

Timber Automata

Context

- ☒ Digital Technologies
- ☒ Engineered Systems

- ☐ Agriculture and Food Technologies
- ☒ Material Technologies

Timing

10 Weeks

Indicative Hours

37.5 hours

Resources

Radiata Pine (66 x 12)
Plywood 3mm thick
Dowel Ø9
Clickview or another media source
Hand drawing and CAD worksheets and tutorials

Student Laptops and internet access
Workshop tools and machines (Pedestal Drill and hand tools)
Digital Folio Template
Engineering Careers Case Study

Unit Description

Students develop skills across Graphics Technologies, Timber Technologies and Engineering Technology in the design and manufacture of an Automata. This unit includes an introduction to basic engineering principles with activities directed at understanding how engineering impacts upon society and the environment. Students are introduced to the concept of designing and will develop problem solving skills through the application of the PRIME design cycle as a means of developing a solution to the given design brief.

Outcomes

- TE4-1DP designs, communicates and evaluates innovative ideas and creative solutions to authentic problems or opportunities
- TE4-2DP plans and manages the production of designed solutions
- TE4-3DP selects and safely applies a broad range of tools, materials and processes in the production of quality projects
- TE4-8EN explains how **force, motion and energy** are used in engineered systems
- TE4-9MA investigates how the characteristics and properties of tools, materials and processes affect their use in designed solutions
- TE4-10TS explains how people in technology related professions contribute to society now and into the future

Assessment Overview (40%)

The nature of Project Based Learning (PBL) demands assessment for, as and of learning to occur throughout the development of a project and design folio. Teachers should conduct Formative Assessment during various stages of the design process and follow continuous reporting guidelines.

Digital Technologies

Students will utilise a range of digital technologies through the application of equipment and software during the design process. A range of tutorials have been developed and chosen to develop basic skills. Students will then apply their learning to the production of a project and design folio. Students learn to use industry-level software packages, such as Solid Edge and Adobe Illustrator. Students learn to open, save and transfer files and develop internet research skills.

Cross-curriculum priorities

- ☒ Aboriginal and Torres Strait Islander histories and cultures
- ☐ Asia and Australia's engagement with Asia
- ☒ Sustainability

General capabilities

- ☒ Critical and creative thinking
- ☐ Ethical understanding
- ☒ ICT capability
- ☐ Intercultural understanding
- ☒ Literacy
- ☒ Numeracy ☒ Personal and social capability

Other learning across the curriculum areas

- ☐ Civics and citizenship
- ☐ Difference and diversity
- ☒ Work and enterprise

Content	Teaching, Learning and Assessment	Resources
<p>Identifying and defining</p> <ul style="list-style-type: none"> investigate products and services for the individual and/or the community, considering ethical and social factors (ACTDEK029) ST investigate a current and innovative product developed by an Aboriginal and/or Torres Strait Islander designer that is influenced by their cultural identity investigate the role of the professional in the related technology, and their impact on the environment and society develop criteria to evaluate design ideas, processes and solutions, the functionality, aesthetics and a range of constraints, e.g. accessibility, cultural, economic, resources, safety, social, sustainability, technical (ACTDEP038, ACTDIP027, ACTDIP031) DT ST <p>Research and planning</p> <ul style="list-style-type: none"> use appropriate project management processes when working both individually and collaboratively to coordinate the production of a designed solution (ACTDEP039) CT ST 	<p>Problem Phase <i>Focus Question: How can new technologies influence the work of engineers?</i></p> <p>Teacher</p> <ul style="list-style-type: none"> Introduces the design situation and leads a discussion about the requirements of the brief. Relates the design situation to the concept of design as a problem-solving exercise. Discuss the worksheet about cultural landscape; Budj Bim and lead a discussion about hydrological patterns and the impact of design on the environment and society. Exhibits a design folio sample and explains the PRIME design process and design folio documentation procedures required. Uses a media type, such as <i>Australia Designs</i> (Channel 10, 2017) or <i>Managing a Design Project</i> (Clickview, 2012) to prompt an analysis of the needs problems and opportunities associated with the Design Brief. Leads a discussion about the possible criteria and testing techniques used to evaluate the success of a product, such as one featured in the previous media example. Discusses the importance of action/time planning and explains the application of the time plan within the design folio document. <p>Students</p> <ul style="list-style-type: none"> Create a design folio document using PowerPoint and complete the Problem stage of the design process. Participate in discussions about the design brief needs, problems and opportunities. Complete the worksheet and participate in discussions about Function and Aesthetics and the impact of engineers Conduct an analysis of the need by developing a range of constraints and questions associated with the design situation. Develop the criteria to evaluate design ideas, processes and solutions. Develop an action/time plan for the completion of their project and evaluate their progress on an ongoing basis. 	<ul style="list-style-type: none"> https://www.google.com/search?client=firefox-b-d&q=auomata+images Folio template and guide (separate PowerPoint document)

Content	Teaching, Learning and Assessment	Resources
Researching and planning <ul style="list-style-type: none"> investigate the characteristics and properties of a range of materials and products (ACTDEK034) select and justify the safe use of tools and equipment used to create a design solution experiment with a range of appropriate techniques to produce a design solution DT 	Research Phase <i>Focus Question: What are the characteristics of a successful Automata?</i> <p>Teacher</p> <ul style="list-style-type: none"> Outlines the Research section of the design folio and requirements for completion, including the provision of scaffolds for each element. Explains safety requirements relating to the workshop and project tools and machinery. Facilitates completion of appropriate 'onguard' safety tests. Demonstrates the safe and appropriate use of tools and machinery in the development of a skills exercise. Depending upon student ability, this may include cutting shapes with the scroll saw, producing a tea pot stand using a cross halving joint or making a dowel plant holder. Models appropriate investigation of materials using the internet so that students may safely and effectively research the characteristics and properties of timber and joining mechanisms as well as engineered sections of timber such as plywood and dowel. <p>Students</p> <ul style="list-style-type: none"> Login and complete allocated 'onguard' safety tests. Develop practical skills and knowledge of tools and materials by completing the allocated skills exercise. Familiarise themselves with the materials used in the Automata project by investigating the characteristics and properties of timber and listing them in the appropriate design folio pages. Reflect upon the range of appropriate tools and techniques to produce their project and justify their selection within the design folio document. 	Onguard safety tests

Content	Teaching, Learning and Assessment	Resources
	<p>Case Study</p> <p>Teacher</p> <ul style="list-style-type: none"> Leads discussion and questions about the use of mechanisms and how they work. Discuss cams and gears and a range of different mechanisms. Introduces and explains the case study on Engineering and types of jobs associated with engineering. Provides direct instruction regarding techniques for effective poster design. <p>Students</p> <ul style="list-style-type: none"> Engage in discussion and questioning regarding engineering. Complete a case study by investigating and assessing the benefits of an engineering degree, <i>outlining their findings in the design of a poster.</i> 	<ul style="list-style-type: none"> https://technologystudent.com/cams/camdex.htm

Content	Teaching, Learning and Assessment	Resources
Researching and planning <ul style="list-style-type: none"> generate and communicate the development of design ideas, plans and processes for various audiences using appropriate technical terms and technologies including graphical representation techniques, for example: (ACTDEP036) CT DT <ul style="list-style-type: none"> sketches, drawings and computer-aided drawings (CAD) patterns models digital presentations 	Ideas Phase <i>Focus Question: How do designers develop creative design ideas?</i> <p>Teacher</p> <ul style="list-style-type: none"> Outlines the Ideas section of the design folio and requirements for completion, including the provision of scaffolds for each element. Demonstrates a range of hand drawing skills which, depending upon student ability, may include pictorial, orthogonal, perspective or rendering exercises. Provides feedback and advice relating to student idea generation. Demonstrates the use of Illustrator CAD Software which, depending upon student ability, may involve developing shapes, creating cutouts, sketching or rendering. <p>Students</p> <ul style="list-style-type: none"> Practice and refine hand drawing skills by completing a range of drawing exercises. Brainstorm, develop and evaluate a range of initial idea sketches for their project. Practice and refine CAD skills by completing a range of video tutorials. Produce a CAD development of their chosen idea and communicate pictorial and orthogonal versions within their design folio document. Within the design folio, evaluate the use of CAD technology for the purpose of communicating their design idea. 	<ul style="list-style-type: none"> Isometric Grid Drawing Exercises Adobe Illustrator

Content	Teaching, Learning and Assessment	Resources
<p>Researching and planning</p> <ul style="list-style-type: none"> select from a range of materials, components, tools, equipment and processes to develop design solutions (ACTDEP035) ST <p>Producing and implementing</p> <ul style="list-style-type: none"> demonstrate safe, independent and collaborative work practices in the production of designed solutions (ACTDEP037) apply appropriate tools, equipment, materials, techniques and processes in the production of a design project, for example: (ACTDEP034) ST <ul style="list-style-type: none"> contemporary, traditional and/or advancing manufacturing techniques surface preparation techniques, finishes, embellishments and/or decorations materials to meet a specific need consider innovative applications of advancing technologies to increase efficiency of time and/or materials in the production of models or products DT 	<p>Manufacturing Phase <i>Focus Question: Why are most products manufactured in industrial settings?</i></p> <p>Teacher</p> <ul style="list-style-type: none"> Assists students in the development of a Manufacturing Plan – including consideration of tools required and safety precautions necessary. Identifies and discusses contemporary and advanced manufacturing techniques that would be used in an industrial or commercial setting. Facilitates a Think – Pair – Share activity to prompt student discussion about advantages and disadvantages of technologically advanced manufacturing techniques. Demonstrates safe use of tools, equipment and processes required to prepare and construct the Automata project. Monitors student progress during practical activities and provides feedback to develop student skills and maintain quality project work. <p>Students</p> <ul style="list-style-type: none"> Analyse and identify their chosen tools, materials and techniques for the development of their project idea through the development of a Manufacturing Plan within the design folio document. Participate within a discussion and Think – Pair – Share activity relating to advantages and disadvantages of advanced manufacturing techniques. Select and use a range of tools, equipment and processes in the development of their design solution. Processes include marking out and preparing timber, using hand tools and basic machinery for cutting, drilling and shaping timber, laser-cutting and engraving of thin plywood, surface preparation. 	

Content	Teaching, Learning and Assessment	Resources
Testing and evaluating <ul style="list-style-type: none"> evaluate the effectiveness and suitability of choices made during the development and production of the solution assess the solution against the predetermined criteria 	Evaluation Phase <i>Focus Question: How do I know whether my solution is effective?</i> Teacher <ul style="list-style-type: none"> Describes the evaluation process – as established in the criteria to evaluate success – used within the design folio document. Facilitates peer evaluation of student design solutions. Provides a scaffold for the development of an effective reflective writing piece. Students <ul style="list-style-type: none"> Undertake an evaluation of their project by completing the evaluation table within the design folio document. Compare their personal evaluation with that provided by their peers and write a reflection piece to suggest improvements to their design or design approach. 	

UNIT EVALUATION

Class	Teacher Code	Start Date	End Date	Were all outcomes, content & skills taught? (if no, please specify)	Evaluation <i>Were any significant changes made to the planned teaching and learning program, such as a change to the scope and sequence or parts of the program not covered?</i>
7TEm, 7TES	JLI	Term 1 Week 1	Term 1 Week 11	Yes	Students completed their project. Most students worked well but some additional support was needed for students. Illustrator online was used again. OneNote was used as a learning support resource for the portfolio. 7TEs was significantly slower than 7TEm and required more time to complete each activity. No major changes were made.
7TEP, 7TEw	JLI, MCA	Term 2 Week 2	Term 2 Week 9		

7TEg	JLI,MCA	Term 3 Week 1	Term 3 Week 10		

Term 2: The assembly of the automata was slightly modified. No significant changes.