

Benchmarking of the Building and Construction Authority's (BCA) Academic Programmes: Final Report

On behalf of the Singapore Building and Construction Authority Academy

Submitted by UK NARIC

The National Recognition Information Centre for the
United Kingdom

The national agency responsible for providing information and expert opinion on
qualifications and skills worldwide

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Commercial in confidence

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Executive Summary

The Building and Construction Authority (BCA) Academy, Singapore, commissioned UK NARIC to undertake a benchmarking study of a selection of the BCA Academy's programmes in the architecture, engineering and construction (AEC) sector. In undertaking this study, UK NARIC has employed a tailored methodological process based on the core principles of credential evaluation. This considered the identifiable learning outcomes; programme structure and content; qualification entry requirements; duration; modes of learning and assessment; quality assurance mechanisms; and associated outcomes. The full methodology can be found in Section 3 of this report.

The study has addressed two key areas: an analysis of the BCA Academy qualifications in the context of the national education system in Singapore through comparative analysis with awards offered by Singapore's polytechnics; and an analysis of the qualifications in an international context through comparisons against the Qualifications and Credit Framework (QCF) in England and the Australian Qualifications Framework (AQF) with both England and Australia being popular destinations for Singaporeans.

It is envisaged that through the comparative review and benchmarking of the BCA Academy's qualifications against established standards both in Singapore and internationally, the study will facilitate greater understanding and recognition of the qualifications outside of the national AEC sector.

Six of the BCA Academy's diploma programmes were examined against the core components and content of polytechnic diplomas in Singapore. The study revealed notable differences in the content and breadth of study between many of the diplomas offered by the BCA Academy and those offered in polytechnics, reflecting the varying aims and objectives of the programme. To accurately reflect these differences within the assessment results, it was necessary to employ three distinct comparability statements:

- not comparable;
- of a comparable level to the polytechnic diploma; and
- comparable to a particular polytechnic diploma.

The latter statement was applied only where the BCA programme displayed a notional 75% coverage of the content prescribed for the polytechnic diplomas. This applied to the following qualifications:

Table 1: Comparable BCA Academy and polytechnic qualifications

BCA Academy Diploma	Comparability with Singaporean Polytechnic Diplomas
Diploma in Mechanical Engineering (Green Building Technology)	Is considered comparable to the Diploma in Green Building and Sustainability awarded by Temasek Polytechnic
Diploma in Design (Interior and Landscape)	Is considered comparable to the Diploma in Interior Architecture and Design, Temasek Polytechnic

The remaining BCA Academy diplomas were found to be of a comparable level to the polytechnic diplomas. More information on the assessment of individual awards is presented in Section 6 of the report.

Comparison of the BCA Academy programmes against the QCF revealed close alignment with QCF level 4 with certain elements of the programme approaching level 5 due to the specialised nature of the programmes and the focus on developing supervisory and certain management duties. Comparison against the AQF was more complex in that the AQF descriptors were found to be notably more prescriptive than those outlined in the QCF. The analysis found that the diplomas were broadly comparable in terms of expected generic knowledge, skills and competencies prescribed at level 5 of the AQF. Furthermore the learning outcomes associated with those modules which are common to all BCA Academy diplomas correspond closely with those expected on completion of the AQF Diploma.

In summary, the report finds the BCA Academy diplomas to be of comparable academic standing to their polytechnic counterparts, comparable to level 5 of the AQF, and between levels 4 and 5 of the English QCF. Qualifications prepare students with the necessary subject-knowledge and study skills to enable articulation into Bachelor degrees in relevant subjects in Singapore, England and Australia, at institutional discretion.

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1. Context

The BCA Academy has a long history of training workers for the construction industry beginning in 1984 with the establishment of the Construction Industry Training Centre (CITC) which was renamed the Construction Industry Training Institute (CITI) in 1994 and finally the BCA Academy in 2007. As the education, training and research arm of Singapore's Building and Construction Authority, it offers a wide range of programmes including sector-specific certification programmes, diplomas, specialist diplomas, and Bachelor and Master's degrees in the architecture, engineering and construction (AEC) sector and related disciplines.

Whilst the BCA Academy programmes and qualifications are understood and well recognised within the AEC sector, the recognition of the awards is limited on a national level as they do not fall under the supervision of the Ministry of Education but the Ministry of National Development. To address this, the BCA is seeking an analysis of the Academy's qualifications against national standards through a benchmarking study of a number of its diplomas against existing awards in Singapore.

The BCA is also interested in placing the Academy's qualifications into an international context as many successful qualification holders may seek employment overseas. Analysis of training provision within Australia and England – two common destinations amongst Singaporeans – will help determine the standing of the selected BCA Academy awards in an international context, and highlight similarities and differences between sectoral training in the respective countries. Australia and the UK have also been selected in view of the similarities between the two systems and the vocational education system in Singapore. Moreover, the level of provision and quality assurance process in these two countries are well developed, ensuring that the qualifications are reliable benchmarks of quality against which the BCA awards can be compared.

It is envisaged that through the comparative review and benchmarking of the BCA Academy's diploma programmes against established domestic and overseas standards, the study will facilitate greater understanding and recognition of the BCA Academy programmes nationally and internationally, and to potentially inform further development of the qualifications, as appropriate.

2. Scope

This study focused on the following six awards offered by the BCA Academy:

- Diploma in Construction Engineering;
- Diploma in Strategic Facilities Management;
- Diploma in Construction Information Technology;
- Diploma in Electrical Engineering and Clean Energy;
- Diploma in Design (Interior and Landscape); and
- Diploma in Mechanical Engineering (Green Building Technology).

The report is divided into two main focal points: national analysis and evaluation; and international comparison.

The national analysis section of the report compares the level and content of the BCA Academy awards to a number of diplomas provided by recognised polytechnics in Singapore in the AEC and related sectors. Comparative analysis will highlight similarities and differences in relation to the content provision of other AEC qualifications.

The international analysis section considers the structure of the English and Australian national education systems with reference to training provision in the sector. The findings can then be used to discern the comparable academic standing of the BCA Academy diplomas in the English and Australian contexts for the purpose of articulation to undergraduate degree programmes in these countries.

The findings of this analysis will provide an overseas context against which the BCA Academy awards can be viewed, with potential for a subsequent, in-depth study of provision in a broader global context to be conducted in the future.

Section 3 outlines the methodological process through which the benchmarking exercise was undertaken.

Section 4 provides an overview of the BCA Academy qualifications, isolating the qualifications' core components in preparation for comparative analysis with national qualifications and international standards.

Section 5 aims to provide background contextual information on polytechnic education provision in Singapore while assessment of the BCA Academy diplomas against a selection of polytechnic diplomas is detailed in Section 6.

Sections 7 and 8 present an analysis of the BCA Academy qualifications against levels within the English and Australian education systems respectively, with reference to the national frameworks and broad qualification provision within the AEC sector.

Section 9 summarises the key project findings derived from Sections 4 to 8, offering qualitative judgements on the standing of the BCA Academy diplomas in Singapore, England and Australia.

3. Methodology

UK NARIC has developed a secure methodological process for benchmarking qualifications based upon the core principles of credential evaluation.

The process used to evaluate international qualifications has been quality assured by the UK NARIC Advisory Council and Quality Standards Group. Both of these committees include key representatives from bodies such as the Quality Assurance Agency (QAA), the Department for Business, Innovation and Skills (BIS) and the Inter Professional Group. Input from these bodies helps ensure that UK NARIC's methodology and evaluation criteria are fair, transparent and able to stand up to scrutiny.

This section outlines the methodological approach taken by UK NARIC in order to:

- identify relevant qualifications from Singapore polytechnics for comparison;
- compare the BCA Academy awards against selected Singaporean qualifications;
- establish the benchmark level of the BCA Academy awards in the English and Australian contexts.

3.1 Identification of Singaporean AEC awards

To provide a balanced assessment of comparability within the national context, it was first necessary to identify suitable benchmarks within the Singaporean education system against which the BCA Academy qualifications could be reliably compared. As such each of the six BCA Academy awards was to be critically and comparatively analysed against a number of diplomas from the Singapore polytechnics.

UK NARIC conducted an initial review of the BCA Academy awards to determine the scope and breadth of content. Initial desk-based research then served to identify a selection of diplomas in relevant fields. In consultation with the BCA Academy, those qualifications deemed most appropriate for benchmarking and comparison, focusing on quality and industry recognition, were selected for analysis.

3.2 Benchmarking and mapping of the BCA Academy awards against identified Singaporean awards

This stage involved the analysis and assessment of the BCA Academy awards against those qualifications identified in the previous phase with consideration of qualification design and delivery as well as associated quality assurance mechanisms.

3.2.1 Qualification Design and Delivery

Central to the analysis of the BCA Academy and polytechnic qualifications was an in-depth understanding of the qualification design. Accordingly, an examination of the awards' core components and features focused on:

- entry requirements;
- duration;
- programme structure and content;
- modes of learning and assessment;
- identifiable learning outcomes;
- quality assurance mechanisms; and
- associated outcomes.

Entry requirements

Qualification entry requirements are a useful basis for comparison given that they demonstrate the general academic level of the students upon entry to the programme. This in turn provides an indication of the standard of study students should be capable of completing successfully.

Duration

Duration is an important consideration as it provides an indication of the volume of study and the amount of knowledge which may be attained by the individual upon completion of the qualification. It should be noted that although duration constitutes an important criterion in the evaluation of a qualification, it is not considered to be an overriding factor as it must be balanced with consideration of the aims, structure and level of specialisation of the programme.

Programme structure and content

The next stage in the qualification design analysis was examination of programme structure and the balance of theoretical and practical elements within the programme; content; and breadth of study.

These components of the BCA Academy diplomas were reviewed in relation to the selected Singaporean qualifications and the results documented in a series of tables that demonstrate how each of the BCA Academy's awards compare against those from the polytechnics in Singapore, highlighting areas of convergence and divergence in content provision. A number of programmes contained elective units which, although included in the mapping tables, did not impact the overall score awarded for content coverage since these units would not be taken by every student.

It was recognised, however, that the BCA Academy qualifications are specific in nature, with many other institutions integrating popular interdisciplinary subjects into their AEC programmes. While there are, in Singapore, a number of polytechnic diplomas in the field of mechanical and electrical engineering, awards which specifically cover fields such as construction engineering and construction information technology are offered by the BCA Academy alone. It follows then that, for the purposes of this study, more weight was placed on assessing the comparability of the core components, specifically in terms of admission standards, general learning outcomes and progression routes integral to the design of both the BCA Academy and polytechnic qualifications.

Modes of learning

It was also important to take into account the varying modes of learning and their role in developing a student's knowledge and competencies in the field to enable fair comparison with the BCA Academy diplomas against qualifications of a similar type.

Identifiable learning outcomes

The term "learning outcome" is used to identify the key skills that candidates are expected to be able to demonstrate upon successful completion of the qualification. Some awards refer to this in terms of competency statements that are intended to reflect what a successful candidate is able to achieve. Learning outcomes are used to highlight candidate competency and ability in each unit of study and at each level.

A comparison of the generic and subject-specific learning outcomes presented for the BCA Academy and polytechnic awards, where available, informed the benchmarking results.

Associated outcomes / rights attached

Associated outcomes were also considered where appropriate, with particular reference to access on to further / continued study programmes, the entitlement to professional rights or occupational outcomes relevant to the award holders.

3.2.2 Quality Assurance Mechanisms

This involved a review of the quality assurance mechanisms which apply to both the BCA Academy and the polytechnics in Singapore.

3.2.3 Establishing qualification comparability

The final phase of this section of the project involved a summary of the comparability of each BCA Academy diploma against polytechnic standards using the accumulated knowledge and key findings of the comparative analysis.

To indicate comparability with the Singaporean polytechnic awards, the following statements were used:

- Is considered comparable to *[qualification / qualification level]*

This statement applies where strong alignment was observed between the qualifications' core components and a notional 75% of the polytechnic diploma's content had been addressed by the respective BCA Academy diploma.

- Is considered to be of a comparable level to *[qualification / qualification level]*

This statement applies where broad comparability was discerned between the qualifications' core components sufficient to conclude the qualifications are of comparable academic level but where the content of the qualifications is different.

- Is not considered comparable to *[qualification / qualification level]*

This was used in cases where the BCA Academy qualification was not deemed to align sufficiently in terms of content, level and outcomes to the selected qualification or qualification level.

3.3 Establishing the benchmark level of the BCA Academy awards in the English and Australian contexts

In order to demonstrate the academic standing of the BCA Academy diplomas outside of the national context, UK NARIC also examined qualification provision in Australia and England.

Once again, the UK NARIC methodology for qualification benchmarking was applied, using the core components of the BCA Academy awards against English and Australian qualification standards as defined within the Qualifications and Credit Framework (QCF) and the Australian Qualifications Framework (AQF) respectively.

This considered generic framework level descriptors, core competencies expected at those levels and the core knowledge, understanding and skills holders of qualifications at these levels should be capable of demonstrating. This was supported through examination of content and subject-specific outcomes for qualifications in the field at appropriate levels.

4. Review of the BCA Academy Qualifications

4.1 BCA Academy Qualification Design

The focus of this study will be on the six aforementioned diplomas offered by the BCA Academy. This section provides a detailed overview of the programmes.

Entry requirements

Primarily intended for school leavers, the Diplomas require one of the following for admission:

- three GCE O Levels (English Grade 1-7, Mathematics Grade 1 – 6 and a relevant subject Grade 1 – 6)¹;
- Higher National Institute of Technical Education Certificate (Higher NITEC); or
- GCE N Levels and NITEC with a minimum GPA of 2.75 in a relevant discipline

The BCA Academy also looks to recruit students with either good level general skills or a good score in a vocational qualification who are committed to developing their career by undertaking further specialised study in construction and engineering disciplines to improve their skill set and increase their career opportunities.

Duration

The diplomas, when taken as full-time programmes, involve three years' full-time study with the associated learning hours ranging from 2,417 to 3,080 hours depending on the subject.

Mode of Learning and Assessment

A range of assessment methods are used to test students' knowledge, understanding and the ability to apply that knowledge through written examinations comprising multiple-choice, short answer and extended essay questions; projects and presentations.

Programme Content, Breadth of Study and Learning Outcomes

The BCA Academy endeavours to provide students with the skills and knowledge required to either continue into further related study in higher education or to gain work by providing them with clear employable skills and a distinct professional orientation.

¹ Additional combined science; combined science; integrated science; physical science; physics; science (physics and biology); science (physics, chemistry); science (physics, chemistry, biology); design and technology; art; history; geography; and principles of accounting.

The programmes open a range of career prospects in related industries and often allow articulation into Bachelor degrees in Engineering and related subjects in Singaporean and selected international universities.

The content and subject-specific learning outcomes vary according to the diploma in question and as such are examined in more detail within the sub-sections on the respective diplomas.

Quality Assurance

The BCA is a statutory board under the Ministry of National Development. The BCA Academy is the education and training section of the BCA. The BCA Academy also has an advisory panel which, with the aim of advising on training programme curricula and institution strategies, comprises representatives from Singapore's universities (Nanyang Technological University, National University of Singapore and Singapore Management University), BCA Board Members and other relevant industry stakeholders.

The Academy also has detailed internal quality assurance measures and monitoring procedures which serve to ensure consistency in standards, delivery and assessment across the board.

4.2 Diploma in Construction Engineering

Qualification purpose, structure and identified learning outcomes

The Diploma in Construction Engineering is a three-year full-time programme that aims to equip students with knowledge of current construction technologies and the ability to:

- perform and supervise effectively the construction works on site;
- plan and schedule construction effectively to achieve high productivity and minimize delay;
- perform simple designs relating to reinforced concrete, precast and pre-stressed concrete and steel construction;
- manage the safety aspects of construction; and
- apply the management and financial know-how for business.

Associated outcomes

This diploma has a number of associated outcomes in terms of both professional and academic progression, offering a number of career prospects as:

- Assistant Project Engineer;
- Assistant Design Engineer;
- Suite Engineer;
- Laboratory Technician; and
- Sales Executive.

In terms of academic rights, holders of the Diploma in Construction Engineering may be considered eligible for articulation into Bachelor degrees offered by certain universities in Singapore and Australia. Relevant fields include:

- civil engineering;
- environmental engineering;
- construction management / quantity surveying; and
- construction management and economics.

Upon successful completion of this award, holders will additionally be awarded the Certificate of Successful Completion on Internal Audit (QEHS) on Quality ISO9001, Environmental 14001 and Health and Safety OHSAS 18001.

4.3 Diploma in Construction Information Technology

Qualification purpose, structure and identified learning outcomes

The Diploma in Construction Information Technology (DCIT) is three years in duration. It covers topics such as Computer Aided Design (CAD); software engineering; building design and services and construction technology with the aim of training student to employ 3-D technology and IT skills in the building sector. It includes a 16-week industrial attachment.

Upon completion of the Diploma, students should be able to:

- develop building drawings and documentation conforming to industry standards and practices through the use of Building Information Modelling (BIM);
- analyse design of building by integrating various building services and applying productive design and construction coordination through BIM solution; and
- manage data integrity from design to construction and facility management.

Associated outcomes

Successful completion of the programme develops career prospects in a range of professions specialising in Building Information Modelling.

Holders of the award may be eligible for credit exemption in Bachelor degree programmes in relevant fields at university discretion.

4.4 Diploma in Design (Interior and Landscape)

Qualification purpose, structure and identified learning outcomes

The Diploma in Design (Interior and Landscape) is a three-year full-time programme covering interior and landscape design theory and practice in the context of the construction industry. Upon successful completion, holders will be able to creatively integrate design with construction technology creatively and present design schemes.

Associated outcomes

On completion, graduates will also be awarded the Certificate of Successful Completion in Internal Audit (QEHS) on Quality ISO9001, Environmental 14001 and Health and Safety OHSAS 18001.

Holders may be eligible for admission to a Bachelor degree programme in related subjects such as Design Studies; Interior Design and Interior Architecture.

4.5 Diploma in Electrical Engineering and Clean Energy

Qualification purpose, structure and identified learning outcomes

The Diploma in Electrical Engineering and Clean Energy is a three year programme designed to provide students with a solid grounding in electrical engineering and renewable energy along with softer skills in design and communication through theory-based classes, a final year project and an industrial attachment in the third year. It aims to develop students' competencies in the field so that on completion, students are able to assist engineers and managers in:

- designing, operating and maintaining of electrical services for buildings;
- performing and supervising effectively the various electrical works on-site;
- performing energy auditing works;
- designing and commissioning grid-tied and stand-alone photovoltaic systems;
- conserving and optimising energy usage in buildings.

Associated outcomes

Students can gain the title of Singapore Certified Energy Manager (Associate) and a Certificate of Successful Completion in Internal Audit (QEHS) on Quality ISO9001, Environmental 14001 and Health and Safety OHSAS 18001. Holders of the Diploma in Electrical Engineering may be able to access further studies such as the Bachelor of Construction Project Management at the University of Technology Sydney, Australia.

4.6 Diploma in Mechanical Engineering (Green Building Technology)

Qualification purpose, structure and identified learning outcomes

Upon successful completion of the Diploma in Mechanical Engineering (Green Building Technology), students should possess knowledge of mechanical and electrical green building technologies and be able to:

- perform and supervise mechanical and electrical works effectively;
- contribute to an organisation's execution of environmental and quality programmes;
- contribute to the design, fabrication, modification and commissioning of green facilities; and
- apply management and financial know-how of business to the industry.

Associated outcomes

On completion, graduates will be awarded the Singapore Certified Energy Manager (Associate) and the Certificates of Completion in Green Mark Manager Programme; Fire Safety Manager Programme and the Gas Technology Programme. They will also be eligible for further studies in Bachelor of Engineering degree programmes (particularly in Architectural or Mechanical streams) at institutional discretion.

4.7 Diploma in Strategic Facilities Management

Qualification purpose, structure and identified learning outcomes

The Diploma in Strategic Facilities Management aims to develop the following abilities in students to:

- formulate and implement strategic facilities management and maintenance policies to achieve efficient resource utilisation;
- create an environment that meets human physiological needs;
- formulate and implement practices to achieve high level of environmental sustainability;
- plan, manage and market events; and
- apply management and financial know-how of business to the industry.

Associated outcomes

Upon completion, graduates will, in addition, be awarded the following qualifications:

- Certificate of Completion in Fire Safety Manager Programme;
- Singapore Certified Energy Manager (Associate); and
- Certificate of Successful Completion in Internal Audit (QEHS) on Quality ISO9001, Environmental and Health and Safety OHSAS 18001.

5. Polytechnic Education Provision in Singapore

5.1 Overview of polytechnic education

This study includes the five polytechnics in Singapore which are overseen by the Higher Education Division of the Singaporean Ministry of Education:

- Singapore Polytechnic;
- Ngee Ann Polytechnic;
- Nanyang Polytechnic;
- Temasek Polytechnic; and
- Republic Polytechnic.

At the time of writing this report, **Singapore Polytechnic**, established in 1954, offered approximately 100 programmes across a range of subjects and levels. The Polytechnic comprises 10 academic schools specialising in: architecture and the built environment; business; chemical and life sciences; communication, arts and social sciences; design; digital media and infocomm technology; electrical and electronic engineering; mechanical and aeronautical engineering; mathematics and science; and maritime education.

Ngee Ann Polytechnic, inaugurated in 1963, has nine schools and provides qualifications in: business and accountancy; engineering; film and media studies; health sciences; humanities and social sciences; infocomm technology; interdisciplinary studies; life sciences and chemical technology as well as general lifelong learning programmes through its Continuing Education and Training Academy.

Nanyang Polytechnic has been in operation since early 1992, offering students programmes in the fields of: engineering; information technology; design; business management; health sciences; chemical and life science; and interactive and digital media.

Since its creation in 1990, **Temasek Polytechnic** has expanded its initial provision of three programmes to its current provision of 53 full time diplomas and over 40 part time qualifications across a range of levels in the areas of information technology; engineering; humanities; business; design and applied sciences.

Having first enrolled students in 2003, **Republic Polytechnic** is Singapore's newest polytechnic. It offers both full-time and part-time programmes in a broad range of subject areas including applied science; engineering; hospitality; info communications; sports, health and leisure; and technology for the arts.

Education provided by the polytechnics is intended to be practice-oriented, equipping polytechnic graduates with the necessary skills and knowledge in their chosen field for the workplace. Entry is typically based on O levels or National or Higher National Institute of Technical Education (ITE) Certificates (NITEC / Higher NITEC). Programme duration and outcomes vary according to the qualification level.

5.2 Identified awards for comparison

An initial review of education provision in Singapore's five polytechnics revealed that while general qualifications in engineering and design are available, qualifications specifically addressing construction information technology are not available outside of BCA Academy provision and that programmes specifically relating to construction engineering and strategic facilities management are also in short supply. The BCA Academy's Diploma in Interior Design (Interior and Landscape) in particular is heavily focused on landscaping and very specific to the AEC sector and as such only two relevant diplomas in Singapore were identified.

Through consideration of broad subject content correlation and consultation with the BCA Academy, the following awards were selected for comparison:

Table 2: Singapore polytechnic programmes selected for comparative analysis

BCA Academy Programme	Relevant Programmes	Awarding Institution
Diploma in Construction Engineering	Diploma in Civil Engineering with Business	Singapore Polytechnic
	Diploma in Architecture	Singapore Polytechnic
	Diploma in Sustainable Urban Design and Engineering (Architecture Specialisation)	Ngee Ann Polytechnic
Diploma in Construction Information Technology	Diploma in Green Building and Sustainability	Temasek Polytechnic
	Diploma in Sustainable Urban Design and Engineering	Ngee Ann Polytechnic
	Diploma in Architecture	Singapore Polytechnic
Diploma in Design (Interior and Landscape)	Diploma in Interior Design	Singapore Polytechnic
	Diploma in Interior Architecture and Design	Temasek Polytechnic
Diploma in Electrical Engineering and Clean Energy	Diploma in Electrical Engineering	Ngee Ann Polytechnic
	Diploma in Clean Energy	Singapore Polytechnic
	Diploma in Electrical Engineering with Eco-Design	Nanyang Polytechnic
Diploma in Mechanical Engineering (Green Building Technology)	Diploma in Mechanical Engineering	Ngee Ann Polytechnic
	Diploma in Green Building and Sustainability	Temasek Polytechnic
	Diploma in Renewable Energy Engineering	Republic Polytechnic
Diploma in Strategic Facilities Management	Diploma in Hotel and Leisure Facilities Management	Ngee Ann Polytechnic
	Diploma in Hotel and Leisure Facilities Management (Property and Facilities Stream)	Singapore Polytechnic
	Diploma in Integrated Facility Management	Temasek Polytechnic

6. Comparative Analysis with Singaporean Polytechnic Qualifications

6.1 Diploma in Construction Engineering

This section examines the Diploma in Construction Engineering offered by the BCA Academy against awards provided by Singapore Polytechnic and Ngee Ann Polytechnic.

6.1.1 Diploma in Civil Engineering with Business, Singapore Polytechnic

Entry Requirements

There are a number of entry routes into the Diploma in Civil Engineering with Business, offered by Singapore Polytechnic. These include:

- GCE 'O' level English language grade 1-7, Mathematics grade 1-6 and a further relevant subject i.e. scientific or technological grade 1-6;
- GCE 'A' level General paper (English Medium) A-E or Knowledge and Inquiry Grades A-E, Any Mathematics grade A-E and Physics grade A-E;
- UEC Qualification with English, Mathematics and a science grades 1-6;
- Higher NITEC in an Engineering or Technological discipline with a minimum Grade Point Average of 2.0; and
- NITEC Qualification with at least an 'N' level qualification in a Drafting or Technological discipline with a minimum GPA of 3.5.

Programme Structure and Content

The Diploma in Civil Engineering with Business is modular in nature and run over three years. The programme is broad-based and multi-disciplinary providing students with training in civil engineering within the context of a business environment. Mathematics, business and communication skills are developed as part of the qualification. The aim of the programme is to prepare graduates to set up and run their own civil engineering businesses.

Students complete introductory modules in the first year and progressively build on their knowledge in the second and third years prior to undertaking electives and project work in the third year. The programme includes a 12-week internship and there is an option to take a Diploma-Plus programme for high performing students.

The table below indicates areas of similarity between this award and the BCA Academy Diploma in Construction Engineering:

Table 3: Diploma in Civil Engineering from Singapore Polytechnic

Diploma in Civil Engineering with Business subjects:	Covered by BCA Academy Diploma?	Diploma in Civil Engineering with Business subjects:	Covered by BCA Academy Diploma?
Core Subjects:			
Geomatics 1 and GIS	Yes. CE015	Critical Reasoning and Persuasion	Yes. ID861
Economics	No	Basic Mathematics	Yes. CE904
Structural Mechanics	Yes. CE023	CE Project 1	No
Virtual Construction Simulation and CAD 1	No. Partial coverage is offered by CE812 which provides students with basic knowledge and skills of interpreting drawings and drawing techniques but it is not clear that CAD is covered by this module or others within the programme.	RC Design and CAD	Yes. CE813

Introduction to Civil Engineering and Building 1	Yes. This is a 75 hour module covering the full cycle of a building project. Partial coverage is offered by CE049, a 30 hour module introducing building construction methods. The other elements of the polytechnic module including project management are also covered with the BCA Academy diploma.	Structural Analysis	Yes. CE024
Virtual Construction Simulation and CAD2	No. CE011 may introduce similar concepts however it does not appear to address CAD, the fundamental part of the Singapore Polytechnic module.	Safety, Health and Environmental Management	Yes. CE614
Introduction to Civil Engineering and Building 2	No	CE Construction and Measurement	Yes. CP244
Hydrology and Hydraulics	No	Transportation Engineering	No
Communication Skills	Yes. ID862	Geomatics 2 and GPS	No
Critical Reasoning and Argumentation	Yes. ID860	Water technology	Yes. CE020
Accounts and Finance	No	Social Innovation Project	No
Independent Study Project and Presentation	Yes. ID911	Engineering Mathematics 2	Yes. CE905

Construction Law	No. Partial coverage is provided by ID917, a 30-hour module introducing various aspects of business law but the polytechnic module is longer and specialises in the legal aspects of construction project management.	CE Project 2	No
Structural Inspection and Repair	Yes. CE041/CP041	Civil Engineering Project Management	Yes. FA712
Steel design and CAD	No. Partial coverage through CE022 however CAD is not an explicit feature within the BCA Academy diploma unit.	Geotechnical Engineering	Yes. CE020
Internship Programme	Yes. ID912	Communication Skills for Work	Yes. ID862
Elective Options 3.1			
Green Building Technology	No	Higher Mathematics	No
Elective Options 3.2			
ABC Waters Design	No	Entrepreneurship	No
Approximate coverage of core subjects:		59%	
Approximate overall content coverage:		56%	

Modes of Learning and Assessment

The programme is delivered through a mixture of class-based theory and practical application in that classroom teaching is supplemented with tutorials in small groups

and practical sessions in the laboratory. Assessment is through examination, practical and theoretical, project work and report writing.

Identifiable Learning Outcomes

Upon completion, students should be able to:

- build structures with concrete, timber and steel;
- solve problems by analysing beams, structures and calculating stresses and strains;
- design pipelines and open channels to convey water;
- explore the use of computer software to manage projects; and
- acquire knowledge of Workplace Safety legislation and environmental control.

Rights Attached

Graduates are certified by the Building and Construction Authority as Resident Technical Officers to supervise structural works.

Graduates may also obtain direct entry into the second year of the four-year civil engineering degree programme in the National University of Singapore and Nanyang Technological University.

Summary

Despite differences in the programme content, the BCA Academy Diploma in Construction Engineering is broadly comparable to the Diploma in Civil Engineering with Business awarded by Singapore Polytechnic. Both programmes have very similar entry requirements, a duration of three years, and a programme content which seeks to enable students (on completion) to demonstrate competent design and construction skills set against an understanding of current industry standards and business practice. Mathematics and technical communication are also of vital importance as is the project and internship.

On completion candidates of both programmes are ready for certification as Resident Technological Officers.

6.1.2 Diploma in Architecture, Singapore Polytechnic

Entry Requirements

Admission to the Diploma in Architecture offered by Singapore Polytechnic is based on the following:

- GCE 'O' level or UEC English language grade 1-7, Mathematics grade 1-7 and a further two 'O' levels in any subject;
- Higher NITEC in an Engineering or Technological discipline with a minimum Grade Point Average of 2.0; or
- NITEC Qualification with at least an 'N' level qualification in a specific Drafting/Design or Technological discipline with a minimum GPA of 3.5.

Programme Structure and Content

The Diploma programme comprises 21 modules studied over the programme of three years. It is broad in nature and provides students with training in design, presentation and knowledge of architectural history and theory to prepare graduates for a career in architecture. Students complete introductory modules in the first year and progressively build on their knowledge in subsequent years prior to undertaking their 12-week internship and project work.

The following table illustrates how the BCA Academy Diploma in Construction Engineering compares, in terms of content, with the Diploma in Architecture:

Table 4: Comparative analysis of programme content: Diploma in Architecture from Singapore Polytechnic

Diploma in Architecture subjects	Covered by BCA Academy Diploma?	Diploma in Architecture subjects	Covered by BCA Academy Diploma?
Architectural Design Studio	Yes. CE812	Architectural Design Studio 2	No
History and Theory of Architecture 1	No	History and Theory of Architecture 2	No
Materials and Architectural Technology 1	Yes. CE012	Materials and Architectural Technology 2	Yes. The content of this module is covered across various modules in the Diploma in Construction Engineering including CE018 and CE251.

Environmental Science 1	No	Environmental Science 2	No
Computer-Aided Design and Presentation	No. Concepts of 2-D and 3-D design are covered in CE813 however the Singapore polytechnic unit places greater focus on design practice	Communication Skills for Work	Yes. ID862
Report writing and presentation	Yes. ID862	Social Innovation Project	No
Oral Communication	Yes. ID862	Independent Study Project and Presentation	Yes. ID911
Critical Reasoning and Argumentation	Yes. ID860	Materials and Architectural Technology 3	No
Critical Reasoning and Persuasion	Yes. ID861	Environmental Science 3	No. Although building systems are addressed in unit FA205, the focus of the Singapore Polytechnic modules is placed more heavily on the impact of these systems on the environment.
Architectural Practice	No	Internship Programmes	Yes. ID912
		Architectural Design Studio 3	No
Approximate content coverage:		48%	

Modes of Learning and Assessment

The programme is fully integrated with 100% in-programme assessment and offers learning opportunities in architectural design and technology within the regional and global context. Students are exposed to design primers and year-long projects. They learn and work in design studios and participate in out-of-classroom activities locally and overseas.

Identifiable Learning Outcomes

Upon completion of the Diploma in Architecture, students should be able to:

- demonstrate knowledge and understanding of design and the fundamentals of specific materials and associated codes and practices for working with them;
- articulate architectural design ideas drawing on knowledge of design theory and environmental and technical requirements;
- conceptualise and develop architectural forms using appropriate technology; and
- undertake pre-contract, contract and post-contract administration processes and procedures within the context of a building project.

Rights Attached

There are no specific rights attached to the Diploma in Architecture however there are a number of employment options related to architecture and students may be able to access the second or third year of a Bachelor degree in architecture at institutional discretion.

Summary

The Diploma in Architecture, offered by Singapore Polytechnic and the Diploma in Construction Engineering awarded by the BCA Academy share a similar broad base. Design principles, knowledge of materials, knowledge of use of layout and the sustainability of building design are all important concepts shared by the qualifications. As well as technical skill and knowledge, both qualifications expose their students to independent research, communication skills and industry practice. Specific content coverage accounts for 33% meaning that the qualifications cannot be considered directly comparable however an analysis of the level and complexity of the content along with the awards' other core components revealed comparability in the level of the two qualifications.

6.1.3 Diploma in Sustainable Urban Design and Engineering (Architecture Specialisation), Ngee Ann Polytechnic

Entry Requirements

Admission is based on the applicants' O level results which should include:

- English language grade 1 – 7;
- mathematics grade 1 – 6; and
- one of the following with grade 1 – 6:
 - science
 - computer studies
 - design and technology
 - fundamentals of electronics.

Programme Structure and Content

The Diploma in Sustainable Urban Design and Engineering is a three year, broad-based programme, providing students with training in the planning, design and development of the built environment. Depending on the stream, graduates should be prepared for a particular career either in architecture or as technical officers with knowledge of sustainable technologies. Students complete introductory modules in the first year and progressively build on their knowledge in the second year by undertaking their two-month internship before pursuing a particular option in the third year.

As illustrated in the following table, the BCA Academy's Diploma in Construction Engineering provides some coverage of the core content however the Diploma in Sustainable Urban Design and Engineering places more focus on interdisciplinary studies.

Table 5: Comparative analysis of programme content: Diploma in Sustainable Urban Design and Engineering from Ngee Ann Polytechnic

Diploma in Sustainable Urban Design and Engineering subject:	Covered by BCA Academy Diploma?	Diploma in Sustainable Urban Design and Engineering subject:	Covered by BCA Academy Diploma?
Compulsory Core Units:			
Green Transportation	No	Urban Conservation and Refurbishment	No
Building Behaviour Studies 1	Yes. CE041	Project Management	Yes. FA712
Sustainable Building Design	Yes. CE011	Workplace Safety and Health	Yes. CE614, CE713
Design Communications	Yes. ID862	Communication Toolkit	Yes. ID862
Engineering Mathematics 1	Yes. CE904	Building Behaviour Studies 2	Yes. CE024
Idea Jumpstart	No	Infrastructure Works	Yes. CE011
Sports and Wellness	No	Two-month Internship	Yes. ID912
Sustainable City Planning	No	Interdisciplinary Studies (IS) module	No
Building Systems Design	Yes. CE011	Professional Practice	Yes. ID912

Structure and Fabric	Yes. CE012	Engineering Mathematics 2	Yes. CE905
Computer Aided Design 1	Yes. CE812		
Compulsory Specialisation Modules (Architecture):			
Integrated Building Systems	Yes. CE612	Architectural Materials and Technology	Yes. CE012
Landscape Design	No	Interior Design and Space Planning	No
History and Theory of Architecture*	No	Computer Aided Design 2	Yes. CE812
Design Studio 1	Yes. CE812	Engineering Mathematics 3	No
Design Studio 2	Yes. CE813	Design Studio 3	Yes. CE812
Approximate content coverage:		68%	

Modes of Learning and Assessment

The programme is delivered through taught classes and design studios and assessed through in-programme assessment.

Identifiable Learning Outcomes

Graduates of this Diploma should possess fundamental knowledge of:

- structural analysis;
- architectural history and principles; and
- codes and practices for urban design.

They should be able to design two- and three-dimensional structures and measure concrete, earth and brick works.

Rights Attached

Holders of the Diploma in Sustainable Urban Design and Engineering may pursue a degree in fields such as architecture; civil engineering; construction management; project and facilities management with advanced standing available at a number of established universities both in Singapore and overseas.

Summary

The BCA Academy Diploma compares closely to the Diploma in Sustainable Urban Design and Engineering for those modules which relate directly to construction and professional practice however the polytechnic programme includes specific training on business and other interdisciplinary modules providing it with a broader focus than

the BCA Academy Diploma in Construction Engineering. As such, comparability can be confirmed in terms of level but not in content.

6.1.4 Comparability of the BCA Academy Diploma in Construction Engineering

Based on the above analysis of the Diploma in Construction Engineering, the following comparability statements are offered:

Table 6: Comparability of the BCA Academy Diploma in Construction Engineering to Singaporean polytechnic qualifications

BCA Academy Diploma	Comparability with Singaporean Polytechnic Diplomas
Diploma in Construction Engineering	Is considered to be of a comparable level to the Diploma in Civil Engineering with Business offered by Singapore Polytechnic.
	Is considered to be of a comparable level to the Diploma in Architecture offered by Singapore Polytechnic.
	Is considered to be of a comparable level to the Diploma in Sustainable Urban Design and Engineering (Architecture Specialisation) offered by Ngee Ann Polytechnic.

6.2 Diploma in Construction Information Technology

6.2.1 Diploma in Green Building and Sustainability, Temasek Polytechnic

Entry Requirements

Admission to the Diploma in Green Building and Sustainability is usually based on results in the O levels. Students should hold a grade of:

- English with grade 1 – 7;
- mathematics 1 – 6;
- science; and
- passes in two other subjects.

Programme Structure and Content

The programme involves three years of full-time study. The range of modules studied ensures the student attains a broad but solid foundation in environmentally-friendly construction techniques; sustainability; engineering mathematics and building management and control systems as follows:

Table 7: Comparative analysis of programme content: Diploma in Green Building and Sustainability from Temasek Polytechnic

Diploma in Green Building and Sustainability subject	Covered by BCA Academy Diploma?	Diploma in Green Building and Sustainability subject	Covered by BCA Academy Diploma?
Writing and Oral Presentation	Yes. ID862	Engineering Mathematics 1	Yes. CE904
Introduction to Effective Communication	Yes. ID862	Engineering Mathematics 2	No
Applied Principles for Effective Living 1 (APEL 1)	Yes. ID860	Problem-solving and Process Skills	No
Applied Principles for Effective Living 2 (APEL 2)	No	Computer Programming	No
Applied Principles for Effective Living 3 (APEL 3)	No	Introduction to Green Development	Yes. TA842 and FA617
Organisational Communication	No	Building Information Modelling	Yes. TA859
Student Internship Programme	Yes. ID911	Project Management	Yes. FA712
Career Communication	Yes. ID862	Building Management Systems	Yes. TA864

Computer-Aided Design and Building Specifications	Yes. DL858/TA132	Building Control Systems	Yes. TA843
Fundamentals of Clean Energy	Yes. FA617	Fire and Life Safety Management	No
Circuit Analysis	No	Air Conditioning and Mechanical Ventilation	Yes. SC523
Digital Fundamentals	No	Hydraulics and Drives	No
Electrical Services for Facilities	Yes. FA205	Green Building Modelling and Simulation	Yes. TA842 FA617
Total Building Performance	Yes. SC523	Sustainable Design	Yes. FA617
Energy Management and Audit	No	Sustainable Facility Management	Yes. TA842 TA873
Green Strategies for Building Systems	Yes FA617	Major Project	Yes ID911
Approximate content coverage:		66%	

Modes of Learning and Assessment

Programme delivery is predominantly class-based with assessment undertaken by examination, programme work and practical placement.

Identifiable Learning Outcomes

Upon completion of the programmes, students should be able to demonstrate sound knowledge of:

- building practice and design
- green building construction practices with a view to:
 - performing energy audits;
 - reducing environmental impact of buildings and
 - increasing the efficiency of resource use.

Rights Attached

The Diploma prepares students for careers including but not limited to:

- Green Building Consultant;
- Energy Consultant or Engineer;
- Marketing or Business Development Manager in energy and environmental solution projects.

According to the School of Engineering website², advanced standing has been awarded to Diploma holders by a number of universities. The amount of advanced standing varies according to the institution and the programme for which the individual is applying but typically is up to one year. Of particular note is the possibility to obtain a Bachelor (Honours) degree in Building Services Engineering at Northumbria University in England within 11 months.

Summary

The BCA Academy Diploma in Construction Information Technology provides similar content to the Diploma in Green Building and Sustainability although it falls below the notional threshold of 75% for direct comparability. The programme offered by Temasek Polytechnic has greater coverage of green environmental design practices such as “Fundamentals of Green Energy and Energy Management” while the BCA Academy programme places more focus on computer databases. The modules covered teach comparable technical skill and knowledge however there is a considerable proportion of modules which are not covered, preventing direct comparability of the qualification.

6.2.2 Sustainable Urban Design and Engineering (Architecture Specialisation), Ngee Ann Polytechnic

Entry Requirements

Entry to the Diploma in Sustainable Urban Design and Engineering is based on students' achievement at O level, specifically in:

- English language with grade 1 – 7;
- mathematics with grade 1 – 6;
- one of the following with grade 1 – 6:
 - science (grade 1-6);
 - computer studies;
 - design and technology;
 - fundamentals of electronics.

Programme Structure and Content

The programme is three years in duration and comprises a broad range of modules that provide students with training in design, presentation and knowledge of architectural history and theory, and 2- and 3-D computer software design to prepare students for a career in architecture. Students complete introductory modules in the first year and progressively build on their knowledge as the programme progresses prior to undertaking a 12-week internship and project work in the third year.

² http://www-eng.tp.edu.sg/eng_home/eng_courses/eng_ft_courses/eng_gbs_home/eng_gbs_further_studies.htm

Table 8: Comparative analysis of programme content: Diploma in Sustainable Urban Design and Engineering (Architecture Specialisation) from Ngee Ann Polytechnic

Diploma in Sustainable Urban Design and Engineering subject:	Covered by BCA Academy Diploma?	Diploma in Sustainable Urban Design and Engineering subject:	Covered by BCA Academy Diploma?
Core Units:			
Green Transportation	No	Urban Conservation and Refurbishment	No
Building Behaviour Studies 1	No	Project Management	Yes. FA712
Sustainable Building Design	Yes. TA842	Workplace Safety and Health	No
Design Communications	Yes. ID862	Communication Toolkit	Yes. ID862
Engineering Mathematics 1	Yes. CE904	Building Behaviour Studies 2	No
Idea Jumpstart	No	Infrastructure Works	No
Sports and Wellness	No	Two-month Internship	Yes. ID912
Sustainable City Planning	No	Interdisciplinary Studies (IS) module	No
Building Systems Design	Yes. FA205	Professional Practice	Yes. ID912
Structure and Fabric	Yes. CE011	Engineering Mathematics 2	No
Computer Aided Design 1	Yes. DL858		
Specialisation modules (Architecture):			
Integrated Building Systems	Yes. FA205	Architectural Materials and Technology	Yes. CE011
Landscape Design	No	Interior Design and Space Planning	No
History and Theory of Architecture	No	Computer Aided Design 2	Yes. CE812
Design Studio 1	Yes. TA835	Engineering Mathematics 3	No
Design Studio 2	Yes. DL816	Design Studio 3	No
Approximate content coverage:		48%	

Modes of Learning and Assessment

The programme is fully integrated with 100% in-programme assessment and offers learning opportunities in architectural design and technology within the regional and global context. Students are exposed to design primers and year-long projects. They learn and work in design studios and participate in out-of-classroom activities locally and overseas.

Identifiable Learning Outcomes

Upon completion, students should be able to:

- formulate architectural design ideas for environments with influence from design theory and environmental and technical requirements;
- learn the fundamentals of specific materials;
- appreciate codes and practices for working with water; and
- explore technology in the conceptualisation and the development of architectural forms and detailing.

Students will also, during the programme, develop competency regarding Pre-Contract, Contract and Post-Contract administration procedures of a building project

Rights Attached

Upon graduation, holders of the Diploma in Sustainable Urban Design and Engineering may apply for entry to Bachelor degree studies in related fields. Universities which have previously awarded advanced standing to holders of this diploma include:

- Nanyang Technological University;
- National University of Singapore;
- RMIT University, Australia;
- University of Strathclyde, UK;
- Heriot-Watt University, UK; and
- University of Newcastle upon Tyne, UK.

Summary

There is more focus in the BCA Academy Diploma in Construction Information Technology on IT programme creation and information management. The Ngee Ann Diploma in Sustainable Urban Design and Engineering is more focused on software usage to support environmental, green energy usage and construction design; however, the majority of units have comparable learning outcomes and train their graduates to a comparable level allowing broad lines of comparability to be drawn between the programme levels.

6.2.3 Diploma in Architecture, Singapore Polytechnic

Entry Requirements

Admission to the Diploma in Architecture is open to holders of:

- levels or UEC, with suitable passes in:
 - English language,
 - mathematics and
 - two further subjects;
- Higher NITEC in an Engineering or Technological discipline with a minimum Grade Point Average of 2.0
- the NITEC with at least an 'N' level qualification in a specific Drafting / Design or Technological discipline and with a minimum GPA of 3.5

Programme Structure and Content

The three-year, modular programme is broad in nature, aiming to provide students with a solid grounding in design, presentation and knowledge of architectural history and theory, 2 and 3-D design and core skills for work such as communication and report writing. The following table illustrates the extent of coverage by the BCA Academy Diploma in Construction Information Technology:

Table 9: Comparative analysis of programme content: Diploma in Architecture from Singapore Polytechnic

Diploma in Architecture subject	Covered by BCA Academy Diploma?	Diploma in Architecture subject	Covered by BCA Academy Diploma?
Architectural Design Studio 1	Yes. CE812	Architectural Design Studio 2	Yes. TA132 TA134
History and Theory of Architecture 1	No	History and Theory of Architecture 2	No
Materials and Architectural Technology 1	Yes. The core content of this unit is met across a range of BCA Academy modules including CE046 and TA132	Materials and Architectural Technology 2	Yes. The core content of this modules is covered by a combination of modules including CE046; CE049 and TA132
Environmental Science 1	No	Environmental Science 2	No
Computer-Aided Design and Presentation	Yes. TA835 DL858	Communication Skills for Work	Yes. ID862

Report writing and presentation	Yes. ID862	Social Innovation Project	No
Oral Communication	Yes. ID862	Independent Study Project and Presentation	Yes. ID911
Critical Reasoning and Argumentation	No	Materials and Architectural Technology 3	Yes. TA134
Critical Reasoning and Persuasion	No	Environmental Science 3	No
Architectural Practice	No	Internship Programmes	Yes. ID912
		Architectural Design Studio 3	No. This unit centres on design for high-rise buildings however the design modules offered by the BCA Academy diploma focus on medium-rise.
Approximate content coverage		52%	

Modes of Learning and Assessment

The programme is fully integrated with 100% in-course assessment and offers learning opportunities in architectural design and technology within the regional and global context. Students are exposed to design primers and extended projects. They learn and work in design studios and participate in out-of-classroom activities locally and overseas.

Identifiable Learning Outcomes

A number of subject-specific learning outcomes are implied by the programme content including the student's:

- ability to formulate architectural design ideas for environments with influence from design theory and environmental and technical requirements
- knowledge of working with specific materials and
- knowledge of working with codes / practices in relation to water supply etc.
- awareness of administration procedures at various stages of a building project, Pre-Contract, Contract and Post-Contract.

Rights Attached

Graduates from the Diploma in Architecture will have a range of career prospects related to architectural consulting both in the private sector and within government agencies. In terms of academic progression, holders may gain access to the second or third year of degree programmes in architecture.

Summary

Although broad comparability can be discerned in terms of programme admission and other core qualification components, the content of the BCA Academy Diploma in Construction Information Technology and the Diploma in Architecture offered by Singapore Polytechnic is markedly different with a little over half the content of the Singapore Polytechnic programme covered within the Diploma in Construction Information Technology syllabus. The focus of the BCA Academy programme is more on database creation, information modelling and information management rather than construction and design.

6.2.4 Comparability of the BCA Academy Diploma in Construction Information Technology

Based on the above analysis of the Diploma in Construction Information Technology, the following comparability statements are offered:

Table 10: Comparability of the BCA Academy Diploma in Construction Information Technology to Singaporean polytechnic qualifications

BCA Academy Diploma	Comparability with Singaporean Polytechnic Diplomas
Diploma in Construction Information Technology	Is considered to be of a comparable level to the Diploma in Green Building and Sustainability of Temasek Polytechnic.
	Is considered to be of a comparable level to the Diploma in Sustainable Urban Design and Engineering (Architecture Specialisation) awarded by Ngee Ann Polytechnic.
	Is considered to be of a comparable level to the Diploma in Architecture from Singapore Polytechnic.

6.3 Diploma in Design (Interior and Landscape)

6.3.1 Diploma in Interior Design, Singapore Polytechnic

Entry Requirements

Admission to the Diploma in Interior Design is generally open to holders of:

- O levels with passes in:
 - English language (as a first language) with grades of 1 – 7;
 - mathematics (elementary / additional) with grades of 1 – 7;
 - any two subjects passed with grades 1 – 6.
- Higher NITEC in a relevant subject with a GPA of 3.0
- NITEC in a relevant subject with a GCE N level and a GPA of 3.5

Programme Structure and Content

The programme comprises an expected 2,445 learning hours divided across six semesters. The final year involves a 30 hour professional practice module and a 240 hour project/industrial attachment.

The following table provides an overview of the programme curriculum highlighted areas of convergence and divergence between the BCA Academy Diploma and the Diploma in Interior Design.

Table 11: Comparative analysis of programme content: Diploma in Interior Design from Singapore Polytechnic

Diploma in Interior Design subject:	Covered by BCA Academy Diploma?	Diploma in Interior Design subject:	Covered by BCA Academy Diploma?
Oral Communication	No	Interior Drawing Studio	Yes. DL810
Critical Reasoning and Argumentation	Yes. Broad coverage of content is achieved through ID860	Industrial Training Programme	Yes. ID920
Visual Arts Studio	Yes. Broad coverage is obtained through modules DL807 and DL808	Report Writing and Presentation	Yes. ID862
Foundation Design Studio	Yes. DL104	Communication Skills for Work	Yes. ID862
Basic Drawing Class	Yes. DL810	Independent Study Project and Presentation	Yes. ID911

Graphic Communication	Yes. DL101	Theory of Design II	No. Following on from the “History and Theory of Ideas” module, this module focuses on the history of Western architectural thought with considerable in-depth study of built and theoretical works through independent research. Partial coverage would be provided by DL104 and DL106 however these modules do not appear to require the level of research and depth included here.
History and Theory of Ideas 1	No. DL106 may develop similar skills however there are some differences in the focus of the module. DL106 is focused more generally on evolving ideas in design and the cultural, social, environmental factors which impact on development rather than specific historical perspectives.	Interior Design Studio 2	No. Partial coverage is achieved through DL125 and DL127 however this unit of the Diploma in Interior Design also centres on understanding associated branding and marketing.
Critical Reasoning and Persuasion	Yes. ID861	Interior Design Communication 2	Yes. Broad coverage is achieved through TA835.
Social Innovation Project	No	Materials and Technology 2	Yes. DL107

Experience Design Methods	Yes DL101	Theory of Design 3	No
Interior Design Studio 1	Yes. This is covered by a range of modules, including DL104	Interior Design Studio 3	Yes. Broad coverage through D126, D127, and D128
Interior Technology 1	Yes – DL107 and DL108	Interior Design Practice	Yes. DL421
Interior Design Communications	Yes – DL807 and DL808	Materials and Technology 3	No
Approximate content coverage		73%	

Modes of Learning and Assessment

Students are tested through continuous assessment. The programme provides a solid grounding in design and technology theory which is then developed through a project and practical classes.

Identifiable Learning Outcomes

The Diploma in Interior Design aims to develop student's creativity and design through a project-based programme so that upon completion students will understand and be able to:

- integrate design theory and technology into detailed and high quality designs;
- conceptualise creative spatial environments using a range of techniques including 3-D models and digital technologies; communicate designs through multimedia; and
- manage project implementation.

Rights Attached

Graduates who perform well may be eligible for advanced standing within a university undergraduate degree. All graduates should be suitably prepared to work in interior design whether in a designer or project manager capacity.

Summary

Although, with coverage at 73%, the BCA Academy Diploma in Design addresses a substantial proportion of the content for Singapore Polytechnic's Diploma in Interior Design, the analysis revealed some differences in terms of content breadth. The BCA Academy programme focuses on interior and landscape design principles and practice while the award offered by Singapore Polytechnic combines these elements

with basic marketing and business so that students' design concepts reflect commercial needs and viability.

6.3.2 Diploma in Interior Architecture and Design, Temasek Polytechnic

Entry Requirements

The most common admission route to the Diploma in Interior Architecture and Design is through successful completion of O levels in English Language and mathematics and three other subjects. Students must also have undertaken at least one of the following subjects:

- science (combined or single subject);
- art / art and design;
- computer studies;
- creative 3-D animation;
- design and technology;
- engineering science;
- food and nutrition;
- fundamentals of electronics; or
- media studies (English).

Programme structure and content

The polytechnic programme considers interior architecture and design across all types of building including standard and specialised residential properties; leisure facilities; schools and workplaces. The following table highlights similarities and differences in diploma content:

Table 12: Comparative analysis of programme content: Diploma in Interior Architecture and Design from Temasek Polytechnic

Diploma in Interior Architecture and Design subject:	Covered by BCA Academy Diploma?	Diploma in Interior Architecture and Design subject:	Covered by BCA Academy Diploma?
Communicating Design Ideas	Yes. ID862	Architectural Design Theory	Yes. CE049/DL101/ DL106
Applied Principles for Effective Living 1	Yes. ID860	Digital Media Visualisation and Presentation	Yes. TA835
Applied Principles for Effective Living 2	No	Portfolio Development	Yes. DL421
Applied Principles for Effective Living 3	No	IAD Project 1	Yes. DL104
Professional Communication for Design	Yes. ID862	IAD Project 2	Yes. DL104

Student Internship Program	Yes. ID911	Construction and Detailing	Yes. CE049
Communicating Design Arguments	Yes. ID862	Building Codes and Standards	Yes. CE612
Media Techniques and Presentation	Yes. DL810/TA835	IAD Project 3	Yes. DL125/DL126
Digital Architectural Drafting	Yes. DL807/DL808	IAD Project 4	Yes. DL107/DL108
Form Exploration	Yes. DL104	Museum and Exhibition Studies	No
Materials and Finishes	Yes. CE049/DL107	Sustainable Environment	No
Design Fundamentals	Yes. DL101	Major Project	Yes. ID911
Approximate content coverage:		83%	

Modes of Learning and Assessment

The programme is delivered through a series of lectures, seminars, studio-based sessions and online seminars and student progress and performance evaluated through continuous assessment and project work.

Identifiable Learning Outcomes

The programme aims to provide students with knowledge of:

- the use of space and its elements within commercial, office, educational and cultural/entertainment buildings;
- how to balance function and appeal within any space;
- colours, materials, lighting, media, shapes and forms; and
- presentation media to communicate design ideas with a variety of clients.

Rights Attached

The programme provides professional competencies associated with the provision of interior design services in corporate, events and exhibition, retail, hospitality and residential settings. Specific and formal academic progression routes are not defined however as a diploma holder, graduates may be eligible for admission to further studies at university level.

Summary

The BCA Diploma in Interior Architecture and Design aligns closely with the Diploma in Interior Architecture and Design, with over 80% of the latter's subject content

covered. The modes of learning and typical progression routes available upon completion are also comparable.

6.3.4 Comparability of the BCA Academy Diploma in Design (Interior and Landscape)

Based on the above analysis of the Diploma in Design (Interior and Landscape), the following comparability statements are offered:

Table 13: Comparability of the BCA Academy Diploma in Design (Interior and Landscape) to Singaporean polytechnic qualifications

BCA Academy Diploma	Comparability with Singaporean Polytechnic Diplomas
Diploma in Design (Interior and Landscape)	Is considered to be of a comparable level to the Diploma in Interior Design at Singapore Polytechnic
	Is considered comparable to the Diploma in Interior Architecture and Design offered by Temasek Polytechnic

6.4 Diploma in Electrical Engineering and Clean Energy

6.4.1 Diploma in Electrical Engineering, Ngee Ann Polytechnic

Entry Requirements

Admission is based on the candidate's O Level results:

- English language with grade 1 – 7 (or 1 – 6 for English as a Second Language);
- Mathematics with grade 1 – 6;
- One of the following with grade 1 – 6:
 - science;
 - computer studies;
 - design and technology
 - fundamentals of technology.

Programme Structure and Content

The programme commences with a broad foundation in electrical, electronic and computer engineering, with students becoming gradually more specialised as the programme progresses. There are five possible specialisations in the final year:

- audio-visual technology;
- electronics;
- engineering management;
- power engineering; and
- solar technology.

Table 14: Comparative analysis of programme content: Diploma in Electrical Engineering from Ngee Ann Polytechnic

Diploma in Electrical Engineering subject	Covered by BCA Academy Diploma?	Diploma in Electrical Engineering subject	Covered by BCA Academy Diploma?
Electrical Technology	Yes. EA274	Engineering Mechanics	Yes. FA028
Computer Programming	Yes. TA821	Engineering Mathematics 1	Yes. CE904
Sports and Wellness	No	Idea Jumpstart	No
Analogue Electronics and Applications	Yes. EA837	AC Circuits	Yes. EA277
Electrical and Electronic Practical Skills	No	Computer-Aided Drawing	Yes. DL858
Engineering Mathematics 2	Yes. CE904 and CE905	Digital Electronics and Practice	Yes. TA831

Communication and Contemporary Issues	No. Partial coverage is provided by ID862 however the polytechnic module also explores contemporary social/community issues which do not appear to be addressed within the BCA Academy diploma.	Electric Circuit Analysis and Measurement	Yes. EA277
Electrical Machines and Drives	Yes. EA278	PLC and Applications	Yes. EA223
Microcontroller and Applications	Yes. TA845	Sensors and Instrumentation	No. Partial coverage is provided by EA223.
Idea Blueprint	No	Electronic Devices and Circuits	Yes. Coverage provided through a combination of EA837, TA831 and EA282.
Engineering Mathematics 3A	No	Power Devices and Applications	No. Partial coverage is provided by EA282 although it is unclear from the module description whether the module includes applied practice. The polytechnic module covers construction of controllers, use of electronic workbench instruments and trouble-shooting techniques.

PC Networking	No. Partial coverage may be provided by but clear coverage of data networking; Open System Interconnection reference model; Transmission Control Protocol/Internet Protocol; structured cabling system standards, media types and performance criteria was not evident.	Digital Systems and Applications	No. Partial coverage is however, offered by TA831.
Advanced PLC and Networking	No	Idea Launchpad	No
World Issues: A Singapore Perspective	No	Interdisciplinary subjects (3)	No
Approximate content coverage (core modules):		50%	

Power Engineering Option			
Electrical Installation Design	Yes. Broad coverage provided by EA224 and SC524.	Power Distribution and Protection	No
Control and Automation	Yes. EA223	Elective Discipline Module ^[1]	Some coverage may be provided depending on the elective chosen.
Approximate content coverage (core content plus Power Engineering option):		52%	

^[1] (Engineering Contract and Project Management, Power System Economics and Energy Market, Power Electronics or Design and Operation of Photovoltaic Systems)

Engineering Management Option			
Electrical Installation Design	Yes. Broad coverage provided by EA224 and SC524.	Engineering Contract and Project Management	No. Coverage of core skills in project management would be met (FA712) but subject focus is different.
Power System Economics and Energy Market	Yes. ID824 and SC519	Elective Discipline Module ^[2]	Some coverage may be provided depending on the elective.
Approximate content coverage (core content plus Engineering Management option):		52%	

Solar Technology Option			
Solar Cell Technology	No. Basic partial coverage may be provided by EA515.	Photovoltaic Technology	Yes. EA515 and EA280
Design and Operation of Photovoltaic Systems	Yes. EA 280	Elective Discipline Module ^[3]	Some coverage may be provided depending on the elective chosen.
Approximate content coverage (core content plus Solar Technology option):		52%	

Modes of Learning and Assessment

The polytechnic programme is delivered through a mixture of classroom-based theoretical study and practical application both through practical seminars and a six month internship in the final year. Comparatively where certain modules in the Diploma in Electrical Engineering from Ngee Ann Polytechnic focus on practice, the BCA Academy diploma, as described within the programme synopsis, appears to place greater emphasis on developing students' knowledge through theory.

^[2] (Power Distribution and Protection, Design and Operation of Photovoltaic Systems or E-Commerce Technology and Applications)

^[3] (Electrical Installation Design, Power Distribution and Protection or Engineering Contract and Project Management)

Identifiable Learning Outcomes

Specific learning outcomes vary according to the option taken. The diploma is intended to provide a broad foundation in electrical, computer and electronic engineering.

Rights Attached

Students may, at institutional discretion, obtain credit exemption or direct entry into the second or third year of a Bachelor degree in Engineering or a related field. A number of institutions were highlighted for possible admission including:

- National University of Singapore;
- Nanyang Technological University;
- Singapore Institute of Technology;
- Singapore University of Technology and Design;
- University of Manchester, UK;
- University of Sheffield, UK;
- University of Southampton, UK;
- University of New South Wales, Australia; and
- Queensland University of Technology, Australia.

Summary

Although broad comparability is apparent in terms of level, the breadth and depth of content is substantially different between the two qualifications and prevents direct comparability from being determined.

6.4.2 Diploma in Clean Energy, Singapore Polytechnic

Entry Requirements

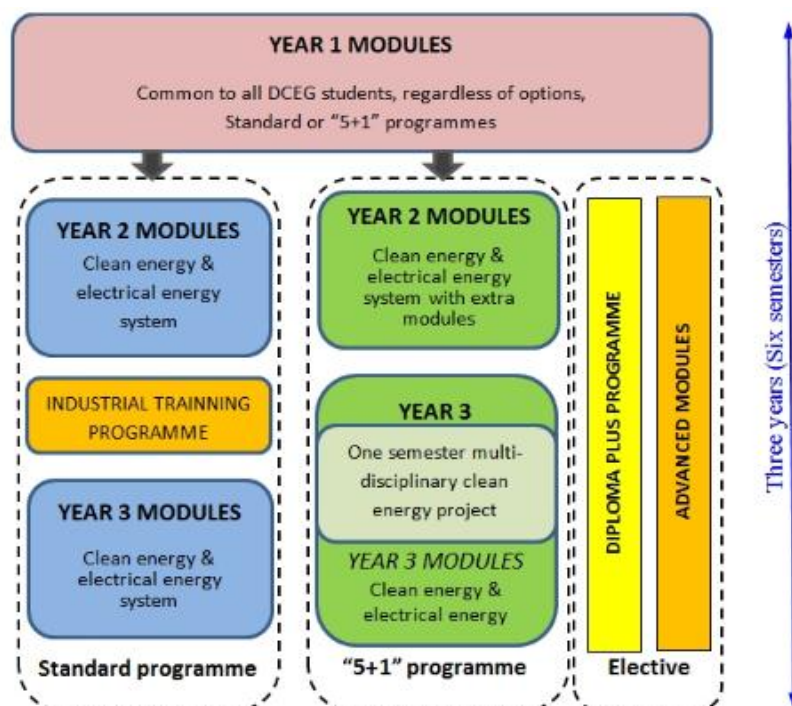
The Diploma in Clean Energy offered by Singapore Polytechnic is open to holders of the:

- O levels with passes in:
 - English language;
 - Mathematics; and
 - a science or technology-based subject
- SPM
- UEC
- NITEC
- Higher NITEC in a relevant field. O level passes in is expected for admission.

Programme Structure and Content

The programme is three years in duration with the first two years each comprising around a dozen modules. In the final year, there is a 150-hour project. As illustrated in the diagram below, the first year is common to all students before students elect to take the standard or “5+1” programme, which is more practice-oriented.

Figure 1: Diploma in Clean Energy streams



Source: Website of Singapore Polytechnic: <http://www.sp.edu.sg/wps/portal/vp-spws/scheee.cse.ftdip.cleanenergy>

Table 15: Comparative analysis of programme content: Diploma in Clean Energy from Singapore Polytechnic

Diploma in Clean Energy subject	Covered by BCA Academy Diploma?	Diploma in Clean Energy subject	Covered by BCA Academy Diploma?
Structured Programming	No	CAD	Yes. DL858
Program Design	No	Digital Electronics I	Yes. TA831
Digital Electronics II	No. TA831 provides an introduction whereas Digital Electronics II is designed to build on knowledge acquired in module I.	Principles of Electrical and Electronic Engineering I	Yes. EA274

Principles of Electrical and Electronic Engineering II	No.	Introduction to Engineering I	No.
Introduction to Engineering II	No.	Teamwork and Communication Skills	Yes. ID862
Critical Reasoning and Argumentation	No. Partial coverage is achieved through ID860	Critical Reasoning and Persuasion	No
Basic Mathematics	Yes. CE904	Engineering Mathematics I	Yes. CE904 plus CE905
Electrical Installation Design	Yes. EA224	Circuit Theory and Analysis	Yes. EA277
PLC Applications	No. Partial coverage only through EA223	Microcontroller Applications	Yes. TA845
Sustainable and Clean Energy	Yes. EA273	Photovoltaic Principles and Materials	Yes. EA280
Workplace Communication Skills	Yes. Broad coverage is provided by ID862.	Report Writing Skills	Yes. ID862
Social Innovation Project	No.	Independent Study Project and Presentation	Yes. ID911
Engineering Mathematics II (A)	No.	Engineering Mathematics II (B)	No. Partial coverage provided by CE905.
Fuel Cells and Biomass Energy	Yes. EA515	Sensors and Instrumentation	Yes. EA223
Power Transmission and Distribution	Yes. EA224	Power System Analysis	No. Partial coverage through EA281
Final Year Project	Yes. ID911	Solar Photovoltaic System Design	No. Partial coverage through EA280

Photovoltaic Manufacturing Process	No. Partial coverage through EA280	Distributed Generation and Grid Interfacing	No. Partial coverage through EA281
Wind Energy Systems	Yes. Broad coverage across a number of models including EA273		
Approximate content coverage:		54%	

Advanced electives are available for capable students. These are intended to provide greater specialisation and depth in certain subjects and are typically aimed at those wishing to undertake university level studies. Students may select up to three modules from the following:

- Advanced Analogue Electronics;
- Advanced Computer Programming;
- Advanced Circuit Analysis;
- Advanced Digital Electronics;
- Signals and Systems;
- Higher Mathematics; and
- Physics for Engineers.

Modes of Learning and Assessment

The programme includes theoretical and applied study assessed through examination and a major practical or industry project working in groups of two or three.

Identifiable Learning Outcomes

Specific programme learning outcomes are not explicit although holders should possess knowledge of the following six key areas:

- energy management;
- photovoltaic manufacturing and process;
- utilisation of clean energy;
- wind energy;
- fuel cell and biomass; and
- solar PV system design.

The programme aims to train technologists for the clean energy market although the combination of specialist modules in clean energy and more general modules in engineering and engineering mathematics provide a broad range of career opportunities for graduates.

Rights Attached

Singapore Polytechnic has established links with a number of universities and higher education institutions both in Singapore, Australia and Germany. Advanced standing for SP graduates is available within engineering programmes offered by these universities.

Summary

The qualifications may be considered comparable in level however there are significant differences in the range and focus of subjects covered and the qualifications cannot therefore be deemed directly comparable.

6.4.3 Diploma in Electrical Engineering with Eco-Design, Nanyang Polytechnic

Entry Requirements

Admission to the Diploma in Electrical Engineering with Eco-Design is available via a number of routes. Those entering with O levels should have:

- English language with grades 1 – 7;
- mathematics with grades 1 – 6; and
- at least one appropriate science or technology programme.

Programme Structure and Content

There is a common, broad core programme which all students follow before opting to specialise in one of the following disciplines: green and smart technologies; clean energy; power systems engineering; and business management.

Table 16: Comparative analysis of programme content: Diploma in Electrical Engineering from Nanyang Polytechnic

Diploma in Electrical Engineering with Eco-Design subject	Covered by BCA Academy Diploma?	Diploma in Electrical Engineering with Eco-Design subject	Covered by BCA Academy Diploma?
Engineering Mathematics 1A/1B	Yes. CE904	Electrical Technology	Yes. EA282
Digital Electronics	Yes. TA831	Electrical System and Distribution Practices	Yes. EA281

Electrical Project	Yes. ID911	Engineering Physics	No. This would be covered by students on the Diploma Plus Stream (CE908)
Communication Skills	Yes. ID862	Introduction to Management	Yes. FA712
Engineering Mathematics 1A/1C	Yes. CE904	AC Circuits	Yes. EA282
Analogue Electronics	Yes. EA282	Computer Programming	Yes. TA821
Electrical CAD	Yes. DL858	Electronic Project	Yes. ID911
Thinking and Problem Solving Skills	Yes. ID860	Introduction to Eco-Design	Yes. FA617
Engineering Mathematics 2A	No. However this would be covered by students on the Diploma Plus Stream (CE906).	Electrical Circuit Analysis	Yes. EA274
Microcontroller Systems	No	Network Technology	No
Electrical Installation Project	No	Principles of Cost Accounting	ID861 includes Business Finance however a more detailed overview of this module would be needed to confirm coverage of the polytechnic material in comparable breadth and depth.
Research and Presentation Skills	Yes. ID911/ID862	Engineering Mathematics 2B	No
Power Devices and Applications	Yes. EA282	Electrical Machines and Drives	Yes. EA278

Automation Control	Yes. Coverage across a range of modules including EA224.	Control System Project	No
Fundamentals of Marketing	No	Service Management	No
Innovation and Entrepreneurship	No	Sustainable System Development	Yes. SC519
Core Modules for all elective programmes			
Professional and Interpersonal Communication Skills	Yes. ID862/ID860	Green Design Practices	Yes. FA617
Industrial Attachment Programme	Yes. ID912	Final Year Project	Yes. ID911
Approximate content coverage of core modules:		69%	

Green and Smart Technologies Stream: Core			
Intelligent Enterprise Systems	No. Partial coverage is achieved through a combination of modules addressing building control and IT however the polytechnic module covers environmental and energy reporting. TA272, as detailed in the BCA Academy prospectus would address the building automation systems element.	Smart Grid	No
Energy Systems and Power Distribution	Yes. EA224	Green Technologies	Yes EA518
Green and Smart Technologies Stream: Prescribed Electives (Choose 1)			
Solar Photovoltaic Systems	Yes. EA280	Enterprise Development	No
Distributed Control Systems	No.	Sustainable Design Project	No

Sustainable Design Project	No	Green Technologies	Yes. EA515
Approximate content coverage (core plus Green and Smart Technologies Stream):		68% (excluding electives)	

Clean Energy Stream: Core			
Renewable Energy Technology and Systems	Yes. EA518	Solar Photovoltaic Systems	Yes. EA280
PV Fabrication Processes	Yes. EA280	Green Technologies	Yes. EA515
Clean Energy Stream: Prescribed Electives (Choose 1)			
Distributed Control Systems	No	Enterprise Development	No
Sustainable Design Project	No	Power Transmission and Distribution	Yes. EA224
Approximate content coverage:		73%(excluding electives)	

Power Systems Engineering: Core			
Instrumentation and Control	Yes. EA223	Power Systems Analysis and Management	Yes. EA275
Smart Grid	No	Power Transmission and Distribution	Yes. EA224
Power Systems Engineering: Prescribed Electives (Choose 1)			
Distributed Control Systems	No	Enterprise Development	No
Sustainable Design Project	No	Green Technologies	Yes. EA515
Approximate content coverage:		70% (excluding electives)	

Modes of Learning and Assessment

The programme combines theoretical and applied study to provide a comprehensive, yet broad-based programme. Assessment is through examination and submission of a number of projects.

Identifiable Learning Outcomes

The programme aims to develop students with expertise in the following areas:

- green and sustainable technologies;
- clean energy;
- energy management solutions;
- smart grids and power systems engineering; and
- business and management.

The project experience, overseas industrial attachment and immersion programme serve to develop the student's practical skills and test their ability to apply theory learned throughout the programme.

Rights Attached

Further studies routes at universities are open to holders of this certificate at institutions such as:

- National University of Singapore;
- Nanyang Technological University;
- University of Birmingham, UK;
- Imperial College London, UK; and
- University of New South Wales, Australia.

Summary

The programmes are display some areas of convergence in terms of content provision, particularly the Clean Energy stream, but the BCA Academy Diploma in Electrical Engineering does not cover enough of the polytechnic diploma programme to enable direct comparability. Comparability can however be observed between the other qualification core components.

6.4.4 Comparability of the BCA Academy Diploma in Electrical Engineering and Clean Energy

Based on the above analysis of the Diploma in Electrical Engineering and Clean Energy, the following comparability statements are offered:

Table 17: Comparability of the BCA Academy Diploma in Electrical Engineering and Clean Energy to Singaporean polytechnic qualifications

BCA Academy Diploma	Comparability with Singaporean Polytechnic Diplomas
Diploma in Electrical Engineering and Clean Energy	Is considered to be of a comparable level to the Diploma in Electrical Engineering, Ngee Ann Polytechnic
	Is considered to be of a comparable level to the Diploma in Clean Energy, Singapore Polytechnic
	Is considered to be of a comparable level to the Diploma in Electrical Engineering with Eco-Design, Nanyang Polytechnic

6.5 Diploma in Mechanical Engineering (Green Building Technology)

6.5.1 Diploma in Mechanical Engineering, Ngee Ann Polytechnic

Entry Requirements

Admission to the Diploma in Mechanical Engineering is open to holders of O Levels with passes in:

- English;
- mathematics;
- one of the following subjects:
 - science,
 - computer studies,
 - design and technology
 - fundamentals of electronics.

Programme Structure and Content

The programme is modular based and run over three years. It is designed to give students a solid foundation in engineering with a particular specialism in mechanical engineering facilitating the employability of the programme's graduates.

ICT, mathematics and electronics are all key components knowledge of which is developed in the first year. Students' business and entrepreneurial skills are tested through the Idea Jumpstart, Blueprint and Launchpad modules which get students to appreciate the business and economic background to the importance of engineering skills.

In the final year students can either choose a four-month internship or a particular engineering specialism from automotive, biomedical, environment and energy, design innovation and automation and robotics disciplines.

There is also an interdisciplinary option continued through the second and third years encouraging students to develop an interest in other academic and/or vocational areas.

Table 18: Comparative analysis of programme content: Diploma in Mechanical Engineering from Ngee Ann Polytechnic

Diploma in Mechanical Engineering subject:	Covered by BCA Academy Diploma?	Diploma in Mechanical Engineering subject:	Covered by BCA Academy Diploma?
Engineering Mathematics 1	Yes. CE904	Thermodynamics	Yes. FA220
Electrical Technology	Yes. EA219	Applied Mechanics	Yes. FA028
Computer Programming	Yes. TA821	Engineering Design Thinking	No
Engineering Mechanics	Yes. FA028	Idea Blueprint	No
Manufacturing Technology and Practice	No	Computer-Aided Design and Analysis	Yes. DL858/CE812
Sports and Wellness	No	Computer-Aided Manufacturing	No
Idea Jumpstart	No	Fluid Mechanics	Yes. FA209
Engineering Design Drafting	Yes. CE812/DL858	Strength of Materials	Yes. FA029
Engineering Mathematics 2	Yes. CE905	Engineering System Design 1	No
Engineering Materials	Yes. CE049	Mechanical Design Practice	Yes. ID911
Electronics Technology	Yes. EA219	Idea Launchpad	No
Communication and Contemporary Issues	Yes. ID862	Engineering System Design 2	No
Engineering Mathematics 3	Yes. CE906	Mechanics of Machines and Materials	Yes. SC522
Applied Thermodynamics	Yes. FA220	World Issues: A Singapore Perspective	Yes. ID824
Instrumentation and Control	Yes. EA223	4-month internship	Yes. ID912
Project Management	Yes. FA712	Three interdisciplinary studies modules	No
Industrial Automation	No		
Approximate content coverage		63%	

Modes of Learning and Assessment

The programme is delivered through a mixture of classroom-based theory and practical application. Assessment is through examination, project work and report writing. Those who choose the internship route will be assessed on their time spent in industry while those who do not continue to be assessed through their class and coursework.

Identifiable Learning Outcomes

Upon completion of the Diploma in Mechanical Engineering, students should be able to:

- appreciate requirements of designs and the engineering process;
- solve problems either mathematical or design;
- use technology appropriately to support the design and engineering process; and
- appreciate the technical skills required in engineering against the context of the business environment.

Rights Attached

Holders of the Diploma in Mechanical Engineering from Ngee Ann Polytechnic may be granted credit exemption and potentially direct admission to the second year of study in relevant Bachelor degree programmes offered by:

- Nanyang Technological University;
- National University of Singapore;
- Singapore Institute of Technology and the University of Glasgow, UK;
- University of Manchester, UK;
- University of Warwick, UK;
- University of New South Wales, Australia; and
- University of Melbourne, Australia.

Summary

The Ngee Ann Polytechnic Diploma in Mechanical Engineering and the BCA Academy Diploma in Mechanical Engineering (Green Building Technology) compare in broad terms and in level however only 63% of the former programme's content is covered within the BCA Academy diploma. The focus on mathematical and technical approach to engineering is supported, in both diplomas, through rigorous application to practice. There is a clear difference in that the BCA Academy diploma prepares its student to gain the award of Singapore Certified Energy Manager (Associate) where the Ngee Ann Polytechnic award does not. Ultimately though, both prepare their student for a career with particular technical skills and business knowledge.

6.5.2 Diploma in Green Building and Sustainability, Temasek Polytechnic

Entry Requirements

Admission to the programme requires five O levels including:

- English with grade 1 – 7;
- mathematics with grade 1 – 6;
- science subject with grade 1 – 6; and
- two other subjects.

Programme Structure and Content

The Diploma in Green Building and Sustainability is a three year programme divided into a large number of modules. The programme is broad in nature with a range of introductory modules studied in the first year, after which students can progressively build on their knowledge in the second and third years.

Table 19: Comparative analysis of programme content: Diploma in Green Building and Sustainability from Temasek Polytechnic

Diploma in Green Building and Sustainability subject	Covered by BCA Academy Diploma?	Diploma in Green Building and Sustainability subject	Covered by BCA Academy Diploma?
Writing and Oral Presentation	Yes. ID862	Engineering Mathematics 1	Yes. CE904
Introduction to Effective Communication	Yes. ID862	Engineering Mathematics 2	Yes. CE905
Applied Principles for Effective Living 1 (APEL 1)	Yes. ID860	Problem-solving and Process Skills	No
Applied Principles for Effective Living 2 (APEL 2)	No	Computer Programming	Yes. TA821
Applied Principles for Effective Living 3 (APEL 3)	No	Introduction to Green Development	Yes. FA617
Organisational Communication	No	Building Information Modelling	Yes. TA864
Student Internship Programme	Yes. ID912	Project Management	Yes. FA712
Career Communication	No	Building Management Systems	Yes. FA221
Computer-Aided Design and Building Specifications	Yes. DL858/CE049	Building Control Systems	Yes. FA221/FA222

Fundamentals of Clean Energy	Yes. EA284	Fire and Life Safety Management	Yes. FA225
Circuit Analysis	Yes. EA219	Air Conditioning and Mechanical Ventilation	Yes. FA221/FA222
Digital Fundamentals	Yes. EA219	Hydraulics and Drives	Yes. SC522
Electrical Services for Facilities	Yes. EA224	Green Building Modelling and Simulation	Yes. FA617
Total Building Performance	Yes. FA221, FA222, SC524	Sustainable Design	No
Energy Management and Audit	Yes. SC520	Sustainable Facility Management	Yes. SC519, SC520, SC522 SC524
Green Strategies for Building Systems	Yes. FA617	Major Project	Yes. ID911
Approximate content coverage		81%	

Modes of Learning and Assessment

The programme is predominantly classroom based with assessment undertaken by examination, coursework and a practical placement

Identifiable Learning Outcomes

Upon graduation, students will:

- have knowledge of green building construction practices;
- have knowledge of building practice and design;
- understand resource use
- be able to perform energy audits and identify strategies to reduce buildings' environmental impact.

Rights Attached

Graduates will be well positioned for employment in engineering, green building, design industry and as stated above, will have advanced entry into higher education studies in universities including, but not limited to:

- Nanyang Technological University, Singapore;
- National University of Singapore;
- Bond University, Australia;
- Curtin University of Technology, Australia;
- Edith Cowan University, Australia;

- Monash University, Australia;
- Athlone Institute of Technology, Ireland;
- Anglia Ruskin University, UK;
- Northumbria University, UK; and
- University of the West of England, UK.

Summary

There is a very close match in terms of broad subject content between the BCA Academy Diploma in Mechanical Engineering (Green Building Technology) and the Diploma in Green Building and Sustainability offered by Temasek Polytechnic. The programme offered by Temasek Polytechnic is somewhat broader in scope than the BCA Academy programme and contains more on green energy and digital technology e.g. Fundamentals of Clean Energy and Digital Fundamentals and an independent problem solving module; however, the modules covered within each diploma programme teach comparable technical skill and knowledge, both in level and focus and in this way the qualifications may be deemed comparable.

6.5.3 Diploma in Renewable Energy Engineering, Republic Polytechnic

Entry Requirements

Students can enter the Diploma in Renewable Energy Engineering with one of the following:

- three O levels to include:
 - English at grade 1 – 7,
 - mathematics at grade 1 – 6;
 - science at grade 1 – 6.
- NITEC in Drafting or a technological discipline with a minimum GPA of 3.5
- Higher NITEC in Engineering or a technological discipline with a minimum GPA of 2.0

Programme Structure and Content

The programme consists of general modules, discipline modules, and specialisation modules. Year 1 covers general modules such as Cognitive Processes and Problem Solving, and Mathematics while Year 2 focuses on discipline modules such as Analogue Electronics and Circuit Analysis. Year 3 focuses on a particular specialism and then provides the student with the opportunity to apply their accumulated knowledge through an internship.

Table 20: Comparative analysis of programme content: Diploma in Renewable Energy Engineering from Republic Polytechnic

Diploma in Mechanical Engineering subject	Covered by BCA Academy Diploma?	Diploma in Mechanical Engineering subject	Covered by BCA Academy Diploma?
Science	No	Analogue Electronics	Yes. EA219
Mathematics	Yes. CE904	Electrical Power Stations	No
Physics	Yes. CE908	Clean Energy Technologies	No
Organisational Behaviour	Yes. D8302	Energy Utilisation and Management	Yes. SC519
Mathematics for Engineering	Yes. CE904/CE905	Energy Systems Instrumentation	Yes. EA223
Cognitive Processes and Problem Solving	No	Building Mechanical and Electrical Systems	Yes. EA224
Introduction to Communication Practice	Yes. ID862	Sustainable Energy Systems	Yes. SC519, SC520
Introduction to Programming	Yes. TA821	Green Building Technology and Design	Yes. FA617
Engineering Design	Yes. CE049, CE812	Photovoltaic System Design	No
Digital Electronics 1	Yes. EA219	Creative Engagement	No
Digital Electronics 2	No	Project	Yes. ID911
Circuit Analysis	Yes. EA219	Industry Immersion Programme	Yes. ID912
Linear Circuits and Control	No	Global Logistics Management	No
Approximate content coverage:		65%	

Modes of Learning and Assessment

Delivery is predominantly class-based with assessment undertaken by examination, programme work and practical placement

Identifiable Learning Outcomes

Upon completion, students will be able to solve problems with demonstrable knowledge of:

- renewable energy;
- green building design;
- energy audit;
- energy management;
- instrumentation used to measure energy flow;
- processes to build in a sustainable and green i.e. environmentally accountable manner; and
- devices and technology of the digital age

Summary

The Republic Polytechnic Diploma in Renewable Energy Engineering gives a more comprehensive overview of electronics, analogue and digital systems and how electrical power is generated and used on a large scale before students specialise in applying electrical power to buildings and engineering projects.

The BCA Academy programme in comparison provides a specialism specifically in energy management, maintenance and usage leading to considerable but not comprehensive coverage of the Republic Polytechnic syllabus.

6.5.4 Comparability of the BCA Academy Diploma in Mechanical Engineering (Green Building Technology)

Based on the above analysis of the Diploma in Mechanical Engineering (Green Building Technology), the following comparability statements are offered:

Table 21: Comparability of the BCA Academy Diploma in Mechanical Engineering to Singaporean polytechnic qualifications

BCA Academy Diploma	Comparability with Singaporean Polytechnic Diplomas
Diploma in Mechanical Engineering (Green Building Technology)	Is considered to be of a comparable level to the Diploma in Mechanical Engineering at Ngee Ann Polytechnic
	Is considered comparable to the Diploma in Green Building and Sustainability offered by Temasek Polytechnic
	Is considered to be of a comparable level to the Diploma in Renewable Energy offered by Republic Polytechnic

6.6 Diploma in Strategic Facilities Management

6.6.1 Diploma in Hotel and Leisure Facilities Management, Ngee Ann Polytechnic

Entry Requirements

Admission to the Diploma in Hotel and Leisure Facilities Management is open to holders of O levels in:

- English language;
- mathematics and
- one of the following subjects:
 - science;
 - computer studies;
 - design and technology; and
 - fundamentals of electronics.

Programme Structure and Content

The table below illustrates how the BCA Academy Diploma in Strategic Facilities Management may be considered to address the content of the Diploma in Hotel and Leisure Facilities Management.

Table 22: Comparative analysis of programme content: Diploma in Hotel and Leisure Facilities Management from Ngee Ann Polytechnic

Diploma in Hotel and Leisure Facilities Management subject	Covered by BCA Academy Diploma?	Diploma in Hotel and Leisure Facilities Management subject	Covered by BCA Academy Diploma?
Front Office Management	No	Marketing and Public Relations	Yes. FA511/FA512
Environmental Health Management	Yes. FA412	Idea Blueprint	No
Events and Project Management	Yes. FA510	Spa and Amenities Management	No
Building Systems 1	Yes. FA262	Principles of Management	No. Partial coverage is provided by ID861 however the polytechnic module appears more in-depth in terms of its approach to management theories and philosophy such

			as Maslow's hierarchy of needs.
Principles of Accounting	Yes. ID861	Security Management and Business Continuity	Yes. FA119
Idea Jumpstart	No	Facilities Maintenance Management	Yes. FA262
Sports and Wellness	No	Computer-Aided Design	No
Food and Beverage	No	Idea Launchpad	No
Executive Housekeeping	No	Hotel Operations and Management	No
Customer Relationship Management	Yes. FA511	Green Building Technologies	Yes. FA617
Business and Contract Law	Yes. ID917	Building Maintenance and Refurbishment	No
Building Systems 2	Yes. FA262	Fire Safety Management	Yes. FA413
Communication Toolkit	Yes. ID862	Intelligent Systems and Energy Management	Yes. SC520
Shopping Mall Management	No	World Issues: A Singapore Perspective	No
Psychology and Consumer Behaviour	Yes. ID824	Six-month internship	No. The Industrial Attachment included within the BCA Academy is 8 weeks in duration.
Structure and Fabric	Yes. CE046		
Approximate content coverage		52%	

Modes of Learning and Assessment

The programme combines theoretical study and practical application with an integrated six-month internship.

Identifiable Learning Outcomes

The Diploma in Hotel and Leisure Facilities Management aims to develop management skills for front-office and back-end operations. Students should also be able to apply basic knowledge of:

- green building technology;
- building automation; and
- building performance simulation in the context of modern hospitality services.

Rights Attached

Upon completion, students are awarded a Fire Safety Manager's Certificate in order to register as a qualified Fire Safety Manager. Graduates may continue their studies through a degree in Project and Facilities Management offered by the National University of Singapore.

Summary

The Diploma in Hotel and Leisure Facilities Management has a markedly different focus to the BCA Academy programme resulting in a little over half of the Diploma's content being covered by the Diploma in Strategic Facilities Management. The relative complexity of the programmes and the qualification core components are comparable however.

6.6.2 Diploma in Hotel and Leisure Facilities Management (Property and Facilities Stream), Singapore Polytechnic

Entry Requirements

Entry is based on good O level passes in:

- English
- mathematics
- one subject related to the following:
 - science,
 - technology
 - design

Programme Structure and Content

The programme, lasting three years, comprises a range of general modules before students are able to select a stream in the final year. The two streams available are Hotel and Leisure Management and Property and Facilities Management. For the purposes of this study, the latter stream will be examined.

Table 23: Comparative analysis of programme content: Diploma in Hotel and Leisure Facilities Management (Property and Facilities Stream) from Singapore Polytechnic

Diploma in Hotel and Leisure Facilities Management subject	Covered by BCA Academy Diploma?	Diploma in Hotel and Leisure Facilities Management subject	Covered by BCA Academy Diploma?
Law	Yes. ID917	Rooms Division Operations and Management	No
Introduction to Hotel and Leisure and Facilities Management	No	Event and Venue Management	Yes. FA512
Structure and Fabric	Yes. CE046	Building Maintenance Technology	Yes. FA271
Principles of Management	Yes. ID861	Fire Safety Management	Yes. FA413
Building Services 1	Yes. FA262	Safety, Health and Security	Yes. CE612
Front Office Management	No	Leisure Amenities Management	No
Principles of Marketing	Yes. FA511	Customer Relationship Management	Yes. FA511
Economics	Yes. ID824	Social Innovation Project	No
Food and Beverage Operations	No	Independent Study Project and Presentation	Yes. ID911
Communication Skills	Yes. ID862	Accounts and Finance	No
Critical Reasoning and Argumentation	No	Building Services II	No
Critical Reasoning and Persuasion	No	Property Maintenance Management	No
IT Applications	Yes. TA852	Environmental Management and Sustainability	Yes. SC519
Public Relations	No		
Property and Facilities Management Option			
IT for Property Facilities Management	Yes. TA852	Building and Refurbishment	No
Property Management	Yes. FA415	Maintenance of Building Service	Yes. FA119/FA262

Facilities Management	Yes. FA415	Communication Skills for Work	Yes. ID862
Approximate content coverage		61%	

Identifiable Learning Outcomes

Specific programme learning outcomes are not detailed although the programme is designed to prepare individuals to fulfil roles such as:

- Hotel Facilities Manager;
- Front Office Managers;
- Rooms Division Managers;
- Project Co-ordinator;
- Hotel Marketing and Sales Executive;
- Customer Service Executive;
- Venue Manager;
- Operations and Logistics Manager;
- Contracts Manager; and
- Property Executive.

Modes of Learning and Assessment

The programme is delivered through face-to-face classes, out-of-classroom practical activities arranged in collaboration with hotels, restaurants and other relevant organisations and a one-semester internship. Assessment is conducted through continual coursework and a number of projects.

Rights Attached

The Diploma in Hotel and Leisure Facilities Management opens access to a range of careers and should enable exemption from the first year of study of a Bachelor degree in a related field. Advanced standing is offered at universities such as:

- National University of Singapore;
- Nanyang Technological University;
- Singapore Institute of Technology;
- University of South Australia, Australia;
- University of New South Wales, Australia;
- University of Queensland, Australia; and
- RMIT University, Australia.

Summary

There is a close correlation between the Diploma in Hotel and Leisure Facilities and the BCA Academy Diploma in terms of learning outcomes and associated academic progression routes. Furthermore, the BCA Diploma covers over half of the subject

content included within the Polytechnic Diploma, indicating comparable breadth of study.

6.6.3 Diploma in Integrated Facility Management, Temasek Polytechnic

Entry Requirements

Admission is usually granted to O level holders with passes in:

- English with grade 1 – 7;
- Mathematics with grade 1 – 6; and
- One to two of the following subjects:
 - Biology;
 - Chemistry;
 - Physics;
 - Physical Science;
 - Combined Science / Science (Chemistry, Biology) / Science (Physics, Biology) / Science (Physics, Chemistry);
 - Design and Technology; and
 - Engineering Science.

Programme Structure and Content

The qualification covers a broad range of subjects over the three year programme with areas of convergence and divergence with the BCA Academy Diploma in Strategic Facilities Management highlighted below:

Table 24: Comparative analysis of programme content: Diploma in Integrated Facility Management from Temasek Polytechnic

Diploma in Integrated Facility Management	Covered by BCA Academy Diploma?	Diploma in Integrated Facility Management	Covered by BCA Academy Diploma?
Writing and Oral Presentation	Yes. ID862	Quantitative Methods	Yes. ID916
Introduction to Effective Communication	Yes. ID862	Human-Centred Space Planning	Yes. FA412
Applied Principles for Effective Living 1	Yes. ID860	Security and Surveillance	Yes. FA119/EA263
Applied Principles for Effective Living 2	Yes. FB850	Building Information Modelling	Yes. TA859
Applied Principles for Effective Living 3	No	Project Management	No
Organisational Communication	No	Service Quality and Management	Yes. FA511

Student Internship Programme	Yes. ID911/ID912	Contract Management	Yes. ID408/FA419
Career Communication	Yes. ID862	Air Conditioning and Mechanical Ventilation	Yes. FA516
Computer Aided Design and Building Specifications	No	Total Building Performance	Yes. SC520
Real Estate Business	No	Financial Management and Forecasting	No
Facility Operations and Maintenance	Yes. FA262	Business Continuity Management	Yes. FA707
Electrical Services for Facilities	Yes. EA263	Energy Management and Audit	Yes. SC519/SC520
Engineering Mathematics 1	No	Sustainable Facility Management	Yes. FA415
Engineering Mathematics 2	No	Major Project	Yes. ID911
Problem-solving and Process Skills	No		
Elective Subjects: Hospitality cluster			
Introduction to Hospitality and Tourism	No	Club and Resort Business	No
Integrated Resort Management	No		
Special Elective Subjects			
Special Project 1	No	Higher Engineering Skills 2	No
Special Project 2	No	Higher Engineering Mathematics	No
Higher Engineering Skills 1	No		
Approximate content coverage		69% (excluding electives)	

Modes of Learning and Assessment

The programme is multi-disciplinary and combines broad theoretical study with internships and a project to test students' ability to apply the theory they have learned in various contexts.

Identifiable Learning Outcomes

Specific learning outcomes will depend on the cluster (stream) undertaken which could be hospitality or aviation. Holders should possess broad knowledge and skills related to:

- business continuity management;
- service quality and management;

- contract management;
- sustainable facility management; and
- energy management and audit.

The programme aims to prepare students to undertake the responsibilities associated with roles such as:

- Facilities officers or management executives;
- Property officers;
- Events executives; and
- Airport management executives.

Rights Attached

Specific exemptions have been defined for further studies in Singapore: the National University of Singapore grants exemptions for nine modules in both the Bachelor of Science in Project and Facilities Management and the Bachelor of Science in Real Estate. More examples of exemptions previously awarded can be found on the Temasek Polytechnic's School of Engineering website³.

Summary

The Diploma in Strategic Facilities Management broadly compares to the Polytechnic Diploma in a number of areas. Although there are some notable gaps in content, most of the subject areas in the core modules of the Polytechnic Diploma are covered. Moreover, as with the BCA Diploma, completion of the Polytechnic Diploma can enable graduates to gain advanced standing onto degree level programmes, highlighting a similarity in progression routes.

³ http://www-eng.tp.edu.sg/eng_home/eng_courses/eng_ft_courses/eng_fdm_home/eng_fdm_further_studies_opportunitiesg.htm

6.6.4 Comparability of the BCA Academy Diploma in Strategic Facilities Management

Based on the above analysis of the Diploma in Strategic Facilities Management, the following comparability statements are offered:

Table 25: Comparability of the BCA Academy Diploma in Strategic Facilities Management to Singaporean polytechnic qualifications

BCA Academy Diploma	Comparability with Singaporean Polytechnic Diplomas
Diploma in Strategic Facilities Management	Is considered to be of a comparable level to the Diploma in Hotel and Leisure Facilities Management at Singapore Polytechnic
	Is considered to be of a comparable level to the Diploma in Hotel and Leisure Facilities of Ngee Ann Polytechnic
	Is considered to be of a comparable level to the Diploma in Integrated Facility Management awarded by Temasek Polytechnic

7. Benchmarking BCA Academy Qualifications to English Standards

This section aims to demonstrate how the BCA Academy diplomas compare to standards in England. This will be achieved primarily through examination and comparative analysis of the awards against levels within the QCF in order to align the diplomas with an appropriate level or levels on the English national framework. This process will be supported by references to existing awards in the AEC sector.

7.1 Understanding the English context

7.1.1 The national framework

The English education system is described by the Qualifications and Credit Framework (QCF). The QCF was introduced in 2008 to replace the National Qualifications Framework (NQF) with a clear, flexible, and outcomes-based framework to allow for flexible learning paths and accumulation and transfer of credit achievement.

The QCF is a unit-based system where achievements are expressed in terms of credits and levels. Credits are intended to represent the size of a unit (one credit represents ten hours), while the level indicates the standard of the award and the challenge that it poses to learners. Credits are awarded for each unit completed, and students may transfer credits between programmes.

There are also three sizes of qualification in the QCF as follows:

Figure 2: The Structure of the QCF



Source: Ofqual, http://www.ofqual.gov.uk/files/Regulatory_arrangements_QCF_August08.pdf

The framework comprises three entry levels and eight further levels encompassing qualifications from basic entry level certificates up to doctoral level. Level indicators describe the knowledge, understanding, skills and learner autonomy expected at each level of the framework.

The QCF is provided for reference within Appendix 1.

7.1.2 The AEC sector

The sector in England is referred to as the Construction and Building Services Sector and is represented by two Sector Skills Councils (SSCs): Construction Skills and Summit Skills. The UK has a number of SSCs for different sectors. Each is responsible for input into qualification design and standards to ensure the link between sector-specific qualifications and the needs of employers.

Nationally recognised qualifications in the sector are listed on the Ofqual Register of Regulated Qualifications⁴. There are currently over 1000 qualifications at varying levels in the broad sector. Key providers (based on the number of programmes offered in the sector) include City and Guilds; CSkills Awards; and Edexcel.

Award types

A number of different types of qualification are available at the post-secondary level including:

- National Vocational Qualifications (NVQs);
- City and Guilds Qualifications; and
- BTEC Qualifications.

NVQs reflect the skills, knowledge and understanding a student possesses in relation to a specific area of work. They are not based upon the completion of a prescribed programme of study but are unit-based with the number and size of units varying between vocational areas. Candidates successfully complete units once they have been assessed as competent in the application of those skills and knowledge. Consequently, assessment occurs within the workplace. NVQ candidates are generally employees, or students with part-time jobs or work placements.

Because of the lack of academic study within these qualifications, the NVQs were not deemed to be a suitable comparator for the BCA Academy qualifications. Furthermore the UK vocational education and training system is undergoing considerable reform with most of the traditional NQF NVQs already phased out in order to be replaced by QCF NVQs at varying levels.

City and Guilds offer classroom-based vocational qualifications and employment-based NVQs across all levels of the QCF in a broad range of subjects.

⁴ <http://register.ofqual.gov.uk>

BTEC qualifications are run by Edexcel and represent a group of specialist work-related qualifications in a range of sectors such as:

- agriculture;
- computing and IT;
- construction and civil engineering;
- engineering;
- health and social care;
- business and management;
- sport and exercise sciences;
- performing arts;
- retail and distribution; and
- hospitality management.

They have been developed to provide the knowledge, understanding and skills necessary to prepare learners for employment and/or to provide career development opportunities for those already in work. Consequently they provide a programme of study for full-time or part-time learners in schools, colleges and training centres, combining theoretical classroom study with practical application and skills development. They link to the National Occupational Standards for the sector, where these are appropriate, and are supported by the relevant Standards Setting Body (SSB) or SSC.

The qualifications include certificates and diplomas at different levels including: BTEC First; BTEC National; and BTEC Higher National. The nature of study within the BTEC qualifications is the most similar in nature to the BCA Academy diplomas and as such will be further explored within the comparative analysis sub-section that follows.

7.2 Comparative Analysis of the BCA Academy Diplomas with the QCF

7.2.1 Comparative Overview

The table below highlights the expected generic competencies for a qualification of any type or field falling at levels 3, 4 and 5 of the QCF.

Table 26: Expected generic competencies at levels 3, 4, and 5 of the English Qualifications and Credit Framework

Expected generic competencies		
QCF Level 3	QCF Level 4	QCF Level 5
Achievement at level 3 reflects the ability to identify and use relevant understanding, methods and skills to complete tasks and address problems that, while well defined, have a measure of complexity.	Achievement at level 4 reflects the ability to identify and use relevant understanding, methods and skills to address problems that are well defined but complex and non-routine.	Achievement at level 5 reflects the ability to identify and use relevant understanding, methods and skills to address broadly defined, complex problems.
It includes taking responsibility for initiating and completing tasks and procedures as well as exercising autonomy and judgement within limited parameters.	It includes taking responsibility for overall courses of action as well as exercising autonomy and judgement within fairly broad parameters.	It includes taking responsibility for planning and developing courses of action as well as exercising autonomy and judgement within broad parameters.
It also reflects awareness of different perspectives or approaches within an area of study or work.	It also reflects understanding of different perspectives or approaches within an area of study or work.	It also reflects understanding of different perspectives or schools of thought and the reasoning behind them.

Assessing the BCA Academy diplomas against the expected generic competencies outlined for each QCF level above, it is evident that the programmes require a higher level of knowledge, understanding and responsibility than is prescribed for QCF level 3. To graduate from the BCA Academy, diploma students have to demonstrate an understanding of key engineering principles and apply them to scenarios in which they are expected to manage outcomes and provide solutions to problems. They are expected to develop a theoretical knowledge of their area, to understand and implement strategies to solve problems and manage works, projects and, depending on the stream, to manage people. They are expected to implement processes from scratch.

Similarly, when considering the expected competencies of students holding a QCF level 3 engineering qualification, it is worth noting that the QCF level 3 requires adherence to safe working practices and knowledge of preparation for work and participation in works at an autonomous level. In contrast, the BCA Academy diplomas prepare students to be responsible for the development of designs and working practices, to supervise the adherence to these practices and the relevant

health and safety working codes and the delivery of projects to time and with efficient use of the resources employed.

As such BCA Academy diploma programmes sit above Level 3 of the QCF. This level is typically for skilled workers who, although exhibiting autonomy in work and development of basic supervisory skills, have a limited range of skills to apply to specific tasks and problems.

The differences between levels 4 and 5 of the QCF are more subtle and require a more in-depth analysis of the core knowledge and competencies expected of students at each level.

7.2.2 Comparison of Core Competencies, Knowledge and Understanding

The following table outlines the expected outcomes for qualifications placed at levels 4 and 5 of the QCF. Differences between the descriptors are noted in italics.

Table 27: Core competencies, knowledge and understanding expected at levels 4 and 5 of the English QCF

Expected outcomes	QCF Level 4	QCF Level 5
Knowledge and understanding	<p>Use practical, theoretical or technical understanding to address problems that are <i>well defined</i> but complex and non-routine</p> <p>Analyse, interpret and evaluate relevant information and ideas.</p> <p>Be aware of the nature and <i>approximate</i> scope of the area of study or work</p> <p><i>Have an informed awareness</i> of different perspectives or approaches within the area of study or work.</p>	<p>Use practical, theoretical or technological understanding to <i>find ways forward</i> in <i>broadly defined</i>, complex contexts.</p> <p>Analyse, interpret and evaluate relevant information, <i>concepts</i> and ideas</p> <p>Be aware of the nature and scope of the area of study or work</p> <p><i>Understand</i> different perspectives, approaches or schools of thought and the reasoning behind them.</p>
Application and action	<p>Address problems that are complex and non-routine while normally <i>fairly well defined</i></p> <p><i>Identify</i>, adapt and use appropriate methods and skills</p> <p>Initiate and use appropriate investigation to inform actions</p> <p><i>Review the effectiveness and appropriateness</i> of methods, actions and results.</p>	<p>Address <i>broadly defined</i>, complex problems</p> <p><i>Determine</i>, adapt and use appropriate methods and skills</p> <p><i>Use relevant research or development to inform actions</i></p> <p><i>Evaluate</i> actions, methods and results.</p>

Autonomy and accountability	Take responsibility for courses of action, including, where relevant, responsibility for the work of others	Take responsibility for <i>planning and developing</i> courses of action, including, where relevant, responsibility for the work of others
	Exercise autonomy and judgement within broad but generally well-defined parameters.	Exercise autonomy and judgement within broad parameters.

Comparing knowledge, understanding and competencies at QCF level 4

At QCF level 4, there is increased integration of subject knowledge and skills with more assumed responsibility. The individual is expected to be aware of other individuals' responsibilities to potentially assume more responsibility for the wider work goals. There is also an increased expectation that individuals are able to address, as a matter of course, non-routine problems and fulfil supervisory duties.

This level has similarities with the BCA Academy diploma programmes where students will be able to "address problems that are complex and non-routine while normally fairly well defined" as required at QCF level 4 by, for example, "designing, operating and maintaining of electrical services for buildings" and "performing and supervising effectively the various electrical works on-site". BCA Academy graduates are taught to be able to assume responsibility for aspects of project delivery and to provide advice to ensure that the project runs smoothly, "plan and schedule construction works effectively to achieve high productivity and minimise delay".

The QCF level 4 graduate should also "be aware of the nature and approximate scope of the area of study or work", whilst, "taking responsibility for courses of action, including, where relevant, responsibility for the work of others". The BCA Academy programmes prepares its graduates to understand the requirements legal, financial, design and health and safety requirements, in order to meet the demands of projects related to the industry in which they are responsible.

Furthermore, a QCF level 4 graduate is to be able to, "review the effectiveness and appropriateness of methods, actions and results" and as such there is an element that the individual does not simply follow step-by-step instructions but applies their knowledge and skill in the best manner possible. BCA Academy diploma graduates are, for example, expected to "contribute to the operational and management of services related to green facilities". Thus with the skill and knowledge level developed in the first and second years and the project management and communication skills, developed concurrently, BCA Academy diploma students are developed to a point where they are ready to contribute to projects, to receive direction and discharge their duties competently whilst offering advice to colleagues and, where appropriate, delegating tasks to technicians and assistants.

Comparing knowledge, understanding and competencies at QCF level 5

At QCF level 5 the learner is expected to demonstrate skill to accept increased responsibility for work tasks to a level that “includes taking responsibility for planning and developing courses of action as well as exercising autonomy”. The BCA Academy diplomas prepare graduates to, for example, “supervise M & E works effectively and apply management and financial know-how of business to the industry”. Although graduates may not immediately assume this level of responsibility on completion of their qualification, the level of the learning requires that they demonstrate competency in the area of project management in order to be awarded the diploma.

A BCA Academy diploma student spends two years developing factual, technical and technological knowledge within their programme. This technical and factual knowledge is a blend of project management principles and actual technical knowledge, on completion of which they further specialise in the third year with an independent research project and/or time spent in industry. These activities provide students with the opportunity to apply their knowledge with a level of autonomy. Exposure to legislative provisions, safety codes and/or building regulations means that students understand that the application of their knowledge is governed by particular frameworks and that these frameworks are subject to change.

The BCA Academy provides its students with the opportunity to analyse, design and implement. BCA Academy students are taught to generate information to assist decision-making, analyse data and determine appropriate action. The BCA Academy diplomas focus on contextual knowledge - i.e. building codes, regulations and principles - allowing graduates to add context to their design and build technical knowledge. This context enables BCA Academy graduates to evaluate how to best implement their designs e.g. “to develop programmes integrating building services with Building Automation Systems and to implement green solutions supporting building sustainability”.

As such, BCA Academy students develop an ability to approach a technical problem and analyse it. From their analysis they are able to formulate criteria: from which they are able to develop designs to create solutions to the technical problem with which they are faced. In short, BCA Academy diploma graduates are able to identify and use relevant understanding, methods and skills to address broadly defined, yet complex problems.

In this sense the BCA Academy diplomas provide opportunities to undertake learning that sufficiently enables a graduate to demonstrate the level of knowledge and understanding prescribed at QCF level 5.

7.2.2 Comparison of Core Content

A selection of relevant qualifications on the QCF were reviewed in order to support the analysis conducted in 7.2.1. This involved a broad examination of the general learning outcomes with reference to Blooms Taxonomy⁵. The lower order skills of accumulating knowledge and comprehension are included within the BCA Academy programmes, with reference to the terms “describe”, “define”, “list” and “explain”. Higher order thinking skills are also mentioned in the BCA Academy programme outcome statements, candidates are expected to “compare” and “contrast”, “analyse”, “discuss”, “judge” and “evaluate”. The range of functions and their cognitive demand compare broadly to those developed by higher level academic qualifications accredited on the QCF.

The qualifications selected for consideration against the outcome levels prescribed for the BCA Academy Diploma in Mechanical Engineering (Green Building Technology), were the Edexcel BTEC Level 4 HNC Diploma in Mechanical Engineering (QCF) and the Edexcel BTEC Level 5 HND in Mechanical Engineering.

The precise subject content was notably different to that in Singapore however by comparing the level of knowledge, skills and competencies expected of graduates of each programme, it was possible to provide an assessment of the academic standing of the BCA Academy diplomas in the English context.

Both the HNC and the HND aim to develop core competencies and techniques both in relation to engineering science and design and broader areas of business management. It should be noted however that students studying the HNC may undertake individual modules at level 5 whilst those studying the HND may undertake certain level 4 modules.

To be awarded the Level 4 HNC, students must complete a minimum of 65 credits at level 4 while to obtain the Level 5 HND, a minimum of 125 credits should be obtained at level 5.

As such the table below demonstrates how the Diploma in Mechanical Engineering offered by the BCA Academy compares broadly to some of the level 4 competencies prescribed for HNC and HND students.

⁵ Bloom's Taxonomy refers to a classification of the different outcomes that educators set for students (learning objectives).

Table 28: Analysis of the BCA Academy Diploma in Mechanical Engineering against QCF level 4 and 5 modules

Level 4 modules:	Core competencies broadly met by the BCA Academy Diploma in Mechanical Engineering?
Business Management	<p>Yes.</p> <p>The programme develops management skills and financial know-how of business to the industry.</p> <p>Certain BCA modules are particularly relevant here in their coverage of contract management (to perform basic estimation and costing) and Project Management (where students learn ways to set up an effective and efficient site) respectively.</p>
Analytical Methods for Engineers	<p>Yes.</p> <p>Relevant studies include:</p> <ul style="list-style-type: none"> • Structural Analysis - analyse determinate and indeterminate structures for axially loaded member and torsion • Energy Modelling - use computer simulation to analyse and evaluate the effectiveness of the strategies applied • Statistics for Management - students are taught to analyse data by applying statistics to generate information for decision making • Strength of Materials - students learn to apply concepts of stresses, stress-strain diagrams and Hooke's Law to solve engineering problems
Engineering Science	<p>Yes.</p> <p>Relevant modules include:</p> <ul style="list-style-type: none"> • Engineering Mechanics - applications of Newton's laws, linear momentum, conservation of energy and static equilibrium • Sustainable Services - students will learn to explain the principles of major renewable energy systems <p>Furthermore BCA Academy students can, depending on stream, earn the Singapore Certified Energy Manager (Associate) qualification through which they will develop an ability to manage energy systems.</p>
Materials Engineering	<p>Yes.</p> <p>The module in Building Technology covers building construction systems using a broad range of materials while the Strength of Materials module builds students' knowledge of materials and effects of external forces.</p>
Level 5 modules:	Core competencies broadly met by the BCA Academy Diploma in Mechanical Engineering?
Project Design, Implementation and Evaluation	<p>No.</p> <p>Students of the BCA Academy demonstrate their research, analytical and communication skills within the final year project by investigating a topic of interest and relevance to the programme.</p> <p>Students will demonstrate an ability to pursue unaided investigations, to communicate the findings clearly, concisely and with detachment to draw relevant conclusions.</p> <p>At this level of the QCF however, students would not only be expected to manage their own input but the input of a team necessitating development of resource planning and allocation</p>

	and critical evaluation of project methodology and formulation of recommendations for further developments.
Mechanical Principles	Yes although the focus of the two programmes is notably different.
Engineering Design	Yes. In accordance with the level 5 competency descriptors, students of the BCA Academy programme should be capable of preparing a design specification and using computer-based technology in the design process.
Managing the Work of Individuals and Teams	No. This and other modules in management within the HND require not only supervisory skills but specific competencies in assessing the performance of individuals and teams.

Summary

The above table demonstrates the relatively comprehensive coverage of the competencies expected at level 4 by the BCA Academy Diploma in Mechanical Engineering despite some differences in the subject focus. Both qualifications seek to develop graduates that can perform tasks in the workplace autonomously whilst having an understanding of the requirements of the wider engineering project in which they involved. The learning outcomes for the BCA Academy Diploma compare favourably with those prescribed for the Level 4 HNC as both sets predominantly fall in the comprehension to analysis taxonomy according to Bloom. In the initial stages of the qualification, the first and second years, the emphasis is on exposure to systems and processes. Subsequently in the latter stages of the second and third years; the emphasis is on application of knowledge for example, through projects or internships. This is logical given that Bloom categories are seen as degrees of difficulties and as such qualifications which ensure that, during the initial learning stages, students build knowledge and comprehension thus ensure that they have more information to be able to meet learning outcomes which challenge to student to apply, analyse and evaluate information.⁶

Some basic elements of level 5 competencies are attained through the BCA Academy diploma however at QCF level 5, students should be responsible not for supervision of others but rather the direct management of others, with responsibility for managing teams of people, assessing performance and identifying areas for development. This level of accountability and autonomy and specific management competencies are not present in the BCA Academy diploma programmes and as such cannot be deemed to meet the requirements for QCF level 5 overall.

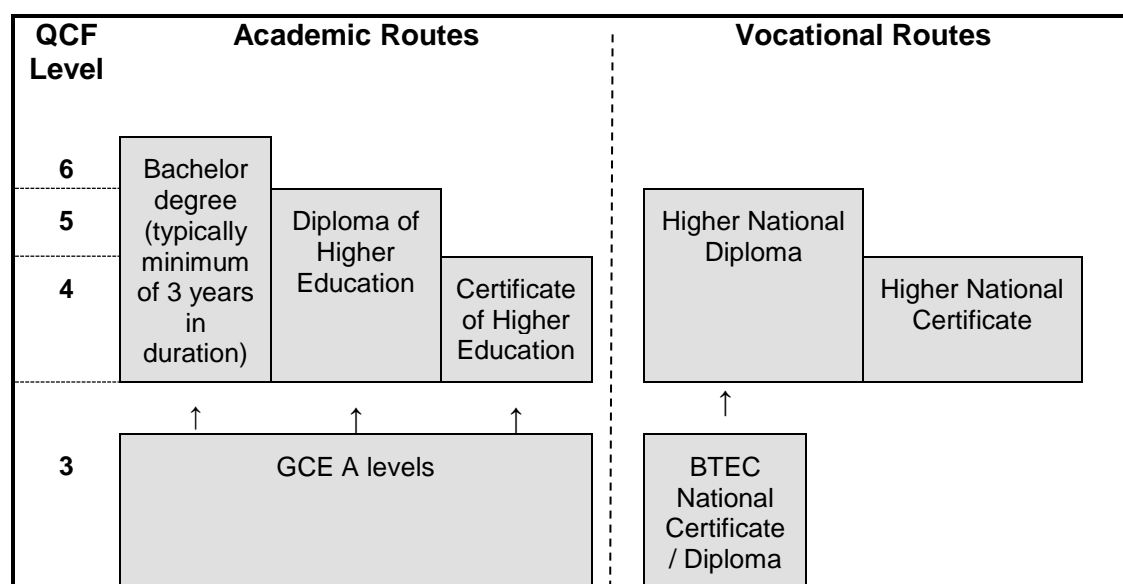
⁶ See

http://www.edexcel.com/migrationdocuments/BTEC%20Higher%20Nationals/144603_HN_Mechanical_Engineering_units.pdf

7.3 Articulation and Progression

Admission to undergraduate university studies in the UK is typically based on QCF level 3 studies, namely the General Certificate of Education Advanced Levels. The chart below shows broadly how the academic and vocational levels in England correspond in terms of their placement on the QCF.

Figure 3: Academic and vocational study routes and their relation to the QCF



Holders of the BCA Academy diplomas may be eligible for credit exemption or advanced standing for entry to a Bachelor degree in the UK. The point at which they are admitted would be determined by a number of factors such as:

- the programme they are applying for and the relevance of the BCA Academy modules undertaken to those offered within the particular Bachelor degree;
- the length of the programme for which the student is applying. Bachelor degrees in the UK are typically three or four years in duration and may be longer depending on the subject area;
- institution discretion.

A HND would typically allow admission to the final year of a three year degree or the third year of a four year degree in a relevant subject while a Higher National Certificate is generally considered to correspond to the first year of a Bachelor degree, thereby enabling students to enter the second year of a Bachelor degree in a relevant field.

7.4 Comparability to the QCF

This table provides a summary of the analysis undertaken of the BCA Academy Diplomas against levels in the QCF highlighting whether the awards miss, meet or exceed the standards prescribed for each level in England.

Table 29: Comparability of the BCA Academy diplomas to the QCF

QCF level	3	4	5
Comparative overview: generic competencies	Exceeds	Meets	Not comparable
Core knowledge and understanding	Exceeds	Meets	Meets
Qualification core competencies and content level	Exceeds	Meets	Not comparable

As demonstrated within the table, the BCA Academy diplomas fall above level 3 of the QCF in all areas. The awards instead meet the standards prescribed for level 4 with some areas approaching those standards prescribed for level 5.

8. Benchmarking BCA Academy Qualifications to Australian Standards

This section provides a comparative analysis of the BCA Academy qualifications against the Australian Qualifications Framework in order to provide the BCA with an assessment of their qualifications against the standards of the Australian education system.

8.1 Understanding the Australian context

8.1.1 The national framework

The Australian Qualifications Framework (AQF)⁷ is an outcomes-based framework which describes the generic knowledge, skills and application expected at each of the ten levels.

The AQF provides an agreed framework for designing, developing and issuing recognised qualifications within Australia. In vocational education and training, qualifications are based on competencies and established through industry-defined Training Packages and/or through accredited programmes developed by State Accreditation Authorities, Registered Training Organisations and other bodies.⁸ There is, in effect, an emphasis on producing graduates ready for work. The level of responsibility and complexity of the task they may be expected to perform is reflected in the characteristics of the competencies described at the various levels of the AQF. The full AQF can be found online⁹ The following table contains the AQF levels associated with post-secondary and sub-degree level qualifications in Australia, providing a valuable starting point for analysis.

AQF Level	Qualification Type
3	Certificate III
4	Certificate IV
5	Diploma
6	Advanced Diploma
	Associate Degree

⁷

http://www.aqf.edu.au/Portals/0/Documents/Handbook/AustQuals%20FrmwrkFirstEditionJuly2011_FINAL.pdf

⁸ See paragraph 3.2 page 84 of the AQF Implementation Handbook 2007 see http://www.aqf.edu.au/Portals/0/Documents/Handbook/AQF_Handbook_07.pdf

⁹ www.aqf.edu.au

8.1.2 The AEC Sector

Australia has a number of Industry Skills Councils (ISCs) which are recognised and funded by the Australian Government. Each is responsible for supporting the development of training in its respective field.

The AEC sector, as defined for Singapore, would be overseen by two ISCs in Australia: the Construction and Property Services ISC (CISC) and the Manufacturing ISC (MISC).

The ISCs support training and development within their respective industries, developing 'Training Packages' for industry training. A Training Package includes:

- industry-approved competency standards specifying the knowledge and skills to be covered within the Training Package;
- assessment guidelines which ensure the knowledge and skills prescribed within the competency standards are sufficiently tested; and
- a variety of national qualifications at various levels of the AQF (e.g. Certificate IV in Engineering, Diploma in Engineering, Advanced Diploma in Engineering).

8.2 Comparative Analysis of the BCA Academy Diplomas with the AQF

Taking into consideration the core components of the BCA Academy Diplomas, level 3 of the AQF was deemed to fall below the level appropriate for comparison. This section will consider the knowledge, skills and volume of learning associated with levels 4, 5, and 6 of the AQF in order to determine the standing of the BCA Academy qualifications in the Australian context.

8.2.1 Comparative Overview

This table provides a comparative overview of levels 4, 5 and 6 of the AQF.

Table 30: Generic competencies expected at levels 4, 5 and 6 of the Australian Qualifications Framework

Descriptor and expected generic competencies			
	Certificate IV (AQF Level 4)	Diploma (AQF Level 5)	Advanced Diploma (AQF Level 6)
Purpose	The Certificate IV qualifies individuals who apply a broad range of specialised knowledge and skills in varied contexts to undertake skilled work and as a pathway for further learning.	The Diploma AQF level 5 qualifies individuals who apply integrated technical and theoretical concepts in a broad range of contexts to undertake advanced skilled or paraprofessional work and as a pathway for further learning.	The Advanced Diploma at level 6 qualifies individuals who apply specialised knowledge in a range of context to undertake advanced skilled or paraprofessional work and as a pathway for further learning.
Knowledge	Graduates of a Certificate IV will have factual, technical, procedural and theoretical knowledge in an area of work and learning.	Graduates of a Diploma will have technical and theoretical knowledge and concepts, with depth in some areas within a field of work and learning.	Graduates of an Advanced Diploma will have specialised and integrated technical and theoretical knowledge with depth within one or more fields of work and learning
Skills	Graduates of a Certificate IV will have: <ul style="list-style-type: none"> • Cognitive skills to identify, analyse, compare and act on information from a range of sources; • Cognitive, technical and communication skills to apply and communicate technical solutions of a non-routine or contingency nature to a defined range of predictable and unpredictable problems; • Specialist technical skills to complete routine and non-routine tasks and functions; and • Communication skills to guide activities and provide technical advice in the area of work and learning. 	Graduates of a Diploma will have: <ul style="list-style-type: none"> • Cognitive and communication skills to identify, analyse, synthesise and act on information from a range of sources; • Cognitive, technical and communication skills to analyse, plan, design and evaluate approaches to unpredictable problems and/or management requirements; • Specialist technical and creative skills to express ideas and perspectives; and • Communication skills to transfer knowledge and specialised skills to others and demonstrate understanding of knowledge. 	Graduates of an Advanced Diploma will have: <ul style="list-style-type: none"> • Cognitive and communication skills to identify, analyse, synthesise and act on information from a range of sources; • Cognitive and communication skills to transfer knowledge and skills to others and to demonstrate understanding of knowledge with depth in some areas; • Cognitive and communication skills to formulate responses to complex problems; and • Wide ranging specialised technical, creative or conceptual skills to express ideas and perspectives.

Application of knowledge and skills	<p>Graduates of a Certificate IV will demonstrate the application of knowledge and skills:</p> <ul style="list-style-type: none"> • To specialised tasks or functions in known or changing contexts • With responsibility for own functions and outputs, and may have limited responsibility for organisation of others • With limited responsibility for the quantity and quality of the output of others in a team within limited parameters. 	<p>Graduates of a Diploma will demonstrate the application of knowledge and skills:</p> <ul style="list-style-type: none"> • With depth in some areas of specialisation, in known or changing contexts; • To transfer and apply theoretical concepts and/or technical and/or creative skills in a range of situations; • With personal responsibility and autonomy in performing complex technical operations with responsibility for own outputs in relation to broad parameters for quantity and quality; and • With initiative and judgement to organise the work of self and others and plan, coordinate and evaluate the work of teams within broad but generally well-defined parameters. 	<p>Graduates of an Advanced Diploma will demonstrate the application of knowledge and skills:</p> <ul style="list-style-type: none"> • With depth in areas of specialisation, in contexts subject to change; • With initiative and judgement in planning, design, technical or management functions with some direction; • To adapt a range of fundamental principles and complex techniques to known and unknown situations across a broad range of technical or management functions with accountability for personal outputs and personal and team outcomes within broad parameters.
Volume of learning	<p>The volume of learning of a Certificate IV is typically six months to two years. There may be variations between short duration specialist qualifications that build on knowledge and skills already acquired and longer duration qualifications that are designed as entry level requirements for work</p>	<p>The volume of learning of a Diploma is typically one to two years.</p>	<p>The volume of learning of an Advanced Diploma is typically 18 months to two years.</p>

Source: AQF Implementation Handbook: http://www.aqf.edu.au/Portals/0/Documents/Handbook/AustQuals%20FrmwrkFirstEditionJuly2011_FINAL.pdf

The purpose of the BCA Academy diplomas is to qualify individuals for employment in a knowledge based economy with an understanding of contemporary industry practice that is cost-effective and innovative. Graduates of a BCA Academy diploma will be technologically competent and will have practical experience of implementing their theoretical knowledge both through classroom assessment and examinations and also through the final year project and/or the industrial attachment.

The volume of learning for both AQF levels is typically less than that associated with the BCA Academy Diplomas however close alignment is observable between the learning outcomes for the various diplomas and the knowledge, skills and their application as defined for AQF level 5.

8.2.2 Comparison of Core Competencies

Certificate IV Level 4 competencies:	Core competencies broadly met by the BCA Academy diplomas?
Upon completion students should be able to:	
Perform specialised tasks or functions in known or changing contexts	Yes
Take responsibility for these specialised tasks	Yes
Have limited responsibility for quantity and quality of output of others	Yes
Diploma Level 5 competencies:	Core competencies broadly met by the BCA Academy diplomas?
Upon completion students should be able to:	
Demonstrate knowledge with depth in some areas of specialisation, in known or changing contexts	Yes
Transfer and apply theoretical concepts and/or technical and/or creative skills in a range of situations	Yes
Accept personal responsibility and autonomy in performing complex technical operations with responsibility for own outputs in relation to broad parameters for quantity and quality.	Yes
Take initiative and judgement to organise the work of self and others and plan, coordinate and evaluate the work of teams within broad but generally well-defined parameters	Partially. Graduates of the BCA Academy diplomas will be able to effectively plan and conduct their work with autonomy however the requirement to organise others is less integrated within the BCA Academy Diplomas than in the AQF expected competencies at this level.

Advanced Diploma Level 6 competencies:	Core competencies broadly met by the BCA Academy diplomas?
Apply specialised and integrated technical and theoretical knowledge with depth within one or more fields of work and learning	Yes.
Act on information from a range of sources to formulate responses to complex problems	Partially. Although BCA Academy diploma students are made aware of current legislation governing their area of work and the use of software to support design or construction work, the emphasis is upon preparing graduates to respond to problems of a technical nature without the stipulation that these should be of complex nature.
Assume responsibility for a broad range of technical or management functions with accountability for personal outputs and personal and team outcomes within broad parameters	Partially. Although BCA Academy diplomas do cover project management techniques and management skills, the parameters are narrower. The listed career prospects include Technical Officer, Assistant Engineer or Site Engineer rather than management positions.

8.2.3 Comparison of Core Knowledge and Understanding

Comparisons against AQF Level 4 (Certificate IV)

According to the AQF Handbook, holders of the Certificate Level IV should be able to:

- demonstrate understanding of a broad knowledge base incorporating some theoretical concepts;
- apply solutions to a defined range of unpredictable problems;
- identify, analyse and evaluate information from a variety of sources;
- identify and apply skill and knowledge areas to a wide variety of contexts with depth in some areas; and
- take responsibility for own outputs in relation to specified quality standards.

Demonstrate understanding of a broad knowledge base incorporating some theoretical concepts

BCA Academy diplomas provide a broad knowledge of subjects key to performing a skilled role in an engineering-related discipline. Each graduate will have developed communication skills and had the opportunity to further develop their theoretical knowledge by undertaking a 16-week work placement.

Furthermore, the majority of students will have studied mathematics, accountancy, project management, contract management, workplace communication, people management, critical thinking skills and problem solving whilst they begin to specialise in their particular discipline.

Apply solutions to a defined range of unpredictable problems

Similarly BCA Academy programmes tutor students to respond to unpredictable problems within a defined range. For example, the Diploma in Construction Information Technology challenges students to develop a theoretical understanding of problem solving through the “Life Skills” module that then supports the students development of skills related to software troubleshooting, website development and most importantly customising, creating and maintaining Building Information Modelling (BIM) systems that i) fit company processes and ii) conform to industry standards and practices.

Identify, analyse and evaluate information from a variety of sources;

Along with the broad curricula developing key sectoral knowledge and communication skills, BCA Academy diploma holders will also be used to analysing and evaluating information from a variety of sources. Information may be diagrammatic i.e. design plans, displayed on computer or visible on the work site either way Diploma graduates will be accustomed to interpreting data at the design and production stages, and evaluating data on completion of production to continually assess the processes used. As well as exposure to technical data, BCA Academy diploma graduates will be aware of financial data (apply management and financial know-how of business to the industry) and wider industry developments.

Identify and apply skill and knowledge areas to a wide variety of contexts with depth in some areas

BCA Academy diploma students will develop a wide set of skills related to engineering discipline but will develop depth in the area of their diploma’s specialism.

Take responsibility for own outputs in relation to specified quality standards

On completion of their diploma, BCA Academy graduates may be awarded additional industry qualifications on top of their Diploma.

Comparison against AQF Level 5 (Diploma)

According to the AQF Handbook, holders of the Diploma at Level 5 should be able to:

- demonstrate understanding of a broad knowledge base incorporating some theoretical concepts, *with substantial depth in some areas*;
- *analyse and plan approaches to technical problems or management requirements*
- *transfer and apply theoretical concepts and/or technical or creative skills to a range of situations*
- *evaluate information using it to forecast for planning or research purposes*
- take responsibility for own outputs in relation to specified quality standards
- *take some responsibility for the achievement of group outcomes*

NB. Italicised items denote progression or variation for the outcomes prescribed for AQF level 4.

The requirement to take responsibility for one's own outputs is also addressed at level 4. This element also forms part of the BCA Academy training.

Demonstrate understanding of a broad knowledge base incorporating some theoretical concepts, *with substantial depth in some areas*

The phrase “substantial depth” in relation to subject area knowledge is the difference between the competency outcomes at Level 5 and Level 4 on the AQF. *Substantial* depth is required because the graduates of this programme are likely to have to accept greater responsibility in the working environment. Graduates will have more responsibility and as such will be expected to manage a greater workload and be expected to take on a greater burden of decision making and direct work.

As outlined above, the BCA Academy diplomas provide a broad knowledge base. The BCA Academy diplomas require knowledge of common industry skills but also that students begin to develop a specific area of expertise such as: mechanical engineering, construction information technology, construction according to green building principles. Over the three year programme, students develop an understanding of common competences in the first year, hone these skills in the second and then develop a basic understanding of an area of expertise in the final year which is further developed through project and a 16 week industrial attachment.

Development of other competencies outlined above however would not necessarily be met through the current BCA Academy provision.

Take some responsibility for the achievement of group outcomes

Certain units introduce students to duties and roles of safety supervisors and salient features of: BOWEC regulations and self-regulatory measures; Factories Act and Regulations; safety in work site; accident investigation; safety planning and layout for development; fire prevention and control on construction sites and this also provides some experience and understanding of taking responsibility for the safety of others. It is felt however, that the extent to which the level of responsibility for guiding the work of others in a work environment is addressed within the BCA Academy Diplomas is insufficient to enable comparison with the AQF Diploma.

Comparison against AQF Level 6

According to the AQF Handbook, holders of the Advanced Diploma at Level 6 should be able to:

- demonstrate understanding of a *specialised knowledge* with depth in some areas;
- *analyse, diagnose, design and execute judgements* across a broad range of technical or management functions;

- generate ideas through the *analysis of information and concepts* at an abstract level;
- demonstrate a command of *wide-ranging, highly specialised technical, creative or conceptual skills*;
- demonstrate *accountability* for personal outputs within broad parameters;
- demonstrate *accountability* for personal and group outcomes within broad parameters.

NB. Italicised items denote progression or variation for the outcomes prescribed for AQF level 5.

Demonstrate understanding of a *specialised knowledge* with depth in some areas

BCA Diplomas provide a broad knowledge of subjects key to performing a skilled role in an engineering related discipline. Each graduate will have developed communication skills and had the opportunity to further develop their theoretical knowledge with the successful completion of a 16 week work placement with the Industrial Attachment. Furthermore whilst beginning to specialise on their particular discipline, the majority of students will have studied:

- mathematics;
- accountancy;
- project management;
- contract management;
- workplace communication;
- people management;
- critical thinking skills; and
- problem solving.

The phrase “understanding of specialised knowledge” relevant to the discipline is the difference between the competency outcomes at Level 6 and Level 5 on the AQF. Areas of specialisation typically occur in the final year of learning on the BCA Diploma. Although some of the subjects studied during the first two years are unique to each stream, more in-depth specialisation is developed in the final year. For example, during the Diploma in Construction Engineering students cover “Reinforced Concrete Construction” in the first year which covers a number of principles in the production of reinforced concrete, then in the second year students cover a module in “Reinforced Concrete Design 1” and finally in third year students develop more specialised knowledge by completing “Reinforced Concrete Design 2”. Reinforced Concrete Design 1 has an overview of key principles of design and Reinforced Concrete Design 2 has an overview of a couple of industry standards which constitutes specialised knowledge in some areas.

For the most part the knowledge covered in BCA Academy diplomas is broad in comparison to the level of specialisation found at AQF level 6. When students study a module which builds on knowledge covered in previous modules, the learning

outcomes are still described as “overviews” and although certain practical exercises are undertaken e.g. “students will have practical sessions with design software” (Reinforced Concrete Design 2) the outcome remains broad, with less specialised knowledge than would be expected at AQF Advanced Diploma level.

Analyse, diagnose, design and execute judgements across a broad range of technical or management functions

As stated above, although BCA Academy diploma outcomes do cover elements of project management techniques and develop understanding of how to manage health and safety aspects on site, the learning outcomes may not fully ensure an ability to “analyse, diagnose, design and execute judgements across a broad range of technical or management functions” as required in the Advanced Diploma at AQF Level 6.

Generate ideas through the analysis of information and concepts at an abstract level

This outcome highlights the ability of a graduate of an Advanced Diploma to apply their specialist knowledge to problems which they have not trained to face: in effect, to take their knowledge of the subject and apply criteria in a logical manner to determine the nature of the problem and design a solution. The BCA Academy diploma learning outcomes, although broad in coverage with reference to analytical skills, do not make reference to problem solving in unknown or unpredictable situations, which is a key competency specified at AQF Level 6.

Demonstrate a command of wide-ranging, highly specialised technical, creative or conceptual skills

BCA Academy diploma holders will develop a wide set of skills related to engineering discipline but will develop depth in the area of their Diploma’s specialism.

Although BCA Graduates will develop a specialism by studying modules related to a specific engineering discipline the modules of study are broad based and not as specialised as those within the AQF Advanced Diploma. Despite the references to design and formulation in the BCA Academy diploma learning outcomes, it is implied that students are expected to follow set plans and procedures with less reference to creative or conceptual skills.

Demonstrate accountability for personal outputs within broad parameters

“Accountability” indicates a heavy level of responsibility for work tasks akin to management level particular within broad parameters. It infers responsibility for the work of others. However, the modules covered within the BCA Academy diploma, typically train to provide a sound technical knowledge rather than a great level of site management and project management expected of someone who had gained an Australian Advanced Diploma. For example, although some of the BCA Academy diploma learning outcomes make reference to supervision of staff, it is not implied

that graduates would be expected to undertake full management responsibility to encompass all aspects of projects from planning to completion. In contrast, graduates of the AQF Advanced Diploma must demonstrate that they can perform “a broad range of technical or management functions”.

Demonstrate *accountability* for personal and group outcomes within broad parameters.

Although units such as C6909 Building Construction Supervisors Safety Course which introduces students to duties and roles of safety supervisors, salient features of BOWEC regulations and self-regulatory measures, Factories Act and Regulations, safety in work site, accident investigation, safety planning and layout for development, fire prevention and control on construction sites and leads to some experience and understanding of taking responsibility for the safety of others it is felt that there is not as comparable a level of responsibility for guiding the work of others in a work environment.

8.2.4 Comparison of Core Content

The following programmes were examined: MEM40105 Certificate IV in Engineering, MEM50211 Diploma of Engineering and MEM60111 Advanced Diploma of Engineering to provide a broad basis for content and skills analysis. Reference was made to the employability skills prescribed for each qualification as well as a selection of competency standards and performance criteria. The former are divided into the broad categories including:

- communication;
- teamwork; and
- self-management

Communication

The BCA Academy diplomas easily cover the skills prescribed for the Certificate IV such as:

- read, interpret, follow and communicate information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents; and
- produce sketches, diagrams, charts or graphs

The AQF Diploma in Engineering places greater emphasis on the student's ability to communicate effectively, conduct a certain level of research and produce technical reports: skills covered within all of the BCA Academy diplomas through modules such as Technical Communications (ID862/IP862).

Some of the skills expected at Advanced Diploma level are similar to those expected of Diploma holders however holders of the Advanced Diploma must also be suitably prepared to:

- “communicate complex ideas through presentations, meetings and one-on-one communication;
- consult and advise internal and external clients to ensure clarification of requirements for projects or operations;
- liaise with internal and external stakeholders and others to confirm specifications and discuss alternatives
- research, evaluate and report information on systems, techniques, requirements, options and solutions.”

The BCA Academy diplomas do cover the underlying skills here, for example developing research skills through the project; however, this would be focused on a topic chosen by the student. It is evident that neither this, nor other modules, would necessarily provide the skills to be able to research and evaluate systems as required within the Advanced Diploma in Engineering.

Teamwork

The BCA Academy diplomas exceed the skills required for level 4, which include autonomous working and working as a team but do not include the level of supervisory duties found both within the AQF Diploma (level 5) and the BCA Academy diplomas. There is some broad correlation between the supervisory duties expected at level 6 and the Management Skills A & B (ID861/IP861) however the managerial responsibilities expected within the Advanced Diploma in Engineering are defined in greater depth. For example the AQF unit MEM220004A Manage Engineering Projects comprises the following core elements:

- scope the project;
- manage people;
- manage the physical resources within the project;
- manage quality, safety and environmental risk;
- manage procurement;
- manage time and progress
- finalise the project

Assigned to each of these elements are criteria for performance with examples of evidence which could be used to determine whether the student was suitably competent in that area.

The BCA Academy diplomas do include Management Skills (ID861) that aims to provide students with the human resource knowledge and skills expected for future supervisors and managers, and all but the Diploma in Strategic Facilities Management include a module on Project Management (FA712/FP712). This module however appears to be less comparable in terms of depth, introducing the broad concepts and skills relevant to project management and the importance of various components rather than focusing on the development of specific competencies in these areas to the extent expected at AQF Advanced Diploma level.

Self-management

The BCA Academy diplomas correspond well with the expectations placed on holders of the AQF Diploma in Engineering, namely to able to:

- carry out work within given timeframe, process and quality constraints;
- carry out work safely and in accordance with company policy and procedures and legislative requirements; and
- monitor work to ensure compliance with legislation, codes and national standards.

They also provide broad coverage of those skills required at Advanced Diploma level, to:

- manage own time and own processes;
- complete tasks in a competent and timely manner;
- set personal goals and plans;
- gain and use feedback to improve personal performance; and
- address all legislation, codes and standards related to safety, environmental impact and sustainability issues.

8.3 Articulation and Progression

Entry to higher education institutions in Australia is normally based on completion of Year 12 of school and determined by the student's tertiary entrance score or rank.

The academic progression routes for the BCA Diplomas most closely match those available for holders of the AQF Diploma. Graduates of the BCA diplomas, as with holders of the AQF Level 5 Diplomas, may be able to gain direct entry to a Bachelor degree in a relevant field or credit exemption for entry to the second year of a degree level programme in Australia. In reflection of their increased knowledge and skill level in relation to AQF Level 5 holders, AQF Advanced Diploma graduates may at the institution's discretion, gain entry onto the third year of university studies in a similar subject area.

Many of the Singaporean polytechnic diplomas had established progression pathways within certain degree programmes offered by Australian universities and given the comparable level of the BCA Academy diplomas, such opportunities for articulation may be afforded to BCA Academy graduates in particular fields and at institutional discretion.

8.4 Comparability to the AQF

The BCA Academy diplomas address the competencies expected at AQF Level 4 such as communication; teamwork; problem-solving; initiative and enterprise; planning and organising; self-management; learning; technology. The breadth of knowledge is however wider in the BCA Academy diplomas and the occupational outcomes are more advanced.

For the most part the BCA Academy diplomas have comparable breadth of study and provide comparable learning outcomes to the outcomes expected for graduates of AQF Diplomas such as the Australian MEM50211 Diploma of Engineering – Technical. Certain areas are less common to all diplomas and yet form a considerable part of the learning outcomes for the Australian Diploma namely to provide clear and precise information to team members; and to delegate and supervise work where appropriate

Supervisory capacity, responsibility for others work is not a common feature to all BCA Academy diplomas although it is argued that on balance the learning outcomes in terms of core knowledge, understanding and competencies of the modules common to all diplomas are broadly comparable to the requirements prescribed at AQF level 5:

Table 31: Table 29: Comparability of the BCA Academy diplomas to the AQF

AQF level	4	5	6
Comparative overview: descriptors and generic competencies	Exceeds	Meets	Not comparable
Core knowledge and understanding	Exceeds	Meets	Not comparable
Qualification core competencies and content level	Meets	Meets	Broadly meets

9. Summary and Analysis

The comparative analysis conducted by UK NARIC revealed that despite evident differences in content, the BCA Academy diplomas can be considered, in terms of level and academic standing, to meet the standards associated with the identified polytechnic diplomas in Singapore.

The key differences observed between BCA Academy programmes and polytechnic provision largely resulted from the diversity of the programmes' intended occupational outcomes. Whilst the BCA Academy and polytechnic programmes may, in some areas, tackle similar topics, the perspective from which they are addressed can differ notably with, for example, design modules offered by the BCA Academy centred on end usability, and in certain units, sustainability, while those offered by polytechnics largely promote design which takes into consideration social contexts and commercial viability.

The polytechnic diplomas, on the whole, provided a broader-based training, supporting modules in engineering with units in critical reasoning; management; teamwork and communication skills. Similarly polytechnics challenge students' creativity and innovation by requiring them to develop ideas, either marketing them in competition with fellow students such as in the creative engagement module with Republic Polytechnic and the Idea Jumpstart, Idea Blueprint and Idea Launchpad modules offered by Ngee Ann Polytechnic.

While the BCA Academy programmes develop soft skills in communication, the overarching focus of the qualifications is on developing specialisation in the subject area, providing comprehensive and in-depth study of theory of design, materials and technology.

The results of the analysis against Singaporean polytechnic diplomas are therefore as follows:

BCA Academy Programme	Comparability
Diploma in Construction Information Technology	Is considered to be of a comparable level to the Diploma in Green Building and Sustainability, Temasek Polytechnic
	Is considered to be of a comparable level to the Diploma in Sustainable Urban Design and Engineering, Ngee Ann Polytechnic
	Is considered to be of a comparable level to the Diploma in Architecture, Singapore Polytechnic
Diploma in Construction Engineering	Is considered to be of a comparable level to the Diploma in Civil Engineering with Business, Singapore Polytechnic
	Is considered to be of a comparable level to the Diploma in Architecture, Singapore Polytechnic
	Is considered to be of a comparable level to the Diploma in Sustainable Urban Design and Engineering (Architecture Specialisation), Ngee Ann Polytechnic
Diploma in Design (Interior and Landscape)	Is considered to be of a comparable level to the Diploma in Interior Design, Singapore Polytechnic
	Is considered comparable to the Diploma in Interior Architecture and Design, Temasek Polytechnic
Diploma in Mechanical Engineering (Green Building Technology)	Is considered to be of a comparable level to the Diploma in Mechanical Engineering, Ngee Ann Polytechnic
	Is considered comparable to the Diploma in Green Building and Sustainability, Temasek Polytechnic
	Diploma in Renewable Energy Engineering, Republic Polytechnic
Diploma in Strategic Facilities Management	Is considered to be of a comparable level to the Diploma in Hotel and Leisure Facilities Management (Property and Facilities Stream), Singapore Polytechnic
	Is considered to be of a comparable level to the Diploma in Hotel and Leisure Facilities Management Ngee Ann Polytechnic
	Is considered to be of a comparable level to the Diploma in Integrated Facility Management, Temasek Polytechnic
Diploma in Electrical Engineering and Clean Energy	Is considered to be of a comparable level to the Diploma in Electrical Engineering, Ngee Ann Polytechnic
	Is considered to be of a comparable level to the Diploma in Clean Energy, Singapore Polytechnic
	Is considered to be of a comparable level to the Diploma in Electrical Engineering with Eco-Design, Nanyang Polytechnic

Comparison of the BCA Academy programmes against the QCF revealed close alignment with QCF level 4 in terms of the overall purpose of the qualifications and the core competencies, knowledge and understanding expected of students at this level. Certain elements of the programmes approached level 5 however the absence of high level management competencies and duties with the BCA Academy diplomas prevented direct comparability.

When assessed against the AQF, the BCA Academy diplomas were found to be broadly comparable in terms of both the generic expected knowledge and competencies and the sector-specific skills prescribed at level 5 of the AQF.

In summary, the study has determined comparability against the English QCF and the Australian AQF as follows:

Country	Comparability
Australia	The BCA Academy Diplomas may be considered comparable to AQF Level 5 (Diploma) standard.
England	The BCA Academy Diplomas may be considered comparable to a standard between QCF levels 4 and 5.

10. References

A variety of sources were used during the course of this study, including, but not limited to:

- BCA Academy Full –Time Diploma Programmes Prospectus
- BCA Articulation Document
- Programme overviews and unit outlines for the selected Singaporean polytechnic diplomas accessed via institution websites:
 - Website of Singapore Polytechnic, www.sp.edu.sg
 - Website of Temasek Polytechnic, www.tp.edu.sg
 - Website of Ngee Ann Polytechnic, www.np.edu.sg
 - Website of Nanyang Polytechnic, www.nyp.edu.sg
 - Website of Republic Polytechnic, www.rp.edu.sg
- Website of the Office of Qualifications and Examination Regulation, www.ofqual.gov.uk
- The Register of Regulated Qualifications, <http://register.ofqual.gov.uk>
- Regulatory arrangements for the Qualifications and Credit Framework, http://www.ofqual.gov.uk/files/Regulatory_arrangements_QCF_August08.pdf
- Website of City and Guilds, www.cityandguilds.com
- City and Guilds Certificate in Engineering Construction Handbook, http://www.cityandguilds.com/documents/ind_engineering_production_maintenance/2456_Handbook_Sept.pdf
- Edexcel website, www.edexcel.com
- BTEC Higher Nationals Mechanical Engineering Specification Level 4, <http://www.edexcel.com/migrationdocuments/BTEC%20Higher%20Nationals%20from%202010/BH029305-HNCD-Mechanical-Engineering-spec-Issue4.pdf>
- Australian Qualification Framework Implementation Handbook Fourth Edition 2007, http://www.bcaa.edu.sg/cmsresource/BCAA_A4_website.pdf
- Quality Procedure Manual for Training and Professional Development (BCA Academy)
- MEM40105 Certificate IV in Engineering, Department of Education, Employment and Workplace Relations, July 2011

- MEM50211 Diploma of Engineering – Technical, Department of Education, Employment and Workplace Relations, July 2011
- UEE62010 Advanced Diploma of Engineering Technology – Renewable Energy, Department of Education, Employment and Workplace Relations, July 2011

Appendix 1: The QCF

Level	Summary	Knowledge and understanding	Application and action	Autonomy and accountability
Entry level	Entry 1 recognises progress along a continuum that ranges from the most elementary of achievements to beginning to make use of skills, knowledge or understanding that relate to the immediate environment.			
	Achievement at Entry 2 reflects the ability to make use of skills, knowledge and understanding to carry out simple, familiar tasks and activities with guidance.	Use knowledge or understanding to carry out simple, familiar activities Know the steps needed to complete simple activities	Carry out simple, familiar tasks and activities Follow instructions or use rehearsed steps to complete tasks and activities	With appropriate guidance begin to take some responsibility for the outcomes of simple activities Actively participate in simple and familiar activities
	Achievement at Entry 3 reflects the ability to make use of skills, knowledge and understanding to carry out structured tasks and activities in familiar contexts, with appropriate guidance where needed.	Use knowledge or understanding to carry out structured tasks and activities in familiar contexts Know and understand the steps needed to complete structured tasks and activities in familiar contexts	Carry out structured tasks and activities in familiar contexts Be aware of the consequences of actions for self and others	With appropriate guidance take responsibility for the outcomes of structured activities Actively participate in activities in familiar contexts
Level 1	Achievement at level 1 reflects the ability to use relevant knowledge, skills and procedures to complete routine tasks. It includes responsibility for completing tasks and procedures subject to direction or guidance.	Use knowledge of facts, procedures and ideas to complete well-defined, routine tasks Be aware of information relevant to the area of study or work	Complete well-defined routine tasks Use relevant skills and procedures Select and use relevant information Identify whether actions have been effective	Take responsibility for completing tasks and procedures subject to direction or guidance as needed

Level	Summary	Knowledge and understanding	Application and action	Autonomy and accountability
Level 2	Achievement at level 2 reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well-defined tasks and address straightforward problems. It includes taking responsibility for completing tasks and procedures and exercising autonomy and judgement subject to overall direction or guidance.	<p>Use understanding of facts, procedures and ideas to complete well-defined tasks and address straightforward problems</p> <p>Interpret relevant information and ideas</p> <p>Be aware of the types of information that are relevant to the area of study or work</p>	<p>Complete well-defined, generally routine tasks and address straightforward problems</p> <p>Select and use relevant skills and procedures</p> <p>Identify, gather and use relevant information to inform actions</p> <p>Identify how effective actions have been</p>	<p>Take responsibility for completing tasks and procedures</p> <p>Exercise autonomy and judgement subject to overall direction or guidance</p>
Level 3	Achievement at level 3 reflects the ability to identify and use relevant understanding, methods and skills to complete tasks and address problems that, while well defined, have a measure of complexity. It includes taking responsibility for initiating and completing tasks and procedures as well as exercising autonomy and judgement within limited parameters. It also reflects awareness of different perspectives or approaches within an area of study or work.	<p>Use factual, procedural and theoretical understanding to complete tasks and address problems that, while well defined, may be complex and non-routine</p> <p>Interpret and evaluate relevant information and ideas</p> <p>Be aware of the nature of the area of study or work</p> <p>Have awareness of different perspectives or approaches within the area of study or work</p>	<p>Address problems that, while well defined, may be complex and non-routine</p> <p>Identify, select and use appropriate skills, methods and procedures</p> <p>Use appropriate investigation to inform actions</p> <p>Review how effective methods and actions have been</p>	<p>Take responsibility for initiating and completing tasks and procedures, including, where relevant, responsibility for supervising or guiding others</p> <p>Exercise autonomy and judgement within limited parameters</p>

Level	Summary	Knowledge and understanding	Application and action	Autonomy and accountability
Level 4	Achievement at level 4 reflects the ability to identify and use relevant understanding, methods and skills to address problems that are well defined but complex and non-routine. It includes taking responsibility for overall courses of action as well as exercising autonomy and judgement within fairly broad parameters. It also reflects understanding of different perspectives or approaches within an area of study or work.	<p>Use practical, theoretical or technical understanding to address problems that are well defined but complex and non-routine</p> <p>Analyse, interpret and evaluate relevant information and ideas</p> <p>Be aware of the nature and approximate scope of the area of study or work</p> <p>Have an informed awareness of different perspectives or approaches within the area of study or work</p>	<p>Address problems that are complex and non-routine while normally fairly well defined</p> <p>Identify, adapt and use appropriate methods and skills</p> <p>Initiate and use appropriate investigation to inform actions</p> <p>Review the effectiveness and appropriateness of methods, actions and results</p>	<p>Take responsibility for courses of action, including, where relevant, responsibility for the work of others</p> <p>Exercise autonomy and judgement within broad but generally well-defined parameters</p>
Level 5	Achievement at level 5 reflects the ability to identify and use relevant understanding, methods and skills to address broadly-defined, complex problems. It includes taking responsibility for planning and developing courses of action as well as exercising autonomy and judgement within broad parameters. It also reflects understanding of different perspectives, approaches or schools of thought and the reasoning behind them.	<p>Use practical, theoretical or technological understanding to find ways forward in broadly-defined, complex contexts</p> <p>Analyse, interpret and evaluate relevant information, concepts and ideas</p> <p>Be aware of the nature and scope of the area of study or work</p> <p>Understand different perspectives, approaches or schools of thought and the reasoning behind them</p>	<p>Address broadly-defined, complex problems</p> <p>Determine, adapt and use appropriate methods and skills</p> <p>Use relevant research or development to inform actions</p> <p>Evaluate actions, methods and results</p>	<p>Take responsibility for planning and developing courses of action, including, where relevant, responsibility for the work of others</p> <p>Exercise autonomy and judgement within broad parameters</p>

Level	Summary	Knowledge and understanding	Application and action	Autonomy and accountability
Level 6	Achievement at level 6 reflects the ability to refine and use relevant understanding, methods and skills to address complex problems that have limited definition. It includes taking responsibility for planning and developing courses of action that are able to underpin substantial change or development, as well as exercising broad autonomy and judgement. It also reflects an understanding of different perspectives, approaches or schools of thought and the theories that underpin them.	<p>Refine and use practical, conceptual or technological understanding to create ways forward in contexts where there are many interacting factors</p> <p>Critically analyse, interpret and evaluate complex information, concepts and ideas</p> <p>Understand the context in which the area of study or work is located</p> <p>Be aware of current developments in the area of study or work</p> <p>Understand different perspectives, approaches or schools of thought and the theories that underpin them</p>	<p>Address problems that have limited definition and involve many interacting factors</p> <p>Determine, refine, adapt and use appropriate methods and skills</p> <p>Use and, where appropriate, design relevant research and development to inform actions</p> <p>Evaluate actions, methods and results and their implications</p>	<p>Take responsibility for planning and developing courses of action that are capable of underpinning substantial changes or developments</p> <p>Initiate and lead tasks and processes, taking responsibility, where relevant, for the work and roles of others</p> <p>Exercise broad autonomy and judgement</p>

Level	Summary	Knowledge and understanding	Application and action	Autonomy and accountability
Level 7	Achievement at level 7 reflects the ability to reformulate and use relevant understanding, methodologies and approaches to address problematic situations that involve many interacting factors. It includes taking responsibility for planning and developing courses of action that initiate or underpin substantial change or development, as well as exercising broad autonomy and judgement. It also reflects an understanding of relevant theoretical and methodological perspectives, and how they affect their area of study or work.	<p>Reformulate and use practical, conceptual or technological understanding to create ways forward in contexts where there are many interacting factors</p> <p>Critically analyse, interpret and evaluate complex information, concepts and theories to produce modified conceptions</p> <p>Understand the wider contexts in which the area of study or work is located</p> <p>Understand current developments in the area of study or work</p> <p>Understand different theoretical and methodological perspectives and how they affect the area of study or work</p>	<p>Conceptualise and address problematic situations that involve many interacting factors</p> <p>Determine and use appropriate methodologies and approaches</p> <p>Design and undertake research, development or strategic activities to inform the area of work or study, or produce organisational or professional change</p> <p>Critically evaluate actions, methods and results and their short- and long-term implications</p>	<p>Take responsibility for planning and developing courses of action that initiate or underpin substantial changes or developments</p> <p>Exercise broad autonomy and judgement across a significant area of work or study</p> <p>Initiate and lead complex tasks and processes, taking responsibility, where relevant, for the work and roles of others</p>

Level	Summary	Knowledge and understanding	Application and action	Autonomy and accountability
Level 8	<p>Achievement at level 8 reflects the ability to develop original understanding and extend an area of knowledge or professional practice. It reflects the ability to address problematic situations that involve many complex, interacting factors through initiating, designing and undertaking research, development or strategic activities. It involves the exercise of broad autonomy, judgement and leadership in sharing responsibility for the development of a field of work or knowledge or for creating substantial professional or organisational change. It also reflects a critical understanding of relevant theoretical and methodological perspectives and how they affect the field of knowledge or work.</p>	<p>Develop original practical, conceptual or technological understanding to create ways forward in contexts that lack definition and where there are many complex, interacting factors</p> <p>Critically analyse, interpret and evaluate complex information, concepts and theories to produce new knowledge and theories</p> <p>Understand and reconceptualise the wider contexts in which the field of knowledge or work is located</p> <p>Extend a field of knowledge or work by contributing original knowledge and thinking</p> <p>Exercise critical understanding of different theoretical and methodological perspectives and how they affect the field of knowledge or work</p>	<p>Conceptualise and address problematic situations that involve many complex, interacting factors</p> <p>Formulate and use appropriate methodologies and approaches</p> <p>Initiate, design and undertake research, development or strategic activities that extend the field of work or knowledge or result in significant organisational or professional change</p> <p>Critically evaluate actions, methods and results and their implications for the field of work or knowledge and its wider context</p>	<p>Take responsibility for planning and developing courses of action that have a significant impact on a field of work or knowledge, or result in substantial organisational or professional change</p> <p>Exercise broad autonomy, judgement and leadership as a leading practitioner or scholar sharing responsibility for the development of a field of work or knowledge, or for substantial organisational or professional change</p> <p>Take responsibility for the advancement of professional practice</p>

Source: Regulatory arrangements for the Qualifications and Credit Framework
http://www.ofqual.gov.uk/files/Regulatory_arrangements_QCF_August08.pdf

Appendix 2: Glossary of Key Terms

Programme

A course of study.

Qualification

An award conferred upon the student on completion of a programme of study.

Subject

A course or area of study.

Graduate

One who has successfully completed a programme of study and has been awarded a qualification.

Student

One who is enrolled or attends classes at a school, college, or university.

Holder

One who is in possession of a qualification or professional title.