduates will have this skill is seen in the ICT Professional Body of Knowledge – Core Body of Knowledge (both in Professional Knowledge and Problem Solving) as well as in Role Specific Knowledge (see also Accreditation requirement Section 3.2.3 (b), ITP Accreditation - Document 2 Application Guidelines).

Individual and Team Work	Function effectively as an individual and as a member or leader of a team in multi-disciplinary settings
	Teamwork concepts and issues Topics covered should include: collaboration, group dynamics, leadership styles, conflict resolution, team development and groupware. This area is covered in the ICT Professional Body of Knowledge – Core Knowledge Area: Professional Knowledge (see also (Accreditation requirement Section 3.2.3 (b), ITP Accreditation - Document 2 Application Guidelines).

Communication	Communicate effectively with the computing community about *complex* computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions
	Communication Topics covered should include: oral and written presentations, technical report writing, writing user documentation and the development of effective interpersonal skills. This area is covered in the ICT Professional Body of Knowledge – Core Knowledge Area: Professional Knowledge (see also (Accreditation requirement Section 3.2.3 (b), ITP Accreditation - Document 2 Application Guidelines).

Computing Professionalism and Society	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice
	Professionalism Topics covered should include: • Basic concepts of professionalism (expertise, certification, competence, autonomy, excellence, reflection, responsibility and accountability); and • ICT specific professionalism issues. **Societal issues** Topics covered should include: privacy and civil liberties, environmental and sustainability issues, computer crime, intellectual property and legal issues. **History and status of discipline** Professionals should have some knowledge of where and when their discipline began and how it has evolved, in addition to understanding of ongoing issues in the discipline. **Governance and organisational issues** Topics covered should include: • Fundamental governance principles (eg. structures to encourage moral behaviour within organisations and corporations, and moral behaviour by organisations and corporations); • ICT specific governance issues, including ICT management and ICT value assessment; • Organisational context, including business processes, organisational culture and change management; and • Security policy. This area is covered in the ICT Professional Body of Knowledge – Core Knowledge Area: Professional Knowledge (see also (Accreditation requirement Section 3.2.3 (b), ITP Accreditation - Document 2 Application Guidelines).

Ethics	Understand and commit to professional ethics, responsibilities, and norms of professional computing practice
	Ethics Topics covered should include: • Fundamental ethical notions (virtues, duty, responsibility, harm, benefit, rights, respect and consequences); • Basic ethics theories; • Integrity systems (including the IIPT Code of Professional Conduct, the ITP Code of Practice, ethics committees and whistle blowing); • Methods of ethical analysis; • Methods of ethical reflection; • Methods and procedures of ethical repair and recovery; and • ICT specific ethical issues (professional – e.g. compromising quality and conflict of interest, and societal – e.g. phishing and privacy. This area is covered in the ICT Professional Body of Knowledge – Core Knowledge Area: Professional Knowledge (see also (Accreditation requirement Section 3.2.3 (b), ITP Accreditation - Document 2 Application Guidelines).

Life-long Learning	Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.
	A graduate would be expected to develop the skills for long-life learning throughout the programme (see Accreditation requirement Section 3.2.3 (g), ITP Accreditation - Document 2 Application Guidelines).