Graphics
Senior Syllabus 2013
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1 Rationale

Graphics engages students in solving design problems and presenting their ideas and solutions as graphical products. Students explore design problems through the lens of a design process where they identify and explore a need or opportunity of a target audience; research, generate and develop ideas; produce and evaluate solutions. Students communicate solutions in the form of graphical representations using industry conventions where applicable.

Graphics develops students’ understanding of design factors and design processes in graphical contexts. Design problems provide settings for units of work where students create graphical representations of design solutions for a range of audiences, including corporate and end-user clients. These design settings are based in the real-world design areas of industrial design, graphic design and built environment design (architecture, landscape architecture and interior design).

In the development of solutions to design problems, students sketch and draw freehand, develop spatial cognition and visualisation, produce technical graphical representations in both two-dimensional and three-dimensional formats and use existing and emerging technologies to present solutions graphically. Students will interpret, generate and create visual communications for particular purposes and audiences. Students plan and produce graphical representations in simulated real-world contexts. They make judgments and justify decisions.

Graphics contributes to the development of technological literacy and develops the communication, analytical and problem-solving skills required for a large number of educational and vocational aspirations, including the fields of graphic design, industrial design, built environment design (architecture, landscape architecture and interior design), engineering, urban and regional planning, surveying and spatial sciences, and building paraprofessionals.
2 Dimensions and objectives

The dimensions are the salient properties or characteristics of distinctive learning for this subject. The dimensions are described through their objectives and it is these that schools are required to teach and that students have the opportunity to learn. The objectives describe what students should know and be able to do by the end of the course of study.

Progress in a particular dimension may depend on the qualities and skills developed in other dimensions. Learning through each of the dimensions must increase in complexity to allow for greater independence of the learner over a four-semester course of study.

Schools must assess how well students have achieved the objectives. The standards have a direct relationship with the objectives, and are described in the same dimensions as the objectives.

The dimensions for a course of study in this subject are:

- Dimension 1: Knowledge and understanding
- Dimension 2: Analysis and application
- Dimension 3: Synthesis and evaluation.

2.1 Dimension 1: Knowledge and understanding

The dimension Knowledge and understanding encompasses the range of knowledge and understandings required to respond to design problems.

2.1.1 Objectives

By the conclusion of the course of study, students should:

- explain design problems using design factors
- identify and describe design criteria
- comprehend graphical principles, procedures and conventions.

When students explain, they use the design factors and provide examples to clarify the meaning of the design problem.

When students identify and describe, they outline, state or provide details about the design criteria that will be used to judge the quality of the design solutions and graphical representations.

When students comprehend, they demonstrate an understanding of the principles and procedures of 2-D and 3-D graphical communications and conventions. These conventions are specific to the design problem and the design area.

2.2 Dimension 2: Analysis and application

The dimension Analysis and application encompasses selecting, analysing and interpreting information about design problems.

2.2.1 Objectives

By the conclusion of the course of study, students should:

- apply design factors to develop ideas
- analyse and interpret graphical and design information
- use graphical skills to produce graphical products for particular audiences.
When students apply design factors, they consider how these will influence and develop design ideas and graphical solutions.

When students analyse, they dissect data, examine aspects of graphical and design information in design areas and establish the connections between these. When students interpret they generate and refine ideas to understand what the design problem requires them to do.

When students use graphical skills, they consider and demonstrate manual and computerised skills to refine and produce graphical products that communicate ideas and solutions to design problems for a particular audience.

2.3 **Dimension 3: Synthesis and evaluation**

The dimension *Synthesis and evaluation* encompasses the synthesis of ideas and making and justifying decisions. It encompasses the recommendations made throughout the design process and justification of the final solution. It includes evaluating and making judgments about the quality of the graphical representations against design criteria.

### 2.3.1 Objectives

By the conclusion of the course of study, students should:

- synthesise ideas to develop graphical solutions
- evaluate solutions and graphical representations
- propose recommendations and justify decisions.

When students synthesise ideas, they combine ideas, make design decisions and decide upon graphical solutions for the design problem.

When students evaluate design and graphical information, they judge the quality of graphical products and representations, including design ideas and solutions using design criteria.

When students propose recommendations, they suggest ways in which outcomes may be improved. When students justify decisions, they provide support as to why a decision was made and how that decision best solves the design problem.
3 Course organisation

3.1 Course overview

The minimum number of hours of timetabled school time, including assessment, for a course of study developed from this syllabus is 55 hours per semester. A course of study will usually be completed over four semesters (220 hours).

Graphics is designed to enable schools to develop a course with a diverse range of teaching and learning experiences through the dimensions Knowledge and understanding, Analysis and application and Synthesis and evaluation.

Across the four-semester course of study there should be:

- four to eight units of work that:
  - use core subject matter arising from
    - design processes
    - design factors
    - graphical representations
  - are based in design areas
- an emphasis on student use of electronic media appropriate to the chosen design area/s.

In each year of a course of study there should be:

- at least two design areas
- two to four units of work
- at least one unit that uses Computer Aided Design and Drafting (CADD) software in the production of the graphical representations for the solution to a design problem.

3.2 Core subject matter

The core subject matter in Graphics is a design process, design factors, and a range of graphical representations. All core subject matter is included in Year 11 and then revisited and further developed in Year 12. Emphasis is on depth rather than breadth. Subject matter is developed within design areas (see Section 3.3). It is not expected that all subject matter will be covered in each unit.

3.2.1 A design process

In solving design problems graphically students use a design process. It is iterative, emphasising the recursive and reflective nature of design. As a minimum, students should understand and use this design process when solving design problems.

Students should be made aware that more than one design process exists and that similarities exist in all design processes. Various design processes are accepted practice in different contexts and industries.

For students to develop knowledge and understanding of a design process it is critical that teachers provide teaching and learning opportunities that enable students to work with subsets of a design process as well as the complete design process when developing graphical solutions.

The dimensions and objectives are evidenced as students engage in the process, where they understand and define the design problem (Exploring design problems), develop and refine ideas (Developing ideas), produce graphical products and evaluate solutions (Producing graphical products). Students communicate ideas, information and solutions through annotated graphical representations.
As students experience the stages of a design process they engage in a range of cognitive, communication, creative, research and technical skills. Possible aspects of each stage are outlined below.

Exploring design problems may involve:

- describing the needs and opportunities of individual or community users within the selected design area
- evaluating how well existing products and graphical representations meet needs, and identifying possible improvements
- explaining the design problem
- investigating design factors by accessing information from primary sources (e.g. interviews with users, surveys) and secondary sources (e.g. books, existing graphical products, other designers) to understand the nature of the design problem
- analysing the graphical conventions for the design area and the design problem
- analysing graphical representations that could be used for the design area and the design problem
- developing a design brief from the design problem
- establishing criteria based on the design factors to evaluate the quality of ideas, solutions and graphical products.
Developing ideas may involve:
• generating and representing ideas (e.g. annotated sketches and drawings)
• evaluating ideas in relation to the design criteria
• collecting data and information through research and testing to progress and evaluate ideas and inform the selection of a solution
• selecting and refining a solution to satisfy design criteria and justify decisions
• evaluating the proposed solution.

Producing graphical products may involve:
• producing sketches and drawings for a particular audience and purpose
• managing the production of the graphical representations
• evaluating the proposed graphical representations against the design criteria
• making and justifying decisions to modify the graphical representations
• evaluating and describing how the final solution and graphical products meet the design criteria
• making and justifying recommendations for improvements to design processes and graphical products.

3.2.2 Design factors

The design factors are part of core knowledge for this subject. They are used to frame and explore design problems, to inform solutions, and as criteria against which the effectiveness of graphical solutions can be judged.

The design factors are based on the concept of user-centred design, which identifies human needs, opportunities or problems with a view to improving wellbeing and the quality of life for end-users.

Teachers are required to explicitly teach and model how the design factors are used in the design process. The design factors should be used by students to define the parameters for investigation of solutions for design problems.

All of the design factors do not have to be covered in each design problem. Some design factors may be stipulated by the design problem, have varying impact on solutions and may not be evident in the graphical representations produced. The relevance and emphasis of each design factor will vary according to the design problem.

Development in the depth of understanding of the design factors should occur over the course of study. Students must be able to make decisions about design factors when solving design problems.

Students will also increasingly learn to manage the design process as they experience more open-ended design problems or if they identify design problems of their own.

The design factors:
• include the range of aspects that influence design and the choice and creation of graphical products
• will be interconnected with the emphasis and importance of each dependent on the design problem
• are used to establish the criteria upon which the graphical representations and design solutions will be judged.

The key ideas illustrate the scope of the design factors while the suggested subject matter shows the breadth of knowledge within the key idea.
Key ideas are listed for each design factor. All key ideas should be introduced in Year 11 and be evident in the course of study before verification in Year 12. Over the course of study there should be an increase in complexity of knowledge and understanding of the key ideas.

The design factors, key ideas and suggested subject matter with guiding questions are outlined in the following table.

Table 1: Design factors, key ideas, subject matter and guiding questions

<table>
<thead>
<tr>
<th>Design factors</th>
<th>Key ideas</th>
<th>Subject matter and guiding questions</th>
</tr>
</thead>
</table>
| **User-centred design**             | When solving design problems, the purpose is to identify the human needs or capitalise on an opportunity with a view to developing a solution that functions and satisfies the user. | What is the design problem asking me to do?  
  - what, who, when, where, how  
What is the need to be solved or the reason for the new product?  
  - social  
  - physical — comfort, ergonomics and anthropometric data  
  - mechanical, functional  
  - aesthetic  
  - economic.  
Who is the audience for the solution and the graphical products? (This may be client or end-user.)  
  - age, gender and economic status  
  - cultural and religious considerations.  
Will the needs of other stakeholders require consideration?  
  - emotional and sensory appeal  
  - fashion and trends.  
What is the design area in which this solution will be produced?  
  - industrial design  
  - built environment design  
  - graphic design  
  - corporate/business  
  - personal.  
How do the requirements for safety, operation, performance, reliability and quality affect the design ideas and graphical representations produced? |
| **Elements and principles of design** | **Elements of design** refer to the components available for the designer to communicate visually, while **principles of design** describe how the elements could be used. | How do elements and principles of design influence graphical solutions?  
Elements of design most commonly used are:  
  - space  
  - line  
  - colour  
  - shape  
  - texture  
  - tone  
  - form.  
The principles of design most commonly used are:  
  - balance — symmetry, asymmetry, radial, pattern  
  - contrast  
  - proximity  
  - harmony/unity  
  - alignment  
  - repetition/consistency  
  - hierarchy/proportion/scale. |
<table>
<thead>
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</tr>
</thead>
</table>
| **Technologies** | Tools, processes and skills are selected according to the graphical representations required. | What are the tools, processes and skills required to produce graphical products?  
- software systems, including CADD programs  
- drawing tools  
- printers (2-D and 3-D)  
- procedures and conventions. |
| **Legal responsibilities** | Legal responsibilities ensure that solutions to design problems are accountable and safe. | What are the legal responsibilities to be considered?  
- intellectual property  
- safety, standards and regulations. |
| **Design strategies** | To facilitate innovation when developing new or improved solutions to design problems, consideration of design strategies should be used to develop, refine and document solutions. | What design strategies might be used to help solve the design problem?  
- brainstorming activities  
- design heuristics (e.g. SCAMPER — substitute, combine, adapt, modify, propose, eliminate, rearrange)  
- graphic organisers. |
| **Project management** | Planning and implementing project management skills are used throughout a design process. | What skills are required to undertake and manage projects?  
- resource management  
- planning and reviewing milestones  
- time monitoring. |
| **Sustainability** | To develop sustainable solutions consideration must be given to the impacts of social, economic and environmental sustainability in all stages of the design process. | How does sustainability influence graphical solutions?  
Social sustainability  
- historical and cultural influences such as:  
  - changing social trends  
  - the changing nature of work  
  - technological change.  
Economic sustainability  
- responsible use of resources  
- ensuring products are "built to last" and function efficiently over a long time.  
Environmental sustainability  
- life cycle analysis  
- eco-footprint  
- recycling  
- use of renewable energy and resources and systems to ensure sustainability. |
| **Materials** | The visible characteristics of materials influence the presentation of graphical representations. | How will the visual characteristics of materials be communicated in the graphical products?  
- aesthetic considerations  
- visual representations of materials (paper, metal, plastics, glass, ceramics, composites, biomaterials, textiles, wood). |
3.2.3 Graphical representations

Graphical representations are part of the core subject matter of this subject. Students must experience a range of 2-D and 3-D sketches and drawings, including orthographic projections and pictorials.

Table 2: Explanation of core graphical representation terms

<table>
<thead>
<tr>
<th>Sketches</th>
<th>Drawings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sketched are completed freehand, often instantly capturing an idea for later use and therefore lack presentation quality. High-quality sketches may be used for final presentation depending on the design area, function and audience. Sketches are usually produced manually but may be software assisted.</td>
<td>Drawings encompass a range of graphical representations for particular design areas, functions and audiences. Drawings are usually produced using software systems but could be produced manually depending on the design area, function and audience.</td>
</tr>
</tbody>
</table>

Based on what is represented for what purpose, there are three types of sketches and drawings that should be experienced by Graphics students. These are:

- Sketches and drawings not based solely on descriptive geometry (mathematical based constructions). These include the images and illustrations commonly used in Graphic Design.
- An orthographic projection (3-D objects represented as 2-D images) is a method of projection in which an object is depicted or a surface mapped using parallel lines to project its shape onto a plane. Orthographic projections are usually arranged in a group with particular views, chosen to best describe the object, laid out in a pattern so that each view may be projected from other views in the system.
- A pictorial (3-D objects represented as 3-D images) is a view of an object (actual or imagined) as it would be seen by an observer who looks at the object either in a chosen direction or from a selected point of view.

Graphical representations document ideas and solutions to design problems as students progress through design processes. Although students should know about these, they need only develop graphical skills for those types of graphical representations required in the design problems they undertake. Examples of common types of graphical representations that students may encounter are:

- diagrams, including symbols, charts, graphs and maps
- single, multiple and section views and cut-away sections
- concept, working, perspective, presentation and final drawings
- axonometric projections; assembly, working assembly, detail, exploded or open and in line for assembly, and exploded view drawings
- animations and simulations.

Appendix 1 provides further explanations for this range of common graphical representations.

Students will be taught the principles and procedures necessary to reproduce the type of graphical representations required by the design problems they are undertaking. The design area, purpose and audience will influence the conventions and the computerised or manual procedures under which sketches and drawings are completed and presented. Students must have opportunities to produce sketches and a range of drawings in each unit of work.
3.2.4 Software systems

This course emphasises students’ use of software systems appropriate to the design areas in which they are working. There are three groupings of relevant software systems. Graphics software used for the production of 2-D imagery specifically for graphic design purposes, and 2-D and 3-D CADD systems. In the course, students must at least have access to a CADD system to produce graphical representations. Access to all three types of systems would benefit students in their understanding of the possible range of graphical representations. Appendix 2 contains further information.

3.3 Design areas

Graphical representations are produced as the result of learning experiences and assessment opportunities, as students solve design problems that are situated in three design areas. Across the course of study students must experience at least two of these design areas.

The three design areas are:

- industrial design
- built environment design (architecture, landscape architecture and interior design)
- graphic design.

3.3.1 Industrial design

Industrial design is the professional service of creating and developing concepts and specifications that optimise the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer. Industrial design uses a combination of applied art and applied science to improve the aesthetics, utility and usability of a product, which also may improve the product’s marketability and production.

3.3.2 Built environment design

Built environment design includes the areas of architecture, landscape architecture and interior design. It refers to indoor and outdoor spaces that have been structurally changed by human action.

- Architecture involves the design of buildings and structures for human activity including residential spaces ranging from individual homes to large housing complexes, major public infrastructure such as hospitals and museums and commercial office spaces and entertainment facilities.
- Landscape architecture involves the design of long lasting, meaningful and enjoyable outdoor spaces including parks and other recreational spaces, botanic gardens, sporting complexes, various educational, commercial, industrial and residential sites as well as landscapes associated with major infrastructure systems such as roads and railways.
- Interior design is concerned with the relations between people and the environment to create efficient, meaningful and appealing interior spaces in settings such as domestic residences, commercial buildings such as offices, entertainment and retail spaces and industrial and transportation interiors including vehicle and train interiors.

3.3.3 Graphic design

Graphic design involves the manipulation, combination and use of shape, colour, imagery, typography and space to create visual solutions for reproduction by any means of visual communication. Graphical products include identity (logos and branding), publications (magazines, webpages, newspapers and books), advertisements, product packaging, maps and charts.
3.4 Units of work

Units of work must be developed through design problems based in a design area. Units of work are to be developed to provide opportunity to offer a range of design and graphical experiences that increase in complexity, independence and level of challenge across the four-semester course of study.

Increasing complexity refers to increasing the demands made on students as they progress through the course. Students initially encounter learning experiences and assessment that may provide design problems with few stipulated design factors, subsets of the design process and specified graphical representations. They build upon their knowledge, understandings and skills with design problems that are more open and require students to make more complex decisions when designing and graphically representing solutions for particular audiences.

Increasing independence develops as students are required to accept responsibility for their own learning across the course. Students begin with assisted and modelled learning and assessment and then move to greater degrees of independence. Initially, students may be provided with design problems that state the needs of the particular audience/s as the basis for their initial design activities and graphical products. Later in the course of study students identify and describe the design and graphical needs of the particular audience/s.

Increasing levels of challenge are in the breadth and depth of understanding of design factors, the design process and graphical representations. Breadth refers to the range and extent of the design factors and graphical representations across the course of study. Depth refers to the increasing complexity of knowledge and understandings of graphical conventions, design factors and the application of the design process and graphical procedures.

There should be four to eight units of work across a course of study.

Units of work provide opportunities for:

- teaching, learning and assessment of the dimensions and objectives
- student engagement in a design process
- application and analysis of the design factors and key ideas relevant to design problems in a design area. Not all design factors and key ideas need be in a single unit, however learning experiences about each design factor and key idea should be included in Year 11 and further developed in Year 12
- the explicit teaching and development of graphical skills and the production of graphical products.

3.4.1 Design problems

In this syllabus units of work are developed through design problems that are as authentic and real-world as possible. A design problem is situated in a particular design area. In each unit of work more than one design problem may be explored in a design area.

Graphical products are produced as the outcome of a design problem. Design problems require innovative and creative solutions and are the basis for each unit of work. A design problem may be expressed as a problem, a human need or an opportunity that requires solving. Design problems will be based on an identified need or opportunity for a particular audience.

In the early stages of the course teachers will develop and model the approaches and skills required to solve design problems and create graphical products. As the course progresses the design problem may be developed in consultation with students.

Design problems will range from those early in the course requiring few design decisions, to more complex open problems later in the course. All design problems require students to make design decisions and demonstrate these solutions through the generation of graphical representations.
A design problem:

- is explored through a design process
- articulates the need or opportunity that requires a design solution, resulting in a graphical product for a particular audience
- identifies a particular audience, purpose and design area for the design problem
- provides information for students to develop a design brief and design criteria
- requires students to use a range of sketches and drawings
- may have a number of possible solutions.

3.5 Advice, guidelines and resources

The following advice, guidelines and resources support the implementation of the syllabus. Where indicated further information may be obtained from the Graphics subject page of the QSA website <www.qsa.qld.edu.au/20321.html>.

3.5.1 Aboriginal and Torres Strait Islander perspectives

The Queensland Government has a vision that Aboriginal and Torres Strait Islander Queenslanders have their cultures affirmed, heritage sustained and the same prospects for health, prosperity and quality of life as other Queenslanders. The QSA is committed to helping achieve this vision and encourages teachers to include Aboriginal and Torres Strait Islander perspectives in the curriculum.

The Queensland Studies Authority (QSA) recognises Aboriginal and Torres Strait Islander peoples, their traditions, histories and experiences from before European settlement and colonisation through to the present time. To strengthen students’ appreciation and understanding of the first peoples of the land, opportunities exist in the syllabus to encourage engagement with Aboriginal and Torres Strait Islander:

- frameworks of knowledge and ways of learning
- contexts in which Aboriginal and Torres Strait Islander peoples live
- contributions to Australian society and cultures.

Subject-specific resources are available on the Graphics subject page. In addition, guidelines about Aboriginal and Torres Strait Islander perspectives and resources for teaching are available on the QSA website <www.qsa.qld.edu.au/577.html>.

3.5.2 Composite classes

This syllabus enables teachers to develop a course of study that caters for a variety of ways to organise learning, such as combined Years 11 and 12 classes, combined campuses, or modes of delivery involving periods of student-managed study. This resource provides guidelines about composite classes.

3.5.3 Embedding educational equity in the course of study

Equity means fair treatment of all. In developing work programs from this syllabus, schools need to provide opportunities for all students to demonstrate what they know and what they can do. All students, therefore, should have equitable access to educational programs and human and material resources.

In addition to the subject-specific resources available on the Graphics subject page, guidelines about educational equity and resources for devising an inclusive work program are available on the QSA website <www.qsa.qld.edu.au/10188.html>. 
3.5.4 Language education in Graphics

It is the responsibility of teachers to develop and monitor students’ abilities to use the forms of language appropriate to their own subject areas. This involves providing opportunities for the development of students’ abilities in:

- selection and sequencing of information required in various forms (such as reports, essays, interviews and seminar presentations)
- use of technical terms and their definitions
- use of correct grammar, spelling, punctuation and layout.

3.5.5 Learning experiences and sample resources

This resource provides guidelines for learning experiences and sample resources, which may include unit/s of work.

3.5.6 Mathematical concepts in Graphics

It is the responsibility of teachers to develop and monitor students’ abilities to use mathematical concepts appropriate to their own subject areas. This involves providing opportunities for the development of students’ abilities to:

- comprehend basic concepts and terms underpinning the areas of number, space, probability and statistics, and measurement
- extract, convert or translate information given in numerical forms, or as diagrams, maps, graphs or tables
- calculate and apply procedures
- use skills or apply concepts from one problem or one subject to another.

3.5.7 Reference materials

This resource provides links to reference materials, text and reference books, websites, newspaper reports, periodicals, electronic media and learning technology, and organisations and community resources for the subject.

3.5.8 Work program requirements

A work program is the school’s plan of how the course of study will be delivered and assessed, based on the school’s interpretation of the syllabus. It allows for the special characteristics of the individual school and its students. Work program requirements are available on the Graphics subject page of the QSA website <www.qsa.qld.edu.au/20321.html>. Instructions for online submission of work programs are available from <www.qsa.qld.edu.au/wponline/login.qsa>.
4 Assessment

Assessment is an integral part of the teaching and learning process. For Years 11 and 12 it is the purposeful, systematic and ongoing collection of information about student learning outlined in the senior syllabuses.

In Queensland, assessment is standards based. The standards for each subject are described in dimensions, which identify the valued features of the subject about which evidence of student learning is collected and assessed. The standards describe the characteristics of student work.

The major purposes of assessment in senior Authority subjects are to:

- promote, assist and improve learning
- inform programs of teaching and learning
- advise students about their own progress to help them achieve as well as they are able
- give information to parents, carers and teachers about the progress and achievements of individual students to help them achieve as well as they are able
- provide comparable levels of achievement in each Authority subject which may contribute credit towards a Queensland Certificate of Education
- provide base data for tertiary entrance purposes
- provide information about how well groups of students are achieving for school authorities and the State Minister responsible for Education.

4.1 Principles of exit assessment

All the principles of exit assessment must be used when planning an assessment program and must be applied when making decisions about exit levels of achievement.

A standards-based assessment program for the four-semester course of study requires application of the following interdependent principles:

- information is gathered through a process of continuous assessment, i.e. continuous assessment
- balance of assessment is a balance over the course of study and not necessarily a balance over a semester or between semesters, i.e. balance
- exit levels of achievement are devised from student achievement in all areas identified in the syllabus as being mandatory, i.e. mandatory aspects of the syllabus
- assessment of a student’s achievement is in the significant aspects of the course of study identified in the syllabus and the school’s work program, i.e. significant aspects of the course of study
- selective updating of a student’s achievement is undertaken over the course of study, i.e. selective updating
- exit assessment is devised to provide the fullest and latest information on a student’s achievement in the course of study, i.e. fullest and latest information.

4.1.1 Continuous assessment

Judgments about student achievement made at exit from a course of study must be based on an assessment program of continuous assessment.
Continuous assessment involves gathering information on student achievement using assessment instruments administered at suitable intervals over the developmental four-semester course of study.

In continuous assessment, all assessment instruments have a formative purpose — to improve teaching and student learning and achievement.

When students exit the course of study, teachers make a summative judgment about their levels of achievement in accordance with the standards matrix.

The process of continuous assessment provides the framework in which the other five principles of exit assessment operate: balance, mandatory aspects of the syllabus, significant aspects of the course of study, selective updating, and fullest and latest information.

4.1.2 Balance
Judgments about student achievement made at exit from a course of study must be based on a balance of assessments over the course of study.

Balance of assessment is a balance over the course of study and not a balance within a semester or between semesters.

Balance of assessment means judgments about students' achievements of the dimensions and objectives are made a number of times using a variety of assessment techniques and a range of assessment conditions over the developmental four-semester course of study.

See also Section 4.6, Verification folio requirements.

4.1.3 Mandatory aspects of the syllabus
Judgments about student achievement made at exit from a course of study must be based on mandatory aspects of the syllabus.

The mandatory aspects are:

- the dimensions Knowledge and understanding, Analysis and application and Synthesis and evaluation
- a design process, design factors and graphical representations.

To ensure that the judgment of student achievement at exit from a four-semester course of study is based on the mandatory aspects, the exit standards for the dimensions stated in the standards matrix must be used (see Section 4.8.2, Awarding exit levels of achievement).

4.1.4 Significant aspects of the course of study
Judgments about student achievement made at exit from a course of study must be based on significant aspects of the course of study.

Significant aspects are those areas described in the school's work program that have been selected from the choices permitted by the syllabus to meet local needs.

The significant aspects must be consistent with the objectives of the syllabus and complement the developmental nature of learning in the course of study over four semesters.

4.1.5 Selective updating
Judgments about student achievement made at exit from a course of study must be selectively updated throughout the course of study.

Selective updating is related to the developmental nature of the course of study and works in conjunction with the principle of fullest and latest information.

As subject matter is treated at increasing levels of complexity, assessment information gathered at earlier stages of the course of study may no longer be representative of student achievement.
Therefore, the information should be selectively and continually updated (and not averaged) to accurately represent student achievement.

Schools may apply the principle of selective updating to the whole subject-group or to individual students.

**Whole subject-group**

A school develops an assessment program so that, in accordance with the developmental nature of the course of study, later assessment information based on the same groups of objectives replaces earlier assessment information.

**Individual student**

A school determines the assessment folio for verification or exit (post-verification). The student’s assessment folio must be representative of the student’s achievements over the course of study. The assessment folio does not have to be the same for all students; however, the folio must conform to the syllabus requirements and the school’s approved work program.

Selective updating must not involve students reworking and resubmitting previously graded responses to assessment instruments.

### 4.1.6 Fullest and latest information

Judgments about student achievement made at exit from a course of study must be based on the fullest and latest information available.

- **Fullest** refers to information about student achievement gathered across the range of objectives.
- **Latest** refers to information about student achievement gathered from the most recent period in which achievement of the objectives is assessed.

As the assessment program is developmental, fullest and latest information will most likely come from Year 12 for those students who complete four semesters of the course of study.

The fullest and latest assessment information on mandatory and significant aspects of the course of study is recorded on a student profile.

### 4.2 Planning an assessment program

To achieve the purposes of assessment listed at the beginning of this section, schools must consider the following when planning a standards-based assessment program:

- dimensions and objectives (see Section 2)
- course organisation (see Section 3)
- principles of exit assessment (see Section 4.1)
- variety in assessment techniques and conditions over the four-semester course of study (see Section 4.5)
- verification folio requirements, i.e. the range and mix of assessment instruments necessary to reach valid judgments of students’ standards of achievement (see Section 4.6)
- post-verification assessment (see Section 4.6.1)
- exit standards (see Section 4.7).

In keeping with the principle of continuous assessment, students should have opportunities to become familiar with the assessment techniques that will be used to make summative judgments.

Further information can be found on the Graphics subject page of the QSA website <www.qsa.qld.edu.au/20321.html>.
4.3 Special provisions

Guidance about the nature and appropriateness of special provisions for particular students are described in QSA’s Policy on Special Provisions for School-based Assessments in Authority and Authority-registered Subjects (2009), <www.qsa.qld.edu.au/2132.html>.

This statement provides guidance on responsibilities, principles and strategies that schools may need to consider in their school settings. Reasonable adjustments to students with specific educational needs must be planned and negotiated as early as possible so that students can be provided with appropriate support in order to commence, participate and complete course of study requirements. The special provisions might involve alternative teaching approaches, assessment plans and learning experiences.

4.4 Authentication of student work

It is essential that judgments of student achievement be made on genuine student assessment responses. Teachers should ensure that students' work is their own, particularly where students have access to electronic resources or when they are preparing collaborative tasks.

The QSA’s A–Z of Senior Moderation contains a strategy on authenticating student work <www.qsa.qld.edu.au/10773.html>. This provides information about various methods teachers can use to monitor that students' work is their own. Particular methods outlined include:

- teachers seeing plans and drafts of student work
- student production and maintenance of evidence for the development of responses
- student acknowledgment of resources used.

Teachers must ensure students use consistent accepted conventions of in-text citation and referencing, where appropriate.


4.5 Assessment techniques

The assessment techniques relevant to this syllabus are identified in the diagram below, and described in detail in Sections 4.5.2 and 4.5.3.

Figure 2: Graphics assessment techniques

Schools design assessment instruments from the assessment techniques relevant to this syllabus. For each assessment instrument, schools develop an instrument-specific standards matrix by selecting the syllabus standards descriptors for the dimension/s to be assessed. The matrix is used as a tool for making judgments about the quality of students’ responses to the instrument and is informed by the syllabus standards descriptors. Assessment is designed to
allow students to demonstrate the range of standards (see Section 4.8.2, Awarding exit levels of achievement). Teachers give students an instrument-specific standards matrix for each assessment instrument.

Where students undertake assessment in a group or team, instruments must be designed so that teachers can validly assess the work of individual students and not apply a judgment of the group product and processes to all individuals.

The assessment instruments students respond to in a Year 11 assessment program should support those included in Year 12.

The conditions of assessment are identified and described below.

### 4.5.1 Conditions of assessment

Over a four-semester course of study, students are required to complete assessment under a range of conditions (see Section 4.1.2, Balance).

Conditions may vary according to assessment. Conditions should be stated clearly on assessment instruments and may include:

- whether supervised or unsupervised
- indicating individual, group or team
- stating time allowed (with perusal time as needed)
- stating length required
- using seen or unseen questions
- using sources or technologies.

Where support materials or technologies (e.g. notes, calculators or computers) are used under supervised conditions, schools must ensure that the purpose of supervised conditions (i.e. to authenticate student work) is maintained.
4.5.2 Design folios

Assessment technique: Design folio

Purpose

This technique assesses the development and creating of graphical representations and will be the outcome of applying a range of cognitive skills as well as technical, physical, creative and/or expressive skills. The focus of this assessment is the production of a design folio. These assessments involve the creative input of students and the application of identified design and graphical skill/s.

Dimensions to be assessed

The dimensions to be assessed should be clearly stated on assessment instruments. The assessment technique is best used to determine student achievement in objectives from the dimensions:

- Knowledge and understanding
- Analysis and application
- Synthesis and evaluation.

Design folio

The design folio involves students undertaking and graphically documenting a design process in response to a design problem for a particular audience. The development of a design folio will include:

- an extended response developed as a result of exploring the design problem, including a design brief that outlines what will be undertaken during the design process, explaining how the solution to the design problem will be solved, establishing the design criteria upon which the solution and graphical products will be judged
- an annotated range of 2-D and 3-D graphical representations responsive to the design problem and suitable to the design area. These will include sketches and drawings with annotations to explain design decisions and final drawings that communicate the design solution to the particular audience
- an appraisal of the design solution and graphical products, explaining their success against the criteria established in the design brief with recommendations for improvement.

Assessment conditions

<table>
<thead>
<tr>
<th>Year 11</th>
<th>Year 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>300-to-600-word extended response developed as a result of exploring the design problem, including a design brief that demonstrates understanding of the design problem and criteria, design area, relevant design factors and graphical representation for the particular audience</td>
<td>400-to-800-word extended response developed as a result of exploring the design problem, including a design brief that demonstrates understanding of the design problem and criteria, design area, relevant design factors and graphical representation for the particular audience</td>
</tr>
<tr>
<td>annotated preliminary sketches and drawings demonstrating development of design ideas</td>
<td>annotated preliminary sketches and drawings demonstrating development of design ideas</td>
</tr>
<tr>
<td>graphical representations that present the solution to the design problem</td>
<td>graphical representations that present the solution to the design problem</td>
</tr>
<tr>
<td>the presentation of a graphical product for the particular audience (set of final drawings and/or an animation or simulation)</td>
<td>the presentation of a graphical product for the particular audience (set of final drawings and/or an animation or simulation)</td>
</tr>
<tr>
<td>design appraisal max 300 words</td>
<td>design appraisal max 400 words</td>
</tr>
</tbody>
</table>

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Assessment technique: Design folio

Further guidance

- The skills required for the production of graphical representations required by the design problem need to be considered and modelled before students engage in the assessment.
- The design folio must be based on a design problem that has a number of possible solutions.
- Solutions must be expressed as a series of sketches and drawings.
- Sketches and drawings should be annotated to demonstrate design decisions.
- The design brief must include:
  - an explanation of the design problem and the identified needs of the particular audience
  - the design criteria upon which graphical products will be judged.
- The appraisal may:
  - include annotations on final drawings
  - be a brief written statement included in the folio
  - use sketches to support recommendations.

4.5.3 Examination

Assessment technique: Examination

Purpose

This technique assesses the application of a range of cognition (knowledge, understanding, application, analysis, evaluation) to responses completed under supervised conditions.

Dimensions to be assessed

The dimensions to be assessed should be clearly stated on assessment instruments. This assessment technique is best used to determine student achievement in objectives from the dimensions:

- Knowledge and understanding
- Analysis and application
- Synthesis and evaluation.

Types of examination

Short response test

- Short response tests typically consist of a number of items, which involve students responding to graphical problems.
- Short response tests occur under supervised conditions as students produce work individually and in a set time to ensure authenticity.
- Items will be in response to unseen stimulus materials, questions, scenarios or design problems. These should not be copied from information or texts that students have previously been exposed to or have directly used in class.
- Each item should require one or more of the following:
  - the annotation of a drawing
  - the generation of at least one sketch or drawing
  - a short written response
  - interpretation, analysis or evaluation of graphs, tables, diagrams, sketches or drawings.
**Assessment technique: Examination**

**Extended response test**

- Extended response tests require students to demonstrate sustained analysis, synthesis and evaluation and typically consist of one item which involves students:
  - responding to a design problem for a target audience
  - communicating ideas using a range of graphical representations
  - producing a graphical product
  - evaluating graphical representations.
- Extended response tests occur under supervised conditions where students produce work individually in a set time to ensure authenticity.
- Students respond to unseen stimulus, design brief or problem.

**Assessment conditions**

<table>
<thead>
<tr>
<th>Year 11</th>
<th>Year 12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommended duration:</strong> 1–1.5 hours</td>
<td><strong>Recommended duration:</strong> 1.5–2 hours</td>
</tr>
<tr>
<td><strong>Short response test:</strong> 3–5 items No more than one written item of 50–250 words</td>
<td><strong>Short response test:</strong> 3–5 items No more than one written item of 50–250 words</td>
</tr>
</tbody>
</table>
| **Extended response test:** A single item that requires:  
  - developmental sketches  
  - 1 to 3 final drawings  
  - annotations. | **Extended response test:** A single item that requires:  
  - developmental sketches  
  - 1 to 4 final drawings  
  - annotations. |

**Further guidance**

- Format the assessment to allow for ease of reading and responding.
- Consider the language needs of the students and avoid ambiguity.
- Ensure the questions allow the full range of standards to be demonstrated.
- Consider the instrument conditions in relation to the requirements of the question/stimulus.
- Outline any permitted material in the instrument conditions.
- Determine appropriate use of stimulus materials and student notes. Ensure stimulus materials are succinct enough to allow students to engage with them in the time provided; if they are lengthy, consider giving students access to them before the assessment.
- Provide students with learning experiences that support the types of items, including opportunities to respond to unseen tasks using appropriate graphical representations and visual communication strategies.
- Indicate on the assessment the dimensions and objectives that will be assessed and explain the instrument-specific standards.
4.6 Verification folio requirements

A verification folio is a collection of a student’s responses to assessment instruments on which the interim level of achievement is based. For students who are to exit after four semesters, each folio should contain the range of assessments for making summative judgments as stated below.

Students’ verification folios for Graphics are to contain a minimum of three and a maximum of four assessment instruments and the relevant student responses. Each folio must include:

- evidence of student work from Year 12 only
- at least two design folios from two design areas
- an examination (extended response test that assesses all dimensions)
- evidence across assessments of 2-D and 3-D sketching and drawing
- evidence of software systems used in the development of graphical products, including CADD software
- a student profile completed to date.

For information about preparing monitoring and verification submissions, schools should refer to QSA’s Moderation handbook for Authority subjects, [www.qsa.qld.edu.au/10773.html](http://www.qsa.qld.edu.au/10773.html).

4.6.1 Post-verification assessment

In addition to the contents of the verification folio, there must be at least one subsequent summative assessment in the exit folio completed after verification. For this syllabus, students are to complete either:

- an examination (extended response test that assesses all dimensions)

or

- a design folio that assesses all dimensions.

4.7 Exit standards

Exit standards are used to make judgments about students’ levels of achievement at exit from a course of study. The standards are described in the same dimensions as the objectives of the syllabus. The standards describe how well students have achieved the objectives and are stated in the standards matrix.

The following dimensions must be used:

Dimension 1: Knowledge and understanding

Dimension 2: Analysis and application

Dimension 3: Synthesis and evaluation.

Each dimension must be assessed in each semester, and each dimension is to make an equal contribution to the determination of exit levels of achievement.

Each dimension must be assessed in each year of the course, and each dimension is to make an equal contribution to the determination of exit levels of achievement.
4.8 Determining exit levels of achievement

When students exit the course of study, the school is required to award each student an exit level of achievement from one of the five levels:

- Very High Achievement (VHA)
- High Achievement (HA)
- Sound Achievement (SA)
- Limited Achievement (LA)
- Very Limited Achievement (VLA).

All the principles of exit assessment must be applied when making decisions about exit levels of achievement.

Exit levels of achievement are summative judgments made when students exit the course of study. For most students this will be after four semesters. For these students, judgments are based on exit folios providing evidence of achievement in relation to all objectives of the syllabus and standards.

For students who exit before completing four semesters, judgments are made based on the evidence of achievement to that stage of the course of study and the principles of exit assessment.

4.8.1 Determining a standard

The standard awarded is an on-balance judgment about how the qualities of the student's responses match the standards descriptors in each dimension. This means that it is not necessary for the student responses to have been matched to every descriptor for a particular standard in each dimension.

4.8.2 Awarding exit levels of achievement

When standards have been determined in each of the dimensions for this subject, Table 3 below is used to award exit levels of achievement, where A represents the highest standard and E the lowest. The table indicates the minimum combination of standards across the dimensions for each level.

Table 3: Awarding exit levels of achievement

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>VHA</td>
<td>Standard A in any two dimensions and no less than a B in the remaining dimension</td>
</tr>
<tr>
<td>HA</td>
<td>Standard B in any two dimensions and no less than a C in the remaining dimension</td>
</tr>
<tr>
<td>SA</td>
<td>Standard C in any two dimensions and no less than a D in the remaining dimension</td>
</tr>
<tr>
<td>LA</td>
<td>At least Standard D in any two dimensions and an E in the remaining dimension</td>
</tr>
<tr>
<td>VLA</td>
<td>Standard E in the three dimensions</td>
</tr>
</tbody>
</table>

### 4.8.3 Standards matrix

<table>
<thead>
<tr>
<th>Knowledge and understanding</th>
<th>Standard A</th>
<th>Standard B</th>
<th>Standard C</th>
<th>Standard D</th>
<th>Standard E</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student work has the following characteristics:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>• succinct and insightful explanation of design problems using the essential aspects of relevant design factors</td>
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<tr>
<td>• identification and comprehensive description of relevant design criteria</td>
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<tr>
<td>• thorough comprehension of a range of graphical procedures, principles, and conventions.</td>
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<tr>
<td></td>
<td>The student work has the following characteristics:</td>
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<td></td>
<td></td>
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<tr>
<td>• effective explanation of design problems using relevant design factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identification and description of relevant design criteria</td>
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<td></td>
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<tr>
<td>• effective comprehension of graphical principles, procedures and conventions.</td>
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</tbody>
</table>

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>The student work has the following characteristics:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• discerning application of relevant design factors to develop a range of feasible ideas</td>
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<tr>
<td>• thorough analysis and insightful interpretation of graphical and design information</td>
<td></td>
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<tr>
<td>• sophisticated use of a range of graphical skills to produce graphical products responsive to the needs of particular audiences.</td>
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<td></td>
<td>The student work has the following characteristics:</td>
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<td></td>
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<tr>
<td>• effective application of relevant design factors to develop a range of ideas</td>
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</tr>
<tr>
<td>• effective analysis and interpretation of graphical and design information</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• proficient use of a range of graphical skills to produce graphical products effective for particular audiences.</td>
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<tr>
<td></td>
<td>The student work has the following characteristics:</td>
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<td></td>
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<tr>
<td>• application of design factors to develop ideas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• analysis and interpretation of graphical and design information</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• use of graphical skills to produce graphical products for particular audiences.</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>The student work has the following characteristics:</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• application of aspects of design factors to develop simplistic ideas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• explanation of graphical and design information</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>• use of basic graphical skills to produce graphical products.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>The student work has the following characteristics:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• minimal application of aspects of design factors to identify ideas</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• reference to graphical or design information</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>• use of limited graphical skills to produce simplistic graphical responses.</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
### Synthesis and evaluation

<table>
<thead>
<tr>
<th>Standard A</th>
<th>Standard B</th>
<th>Standard C</th>
<th>Standard D</th>
<th>Standard E</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
</tr>
<tr>
<td>• thorough synthesis of ideas to develop insightful solutions</td>
<td>• effective synthesis of ideas to develop effective solutions</td>
<td>• synthesis of ideas to develop solutions</td>
<td>• selection of ideas to develop partial solutions</td>
<td>• selection of ideas</td>
</tr>
<tr>
<td>• insightful evaluation of design and graphical representations</td>
<td>• effective evaluation of design and graphical representations</td>
<td>• evaluation of design and graphical representations</td>
<td>• comparison of design and graphical representations</td>
<td>• statements about graphical representations</td>
</tr>
<tr>
<td>• discerning recommendations and valid justification of decisions.</td>
<td>• considered recommendations and plausible justification of decisions.</td>
<td>• recommendations proposed and justification of decisions.</td>
<td>• some recommendations justified by opinion.</td>
<td>• some superficial recommendations.</td>
</tr>
</tbody>
</table>
### 5 Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>accurate</td>
<td>precise, to the point; consistent with a standard</td>
</tr>
<tr>
<td>analysis</td>
<td>the dissection of data and information to ascertain and examine constituent parts and/or their relationships</td>
</tr>
<tr>
<td>application</td>
<td>putting something to use</td>
</tr>
<tr>
<td>aspects</td>
<td>a facet, phase or part of a whole, therefore incomplete</td>
</tr>
</tbody>
</table>

**Australian Standards (The Australian Standards for technical drawing)**

The Australian Standards are guidelines for technical drawings in particular design areas. Some examples are provided below:

- AS 1100.101–1992 defines the general principles for technical drawing and shows tables of symbols and abbreviations and their meanings.
- AS 1100.201–1992 is for mechanical engineering drawing and includes information for surface texture, welding, centre holes, pipelines, springs, gears, splines, seals and knurling.
- AS 1100.301–2008 provides architects, builders, drafting officers and others in the building industry with a common method for the representation of buildings and their components to enable the preparation and unambiguous interpretation of architectural drawings. This Standard indicates methods of presenting drawings of architectural work, before, during and after the construction period. The Standard includes information on abbreviations (additional to those in AS 1100.101), the layout of drawing sheets, line conventions and conventions for the cross-referencing of drawings, coordinates and grids.
- AS/NZS 1100.501: 2002 is for structural engineering drawing. It looks at general applications like dimensioning, lines, symbols, abbreviations, structural elements, scales, cross referencing and arrangement of elements as well as specific applications for structural steel.

<table>
<thead>
<tr>
<th>Term</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>basic</td>
<td>underdeveloped, simple and straightforward</td>
</tr>
<tr>
<td>client</td>
<td>The person, group or community for which drawings are made. The client may have specific requirements for the types of drawings produced. The client is often the intermediary between the person who produces the drawings and the end-user, manufacturer or builder.</td>
</tr>
<tr>
<td>comprehend</td>
<td>Demonstrating that the meaning of something is understood. In Graphics, comprehension is understood by the way students accommodate the conventions required for the creation of their graphical representations.</td>
</tr>
<tr>
<td>considered</td>
<td>thoughtful, to take into account the pros and cons or possibilities of a situation</td>
</tr>
<tr>
<td>descriptive geometry</td>
<td>Descriptive geometry is the branch of geometry which allows the representation of three-dimensional objects in two dimensions, by using a specific set of procedures.</td>
</tr>
<tr>
<td>Term</td>
<td>Explanation</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>design brief</td>
<td>A design brief is developed as a result of exploring the design problem and outlines the design problem using relevant design factors and includes the identified needs of the user or target audience in a selected design area. A design brief will indicate the ways forward to solving the design problem, include the particular audience for the graphical products, and indicate the required graphical representations.</td>
</tr>
<tr>
<td>design criteria</td>
<td>Arising from the design factors, these criteria are used to judge the final design solutions and graphical products. For example:</td>
</tr>
<tr>
<td></td>
<td>- Do the final drawings meet the target audience’s needs?</td>
</tr>
<tr>
<td></td>
<td>- How effectively does the design solution meet the particular audience’s requirements?</td>
</tr>
<tr>
<td></td>
<td>- Have the graphical representations communicated the critical attributes of the solution?</td>
</tr>
<tr>
<td></td>
<td>- How well have the required conventions been followed?</td>
</tr>
<tr>
<td>design strategies</td>
<td>Design strategies concern the conceptual ways in which solutions to design problems are developed and include the thinking skills that facilitate innovation and creativity. Often these developments will be expressed as annotations or explications on graphical representations.</td>
</tr>
<tr>
<td>detailed</td>
<td>meticulous, including many of the parts</td>
</tr>
<tr>
<td>discerning</td>
<td>making thoughtful and astute choices</td>
</tr>
<tr>
<td>effective</td>
<td>causing a result, especially the desired or intended result</td>
</tr>
<tr>
<td>effectively</td>
<td>meeting the assigned purpose; in a way that produces a desired result</td>
</tr>
<tr>
<td>elements and principles of design</td>
<td>Elements and principles of design are the visual tools of design used in every design field. Elements form the basic components of visual design. They are the materials upon which the principles of design act.</td>
</tr>
<tr>
<td>end-user</td>
<td>the person, group or community that uses the product</td>
</tr>
<tr>
<td>essential</td>
<td>necessary, of the most or highest importance for achieving something</td>
</tr>
<tr>
<td>evaluation</td>
<td>assigning merit according to criteria</td>
</tr>
<tr>
<td>feasible</td>
<td>capable of being achieved or put into effect, reasonable enough to be believed or accepted</td>
</tr>
<tr>
<td>graphical conventions</td>
<td>The conventions, rules, standards or requirements that are applied in the production of graphical representations. Conventions are applicable to particular design areas and will change according to circumstance and audience. Conventions include the Australian Standards.</td>
</tr>
<tr>
<td>graphical principles</td>
<td>the underlying mathematical frameworks based on descriptive geometry that underpin the construction and generation of 2-D and 3-D technical drawings</td>
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<tr>
<td>graphical procedures</td>
<td>manual (sketching) and computerised techniques and processes used to generate technical orthogonal and pictorial graphical representations</td>
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<tr>
<td>graphical products</td>
<td>the range of graphical representations that demonstrate both the development of ideas and design solutions</td>
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<tr>
<td>Term</td>
<td>Explanation</td>
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| graphical skills      | Graphical skills include:  
• sketching and drawing skills  
• technology skills  
• knowledge of procedures and conventions.                                                                                       |
| improbable            | not likely to happen, or be effective                                                                                                     |
| insightful            | perceptive, demonstrating high levels of understanding; sometimes innovative and creative                                                  |
| iterative             | recursive; revisiting earlier parts of a process to further clarify meaning or refine ideas and solutions                                     |
| justification         | Providing sound reasons or evidence to support a decision. Soundness requires that the reasoning is logical and, where appropriate, that the premises are likely to be true. |
| legal responsibilities | Legal responsibilities refers to those considerations that students must make and follow in the production of their graphical representations to ensure that laws or requirements governing intellectual property, safety and standards and regulations are met. |
| plausible             | believable and appearing likely to be achievable                                                                                           |
| proficient            | demonstrating a high degree of skill                                                                                                       |
| project management    | Project management refers to planning, organising and managing resources to achieve graphical solutions.                                      |
| relevant              | applicable and pertinent; has direct bearing on                                                                                           |
| simple                | easy to understand and deal with; may concern a single or basic aspect, few steps, limited or no relationships                               |
| simplistic             | tending to oversimplify, especially by avoiding or ignoring complexities                                                                  |
| sophisticated         | complex and advanced                                                                                                                       |
| succinct              | expressed with brevity and clarity, with no wasted words                                                                                   |
| suitable              | of the right type or quality for a particular purpose or occasion                                                                        |
| superficial           | apparent and sometimes trivial; lacking in depth                                                                                           |
| sustainability        | Sustainability involves the connection and interaction between social, ethical, economic and environmental systems to ensure sustainable outcomes. |
| synthesis             | assembling constituent parts into a coherent, unique and/or complex entity                                                                |
| technologies          | Technologies refer to the range of tools, processes and skills needed to realise graphical solutions.                                       |
| thorough              | demonstrating depth and breadth, inclusive of relevant detail                                                                               |
| unclear               | not obvious, definite, or easy to understand                                                                                               |
| uneven                | varying and inconsistent                                                                                                                   |
Term | Explanation
--- | ---
user-centred design | User-centred design optimises the product around how a person can or needs to use a product. In user-centred design purpose, function and design area are the basis on which students formulate and define the types of graphical representations required to solve a design problem. They are interconnected and require consideration together.
- **Purpose** — Students examine the reason for which the drawings will be produced for the design problem. They ask what is the intended goal or outcome for these drawings.
- **Function** — Students examine how the subject of the design problem is designed or suited to its audience and critically evaluate its suitability. Students examine how drawings will be used and how they may be manipulated to suit the needs of the client or target audience.
- **Design area** — Students examine the environment in which these drawings will be produced and ask if there are specific requirements or conventions for that area.
valid | plausible and logical, reasonable and justifiable
well-reasoned | logical and sound, considered
6 Appendixes

6.1 Appendix 1: Range of common graphical representations

The following examples illustrate a range of common graphical representations that students may encounter. The examples are neither definitive nor exhaustive. Types of graphical representations have been grouped, where possible.

- **A diagram** is a symbolic representation of information according to some visualisation technique. It is often two-dimensional and geometric. Symbols, charts, graphs and maps are forms of diagrams.

- **Survey drawings** show the precise measurements, geographical features, structures, boundaries etc. on a particular property, while **site plans** document how a parcel of land is to be improved, including the outlines of all structures and site improvements.

- **Single, multiple and section views** and **cut-away sections** are technical drawings that provide a particular view or views. These drawings are mostly associated with production of objects, often in manufacturing and engineering industries.

- **Concept drawings** are illustrations that convey a visual representation of a design, idea, and/or mood, before it is put into the final product. Concept drawings assist in the visual development of an idea or design. Concept drawings are used across all design areas and may be sketches, 2-D or 3-D technical drawings.

- **A working drawing** is a type of technical drawing, often used as part of the documentation needed to build an engineering product or architecture. For example, in architecture, these could include civil drawings, architectural drawings, structural drawings, mechanical drawings, electrical drawings, and plumbing drawings. In engineering, these drawings show all necessary data to manufacture a given object, such as dimensions and angles, surface finishes, tolerances, revisions and material selections.

- **Development drawings** are 2-D drawings that depict the shape of a 3-D object and often contain detail about folding, transition from different shapes. They may also include net and pattern information.

- **Perspective drawings** represent an image as seen by the eye. It is used to give a three-dimensional appearance. There are two common characteristics in perspective drawings. Firstly, objects appear to get smaller and closer together the further away they are, and secondly, an object’s dimension along the line of sight is relatively shorter than dimensions across the line of sight. There are a number of types of perspective drawings including one point, two point and three point perspective.

- **Presentation drawings** are drawings intended to explain a scheme and to promote its merits and may include working drawings that use tones or hatches to emphasise different materials. Rendering is the art of adding surface textures, shadows and/or reflections to show the visual qualities of a building more realistically. Other specialists may be involved in the preparation of specialist presentation images.

- **Final drawings** are finessed images used to provide the solution to a graphical design problem. These will range from completed technical drawings that stipulate all details for production, to logos and product packages used to sell products, to working animations. The type of final drawing applicable to demonstrating the solution to the design problem will depend on the requirements of the client.
6.1.1 Assembly, exploded view and detail drawings

- **Axonometric projections** are types of orthographic projections used to create a pictorial drawing where the object is rotated along one or more of its axes relative to the plane of projection. There are three main types: isometric, diametric and trimetric.

- **Assembly drawings** are 2-D in nature and can be divided into two different categories — General Assembly and Working Assembly.

  A General Assembly is where the main purpose is to identify individual components and show their assembled relationships. These drawings contain parts lists, part reference balloons and the overall dimensions (may show the working range) of the complete assembly. Assembly views do not show hidden detail lines — instead they employ sectional views to show how internal parts combine to form the assembly.

  Working Assembly drawings are used for very simple assemblies. They are used to show the relationship of the assembly and should include enough dimensional detail of the individual components to enable their manufacture.

- **Detail drawings** show a part of the drawing at a larger scale, for example components or component parts, surface details and decorative elements.

- **Exploded or Open and In Line for Assembly Drawings** are 3-D in nature and show the relationship between parts of an assembly with the individual components separated in order of their assembly. Components are separated as if an explosion has occurred inside the object causing the objects to separate along their axis of assembly. In simple assemblies all components are exploded the same distance from each other. However, steps should be taken to ensure clarity of the individual components in complex assemblies where explosion distances may need to be fine-tuned. These drawings may also contain parts reference balloons and parts lists but they are generally not necessary. The level of detail and annotations shown depends on the design area for which it is being produced.

- **An exploded view drawing** is a diagram, picture or technical drawing of an object that shows the relationship or order of assembly of various parts. It shows the components of an object slightly separated by distance, or suspended in surrounding space in the case of a three-dimensional exploded diagram. An object is represented as if there had been a small controlled explosion emanating from the middle of the object, causing parts to be separated an equal distance away from their original locations. The exploded view drawing is used in parts catalogues, assembly and maintenance manuals and other instructional material.

6.1.2 Animations and simulations

- **An animation** is a series of images that when combined suggest movement. These animations are of varying sophistication and may use 2-D or 3-D imaging. In graphical representations these may be images of an object moving, moving around an object, moving through a space, parts moving, or moving from external to internal views or vice versa.

- **A simulation** is the imitation of the operation of a process or system over time. The act of simulating something first requires that a model be developed; this model represents the key characteristics or behaviours of the selected physical or abstract system or process. The model represents the system itself, whereas the simulation represents the operation of the system over time.

  A simulation is usually a computer-based model of a system created for the purpose of studying certain system dynamics and characteristics. Often the purpose is to enable designers to draw conclusions by analysing the model with the goal of achieving a deeper understanding of the relationships between the elements of the system. A simulation may also be used to demonstrate the working relationships of the model or system to other audiences, including end-users.
6.2 Appendix 2: Software systems

This course emphasises students’ use of software systems appropriate to the design areas in which they are working. In the course students must have access to CADD systems to produce graphical representations. There are two groupings of CADD systems — 2-D and 3-D. Access to both types of systems would benefit students in understanding the possible range of graphical representations.

<table>
<thead>
<tr>
<th>Computer assisted design and drafting (CADD) systems</th>
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<tr>
<td><strong>2-D CADD systems</strong> replace the paper drawing discipline. The lines, circles, arcs and curves are created within the software. It is down to the technical drawing skill of the user to produce the drawing. Its greatest strength over direct to paper technical drawing is in the making of revisions, saving considerable time. 2-D CADD systems can be used to create plans for large projects but provide no way to check how various components fit together.</td>
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<tr>
<td><strong>3-D CADD systems</strong> first produce the geometry of the part. The technical drawing comes from user-defined views of the part. Any orthographic, projected and section views are created by the software. 3-D CADD allows individual parts to be assembled together to represent the final product. Using 3-D CADD systems the final product can be modelled, assembled and checked in 3-D before technical drawings are released for other purposes such as manufacturing.</td>
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**Graphics software** — Graphics software packages are used for the production of 2-D imagery specifically for graphic design purposes. Some packages are vector graphics — based and used to produce images that do not lose clarity during magnification or reduction (lossless format) for the construction of logos, stationery etc. Other packages are raster graphics — based and used in the manipulation of photographs and other images with graduated colourings and tones. These images, due to the fact that they rely on the differentiation of pixel colour, can lose clarity during magnification or reduction (lossy format).