

10ITD: Creating Design Solutions - BRIDGES

Achievement Standard: By the end of Year 10 students will have had the opportunity to design and produce at least four designed solutions focused on one or more of the five technologies contexts content descriptions. Students use design and technologies knowledge and understanding, processes and production skills and design thinking to produce designed solutions to identified needs or opportunities of relevance to individuals and regional and global communities. Students work independently and collaboratively. Problem-solving activities acknowledge the complexities of contemporary life and make connections to related specialised occupations and further study.

Using a range of technologies including a variety of graphical representation techniques to communicate, students generate and represent original ideas and production plans in two and three-dimensional representations using a range of technical drawings including perspective, scale, orthogonal and production drawings with sectional and exploded views. They produce rendered, illustrated views for marketing and use graphic visualisation software to produce dynamic views of virtual products.

Students identify the steps involved in planning the production of designed solutions. They develop detailed project management plans incorporating elements such as sequenced time, cost and action plans to manage a range of design tasks safely. They apply management plans, changing direction when necessary, to successfully complete design tasks. Students identify and establish safety procedures that minimise risk and manage projects with safety and efficiency in mind, maintaining safety standards and management procedures to ensure success. They learn to transfer theoretical knowledge to practical activities across a range of projects.

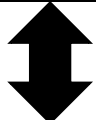
Assessment:
Student Workbook
Practical Project:
Bridge Design
12 weeks
Term 1 -2 Week 12



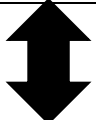
Engineering principles and systems

Engineering principles and systems is focused on how forces can be used to create light, sound, heat, movement, control or support in systems. Knowledge of these principles and systems enables the design and production of sustainable, engineered solutions. Students need to understand how sustainable engineered products, services and environments can be designed and produced as resources diminish. Students will progressively develop knowledge and understanding of how forces and the properties of materials affect the behaviour and performance of designed engineering solutions.

<p>READING / VIEWING/ LISTENING: Core Text 1: "Why is engineering important in the design process." "Bridge design and engineering" online clips showing processes.</p>
<p>COMPREHENSION SKILL FOCUS: Determine importance [Folio construction] Design Processes – use of ICT.</p>



<p>THINKING: Sequence, sketch, draw, explain and evaluate</p>
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<p>WRITTEN / SPOKEN / MULTI-MODAL TEXTS Power point and use of Scaffolded Design Folio Process</p>
<p>HIGHLY VALUED LANGUAGE FEATURE FOCUS: Engineering Analytical Language</p>

WORKSHOP PRACTICES
<p>This project involves gaining knowledge, attitude, and skills, required to select, measure and cut materials according to job specifications, within the quality tolerances and requirements, realistic job completion timeframes, safety and personal conduct requirements of a workshop based production. Key take home skills;</p> <ul style="list-style-type: none"> Have a clear understanding of forces in bridges. Demonstrate knowledge and understanding of designing methods.(Folio) Have a clear understanding of WH&S requirements Demonstrate knowledge of WH&S by using correct PPE and practical demonstration in the workshop Demonstrate basic practical skills such as the use of relevant tools Perform a sequence of routine tasks given clear directions Select only two tools out and in use at one time Work at allocated vice /space with a safe attitude Correct way and attitude to stand in a teacher demonstration (semi-circle single file) Produce a series of sketches and final drawing as part of a design folio Accurately measure and cut materials according to product requirements Entry and exit procedures into the workshop Bags must be locked in the bag box locked for lesson All students must have a pencil and pen for ITD lessons Margin and date in books Housekeeping clean up procedures Timeline for project completion

Standard Elaborations - Proficiency Scale			
	Technologies Contexts	Generating and Designing	Collaborating and managing
4	<p>Informed evaluation of the features of technologies and their appropriateness for purpose for one or more of the technologies contexts when producing designed solutions for identified needs or opportunities</p>	<p>Effective creation and connection of design ideas and processes of increasing complexity and informed justification of decisions. Effective communication and documentation of projects for a range of audiences.</p>	<p>Application of sequenced production and management plans when producing designed solutions: making informed adjustments to plans when necessary working independently and collaboratively</p>
3	<p><i>Recognise or recall technical vocabulary:</i></p> <ul style="list-style-type: none"> Personal protective Equipment, PPE Forces Evaluation Plywood & materials Ratio Safety Induction Routine Techniques Guided investigating Prototype and product Use of technologies graphical representation <p><i>Recognise or recall technical information:</i></p> <ul style="list-style-type: none"> safe working practices for specific classroom design projects properties of plywood engineering design producing design solutions 	<p><i>Perform basic process such as:</i></p> <ul style="list-style-type: none"> Investigating Evaluating Producing Creation Connection of ideas Marking out Cutting out Sequenced production Management plans Adjustments Collaborative work documentation following WH&S and workshop requirements 	<p><i>Recognise or recall vocabulary:</i></p> <p>Explain, evaluate, evaluative language, designed solutions, processes, judge, criteria, functionality, aesthetics, design, collaborate, communicate, justify and technologies.</p> <p><i>Perform basic process such as:</i></p> <ul style="list-style-type: none"> identify features of plywood which match design criteria explain the degree of success of the final product in terms of the criteria and collaborative working explain adjustments to your process and final product communicate ideas in complete sentences and/or appropriate graphical representations

Guaranteed Vocabulary:	Design Question Three Strategies:	Design Question Four Strategy:	21 st Century Skill:
<ul style="list-style-type: none"> • Equipment/names/uses/safety when using equipment • Personal safety, Machine and tool safety • Knowledge of materials • Procedures and processes • Measuring equipment/ templates • Product modification • Individual work • Team work 	<p>ELEMENTS AND STRATEGIES</p> <p>Art and Science of Teaching</p> <p>Element 6-Chunking the content</p> <p>Presenting content in small sequentially related steps</p> <p>Allowing processing time between chunks</p> <p>Element 7- Processing content</p> <p>Thinking hats or Think pair share</p> <p>Element 8- Recording and representing knowledge</p> <p>Academic note books</p> <p>Informal outlines and processes</p> <p>Combination of notes pictures and summaries</p> <p>Summaries – questions to support summary writing</p> <p>Identify big ideas and smaller details into informal outline.</p>	<p>ELEMENTS AND STRATEGIES</p> <p>Element</p> <p>9- structured practice sessions</p> <p>10-Examining similarities and differences</p> <p>11-Examining errors in reasoning</p>	<ul style="list-style-type: none"> • Collaboration and teamwork. • Creativity and imagination. • Critical thinking. • Problem solving.
Guaranteed Skills/Language Features:	Reading Comprehension Skill and Strategy:	Cognitive Verbs:	ICT to Enhance Learning:
<ul style="list-style-type: none"> • PMI & evaluation – this text structure is taught and used for evaluation after each practical lesson • Cornell note taking – this technique is taught and used for taking notes and revising and summarising key information • Design Portfolio – this text structure is taught and used when completing a Design Brief 	<ul style="list-style-type: none"> • Hands on Reading (Buehl, 2017) problem solving the meaning of technical texts to enable the reader to complete the practical task. • Question-Answer Relationships (Buehl, 2017), alert students to balance what an author tells them with what the author expect them to already know. • Structured note-taking (Buehl, 2017), to assist students to see the connections between provided information, subsequent practical lessons and discussions giving an opportunity for visual representation of the information required. 	<ul style="list-style-type: none"> • Select: pick out, choose in preference • Sequence: arrange in a particular order • Investigate: carry out an examination or formal inquiry in order to establish or obtain facts and reach new conclusions • Explain: make an idea or situation plain or clear by describing it in more detail or revealing relevant facts • Evaluate • Compare: display recognition of similarities and differences and recognise the significance of these similarities and differences • Manipulating/operating/using equipment – displaying competence choosing and using an implement to perform a given task effectively 	<ul style="list-style-type: none"> • Research – students research existing Bridge designs to present solutions to a design brief (e.g. meeting a specified time requirement, using a specified materials, utilising specified skills, utilising a specified tools and equipment) • WPH&S – Act and effect in workplaces like schools.

Learning Goals:

Australian Curriculum Content Descriptors	Kirwan High Goals
KNOWLEDGE AND UNDERSTANDING	
<p>Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved ACTDEK040</p>	<p>Students will be able to:</p> <ul style="list-style-type: none"> Analyse factors that lead to safe operating processes including social and sustainability factors
<p>Explain how products, services and environments evolve with consideration of preferred futures and the impact of emerging technologies on design decisions ACTDEK041</p> <ul style="list-style-type: none"> explaining the consequences of social, ethical and sustainability decisions for products, services and environments, for example a managed public environment such as a theme park 	<p>Students will be able to:</p> <ul style="list-style-type: none"> Use the design process to make adjustments to meet design briefs and challenges Use of materials like Plywood in the production of the Bridge through to testing stages in week 12
<p>Investigate and make judgements on how the characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions ACTDEK046</p> <ul style="list-style-type: none"> critiquing the design of an existing product to identify environmental consequences of material selection justifying decisions when selecting from a broad range of technologies – materials, systems, components, tools and equipment analysing and explaining the ways in which the properties and characteristics of materials have been considered in the design of a product with specific requirements 	<p>Students will be able to:</p> <ul style="list-style-type: none"> Follow workshop expectations, entry and exit procedures Safely and correctly use tools and equipment following and creating safe operating procedures
PROCESSES AND PRODUCTION SKILLS	
<p>Critique needs or opportunities to develop design briefs and investigate and select an increasingly sophisticated range of materials, systems, components, tools and equipment to develop design ideas ACTDEP048</p> <ul style="list-style-type: none"> identifying appropriate tools, equipment, techniques and safety procedures for each process and evaluating production processes for accuracy, quality, safety and efficiency 	<p>Students will be able to:</p> <ul style="list-style-type: none"> select and demonstrate correct, safe use of tools and equipment demonstrate correct technique for food preparation and cooking (knife, frypan, whisk, mixing tools...) critique their use of tools and equipment for future practices
<p>Work flexibly to effectively and safely test, select, justify and use appropriate technologies and processes to make designed solutions ACTDEP050</p> <ul style="list-style-type: none"> explaining safe working practices required for a specific classroom design project for individual or community use modifying production processes to respond to unforeseen challenges or opportunities 	<p>Students will be able to:</p> <ul style="list-style-type: none"> make judgements of a finished product against criteria to meet a design brief read and modify texts safe workshop practices and practises for specified design brief work in a team of students to complete a task (practical)
<p>Develop project plans using digital technologies to plan and manage projects individually and collaboratively taking into consideration time, cost, risk and production processes ACTDEP052</p> <ul style="list-style-type: none"> creating production flowcharts using digital technologies to ensure efficient, safe and sustainable sequences 	<p>Students will be able to:</p> <ul style="list-style-type: none"> write detailed design process to meet a design brief or specified criteria follow safe operation procedures to complete a project individually and in a group reflect on and evaluate the design process used against specified criteria

General Capabilities – (highlight what you are covering)

Literacy	Comprehend texts	Navigate, read and view learning area texts	Listen and respond to learning area texts	Interpret and analyse learning area texts	Express opinion and point of view	Understand learning area vocabulary	Use spelling knowledge
	Compose texts	Compose spoken, written, visual and multimodal learning area texts	Deliver presentations	Use knowledge of text structures	Use knowledge of sentence structures	Understand how visual elements create meaning	
Numeracy	Understand and use numbers in context	Estimate and calculate	Use money	Recognise and use patterns and relationships	Interpret proportional reasoning	Apply proportional reasoning	
	Visualise 2D shapes and 3D objects	Interpret maps and diagrams	Interpret data displays				
ICT	Recognise intellectual property	Apply digital information security practices	Apply personal security protocols	Identify the impacts of ICT in society	Define and plan information searches	Locate, generate and access data and information	Select and evaluate data and information
	Generate ideas, plans and processes	Generate solutions to challenges and learning area tasks	Understand computer mediated communications	Collaborate, share and exchange	Manage digital data	Select and use hardware and software	Understand ICT systems
Critical and creative thinking	Pose questions	Identify and clarify information and ideas	Organise and process information	Imagine possibilities and connect ideas	Consider alternatives	Seek solutions and put ideas into action	
	Think about thinking (metacognition)	Reflect on processes	Transfer knowledge into new contexts	Apply logic and reasoning	Draw conclusions and design a course of action	Evaluate procedures and outcomes	
Personal and social capabilities	Recognise emotions	Understand themselves as learners	Develop reflective practice	Express emotions appropriately	Develop self-discipline and set goals	Work independently and show initiative	Become confident, resilient and adaptable
	Appreciate diverse perspectives	Contribute to civil society	Understand relationships	Communicate effectively	Work collaboratively	Make decisions	Negotiate and resolve conflict
Ethical understanding	Recognise ethical concepts	Explore ethical concepts in context	Reason and make ethical decisions	Consider consequences	Reflect on ethical action	Examine values	Explore rights and responsibilities
	Consider points of view						
Intercultural understanding	Investigate culture and cultural identity	Develop respect for cultural diversity	Explore and compare cultural knowledge, beliefs and practices	Communicate across cultures	Consider and develop multiple perspectives	Empathise with others	
	Reflect on intercultural experiences	Challenge stereotypes and prejudices	Mediate cultural difference				

Cross Curriculum Priorities:

Aboriginal and Torres Strait Islander histories and cultures

Asia and Australia's engagement with Asia

Sustainability

Differentiation [for small groups or individuals]:

Choice of product will be adjusted for specific skills and tools where required.

Written LENGTH of responses will be adjusted for individuals where required.

Scaffolding of student worksheets for individuals where required.