JOHN EDMONDSON HIGH SCHOOL

Assessment Notification

Faculty: Industrial Arts Course: Industrial Technology - Engineering Year: 9

Assessment Task: Spaghetti Bridge Design Engineering Report and Practical

Assessment Weighting: 35% Due: Term 2 Week 5 Date: 30/05/2024

Task Type: Hand in Task ☒ In Class Task ☐ Practical Task ☒

Outcomes assessed (NESA)
IND5-4: Selects, justifies and uses a range of relevant and associated materials for specific applications IND5-5: selects, interprets and applies a range of suitable communication techniques in the development, planning, production and presentation of ideas and projects IND5-7: applies and transfers skills, processes and materials to a variety of contexts and projects IND5-8: evaluates products in terms of functional, economic, aesthetic and environmental qualities and quality of construction IND5-1: identifies, assesses, applies and manages the risks and WHS issues associated with the use of a range of tools, equipment, materials, processes and technologies IND5-3: identifies, selects and uses a range of hand and machine tools, equipment and processes to produce quality practical projects IND5-4: selects, justifies and uses a range of relevant and associated materials for specific applications
Task Description/Overview
Spaghetti Bridge Building Engineering Report and Practical Report submitted on CANVAS (by 8.20am)
Detailed Assessment Task Description
See attached pages

Assessment Criteria		
Grade	**Description**	**Mark Range**
Outstanding (O)	The student has an extensive knowledge and understanding of the content and can readily apply this knowledge. In addition, the student has achieved a very high level of competence in the processes and skills and can apply these skills to new situations.	**90-100**
High (H)	The student has a thorough knowledge and understanding of the content and a high level of competence in the processes and skills. In addition, the student is able to apply this knowledge and these skills to most situations.	**80-89**
Sound (S)	The student has a sound knowledge and understanding of the content and has achieved a good level of competence in the processes and skills.	**60-79**
Basic (B)	The student has a basic knowledge and understanding of the content and has achieved a basic level of competence in the processes and skills.	**30-59**
Limited (L)	The student has an elementary knowledge and understanding in a few areas of the content and still required further work to achieve competence in the processes and skills.	**0-29**

Satisfactory completion of courses

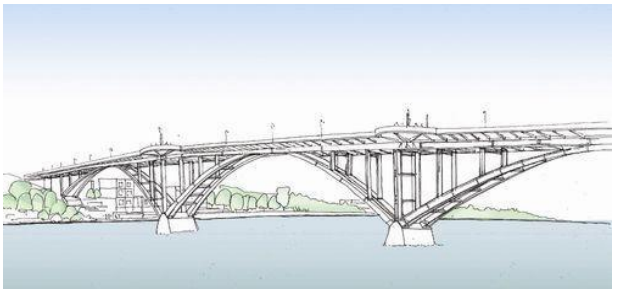
A course has been satisfactorily completed, when the student has:

- Followed the course developed/endorsed by the NSW Educational Standards Authority (NESA)
- Applied himself/herself with diligence and sustained effort to the set tasks and experiences provided in the course.
- Achieved some or all of the course outcomes

Year 9 – Industrial Tech – ENGINEERING

Worth: 35%

[SPAGHETTI BRIDGE CONTEST]



Each group (maximum of 4 members) will have the joy of constructing a bridge that will aim to carry the heaviest load per gram of structure whilst meeting the design specifications. Bridges will be loaded until they fail.

The specifications include:

1. Bridge to be built entirely from spaghetti sticks
2. It must be free standing and span 2 level surfaces which are 400mm apart
3. The ends of the bridge must extend at least 50mm past the span opening
4. Bridge can be constructed using PVA or hot glue. Glue should be used to join the spaghetti only at the joints; it cannot be used to coat strands of spaghetti. Two-pack epoxy glue is not permitted.
5. It must include a decking of spaghetti to provide a suitable road surface at least 50mm wide across the full span of the bridge. In addition, the following conditions must be met:
    a. A block of wood (50mm x 50mm x 100mm long) representing a car must be able to move alongthe length of the decking unobstructed from end to end.
    b. The deck of the bridge must not be more than 50mm above or below the ends of the bridge at any point along its length
6. The maximum vertical depth of the bridge, from the highest point in its structure to the lowest cannot exceed 250mm
7. The total weight of the bridge including spaghetti and glue must not exceed 300g
8. Each bridge will be weighed and inspected prior to and after strength testing (where possible). If the bridge exceeds the weight limit or consists of materials not listed above, it will be disqualified
9. The bridge will be tested for strength by adding weight to a container suspended from the centre (THIS MAY BE ALTERED)

10. The winning bridges will be ranked according to its strength to weight ratio (ie. Amount of load it can hold without breaking divided by its weight before testing). In the event of a tie the lighter bridge will be ranked higher

Engineering Report: An individual Report (not a group report)

You are to write up an Engineering Report on your findings. Each student must write their own report, in their own words, with your own scenario explaining the need, and use the correct engineering terminology. Your sketches of the design must be your own and be scanned and pasted into the document because the report needs to uploaded on CAMNVAS by 8.20am on the due date.

The bridge design and construction is a group effort and results like the weight and destructive testing will be the same as the other members in their group.

To do this report, you should follow the Engineering Design Process (handed out to you earlier in the Term) documented below. You should have a title page, listing your name, your team name, and the other team member's names.

1. **Identify the Need or Problem: (Individual)**
   - Create a scenario in which the construction of a bridge is required.
   - Discuss the effects that the construction of a bridge has on society and the environment.

2. **Research the Need or Problem: (Individual)**
   - Do your research in regards to the particular bridge type you will be constructing. It will be a form of truss bridge and you need to research at least 3.
   - In this research, detail 2 famous bridges (which do have to be restricted to a truss bridge type) including their distance, span, materials used and theimpact this particular bridge has had on society.
   - When detailing the materials that were used to construct that famous bridge, explain why that material was chosen in the construction of the bridge.
   - Include the type of engineers that are involved in bridge construction and what their role is.

3. **Develop Possible Solutions: (Individual)**
   - Provide 2 side-view sketches of your possible design. This must be neatly drawn using pencil.

4. **Select Best Possible Solution: (as a Team)**
   - Draw your final intended design to scale (with dimensions) on A3 or A4 grid paper to make construction easierwhen deciding the lengths of your members (spaghetti sticks).
   - This will be your own dimensioned drawing, but it obviously will the same design for all team members.
   - Your final design should be aesthetically pleasing.

5. **Construct a Prototype: (as a Team)**
   - Explain (document the method and order that your team used) in constructing your bridge
   - Create a computer-generated model if you have prior experience with Onshape or any other modelling software.
   - A photograph of the final model needs to be included in your report.

6. **Test and Evaluate Solution: (as a Team)**
   - Does the solution meet the original design requirements and constraints?
   - What difficulties did you encounter during the engineering process
   - What did you learn from working in a team?

7. **Communicate the solution: (Individual)**
    - Your solution will be communicated via this engineering report. Give credit to your sources and as a minimum this will be the url for the internet source of every picture you found.

8. **Redesign as part of evaluation: (Individual)**
    - How can you improve the design based on the things you learned from testing

MARKING CRITERIA:

Identify Need or Problem	Creatively designs a scenario in which the construction of a bridge is required. Excellent in-depth discussion on the effects of building bridges on society and the environment. **(10 marks)**	Creatively designs a scenario in which the construction of abridge is required. Reasonable discussion on the effects of building bridges on society and the environment. **(8 mks**	Designs a scenario in which the construction of a bridge is required. Brief discussion on the effects ofbuilding bridges on society and the environment. **(6 marks)**	Designs a scenario in which the construction of a bridge is required. Provides only positive or negative effects of building bridges on society and the environment **(4 marks)**	Brief problem statement Brief tion of men positive or negative effects on building bridges on society and environment. **(2 marks)**
Research	An in-depth analysis into 2 famous bridges detailing its distance, span, materials used and why and the impact of the bridge on society. Research on 3 truss bridge designs. Detailed description on the role of various engineering disciplines in bridge construction. **(10 marks)**	A reasonable analysis into 2 famous bridges detailing its distance, span, materials used and why and the impact of the bridge on society. Research on less than 3 truss bridge designs. Detailed description on the role of various engineering disciplines in bridge construction. **(8 marks)**	An in-depth analysis into 1 famous bridge detailing its distance, span, materials used and why and the impact of the bridge on society. Research on less than 3 truss bridge designs. Detailed description on the role of various engineering disciplines in bridge construction. **(6)**	A brief analysis into 1 famous bridge detailing its distance, span, materials used and why and the impact of the bridge on society. Research on less than 3 truss bridge designs. Brief description on the role of various engineering disciplines in bridge construction) **(4 marks)**	A brief response into either 1 famous bridge OR the role of the engineer in bridge construction. **(2 marks)**
Possible Solution		Provides 2 neatly drawn sketches of a possible design **(4 marks)**	Provide 2 rough sketches of a possible design **(3 marks)**	Provide 1 neatly drawn sketch of a design **(2 marks)**	Provides 1 rough sketch of design **(1 mark)**
Best Possible Solution				Provides a well-drawn to scale design on A4 or A3 paper **(3 marks)**	Provides a messy and not to scale design **(1-2 marks)**
Prototype Construction		Well written and step by step method with a picture of final model attached **(4 marks)**	Adequately written and step by step method including a picture of the final model. **(3 marks)**	Brief method with a picture of final model attached **(2 marks)**	No method written and picture of final model attached **(1 mark)**
Test and Evaluate solution		Well written account of the difficulties you encountered.	Brief account of the difficulties you encountered.	States the lessons learnt by working in a team in a	Briefly states the lessons learnt by working in a team

Test and Evaluate solution (cont)		State the lessons you learnt by working in a team **(4 marks)**	State the lessons you learnt by working in a team **(3 marks)**	concise and accurate manner **(2 marks)**	**(1 mark)**
Communicate solution				Presentation follows report guidelines and is well laid out Communication uses diagrams and pictures & is well referenced. **(5 – 10 marks)**	Inaccurate representation of an engineering report with no diagrams and references **(1-4 marks)**
Redesign	Multiple in-depth methods of how the design can be improved after testing **(5 marks)**	Multiple brief methods of how the design can be improved after testing **(4 marks)**	1 In-depth method of how to improve design after testing **(3 marks)**	1 brief method of how to improve design after testing **(2 marks)**	Attempts to give a method of how to improve design after testing **(1 mark)**
Practical construction in small group	Constructed a Bridge to an outstanding level of construction that met all criteria. Bridge held weight, did not have any weak joints that were due to due to poor construction Student worked well in group and contributed equally to construction. **(40-50 marks)**	Constructed a Bridge of a high level of construction thatmet all criteria. Bridge held weight, might have had 1 weak joint due to due to construction errors. Student worked well in group and contributed equally to construction. **(30-39 marks)**	Constructed a Satisfactory Bridge that met most criteria. Bridge held some weight, might have had a few weak joint due to due to construction errors. Student worked satisfactorily in group and contributed equally to construction. **(20-29 marks)**	Constructed a Basic Bridge that met most criteria. Bridge did not hold much weight due to weak joints or poor design or construction. Student contributed to construction. **(10-19 marks)**	Constructed a Bridge of limited success or that did not meet most criteria. Bridge did not hold much weight due to weak joints or poor design or construction. Or: Student contributed less than others to the construction. **(0-9 marks)**
				TOTAL	**/100**