

# Technical Graphics - Foundation

LEVEL 2	15 TCE CREDIT POINTS
COURSE CODE	TEG215120
COURSE SPAN	2020 — 2021
COURSE STATUS	CLOSED
READING AND WRITING STANDARD	NO
MATHEMATICS STANDARD	NO
COMPUTERS AND INTERNET STANDARD	NO

## The design of objects and structures in the built environment and mechanical systems requires a combination of skills in design, mathematical reasoning and drawing techniques

Well-designed products and systems have the potential to solve problems and enhance our daily lives. The study of Technical Graphics - Foundation provides basic skills, knowledge and understanding of freehand, technical (instrument) and Computer Aided Drafting and Design (CADD) drawing to shape and communicate practical solutions to real-world design problems. Learners develop the foundation skills in technical drawing and underpinning geometrical knowledge relevant to engineering, architectural and product design contexts.

### Rationale

The design of objects and structures in the built environment and mechanical systems requires a combination of skills in design, mathematical reasoning and drawing techniques. Well-designed products and systems have the potential to solve problems and enhance our daily lives. The study of Technical Graphics – Foundation provides basic skills, knowledge and understanding of freehand, technical (instrument) and Computer Aided Drafting and Design (CADD) drawing to shape and communicate practical solutions to real-world design problems. Learners develop the foundation skills in technical drawing and underpinning geometrical knowledge relevant to engineering, architectural and product design contexts.

### Learning Outcomes

On successful completion of this course, learners will be able to:

- interpret key standards and conventions to comprehend graphic ideas and information
- use key standards and conventions to communicate graphic ideas and information
- use drawings to communicate knowledge and understanding of plane and solid geometry
- use geometrical skills to solve simple real-world problems
- employ technical skills in sketching, drawing and contemporary digital forms
- identify the relationship between Computer Aided Drafting and Design (CADD) and Computer Aided Manufacturing (CAM) systems\*
- interpret and respond to simple design briefs
- plan, organise and prepare a set of drawings in response to a design brief.

*\*In this course, the term Computer-Aided Drafting and Design (CADD) refers to the process where a drafter/designer uses technology to create drawings or models as part of the design process. These skills and knowledge transfer to Computer Aided Manufacture (CAM) involving properties of materials and manufacturing principles and processes. Digital fabrication provides a strong context for schools. 3D printers and small CNC machines such as laser and vinyl cutters are examples of how CAM can complement CADD in a senior secondary education environment.*

## Pathways

Learners who have completed prior study in the area of Australian Curriculum Technologies band 9-10, or other design-based courses will be placed to engage in *Technical Graphics – Foundation*, however there are no mandatory requirements for this course. *Technical Graphics – Foundation* Level 2 will enhance the opportunities for learners to continue their learning in *Technical Graphics* Level 3 and/or prepare them for further study or employment in vocational areas such as manufacturing, building and construction, and engineering.

## Resource Requirements

Learners require:

- access to tee-squares, set squares, compasses, parallel rolling rulers, scale rulers and drawing pencils, pens and associated stationery
- periodic access to computer technology, the internet and A3 printers.

Access to drawing boards is desirable.

## Course Size And Complexity

This course has a complexity level of 2.

At Level 2, the learner is expected to carry out tasks and activities that involve a range of knowledge and skills, including some basic theoretical and/or technical knowledge and skills. Limited judgement is required, such as making an appropriate selection from a range of given rules, guidelines or procedures. VET competencies at this level are often those characteristic of an AQF Certificate II.

This course has a size value of 15.

## Course Description

Learners will understand and communicate graphical technical information. They will use contemporary processes and emerging technologies to solve simple problems in graphic form. Learners will study the first principles of technical drawing practice using hand drawing, sketching, and Computer Aided Drafting and Design (CADD) forms. A variety of techniques will be used involving practical applications of plane and solid geometry. The knowledge and skills gained will be integrated in the production of a Graphics Folio and related tasks.

## Course Content

This course comprises of two sections:

- Section 1 – Foundation Skills and Knowledge (comprising the following six topics)
  1. First Principles
  2. Geometry
    - 2.a Plane Geometry
    - 2.b Solid Geometry
  3. CADD/CAM
  4. Drawing and Presentation Techniques
  5. Graphic Literacy
  6. The Design Process and Principles
  
- Section 2 – Graphics Folio.

All course content is compulsory.

The topics of the Foundation Skills and Knowledge section are to be undertaken in the listed sequence. The Graphics Folio section will be undertaken after the Foundation Skills and Knowledge section.

### SECTION 1: FOUNDATION SKILLS AND KNOWLEDGE

SUGGESTED 70% OF COURSE DELIVERY TIME FOR THIS SECTION. IT IS NOT EXPECTED THAT TOPICS WILL BE GIVEN EQUAL DELIVERY TIME

#### 1: FIRST PRINCIPLES

The first principles are the basic knowledge and skills sets needed prior to study of the basic concepts of Technical Graphics. These first principles are learnt prior to plane geometry concepts.

#### Basic Knowledge

*Introduction:* Graphical language is used to convey information, standards and conventions. How drawings can overcome language barriers.

*Equipment:* Types of pencils, pens, ink, erasers, compasses, protractors, templates, guides, flexi-curves, French curves, dividers, rulers, scale rulers, set squares, tee squares, drawing machines, and tables. How to use such equipment correctly and safely. Except for specific paper media-based tools, they are device independent.

*Paper:* Different types, sizes and thicknesses of paper.

#### Skills:

- definition of point, line, circle, arc, curve, line types of each of these
- correct way to hold a pencil or pen
- correct way to use a compass and dividers
- correct way to mount paper to drawing table
- draw borders and title blocks to correct set-out
- lettering
- drawing a straight line to a specified length
- notation of points
- bisection of line
- perpendicular from a point on line – construction of
- perpendicular from a point to a line – construction of
- line division
- angles by radius
- bisection of angles
- copying of angles
- construction of triangles, scalene, equilateral, isosceles
- inscribing a triangle
- circumscribing a triangle
- true length lines, horizontal planes and vertical planes.

## 2: GEOMETRY

### 2 a: Plane Geometry

Foundation hand drawing skills for technical graphics – applying the first principles:

- Geometric construction – lines, angles, line division and bisections
- Polygons – right regular only
- Circles – basic arcs and tangents.

Plane geometry applications:

Students will learn about real world examples from engineering and/or architectural applications of:

- Conic curves – conic sections, parabola, hyperbola and ellipse  
*Examples: roof design, ballistics, self-supporting archways in civil engineering and architecture, satellite dishes.*
- Loci – involutes and simple mechanisms  
*Examples: plotting the path of a moving point such as the opening of a garage door, shapes such as a helical stairway or Archimedean spiral ceilings.*

### 2 b: Solid Geometry

1<sup>st</sup> and 3<sup>rd</sup> angle orthographic projections and auxiliary views:

- Elevations and plan views of architectural and engineering objects using descriptive drawing methods relating to specific disciplines  
*Projection of various views of right regular solids – including inclination to one principle plane*
- Applications include architectural and engineering contexts  
*Sectioning of right regular solids – including those inclined to one principle plane*  
*Surface developments of simple solids*
- Applications include boiler making and steel fabrication  
*Interpenetration – basic treatment only (excludes surface development)*
- Applications include:  
*Determining cut lines and true shapes commonly used in sheet metal applications or air conditioning installations such as in the junction between a roof and flue, plumbing joints, change of shape from round to polygon.*

## 3: CADD/CAM

CADD systems can be used as an integrated method in achieving some of the course content. The combination of hand drawing and CADD will assist the learner to establish a foundational understanding of both hand and CADD skills for further study.

### Foundations:

- 2D Cartesian coordinate system
- transformation and translation tools
- layers and libraries
- line work – colours and thickness
- text and dimensioning
- file naming conventions and international standards (e.g. ISO 13567 (layering))
- file types and applications (e.g. DXF, STL)
- relationship of CADD to CAM.

## 4: DRAWING AND PRESENTATION TECHNIQUES

### Standard Drawing Practice

Conventions as described in the current standards.

[Australian Standards](#)

[ISO CADD - Technical product documentation for CADD.](#)

### Materials and Equipment

Conventional and contemporary graphic equipment including CADD systems, processes and materials.

### Technical Freehand Sketching

Technical freehand sketching as an aid to achieving preparatory work for further drawings and for paper and digital drawings in their own right.

**Perspective drawing**

One and two point.

**Orthographic drawing**

Basic understanding of orthographic projection, hand drawn and CADD.

**Pictorial drawing**

Isometric and oblique drawings of simple solids, hand drawn and CADD.

**Rendered sketches**

Freehand toning, shading, textures, colour.

**5: GRAPHIC LITERACY**

Reading and interpreting simple plans and diagrams (e.g. sketches, assembly drawings, CADD representations, plans and elevations).

**6: THE DESIGN PROCESS AND PRINCIPLES**

An introductory study of the process and principles, to include:

- the meaning, objective and components of a design brief
- the requirements and limitations of the design process
- research and investigation
- elementary principles of design
- the importance of working drawings
- presenting a solution in graphical format
- use of CADD as a tool to assist in producing an output.

**SECTION 2: GRAPHICS FOLIO**

SUGGESTED 30% OF DELIVERY TIME

Learners will prepare a graphics folio based on an area of interest (such as, but not limited to design in the following contexts: engineering; architecture; manufacturing; automotive; building and construction; landscape and environment; logos; jewellery; fashion; industrial; product; aeronautical; and marine).

In negotiation with their teacher, learners will develop a design brief and related tasks. The brief and associated tasks will be of a suitable scope to allow learners to develop and demonstrate the integration of the foundation knowledge and skills from content area Section 1.

**Work Requirements**

Learners will complete a graphics folio that will include:

- a description of their area of interest
- working sketches and drawings
- a series of final drawings (i.e. their design solution) demonstrating a number of drawing and presentation techniques including hand sketched, instrument drawn and CADD
- evidence of the use of CADD systems within the process
- tasks selected in consultation with the teacher that allow the learner to demonstrate ability and versatility across a range of drawing and presentation techniques.

## Assessment

Criterion-based assessment is a form of outcomes assessment that identifies the extent of learner achievement at an appropriate end-point of study. Although assessment – as part of the learning program – is continuous, much of it is formative, and is done to help learners identify what they need to do to attain the maximum benefit from their study of the course. Therefore, assessment for summative reporting to TASC will focus on what both teacher and learner understand to reflect end-point achievement.

The standard of achievement each learner attains on each criterion is recorded as a rating 'A', 'B', or 'C', according to the outcomes specified in the standards section of the course.

A 't' notation must be used where a learner demonstrates any achievement against a criterion less than the standard specified for the 'C' rating.

A 'z' notation is to be used where a learner provides no evidence of achievement at all.

Providers offering this course must participate in quality assurance processes specified by TASC to ensure provider validity and comparability of standards across all awards. To learn more, see TASC's quality assurance processes and assessment information.

Internal assessment of all criteria will be made by the provider. Providers will report the learner's rating for each criterion to TASC.

## Quality Assurance Process

The following processes will be facilitated by TASC to ensure there is:

- a match between the standards of achievement specified in the course and the skills and knowledge demonstrated by learners
- community confidence in the integrity and meaning of the qualification.

**Process** – TASC will verify that the provider's course delivery and assessment standards meet the course requirements and community expectations for fairness, integrity and validity of qualifications TASC issues. This will involve checking:

- learner attendance records; and
- course delivery plans (the sequence of course delivery/tasks and when assessments take place):
  - assessment instruments and rubrics (the 'rules' or marking guide used to judge achievement)
  - class records of assessment
  - examples of learner work that demonstrate the use of the marking guide
  - samples of current learner's work, including that related to any work requirements articulated in the course document.

This process may also include interviews with past and present learners.

It will be scheduled by TASC using a risk-based approach.

## Criteria

The assessment for Technical Graphics – Foundation Level 2 will be based on the degree to which the learner can:

1. use standards and conventions to communicate and interpret graphic ideas and information
2. use geometric knowledge, skills and techniques to solve real-world problems
3. apply freehand sketching skills and techniques
4. apply technical drawing skills and techniques
5. respond to design briefs using the design process
6. apply planning and organisational skills

**Standards**

**Criterion 1: use standards and conventions to communicate and interpret graphic ideas and information**

The learner:

Rating A	Rating B	Rating C
correctly identifies, selects and uses appropriate and accurate standards and conventions to present graphic ideas and information	selects and uses appropriate standards and conventions to present graphic ideas and information	uses given standards and conventions to present graphic ideas and information
describes features of drawing conventions in a broad range of contexts, (e.g. architectural, engineering and mechanical drawings)	outlines features of drawing conventions in a range of different contexts (e.g. architectural, engineering and mechanical drawings)	outlines features of drawing conventions in a specific context (e.g. architectural, engineering or mechanical drawings)
identifies and fully explains conventions in simple and complex drawings of to support interpretation	identifies and explains conventions in simple drawings to support interpretation	identifies conventions in simple drawings to support interpretation
uses appropriate terms and conventions to accurately describe CADD, and the relationships between CADD and CAM.	uses appropriate terms and conventions when describing CADD and the relationships between CADD and CAM.	identifies and gives a basic explanation of CADD, including its relationship to CAM, and how CADD and CAM are used in industry.

**Criterion 2: use geometric knowledge, skills and techniques to solve real-world problems**

The learner:

Rating A	Rating B	Rating C
produces accurate solutions to simple and complex geometrical problems	produces accurate solutions to simple geometrical problems	produces solutions to simple geometrical problems. There may be some inaccuracies in the solutions.
produces accurate and detailed geometrical drawings as solutions to design problems	produces accurate geometrical drawings as solutions to design problems	produces geometrical drawings to partially resolve design problems
produces accurate and detailed geometrical CADD output as solutions to design problems, adhering to international standards and conventions	uses CADD to manipulate geometrical CADD output as solutions to problems, and correctly uses some international standards and conventions	uses CADD to produce geometrical drawings that partially solves design problems
discusses - in terms of design - the purpose of information presented in a verbal or graphic brief	describes - in terms of design - the purpose of information presented in a verbal or graphic brief	outlines - in terms of design - the purpose of information presented in a verbal or graphic brief
uses a broad range of plane and solid geometry concepts to solve problems.	uses a range of plane and solid geometry concepts to solve problems.	uses a limited range of plane and solid geometry concepts to solve simple problems.

**Criterion 3: apply freehand sketching skills and techniques**

The learner:

Rating A	Rating B	Rating C
produces complete and detailed freehand sketches representing simple objects with accurate dimensional proportions	produces complete freehand sketches representing simple objects, with dimensional proportions	produces freehand sketches representing simple objects, that resemble the item
draws freehand sketches correctly applying conventions and techniques in orthographic, perspective, and pictorial (isometric and oblique) styles	draws freehand sketches correctly applying conventions and techniques in at least two of the following styles: <ul style="list-style-type: none"> <li>• orthographic</li> <li>• perspective</li> <li>• pictorial (isometric and oblique).</li> </ul>	draws freehand sketches demonstrating limited understanding of the conventions for orthographic, perspective, and pictorial (isometric and oblique) styles
uses a range of appropriate freehand sketching techniques to support the design process, in problem solving exercises, and to develop ideas and solutions	uses freehand sketching to support the design process, in problem solving exercises, and to develop ideas and solutions	uses a limited range of freehand sketching to support the design process, in problem solving exercises, and to develop ideas and solutions
uses appropriate scale and dimensioning to suit the purpose and function of freehand drawings, and tests possible solutions.	uses appropriate scale and dimensioning to suit the purpose and function of freehand drawings.	uses scale and dimensioning in freehand drawings.

## Criterion 4: apply technical drawing skills and techniques

The learner:

Rating A	Rating B	Rating C
identifies, selects and applies a range of appropriate hand and CADD drawing tools to complete technical drawings	selects and applies a range of hand and CADD drawing tools to complete technical drawings	applies hand and CADD drawing tools as directed to complete technical drawings
selects and applies appropriate principles of geometry and solid modelling to drawing tasks and problems	selects and applies principles of geometry and solid modelling to drawing tasks and problems	applies principles of geometry and solid modelling to drawing tasks as directed
produces accurate and detailed drawings of simple objects using the Australian Drawing Standards	produces accurate drawings of simple objects using the Australian Drawing Standards	produces accurate drawings of simple objects
uses presentation techniques that comply with conventions.	uses presentation techniques that generally comply with conventions.	uses a presentation technique as directed.

## Criterion 5: respond to design briefs using the design process

The learner:

Rating A	Rating B	Rating C
progresses through the design process to produce solutions that address the design brief	progresses through the design process to produce solutions that address most aspects of the design brief	progresses through the design process to produce solutions that address aspects of the design brief
discusses information presented in	describes information presented in	outlines information presented in design



design solutions in terms of the design principles involved	design solutions in terms of the design principles involved	solutions in terms of the design principles involved
sources, identifies and accesses information relevant to the design brief	identifies and accesses information relevant to the design brief	accesses information relevant to the design brief as directed
produces a design folio in which uses a broad and appropriate range of graphic methodologies to address the brief	produces a design folio that uses an appropriate range of graphic methodologies to address the brief	produces a design folio that uses some appropriate graphic methodologies to address the brief
identifies and appropriately solves a range of simple problems during the planning and drawing phases	identifies and solves simple problems during the planning and drawing phases	identifies a limited number of problems and proposes some possible solutions during the planning and drawing phases
<p>evaluates a project's finished product in terms of the:</p> <ul style="list-style-type: none"> <li>• quality of work</li> <li>• design solutions used</li> <li>• effectiveness of techniques</li> <li>• effectiveness of processes</li> </ul> <p>in meeting the requirements of the brief</p>	when evaluating a project, makes realistic conclusions about the degree of match between finished product and the brief	when evaluating a project, makes some realistic conclusions about the degree of match between finished product and the brief
identifies areas/aspects for future improvement or modifications		
uses appropriate referencing/citation methods.	uses some appropriate referencing/citation methods.	uses referencing/citation methods as directed.

## Criterion 6: apply planning and organisational skills

The learner:

Rating A	Rating B	Rating C
identifies time, materials and equipment needed to complete a task, and devises a plan for completion	identifies time, materials and equipment needed to complete a task, and devises a basic plan for completion	identifies time, materials and equipment needed for a task
sets personal targets and deadlines to achieve goals and completing tasks	sets deadlines to complete tasks	
maintains task focus	maintains task focus for agreed periods of time	maintains task focus for limited periods of time
sets short-, medium- and long-term goals which are measurable, achievable and realistic, and plans effective actions	sets short- and medium-term goals spanning one to several lessons which are measurable, achievable and realistic, and plans accordingly	sets short-term goals which are generally measurable, achievable and realistic, and follows given plans/directions
reports – orally and/or in writing – on progress towards meeting goals, evaluates progress and plans future actions	reports – orally and/or in writing – on progress towards meeting goals and articulates ways in which goals can be met in the future	reports – orally and/or in writing – on progress towards meeting goals in a constructive manner
considers, selects and uses strategies to manage and complete activities within established timelines.	selects and uses strategies to perform tasks within established timelines.	uses strategies as directed to perform tasks within established timelines.

## Qualifications Available

Technical Graphics - Foundation Level 2 (with the award of):

EXCEPTIONAL ACHIEVEMENT

HIGH ACHIEVEMENT

COMMENDABLE ACHIEVEMENT

SATISFACTORY ACHIEVEMENT

PRELIMINARY ACHIEVEMENT

## Award Requirements

The final award will be determined by the Office of Tasmanian Assessment, Standards and Certification from 6 ratings.

The minimum requirements for an award in Technical Graphics - Foundation Level 2 are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)

5 'A' ratings, 1 'B' rating

HIGH ACHIEVEMENT (HA)

3 'A' ratings, 2 'B' ratings, 1 'C' rating

COMMENDABLE ACHIEVEMENT (CA)

3 'B' ratings, 3 'C' ratings

SATISFACTORY ACHIEVEMENT (SA)

5 'C' ratings

PRELIMINARY ACHIEVEMENT (PA)

3 'C' ratings

A learner who otherwise achieves the ratings for an SA (Satisfactory Achievement) award but who fails to show any evidence of achievement in one or more criteria ('z' notation) will be issued with a PA (Preliminary Achievement) award.

## Course Evaluation

The Department of Education's Curriculum Services will develop and regularly revise the curriculum. This evaluation will be informed by the experience of the course's implementation, delivery and assessment.

In addition, stakeholders may request Curriculum Services to review a particular aspect of an accredited course.

Requests for amendments to an accredited course will be forwarded by Curriculum Services to the Office of TASC for formal consideration.

Such requests for amendment will be considered in terms of the likely improvements to the outcomes for learners, possible consequences for delivery and assessment of the course, and alignment with Australian Curriculum materials.

A course is formally analysed prior to the expiry of its accreditation as part of the process to develop specifications to guide the development of any replacement course.

## Course Developer

The Department of Education acknowledges the significant leadership of Gordon Clark, Ken Laughlin, Shon McIntee and Kent Moore in the development of this course.

## Accreditation

The accreditation period for this course is from 1 January 2020 to 31 December 2021.


**The accreditation of this course will not be renewed after the expiry date.**

## Version History

Version 1 – Accredited on 26 June 2019 for use from 1 January 2020 to 31 December 2021. This course replaces Technical Graphics – Foundation (TEG215115) that expired on 31 December 2019.

**The accreditation of this course will not be renewed after the expiry date.**

## Supporting documents including external assessment material

-  [TEG215115CourseAccreditation.pdf](#) (2017-07-21 01:05pm AEST)



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