## Contents

1  **Rationale** .................................................................................................................. 1

2  **Dimensions and objectives** ................................................................................... 2  
   2.1 Dimension 1: *Analysing design problems* ................................................................. 2  
   2.2 Dimension 2: *Applying design factors and communicating* ................................. 2  
   2.3 Dimension 3: *Synthesising and evaluating designs* ................................................. 3

3  **Course organisation** .............................................................................................. 4  
   3.1 Course overview ......................................................................................................... 4  
   3.2 Core subject matter ................................................................................................. 4  
   3.3 Units of work ........................................................................................................... 9  
   3.4 Advice, guidelines and resources ............................................................................. 10

4  **Assessment** ............................................................................................................ 13  
   4.1 Principles of exit assessment...................................................................................... 13  
   4.2 Planning an assessment program ............................................................................... 15  
   4.3 Special provisions ..................................................................................................... 16  
   4.4 Authentication of student work .................................................................................. 16  
   4.5 Assessment techniques ............................................................................................ 16  
   4.6 Verification folio requirements .................................................................................... 21  
   4.7 Exit standards ........................................................................................................... 21  
   4.8 Determining exit levels of achievement .................................................................... 21

5  **Glossary** .................................................................................................................. 26
1 Rationale

Technology Studies empowers students to explore the relationships between technology and society in order to be informed, responsible and responsive users and creators of technology. Technology encompasses the purposeful application of knowledge, resources, materials and processes to develop solutions. Solutions are the ideas and products developed in response to design problems.

Technology Studies engages students in responding to real-world problems. These problems are based on identified human needs or become opportunities for improvement or advancement. These real-world problems are referred to as design problems. In design problems, students consider the impact of sustainable design when developing innovative ideas and producing products. Sustainable design considers ethical perspectives through the principles of social, economic and environmental sustainability.

In Technology Studies, students develop an understanding of real-world product design and production processes. Technology Studies provides opportunities for students to develop skills in strategic and creative thinking, practical problem solving, information analysis, and project management, and challenges them to understand and appreciate technological innovation and its impact on society.

Using a design process, students investigate design problems from a variety of contexts considering the needs of individuals and communities or responding to identified opportunities. Students explore and analyse design factors to develop ideas and produce products through the practical application of manufacturing technologies and materials. Products are produced by students to confirm their design decisions.

Students build the skills of project management, enabling them to manage resources and risks effectively to develop solutions to design problems. Students critique and evaluate ideas and products against design criteria developed in response to the design problem and they justify decisions and make recommendations.

A course of study in Technology Studies can establish a basis for further education and employment in the fields of industrial design, product design, civil engineering, mechanical engineering, electrical engineering, architecture and project management.
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 should 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: Analysing design problems
- Dimension 2: Applying design factors and communicating
- Dimension 3: Synthesising and evaluating designs.

2.1 Dimension 1: Analysing design problems

The dimension Analysing design problems involves identifying a design problem and analysing the knowledge and understanding, referred to as design factors, required to respond to and develop solutions. Design problems can be found in a variety of contexts. Students should consider both individuals and communities when responding to an identified human need or opportunity.

2.1.1 Objectives

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

- describe design problems and identify design criteria
- interpret design problems using design factors
- analyse the impacts of design factors on decisions.

When describing, students outline for either individuals or communities the details of the context, and the human need or opportunity, to determine the design problem. They identify design criteria from the design problem while considering the quality, functionality and reliability of a product.

When interpreting, students examine the essential features and characteristics of design factors and make connections between the design factors and the design problem.

When analysing, students examine the impacts of design factors, both positive and negative, on decisions made throughout a design process.

2.2 Dimension 2: Applying design factors and communicating

The dimension Applying design factors and communicating involves using information related to the design factors to develop ideas and propose solutions to design problems. Ideas are developed to produce products confirming student’s ideas resolve the design problems. Ideas and decisions are communicated throughout a design process when developing solutions to design problems.
2.2.1 Objectives

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

- apply design factors to develop ideas
- use manufacturing technologies, materials and project management skills to produce products in response to design criteria
- use communication suited to modes and audiences.

When applying the design factors, students generate a range of ideas that are solutions to design problems. To do this they use a range of design strategies.

When using manufacturing technologies, materials and project management skills, students consider the practical knowledge required to use tools and materials. Students produce products that solve design problems and respond to design criteria. When project managing, students consider production processes, including resources and safety, to develop time and cost plans that involve planning and implementation to make products.

When communicating, students use the modes of visual and written communication to document their analysis, ideas and decisions for audiences for an intended purpose. There is opportunity for students to use spoken/signed modes. Visual communication includes sketches and drawings. Written communication includes accepted genre structures and associated conventions. Spoken/signed communication includes verbal and nonverbal features.

2.3 Dimension 3: Synthesising and evaluating designs

The dimension Synthesising and evaluating designs involves synthesising ideas to develop a concept. Decisions are justified throughout a design process and include recommendations to improve ideas and products. Solutions to design problems are evaluated using design criteria to determine the quality, functionality and reliability of a product.

2.3.1 Objectives

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

- synthesise ideas to develop concepts that respond to design problems
- justify decisions and recommendations
- evaluate ideas and products using design criteria.

When synthesising, students bring together possible ideas, which include consideration of design criteria and design factors, to develop a concept. The concept is refined to produce a product.

When justifying, students provide sound reasons or evidence to support decisions. Decisions, including recommendations to improve ideas and products, are made throughout a design process to generate solutions to design problems. When making decisions, students critique and reflect, question and review processes, analyse structures that are in place and review the performance of products, individuals or groups.

When evaluating, students assign merit according to design criteria to assess the quality and effectiveness of their solutions. Solutions are the ideas and products developed in response to design problems. Effective solutions are based on the results of testing and user satisfaction and will be evident throughout the evaluation. Design criteria are established in response to 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).

Technology Studies is designed to enable schools to develop a course with a diverse range of teaching and learning experiences through the dimensions Analysing design problems, Applying design factors and communicating and Synthesising and evaluating designs.

The four-semester course of study consists of:

- core subject matter:
  - design process (Section 3.2.1)
  - design factors (Section 3.2.2)
- six to eight units of work that provide opportunities for students to:
  - investigate a range of design problems
  - apply the design factors
  - apply the design process.

3.2 Core subject matter

The core subject matter in Technology Studies is a design process and design factors. 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. It is not expected that all subject matter will be covered in each unit.

3.2.1 Design process

Design processes are ways of thinking and working that are used to define a design problem and develop viable and innovative solutions that are produced and evaluated against design criteria. Design is a process that helps students develop creativity and innovation.

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 solving design problems, students may work individually or in groups. They manage and evaluate design and production processes. They communicate by documenting their thinking through sketches, drawings, written responses and by producing products. Spoken/signed communication may also be considered.

The dimensions and objectives are evidenced as students engage in a design process with three stages: exploring a design problem; developing ideas and producing products. These stages are iterative and progressive leading to the development of new ideas and innovative products. Students continuously manage and evaluate the ideas, processes, and products they create.

Figure 1 illustrates the stages of the design process.
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 a design problem** may involve:
- identifying and describing the human need or opportunity for either an individual or the community, within a context
- evaluating how well existing products meet a need and identifying areas for possible improvement
- describing the design problem
- investigating design factors by accessing information from primary sources (e.g. interviews with individuals or members of the community, surveys) and secondary sources (e.g. books, internet search of other designers) to understand the nature of the design problem
- analysing the impact of relevant design factors to make informed decisions
- developing and communicating a design brief
- interpreting the design brief and identifying design criteria that are used to determine the suitability of ideas, processes and products.
Developing ideas may involve:

- generating and representing ideas (e.g. sketches, graphic organisers and annotated drawings)
- evaluating ideas in relation to the design criteria (e.g. gathering user feedback, conducting a plus, minus, interesting (PMI) strategy to consider different ideas)
- collecting data and information about relevant design factors through research and testing to progress and evaluate ideas and inform the selection of a concept (e.g. annotations, test results)
- selecting and refining a concept to satisfy design criteria
- justifying the concept.

Producing products may involve:

- producing working drawings
- developing a production plan (e.g. time and cost, manufacturing technologies, materials, production process, personal production skills, safety and risk management)
- managing the implementation of the production plan
- producing a product by applying knowledge and skills of manufacturing technologies and materials
- field testing the product with the user
- making and justifying decisions to modify the product and production plan
- evaluating and describing (e.g. using text, photographs, annotations) how the final product meets the design criteria
- making and justifying recommendations for improvement to design processes and products.

3.2.2 Design factors

Design factors describe the knowledge used when making decisions to solve real-world design problems. The design factors are integral to a design process and therefore are part of the core subject matter for this subject.

For students to develop knowledge and understanding of the design factors it is critical that teachers model how design factors are used throughout a design process to develop solutions to design problems.

In Year 11, the design factors may be taught individually to build students’ knowledge of how the design factors are used throughout a design process. By Year 12 all design factors should be considered when solving design problems. The interconnectedness, emphasis and importance of each design factor will be determined by the design problem.

Not all design factors have to be used in each design problem. The nature of the design problem means that some design factors may be stipulated; others may have varying impact on solutions or may not be evident in the products produced. The relevance and emphasis of each design factor will vary according to the design problem.

Development in the students’ depth of understanding of the design factors should occur over the course of study so students are able to make decisions about them when solving design problems.

The design factors are composed of key ideas. The key ideas illustrate the scope of the design factors. Suggested subject matter shows the breadth of knowledge within each key idea. 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 the complexity of knowledge and understanding of the key ideas.
The design factors, key ideas and suggested subject matter are outlined in Table 1.

### Table 1: Design factors, key ideas and suggested subject matter

<table>
<thead>
<tr>
<th>Design factors</th>
<th>Key ideas</th>
<th>Suggested subject matter</th>
</tr>
</thead>
</table>
| **User-centred design** | When solving design problems, the purpose is to identify the human need or capitalise on an opportunity with a view to developing a solution that functions and satisfies the user. | • Purpose and function includes user’s:  
  - age  
  - emotional and sensory response  
  - social and physical needs  
  - cultural points of view/belief  
  - comfort  
  - accessibility  
  - ergonomics and anthropometric data  
  - safety  
  - trends. |
| **Legal responsibilities** | Legal responsibilities ensure solutions to design problems are accountable and safe. | • Legal responsibilities:  
  - intellectual property (IP), particularly Patents and Design Registration  
  - Australian and International (ISO) standards, regulations and legislation (including OH&S)  
  - safety of the product for the user. |
| **Sustainable design**  | When developing sustainable solutions consideration must be given to the impacts of social, economic and environmental sustainability in all stages of a design process. | • 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 period of time.  
  • Environmental sustainability:  
    - life-cycle analysis  
    - eco-footprint  
    - recycling  
    - use of renewable energy and resources and systems to ensure sustainability. |
| **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. | • Elements of design:  
  - space, line, colour, shape, texture, tone, form and value.  
  • Principles of design:  
    - balance — symmetry, asymmetry, radial, pattern  
    - contrast/harmony  
    - proximity/unity  
    - alignment  
    - repetition/consistency  
    - hierarchy/proportion/scale. |
| **Design strategies**    | When developing new or improved solutions to design problems, consideration of design strategies should be used to facilitate innovation and develop, refine and document solutions. | • Design approaches:  
  - design heuristics, e.g. substitute, combine, adapt, modify/distort, put to other purposes, eliminate, rearrange/reverse (SCAMPER), or a problem-solving method based on logic and data (TRIZ)  
  - sketching and graphic organisers |
<table>
<thead>
<tr>
<th>Design factors</th>
<th>Key ideas</th>
<th>Suggested subject matter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>– processes used by expert designers in a range of fields</td>
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<tr>
<td></td>
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<td>– history of inventions and famous designers</td>
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<td></td>
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<td>– iconic designs</td>
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<td></td>
<td></td>
<td>– existing products and their design processes</td>
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<td></td>
<td></td>
<td>– examples of design opportunities that are identified from research and development, user feedback, new materials and emerging technologies.</td>
</tr>
</tbody>
</table>

**Communication**

Communication is used throughout all stages of a design process and conveys how solutions were achieved. Communication includes visual and written formats. Spoken modes may also be considered.

- **Visual communication:**
  - freehand sketches
  - drawings
  - computer generated images
  - photographs
  - animations
  - video.

- **Written communication:**
  - annotations
  - paragraphs
  - extended writing.

- **Spoken:**
  - verbal features
  - nonverbal features.

**Manufacturing technologies**

Tools, processes and equipment are selected according to the solutions to be developed.

- **Tools:**
  - purpose
    - alter the size, shape or finish of a material
  - types
    - hand tools
    - power tools
    - machinery
  - selection of appropriate tools
    - considering material, expertise, quality, safety.

- **Processes:**
  - applied to change the size, shape or nature of the material being worked:
    - forming materials
    - separating materials
    - combining materials
    - finishing materials
    - safe practices.

- **Equipment:**
  - contemporary and emerging computer-controlled devices:
    - 3D router
    - sewing machine
    - robotics
    - pneumatic and hydraulic control
    - micro controllers
    - CNC machinery
    - laser cutters
    - 3D printers
    - 3D modelling CADD systems
    - electronics
    - electro-mechanical control systems.
### Design factors

<table>
<thead>
<tr>
<th>Key ideas</th>
<th>Suggested subject matter</th>
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</thead>
<tbody>
<tr>
<td><strong>Materials</strong></td>
<td>• Classification of materials:</td>
</tr>
<tr>
<td></td>
<td>- wood, plastic, metal, textiles, composite materials, new and emerging materials.</td>
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<td></td>
<td>• Properties of materials:</td>
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<td></td>
<td>- physical and mechanical properties.</td>
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<td>• Applications of materials based on:</td>
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<td>- information provided in material safety data sheets</td>
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<td></td>
<td>- cost</td>
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<tr>
<td></td>
<td>- weight</td>
</tr>
<tr>
<td></td>
<td>- availability</td>
</tr>
<tr>
<td></td>
<td>- joining and forming methods</td>
</tr>
<tr>
<td></td>
<td>- adherence of surface finishes and adhesives.</td>
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<tr>
<td><strong>Project management skills</strong></td>
<td>• Planning:</td>
</tr>
<tr>
<td></td>
<td>- identifying and developing personal production skills</td>
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<tr>
<td></td>
<td>- identifying and sequencing key stages of producing products</td>
</tr>
<tr>
<td></td>
<td>- developing time and cost plans</td>
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<tr>
<td></td>
<td>- developing materials lists</td>
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<td></td>
<td>- developing production processes considering the availability of tools and equipment</td>
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<td></td>
<td>- identifying and managing potential workshop hazards and risk.</td>
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<tr>
<td></td>
<td>• Implementing</td>
</tr>
<tr>
<td></td>
<td>- managing time</td>
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<tr>
<td></td>
<td>- monitoring time and cost plans</td>
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<tr>
<td></td>
<td>- evaluating processes and product at key stages</td>
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<tr>
<td></td>
<td>- working safely by oneself and with others.</td>
</tr>
</tbody>
</table>

### 3.3 Units of work

Units of work are to be developed to offer a range of design experiences that increase in complexity and independence across the four-semester course of study.

Increasing complexity refers to increasing the demands on students as they progress through the course. Students initially encounter learning experiences and assessment that may provide design problems with few and/or stipulated design factors and subsets of a design process. Students develop their knowledge, understandings and skills with more open design problems that require them to consider the design factors in more breadth and depth, and make more complex decisions using a design process when designing solutions for others, including for the community.

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 independence. Initially students may be provided with design problems that state the users and/or contexts, and/or design briefs as the basis for their design activities. Later in the course of study students identify and describe their own design problems, including selection of contexts and users, both individual and community, and develop their own design briefs.
Six to eight units of work should be included within a course of study. Units of work should include:

- opportunities for teaching, learning and assessment of the objectives for *Analysing design problems, Applying design factors and communicating* and *Synthesising and evaluating designs*
- a variety of learning experiences that include the explicit teaching of a design process and design factors
- a focus on design problems. Across a course of study, design problems should include both individuals and the community and a range of different contexts. In Year 12 there should be at least one design problem that identifies a human need or an opportunity for the community
- application and analysis of the design factors and key ideas relevant to a design problem. 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 (see Section 3.2.2)
- a design process. In Year 11, students may focus on a subset of a design process. By the end of Year 11 students should engage in the complete design process at least once (see Section 3.2.1).

### 3.3.1 Design problems

Design problems present opportunities for students to apply a design process and explore innovative solutions to real-world problems. Design problems should be relevant and challenging and provide the stimulus for students to engage in a design process. Design problems can be specified for students or identified by students themselves.

When establishing a design problem it is important to identify a human need or respond to an opportunity in the context for which a solution is required. Solutions are ideas and products developed by students in response to a design problem. Over the course of study, students should apply a design process in a variety of contexts. This helps them understand the requirements of a range of different users.

Contexts are identified on the basis of solving a human need for individuals or the community, or identifying an opportunity, and are based in fields such as personal, domestic, commercial, agriculture, environment, transport, communication, health or recreation.

A design brief provides a succinct description of the design problem. The design criteria accompany the design brief. The design criteria are identified by analysing the design problem using design factors, and are used to monitor how well solutions resolve the design problem. They provide explicit information about the requirements to evaluate the appropriateness of solutions, which includes quality, functionality and reliability of the product.

### 3.4 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 Technology Studies subject page of the QSA website <www.qsa.qld.edu.au/20323.html>.

#### 3.4.1 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.

In Technology Studies there is opportunity for students to:

- appreciate that Aboriginal and Torres Strait Islander Peoples have a longstanding tradition of developing and utilising a range of technologies in a sustainable way
- understand that Aboriginal and Torres Strait Islander Peoples develop technologies that support sustainable practices for local conditions
- design products appropriate to the cultural needs, values and requirements of Aboriginal and Torres Islander Peoples
- explore how Aboriginal and Torres Strait Islander Peoples’ capacity for innovation is evident in the incorporation of a range of introduced technologies within existing practices in ways that purposefully build or maintain cultural, community and economic capacity.

Subject-specific resources are available on the Technology Studies 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>.

### 3.4.2 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.
3.4.3 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 Technology Studies 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>.

3.4.4 Language education in Technology Studies

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, interviews and possible seminar presentations)
- use of technical terms and their definitions
- use of correct grammar, spelling, punctuation and layout.

3.4.5 Learning experiences and sample resources

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

3.4.6 Mathematical concepts in Technology Studies

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.

3.4.7 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.

3.4.8 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 Technology Studies subject page of the QSA website <www.qsa.qld.edu.au/20323.html>. Instructions for online submission of work programs are available from <https://www.qsa.qld.edu.au/wponline/login.qsa>.
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 Analysing design problems, Applying design factors and communicating and Synthesising and evaluating designs
- a design process and design factors.

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 Technology Studies subject page of the QSA website [<www.qsa.qld.edu.au/20323.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 the 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 4.5.3 and 4.5.4.

*Figure 2: Technology Studies 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, possible modes for assessment and supporting evidence 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:

- indicating individual, group or team
- stating time allowed
- stating length required.

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 Modes of assessment

Assessment techniques may be presented in a variety of modes, e.g. written, spoken/signed and multimodal. An assessment response is communicated to an audience for a particular purpose which may influence the type of text, language features and other textual features used in the response. Purposes may include analysing; persuading; arguing; informing; presenting investigative, experimental or field-based findings; creating; performing; showcasing; reviewing a text or situation; completing calculations or solving problems.

Referencing conventions must be followed regardless of the mode of assessment.

**Written responses**

Written responses require students to communicate a written assessment response to an audience for a particular purpose.

**Spoken responses**

Spoken responses require students to present a spoken assessment response to a live or virtual audience (i.e. through the use of technology) for a particular purpose.
**Multimodal responses**

A multimodal response uses a combination of at least two modes to communicate an assessment response to a live or virtual audience for a particular purpose.

Modes include:
- written
- spoken/signed
- nonverbal, e.g. physical, visual, auditory.

Each of the selected modes contributes significantly to the multimodal response.

Different technologies may be used in the creation or presentation of the response. Replication of a written document into an electronic or digital format does not constitute a multimodal response.

When making judgments about multimodal responses, teachers apply the standards to the entire response — that is to all modes used to communicate the response.

**Supporting evidence**

Supporting evidence is required to substantiate decisions made on spoken and multimodal responses for monitoring, verification and exit purposes. Evidence to support spoken or multimodal responses may include:
- research/data analyses
- notes or annotations
- summary of findings
- journal entries or log book
- seminar brief
- a recording of the response (as appropriate)
- annotated criteria sheet with teacher comments, student notes and other supporting evidence for each student response.
4.5.3 Design folio

Assessment technique: Design folio

Purpose

The assessment technique assesses the application of higher-order cognition (analysis, synthesis and evaluation) and a range of technical and creative skills. Students identify and explore design problems, develop ideas and produce products.

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:
- Analysing design problems
- Applying design factors and communicating
- Synthesising and evaluating designs.

Description of the design folio

- The design folio involves students’ undertaking and documenting a design process in response to an identified real-world design problem. The design problem outlines the context, the human need or opportunity and either an individual or community user.
- Students describe and explore the design problem, identify design criteria, apply design factors, develop multiple ideas, synthesise and evaluate information to develop a concept and produce, through the practical hands-on activity, a product in response to the design problem. Evaluation occurs throughout all stages of a design process.
- Students communicate throughout all stages of the design process in a design folio. Typically this includes:
  - developing a design brief and design criteria
  - generating paragraphs, annotations, drawings, graphs, photographs and tables that show investigation
  - creating sketches and annotations to show ideas, testing of ideas and a concept
  - producing working drawings and a production plan
  - creating photographs and annotations of design refinements/modifications during production
  - generating paragraphs, annotations and photographs of the evaluation of the final product against design criteria
  - making notes and annotations to show justification of decisions made and evaluation throughout the design process.
- Aspects of the design folio may be presented as a spoken or multimodal presentation. A multimodal presentation uses a combination of at least two modes to communicate to a live or virtual audience for a particular purpose. Spoken or multimodal responses must be supported by documentation (see Section 4.5.2). Examples could include students:
  - pitching ideas and the concept to the user
  - demonstrating to the user how well the final product satisfies the design criteria and is the best solution to the problem
  - describing decisions made throughout the design process.
- This assessment occurs over a period of time, in class, and often in students’ own time.

Assessment conditions

<table>
<thead>
<tr>
<th>Year 11</th>
<th>Year 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design folio: 800–1000 words and a product</td>
<td>Design folio: 1000–1500 words and a product</td>
</tr>
<tr>
<td>Spoken: 3–4 minutes</td>
<td>Spoken: 4–5 minutes</td>
</tr>
<tr>
<td>Multimodal: 3–5 minutes</td>
<td>Multimodal: 5–7 minutes</td>
</tr>
</tbody>
</table>
4.5.4 Report

Assessment technique: Report

Purpose

The assessment technique assesses the sustained application of higher-order cognition (analysis, interpretation, evaluation, and justification of conclusions) to respond to stimulus materials. Students explore relationships between technology and society.

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:

- Analysing design problems
- Applying design factors and communicating
- Synthesising and evaluating designs.

Description of the report

- A report involves students’ analysing the relationship between a product and society and may include proposing solutions, expressing and justifying a point of view or explaining and evaluating an issue.
- The report should include recommendations that may be supported by sketches, drawings, and diagrams.
- While research may occur in the writing of the report, it is not the focus of this technique.
- Students respond to a seen question or statement using data, researched information, primary and/or secondary sources. They analyse, interpret and evaluate data and information, and develop and justify conclusions and make recommendations.
- This assessment occurs over a period of time, in class, and often in students’ own time.

Assessment conditions

<table>
<thead>
<tr>
<th>Year 11</th>
<th>Year 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written — report</td>
<td>Written — report</td>
</tr>
<tr>
<td>600–1000 words</td>
<td>800–1200 words</td>
</tr>
<tr>
<td>Spoken:</td>
<td>Spoken:</td>
</tr>
<tr>
<td>3–4 minutes</td>
<td>4–5 minutes</td>
</tr>
<tr>
<td>Multimodal:</td>
<td>Multimodal:</td>
</tr>
<tr>
<td>3–5 minutes</td>
<td>5–7 minutes</td>
</tr>
</tbody>
</table>

Further guidance

- A report may be presented in a variety of modes, including written, spoken and/or multimodal.
- Reports are to include references and, where appropriate, tables of data, diagrams and flow charts.
- Possible ideas for reports are:
  - re-engineering an existing product to reduce a negative impact on society
  - analysing the impact of user-centred design decisions in the redesign of a product
  - expressing and justifying a point of view regarding the impacts of sustainability on product design decisions
  - analysing and evaluating the impact on society of the development of a product.
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 Technology Studies are to contain a minimum of two and a maximum of three assessment instruments and the relevant student responses. Each folio must include:

- evidence of student work from Year 12 only
- at least one design folio that responds to an identified human need or opportunity for the community
- at least one other assessment that assesses all three dimensions
- 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*, <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 one assessment that assesses all three 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: *Analysing design problems*
- Dimension 2: *Applying design factors and communicating*
- Dimension 3: *Synthesising and evaluating designs.*

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 2 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>
<thead>
<tr>
<th>VHA</th>
<th>Standard A in any two dimensions and no less than a B in the remaining dimension</th>
</tr>
</thead>
<tbody>
<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>

Further information is available in the QSA’s *Moderation handbook for Authority subjects*, <www.qsa.qld.edu.au/10773.html>. 
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### 4.8.3 Standards matrix

<table>
<thead>
<tr>
<th></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><strong>Analysing design problems</strong></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>
<td>The student work has the following characteristics:</td>
</tr>
<tr>
<td></td>
<td>• thorough description of design problems and identification of comprehensive and relevant design criteria</td>
<td>• detailed description of design problems and identification of the essential design criteria</td>
<td>• description of design problems and identification of design criteria</td>
<td>• simple description of design problems and vague identification of design criteria</td>
<td>• statements of some design criteria</td>
</tr>
<tr>
<td></td>
<td>• discerning and thorough interpretation of design problems using design factors</td>
<td>• appropriate and detailed interpretation of design problems using design factors</td>
<td>• interpretation of design problems using design factors</td>
<td>• basic interpretation of design problems using some design factors</td>
<td>• statements about aspects of design problems</td>
</tr>
<tr>
<td></td>
<td>• comprehensive and discerning analysis of the impacts of design factors on decisions.</td>
<td>• detailed analysis of the impacts of design factors on decisions.</td>
<td>• analysis of the impacts of design factors on decisions.</td>
<td>• simple analysis of design factors to identify some impacts on decisions.</td>
<td>• statements of the impacts of design factors.</td>
</tr>
<tr>
<td><strong>Applying design factors and communicating</strong></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>
<td>The student work has the following characteristics:</td>
</tr>
<tr>
<td></td>
<td>• comprehensive application of design factors to develop and progress a range of feasible ideas</td>
<td>• effective application of design factors to develop and progress a range of ideas</td>
<td>• application of design factors to develop ideas</td>
<td>• application of aspects of the design factors to develop simple ideas</td>
<td>• application of some aspects of design factors to reproduce ideas</td>
</tr>
<tr>
<td></td>
<td>• discriminating and proficient use of manufacturing technologies, materials and efficient project management skills to produce products in an accurate response to design criteria</td>
<td>• proficient use of manufacturing technologies, materials and systematic project management skills to produce products in an appropriate response to design criteria</td>
<td>• use of manufacturing technologies, materials and project management skills to produce products in response to design criteria</td>
<td>• simple use of manufacturing technologies, materials and elements of project management skills to produce products in response to aspects of design problems</td>
<td>• use of some manufacturing technologies, materials and project management skills to partially produce products in response to aspects of design problems</td>
</tr>
<tr>
<td></td>
<td>• succinct and effective use of communication suited to modes and audiences.</td>
<td>• effective use of communication suited to modes and audiences.</td>
<td>• use of communication suited to modes and audiences.</td>
<td>• use of communication to present information.</td>
<td>• communication of aspects of information.</td>
</tr>
<tr>
<td>Standard A</td>
<td>Standard B</td>
<td>Standard C</td>
<td>Standard D</td>
<td>Standard E</td>
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<tr>
<td><strong>Synthesising and evaluating designs</strong></td>
<td><strong>Synthesising and evaluating designs</strong></td>
<td><strong>Synthesising and evaluating designs</strong></td>
<td><strong>Synthesising and evaluating designs</strong></td>
<td><strong>Synthesising and evaluating designs</strong></td>
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<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>
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<tr>
<td>- discerning synthesis of ideas to develop innovative concepts that insightfully solve design problems</td>
<td>- effective synthesis of ideas to develop functional concepts that solve design problems</td>
<td>- synthesis of ideas to develop concepts that respond to design problems</td>
<td>- selection of ideas to develop concepts that respond to aspects of design problems</td>
<td>- identification of concepts</td>
<td></td>
</tr>
<tr>
<td>- valid and thorough justification of decisions and well-reasoned recommendations</td>
<td>- effective justification of decisions and considered recommendations</td>
<td>- justification of decisions and recommendations</td>
<td>- simple justification of decisions and obvious recommendations</td>
<td>- some recommendations</td>
<td></td>
</tr>
<tr>
<td>- discerning and thorough evaluation of ideas and products using design criteria.</td>
<td>- detailed evaluation of ideas and products using design criteria.</td>
<td>- evaluation of ideas and products using design criteria.</td>
<td>- simple evaluation of solutions using aspects of design criteria.</td>
<td>- partial evaluation of solutions.</td>
<td></td>
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<tr>
<td>Term</td>
<td>Explanation</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>accurate</td>
<td>providing a response to the design problem that meets all the needs identified in the design criteria</td>
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<tr>
<td>application</td>
<td>putting something to use</td>
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</tr>
<tr>
<td>appropriate</td>
<td>fitting, suitable to the context</td>
<td></td>
<td></td>
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<tr>
<td>aspect</td>
<td>a facet, phase or part of a whole, therefore incomplete</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>audience</td>
<td>the individual or group for whom the response is designed and delivered</td>
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<tr>
<td>basic</td>
<td>underdeveloped, straightforward</td>
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<tr>
<td>community</td>
<td>a community is a group of people who have a particular characteristic in common, such as a church, school, not-for-profit organisation, sporting club or a group of people with a particular need, and therefore require design solutions for many users. Community is a required design context in Year 12.</td>
<td></td>
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<tr>
<td>comprehensive</td>
<td>inclusive of a broad coverage of facts, ideas and information</td>
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<tr>
<td>concept</td>
<td>a synthesised theoretical solution to a design problem that meets the design criteria. A concept usually results from the progression of multiple ideas. The concept is refined and produced into a product.</td>
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<tr>
<td>considered</td>
<td>thoughtful, taking into account the pros and cons or possibilities of a situation</td>
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</tr>
<tr>
<td>data</td>
<td>facts, figures, statistics, numbers, records, documents, files</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>describe</td>
<td>outline, state, provide details</td>
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<tr>
<td>design (verb)</td>
<td>intend for a particular purpose</td>
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<tr>
<td>design (noun)</td>
<td>a plan; a project; a scheme</td>
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<tr>
<td>design brief</td>
<td>a design brief provides a succinct description of the design problem. The design brief does not state the solution or describe a product to be produced but should identify the scope, conditions and specifications under which the design problem will be solved. It may contain an outline of the context and include a description of the needs of individuals or the community, or identified opportunities as well as the design criteria that apply to the design problem. Design briefs can vary in the amount of information they provide and the way information is presented.</td>
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<tr>
<td>design criteria</td>
<td>design criteria are identified by analysing the design problem and identifying how well solutions resolve the design problem. They provide explicit information about the requirements to evaluate the appropriateness of solutions and are used to determine the quality, functionality and reliability of the product. The design criteria accompany the design brief.</td>
<td></td>
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</tr>
<tr>
<td>Term</td>
<td>Explanation</td>
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<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>design problems</td>
<td>difficulties or obstacles in real-world design that present opportunities to explore innovative solutions. When determining a design problem it is important to identify a human need or opportunity and the context for which a solution is required. Design problems may be situations or challenges.</td>
<td></td>
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<tr>
<td>detailed</td>
<td>meticulous, including many of the parts</td>
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<td></td>
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</tr>
<tr>
<td>discerning</td>
<td>making thoughtful and astute choices</td>
<td></td>
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<tr>
<td>discriminating</td>
<td>perceptive and selective</td>
<td></td>
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</tr>
<tr>
<td>drawings</td>
<td>drawings are produced using manual and computer-aided techniques and processes. They include orthographic projections and pictorials.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>effective</td>
<td>meeting the assigned purpose, in a way that produces a desired result</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>efficient</td>
<td>well-organised and productive with minimal expenditure of effort; proficient and useful</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>element</td>
<td>a component or constituent part of a whole</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ergonomics and anthropometric data</td>
<td>these two terms are used to describe the application of scientific information about human variability and adaptability to a design process. Ergonomics (also known as Human Factors) describes information about humans in &quot;working&quot; situations. Anthropometrics deals with information about human body size and shape.</td>
<td></td>
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<tr>
<td>essential</td>
<td>important, crucial, indispensable</td>
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<td>evaluate</td>
<td>assigning merit according to criteria</td>
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<td>explain</td>
<td>present meaning with clarity, precision and completeness, and with due regard to the order of statements in the explanation</td>
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<td>feasible</td>
<td>possible, practical, viable, reasonable</td>
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<td>functional</td>
<td>useful, practical, purposeful</td>
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<td>heuristics</td>
<td>experience-based techniques for problem solving, learning, and discovery. Where an exhaustive search is impractical, heuristic methods are used to speed up the process of finding a satisfactory solution. Examples of this method include using a rule of thumb, an educated guess, an intuitive judgment, trial and error, or common sense.</td>
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<td>idea</td>
<td>in this syllabus ideas are theoretical solutions to a design problem that meet the requirements of the design brief</td>
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<td>impact</td>
<td>the forceful effect of the design factors upon solutions to the design problem. There should be consideration of both positive and negative impacts of the design factors on decisions.</td>
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<td>information</td>
<td>knowledge, evidence</td>
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<td>innovative</td>
<td>novel, but not necessarily unique, often involving effective alternatives, modifications or change to given information or routine tasks; the implementation of something new or different; the use of a better and novel idea or method</td>
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<tr>
<td>Term</td>
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<tr>
<td>insightful</td>
<td>perceptive, demonstrating high levels of understanding</td>
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<td>justification</td>
<td>sound reasons or evidence to support a statement. Soundness requires that the reasoning is logical and, where appropriate, that the premises are likely to be true.</td>
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<td>life cycle analysis</td>
<td>assessing a product’s full environmental cost/impact over the life cycle of the product (cradle to grave or cradle). This includes extracting and processing materials, manufacturing, transporting and distribution, use, reuse and maintenance, recycling and final disposal. Quantifies the environmental impact rather than the financial impact.</td>
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<td>mode</td>
<td>a system of communication chosen as the way to transmit a message. The choice of language mode may be written, spoken/signed, nonverbal, visual or auditory. In combination, these systems of communication form multimodal responses.</td>
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<td>nonverbal features</td>
<td>nonverbal features contribute to spoken/signed and multimodal presentations and include both facial expressions and gesture (proximity, body movement, stance)</td>
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<td>obvious</td>
<td>predictable, immediately apparent</td>
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<td>partial</td>
<td>incomplete, half-done, unfinished</td>
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<td>product</td>
<td>the end result of a design process and production. It is three-dimensional. It can be a prototype.</td>
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<td>production plan</td>
<td>identifies and sequences key stages of production needed to produce the product that meets the design criteria. It may include identified production skills, time, costs, consideration of safety and risk management and selected materials, tools processes and equipment.</td>
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<td>proficient</td>
<td>capable, skilful, adept</td>
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<td>prototype</td>
<td>a working trial product</td>
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<td>range</td>
<td>breadth of coverage</td>
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<td>relevant</td>
<td>applicable and pertinent, has a direct bearing on</td>
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<tr>
<td>reproduce</td>
<td>copy ideas or solutions that are not the student’s own</td>
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<td>simple</td>
<td>simple may concern a single or a basic aspect, few steps, obvious data/outcomes, limited or no relationships</td>
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<td>solutions</td>
<td>solutions are the ideas and products developed in response to design problems. They are evidenced through documenting ideas and producing products.</td>
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<td>specifications</td>
<td>should state what the users of the product need in terms of features, functions, performance, constraints, and quality, written in terms of what the product must do or qualities it must have.</td>
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<td>succinct</td>
<td>concise, to the point</td>
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<td>Term</td>
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<td>synthesis</td>
<td>assembling of constituent parts into a coherent, unique and/or complex entity. The term ‘entity’ includes a system, theory, communication, plan, or set of operations.</td>
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<td>systematic</td>
<td>methodical; orderly; arranged in or comprising an ordered system, method or plan</td>
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<td>testing</td>
<td>in this syllabus, testing is to trial or experiment to confirm solutions</td>
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<tr>
<td>thorough</td>
<td>demonstrating depth and breadth, inclusive of relevant detail</td>
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<tr>
<td>valid</td>
<td>plausible and logical, reasonable and justifiable</td>
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<tr>
<td>vague</td>
<td>unclear, imprecise, ambiguous</td>
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<tr>
<td>verbal features</td>
<td>these features contribute to meaning in spoken/signed presentations and include pronunciation; pace; volume; and phrasing</td>
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<tr>
<td>well-reasoned</td>
<td>logical and sound; presented with justification</td>
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<td>working drawings</td>
<td>a set of drawings used as part of the documentation needed to produce a product. In Technology Studies, working drawings should be sufficiently detailed to enable the product to be made.</td>
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<td>written communication</td>
<td>in this syllabus, written communication includes annotations, paragraphs and extended writing. Paragraphs and extended writing use accepted genre structures and associated conventions, for example referencing and quoting in reports. Language conventions, including paragraphing, sentence structure, vocabulary, grammar, spelling and punctuation are also to be considered when completing written work.</td>
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