**Year 10**

Cambridge National Level 2 in Engineering Design

**Unit R106- Product Analysis**

**Review**

To be completed before 7th September

R106 must be finished, by this date, to allow sufficient time to complete R107, R108 and to prepare for the exam R105

**Please make sure you have completed the following before September 7th:**

To help you, at the end of the R106 booklet there is a summary of advice, guidance and questions, which you can also find in Class Charts

**Cambridge NATIONALS LEVEL 1/2**

**ENGINEERING DESIGN**

**Unit R106- Product Analysis and Research**

**Product Analysis: Retractable Tape Measure**

**Scenario for the Assignment:**

Write a short introduction (one paragraph), to the assignment, about retractable tape measures. Consider: what tape measures are, why we use them, types of tape measures, history of measuring, product convenience, general features, types of system (metric/imperial) etc.

LO3: Be able to analyse an existing product through disassembly

* Works **independently** and competently to follow manufacturer’s instructions/manual /disassembly procedure, adhering to special instructions.
* Uses tools and equipment **effectively** and shows a **well-developed** understanding of potential hazards and safety considerations.
* **Clearly** draws upon **relevant** skills/knowledge/ understanding from other units in the specification **(Unit R105/ R107/R108).**
* Carries out a **comprehensive** analysis of an existing product showing a well-developed understanding of components, assembly methods, materials, production methods and maintenance.
1. LO3: Design Briefs, design specifications and user requirements for a retractable tape measure
* **Write a paragraph or create a table using the following headings:**
1. Purpose/function of the product
2. How it works
3. How well it meets the need of the User
4. Aesthetic aspects (how attractive is the product)
5. Anthropometric aspects
6. How ergonomically friendly is the product?
7. Product features
8. Product limitations
9. Durability and reliability
10. New technology
11. LO3: Analysis of an existing product through Disassembly
* **Methodically disassemble the tape measure provided**
1. **You must wear safety glasses/gloves during disassembly.**

**(Make reference to the glasses/gloves in your photos/annotation)**

1. **Take photos of you wearing the glasses/gloves**
2. Take photos at each stage
3. Start with a photo of the complete product
4. Get someone to photograph you with the tool you are using to take apart the tape
5. Write down each step of disassembly, that is, what you did
6. Lay each part out on an A3 page
7. Photograph the disassemble components
8. Download your images onto a computer
9. On computer, set out the photos on an A3 page and describe what you did and label each component
10. State what each component is, what it does (how it works) what it is made from and which manufacturing process was used.

Where applicable, write a detailed report on each component. This could be laid out as a set of paragraphs including photos/images/drawing etc covering each component.

State the component, the material(s) used, purpose of the component, manufacturing process(es), production method(s), maintenance, assembly method etc.

Complete part 2 (LO3) for 3 to 4 other types of tape measure provided.

You do not need to disassemble the other tape measures

LO1: Know how commercial production methods, quality and legislation impact on the design of products and components

* Demonstrates **detailed** knowledge of how commercial production methods and manufacturing processes impact on product/component design.
* **Comprehensively** describes how product end of life considerations can influence product/component design.
* Demonstrates **detailed** knowledge of the importance of conformity legislation and standards
1. LOI: Types of Commercial Production methods (Scales of Production):
2. Import the table you have already done on ‘scales of production’.
3. Add images to help explain/ enhance your work
4. Add a column and describe which method is suitable or not suitable for manufacturing retractable tape measure components.
5. Describe how the production method has effected the design of the tape measure. (Add a column for this information)
6. LO1: Types of manufacturing processes
7. Import the table you have already done on ‘manufacturing processes’.
8. Add images/diagrams to help explain/ enhance your work
9. Add a column and describe which method is suitable or not suitable for manufacturing components of the retractable tape measure.
10. Describe how the manufacturing process has effected the design of the tape measure component. (Add a column for this information)

1. LO1: Product ‘End of Life’ Considerations

Create your own version of this table or present the information a different way.

|  |
| --- |
| Retractable tape measure components ‘End of Life’ Considerations |
|  | **Options for EoL products** |
|  | **Repair** | **Reuse** | **Recycle** | **Landfill** | **Sustainability** |
| Definition |  |  |  |  |  |
| Advantages |  |  |  |  |  |
| Disadvantages |  |  |  |  |  |
| Product/material suitability: Tape measure, Polymer components  |  |  |  |  | Possible alternative Materials: |
| Advantages |  |  |  |  |  |
| Disadvantages |  |  |  |  |  |
| Product/material suitability: Tape measure, Metal components |  |  |  |  | Possible alternative Materials: |
| Advantages |  |  |  |  |  |
| Disadvantages |  |  |  |  |  |

1. LO1: Legislation, quality and safety standards
2. With reference to the following, find out and write down what legislation is applicable to retractable tape measures. Consider:
* tape measure standards such as accuracy etc
* materials used standards, such as strength/durability, safety etc

i) British standards

ii) European standards

 iii) Patents

LO2: Be able to research existing products

* Provides a **comprehensive** description of strengths and weaknesses of existing products.
* Uses **appropriate** methods to provide a **comprehensive** and **detailed** summary of research of existing products.

1. LO2: Strengths and weaknesses of existing products
2. With regard to the tape measure you dismantled and the other tape measures you analysed, create a table with the headings **strengths**, **weaknesses** and **comparison of types of tape measure** in accordance with the following:
* Finish
* Aesthetics
* Suitability to meet user needs
* Materials used
* Durability
* Life cycle
1. LO2: Detailed summary of research of existing products
2. Write a detailed summary of your conclusions about existing products
3. Discuss what you have written in part 7 regarding product suitability, durability etc.
4. R106- Product Analysis & Research (set 24/03/20)

For those of you who did not collect your folders, attached is the guide for helping you complete the coursework. You should have all completed part 2 (LO3-analysis of an existing product through disassembly) by now, (except for LO1: Know how commercial production methods, quality and legislation impact on the design of products and components). What I would like you to do is complete part 3- LO1:Types of commercial production methods (Scales of Production) and part 4 LO1: Types of manufacturing processes by Friday. We have already covered methods and processes prior to commencing R106. Remember all production methods are Batch except for the screws which are continuous flow/mass produced. Only refer to the processes relevant to the retractable tape measure, namely injection moulding, insert moulding-*casing etc*, hardening and tempering- *blade and constant-force spring*, stamping/pressing/punching *belt clip, hook.*

**After Easter, I will provide you with advice on parts 5, 6, 7 and how to complete the end of part 2 LO1(other types of tape measures).**

1. Additional Guidance for Completing Part 3 LO1: Commercial Production Methods and Part 4 LO1 Manufacturing Processes (set 27/03/20)

LO1: Types of Manufacturing Methods

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Production Method** | **Definition of production method** | **Description of production method** | **Advantages****Good points** | **Disadvantages****Bad points** | **Tape Measure components manufactured using this method**  |
| One-Off |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* Please create your own version of this table
* You don’t have to do it as a table
* For the last column state **WHY** the method you have chosen is appropriate for that particular component

LO1: Types of Manufacturing Processes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Manufacturing Process** | **Definition of process** | **Description of process** | **Advantages****Good points** | **Disadvantages****Bad points** | **Tape Measure components manufactured using this process** |
| Injection Moulding |  |  |  |  |  |
| Insert (injection) moulding |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* Please create your own version of this table
* You don’t have to do it as a table
* For the last column state **WHY** the process you have chosen is appropriate for that particular component
1. Completion of the end of part 2 LO3 -Other types of Tape Measures. (set 14/04/20)

To complete part 2 you need to analyse 4 other types of tape measure. **Remember you do NOT need to disassemble them.** If you have **different** tape measures at home, use those. Write about each tape measure in the same style that you did for the tape measure you disassembled in class. Where possible, state what materials you think it is made from, production processes, maintenance, etc. Include what you think are the **advantages and disadvantages** of each tape measure. It is unlikely you will have 4 different types of tape measure. You will therefore have to analyse different tape measures on the internet. For example you could analyse:

1) an inexpensive retractable tape measure (should have minimal features-no thumb lock, no wrist strap, narrow blade etc),

2) 20m or 50m surveyors (fibreglass blade) tape measures (think about how long it would take to wind in 50m of tape, fibreglass tape not likely to rust, stretches over time)

3) Vice-versa tape measures, (advantages?)

4) Laser tape measure, (consider cost, need batteries, reliability, accuracy, durability)

5) Other types of tape measure: magnetic, rust-resistant, keyring

Remember, please try to keep to the deadlines.

1. Further info on analysing different types of tape measures (set 04/05/20)

This maybe useful if any of you are struggling analysing different tapes:
1. Make sure you read my instructions carefully. There are suggestions about what to write about.. 2. Type in the sort of tape measure you are interested in. If you are struggling, leave the first one (inexpensive retractable tape measures) for now. 3. Type in the sort of tape measure and then be more specific eg. '*vice versa tape measure advantages'*. 4. You will have to try different sites. Sometimes there are 'youtube' clips. 5. If you have any tape measures in the house, they would be suitable for analysis, unless it is exactly the same as the one you disassembled in class. If needed, please email me for advice on any aspect of this assignment:

1. 5. LO1: Product 'End of Life' Considerations (set 28/04/20)

*If you have not completed sections 1 to 4 please do so ASAP and to the best of your ability. We do not know how long this will go on for and there are 2 more pieces of coursework and an exam to prepare for in Year 11. If you are struggling/don't understand something, please email me @*

5. LO1: Product 'End of Life' Considerations

In the guide sheet provided you will see section 5 is concerned with what happens after the user has finished with a product (in this case the retractable tape measure). All manufacturers must take EoL (End of Life) of a product into consideration when designing and making.

To complete the table:

1. Define the 5 EoL options (Repair, Reuse etc.) Make sure you reference sources you use from the internet (Wikipedia and Webster's Dictionary should provide you with what you need).

2. Write down the advantages and disadvantages of each option ( Amongst others, CRR- Centre for Remanufacturing and Reuse should provide you with some guidance...remember reference your sources)

3. Write about/discuss the tape measure and the tape measure components regarding their suitability for repair, reuse etc. Consider the ABS components-casing, spring housing, thumb lock (search 'ABS repair/reuse' etc), the blade, constant force spring, belt clip, screws and wrist strap. Again, type in the option and the material to help you get information.

*Generally speaking, retractable tape measures are not worth repairing because the cost of the repair will be more than the value of the product. They also tend not to be reused as they have no particular reusable purpose, other than as a tape measure. However, the tape components can be recycled, should not go to landfill and are not sustainable because of what they are made from (oil-based plastic and steel). Are there  more sustainable materials available? If so, why is it not used? Discuss*

1. 6. LO1: Legislation, quality and safety standards (set 12/05/20)

 *If you have not completed sections 1 to 5 please do so ASAP and to the best of your ability. We do not know how long this will go on for and there are 2 more pieces of coursework and an exam to prepare for in Year 11. If you are struggling/don't understand something, please email me @*

1. 6. LO1: Legislation, quality and safety standards

In the guide sheet provided you will see section 6 is concerned with the legal aspects, quality and safety standards regarding retractable tape measures.  All manufacturers must abide with the laws and relevant standards applicable to their product.

To complete this section:

1) Read Section 6 carefully

2) Define who the British Standard Institute are and what they do.

\*What British standards are there with regard to retractable tape measures?

\*Why do products need to comply with legislation/standards/regulations etc?

3) What are European standards?

\*What is the ESO?

\*What is the 'CE Mark', why is it importance?

\*What is the Mobius symbol and its meaning?

\*What is the Resin Identification Code and its relevance to EoL of a product? *(You might want to add this to Section 5 as well)*

4) What are patents and copyright?

5) What accuracy standards/classes apply to tape measure blades?

\*Where does the accuracy class and other information appear on tape measures?

6) What is the National Measurement and Regulation Office?

\*What information/responsibility do they have regarding tape measures

\* What are the measuring instruments (material measures of length) regulations? (S.I. 2006 No. 1267)

***Type in keywords/questions to help you find the information you are after***

*Wikipedia etc will help you*

***Don't forget to include references in your work***

1. 7. LO2: Strengths and weaknesses of existing products (set 02/06/20)

 *If* *you have not completed sections 1 to 5 and 6 (Legislation, quality and safety standards), please do so ASAP and to the best of your ability. We do not know how long this will go on for and there are 2 more pieces of coursework and an exam to prepare for in Year 11. If you are struggling/don't understand something, please email me @*

 7. LO2: Strengths and weaknesses of existing products

In the guide sheet provided you will see LO2: Strengths and weaknesses of existing products is about comparing the different types of tape measures you have looked at, including the one you have dismantled.

To complete this section:

1. As instructed on the guide sheet:

*With regard to the tape measure you dismantled and the other tape measures you analysed, create a table with the headings* ***strengths****,* ***weaknesses*** *and* ***comparison of types of tape measure,*** *in accordance with the following:  Finish, Aesthetics, Suitability to meet user needs, Materials used, Durability, Life cycle.*

2.Or,as you have done before, you could have a heading for each paragraph eg. **Finish. But write about the advantages, disadvantages and compare the types of tape measure in each paragraph.**

**You do not need to write about the internal components (the components you can't see). Therefore, you only need to write about the casing, tape blade, thumb locks etc.**

For the finish, what have the manufacturers used for the tape blade? Injection moulded products require little or no finishing. They are self-finishing. What is self finishing? advantages? What are the advantages/disadvantages of applying paint to the tape blade? Have all the tapes you looked at used the same method?

1. FINISH: 3. LO1 section d. AND 4. LO1 section d. (set 06/07/20)

*I do not believe we covered 3. LO1section d. and 4. LO1section d. sufficiently well enough, (prior to Lockdown).*

**To finish these sections you need to go back and add/redo the following:**

3. LO1: Types of Commercial Production methods (Scales of Production eg. Mass/Continuous, Batch etc)

**Define DfMA (Design for Manufacture and Assembly**

d. Describe how the production method has affected the design of the tape measure components -consider in terms of ease of fabrication/assembly, speed of assembly, cost saving (labour, materials etc), minimal number of components, modular design, standardised parts, assembly with minimal/without using screws/bolts/glue etc, minimise handling during manufacture, maximise part compliance-that is, parts have tabs/tapers etc to line up parts/aid assembly

4. LO1: Types of Manufacturing Processes (Injection Moulding etc)

d. Describe how the Manufacturing Process has affected the design of the tape measure components (consider in terms of plastic components: Wall thickness, Draft angles, Corner radii/fillets, Ribs, Bosses, Holes, strengthening gussets

**Use the internet to find out more about** **DfMA**

**(Design for Manufacture and Assembly** and **Plastic Component Design).**

**This site will also provide you with information about DfMA:**

<http://news.ewmfg.com/blog/manufacturing/dfm-design-for-manufacturing>

**LOOK AT OTHER SITES AS WELL- TYPE IN DfMA**

1. Completion of R106 06/07/20

*It was good to see some of you on Thursday 2nd July. Below is the information you need to complete R106. Please have it finished and printed off by the time we return in September, because there will not be lesson time to finish R106 as we will need to get on with R107. The next homework will be a bit about starting R107, which will help you and save time in September. Please try and complete it as well.*

***In case you have lost it, please find attached the guide sheet for R106.***

**8. LO2: Detailed Summary of Research of Existing Products**

a. Write a detailed summary of your conclusions about existing products

b. Discuss what you have written in section 7 regarding product suitability, durability etc.

**For this section you need to:**

Summarise which aspects, of each tape measure you have analysed, are:

You could score **(Finish, Aesthetics etc) out of 10**. The highest overall score, therefore, is the best tape and the lowest score the worst.

1. The **best** features (compared to the other tape measures)

2. The **poorest** features (compared to the other tape measures)

3. Remember to justify your comments (state why you think that feature is the best/ poorest compared to the other tapes).

4. Based on your Research Summary, suggest/ present your Research Summary as a table in which you score each specification a which tape measure, overall, you feel would be the best and why.

**For example:**

|  |
| --- |
| Summary of Analysis of Researched Retractable Tape Measures |
| Specification Point: | Tape Measure 1 | Tape Measure 2 | Tape Measure 3 | Tape Measure 4 |
| Finish | 8/10 |   |   |   |
| Aesthetics etc | 6/10 |   |   |   |
| Total |   |   |   |   |

|  |
| --- |
| **Summary of Positive and Negative Aspects of Researched Retractable Tape Measures** |
|  |  |  |  |  |
|  | Tape Measure 1 | Tape Measure 2 | Tape Measure 3 | Tape Measure 4 |
| Best Features | 1.2. |  |  |  |
| Poorest Features | 1.2. |  |  |  |

**Overall, Tape…. is the worst because it…**

**Overall, Tape…. is the best/meets the specification the best/scores the highest etc**

*Remember, if you wish to contact me, my email address is:*