

**EM110 DIPLOMA OF MECHANICAL ENGINEERING  
FACULTY OF MECHANICAL ENGINEERING  
UiTM CAWANGAN JOHOR, PASIR GUDANG CAMPUS**

**MEC332  
MECHANICAL ENGINEERING DESIGN**

**PROJECT:  
SEMI-AUTOMATED HACKSAW MACHINE**

**SUPERVISOR'S NAME:  
NORHISYAM JENAL**

**LECTURER'S NAME:  
MOHD NOOR HALMY AB LATIF**

**GROUP:  
J4EM1105B**

| NO. | NAME                                  | STUDENT ID |
|-----|---------------------------------------|------------|
| 1   | Muhammad Fadhli Bin Mohd Fuad         | 2018672416 |
| 2   | Abdul Halief Ziqri Bin Abdul Aziz     | 2018201442 |
| 3   | Khairunnizam Bin Zulkarnain           | 2018284448 |
| 4   | Muhammad Kassim Abdul Rasid Bin Sarti | 2019195679 |

## LIST OF CONTENT

|   |    |
|---|----|
| CHAPTER 1: INTRODUCTION .....                             | 5  |
| 1.0 RESEARCH BACKGROUND.....                              | 5  |
| 1.1 PROBLEM STATEMENT .....                               | 6  |
| 1.2 OBJECTIVES .....                                      | 7  |
| 1.3 SIGNIFICANCE OF THE PROJECT .....                     | 7  |
| 1.4 PROJECT MANAGEMENT (GANTT CHART) .....                | 9  |
| CHAPTER 2: DESIGN PROBLEM DEFINITION .....                | 10 |
| 2.0 MARKET ANALYSIS .....                                 | 10 |
| 2.1.1 Targeted market and estimation of market size ..... | 10 |
| 2.1.2 Customer needs and identification .....             | 15 |
| 2.2 COMPETITIVE BENCHMARKING PRODUCT.....                 | 15 |
| 2.3 FINAL PRODUCT DESIGN SPECIFICATIONS .....             | 18 |
| CHAPTER 3: CONCEPT GENERATION AND SELECTION.....          | 21 |
| 3.1 FEASIBLE CONCEPT .....                                | 21 |
| 3.1.1 Function Physical Decomposition .....               | 22 |
| 3.2 MORPHOLOGICAL ANALYSIS .....                          | 23 |
| 3.2.1 Concept 1 .....                                     | 23 |
| 3.2.2 Concept 2 .....                                     | 25 |
| 3.2.3 Concept 3 .....                                     | 27 |
| 3.2.4 Concept 4 .....                                     | 29 |
| 3.2.5 Concept 5 .....                                     | 31 |
| 3.3 SELECTION OF FINAL CONCEPT .....                      | 33 |
| 3.4 PUGH CHART ANALYSIS .....                             | 34 |
| 3.5 CONCLUSION.....                                       | 35 |
| CHAPTER 4: EMBODIMENT DESIGN.....                         | 37 |

|  |    |
|--|----|
| 4.1 PRODUCT ARCHITECTURE.....                        | 38 |
| 4.1.1 Schematic Diagram .....                        | 39 |
| 4.1.2 Element Cluster of the Schematic Diagram ..... | 40 |
| 4.1.3 Rough Geometric Layout.....                    | 41 |
| 4.2 CONFIGURATION DESIGN .....                       | 42 |
| 4.2.1 List of Parts .....                            | 42 |
| 4.2.2 Details Standard Part Select.....              | 43 |
| 4.3 PARAMETRIC DESIGN FOR CUSTOM PARTS .....         | 46 |
| 4.3.1 View of Prototype .....                        | 47 |
| CHAPTER 5: DETAILS DESIGN .....                      | 49 |
| 5.1 ENGINEERING DRAWING .....                        | 49 |
| 5.1.1 Details Drawings of Manufactured Parts .....   | 49 |
| 5.1.2 Assembly Drawing.....                          | 79 |
| 5.1.3 Exploded Drawing .....                         | 79 |
| 5.1.4 Bill of Material.....                          | 80 |
| 5.2 COST EVALUATION .....                            | 81 |
| 5.2.1 Break Even Analysis .....                      | 81 |
| CHAPTER 6: DESIGN ANALYSIS .....                     | 84 |
| 6.1 THEORETICAL CALCULATION AND SIMULATION .....     | 84 |
| 6.2 RESULT AND DISCUSSIONS .....                     | 87 |
| CHAPTER 7: CONCLUSION AND RECOMMENDATION .....       | 88 |
| 7.1 CONCLUSIONS ON DESIGNED PROJECT .....            | 88 |
| 7.2 FUTURE WORKS.....                                | 89 |
| REFERENCES.....                                      | 90 |
| APPENDICES.....                                      | 91 |

## **ACKNOWLEDGEMENT**

First and foremost, we would like to extend our greatest gratitude to Allah S.W.T for giving us the opportunity to complete this group assignment together successfully.

We are also like to express our deep and sincere gratitude to our supervisor, Sir Norhisyam Bin Jenal for providing invaluable guidance throughout this assignment. His dynamism, vision, sincerity and motivation have deeply inspired us. He has taught us the methodology to carry out the assignment and to present the final year project as clearly as possible. It was a great privilege and honour to study under his guidance. We would also like to thank him for the friendship and empathy.

Next, we would also like to thank our lecturer, Sir Noor Halmy Bin Ab Latif and group members for being cooperative and making sure this project is to be done on time. This project would not be a success if it was not for their hard work and dedication.

Lastly, we would also like to thank our beloved family members for helping us mentally and physically. They made our jobs at ease by providing us with necessary help and comfortable place so that our assignment is done perfectly.

## 7.1 CONCLUSIONS ON DESIGNED PROJECT

It can be concluded that low-cost semi-automatic hacksaw is possible to be built with relatively better in efficiency and performance than the current technologies which costly for some people. In this report, the chosen motor connected to the sprocket plays an important role here because the cutting movement of the semi-automatic hacksaw helps to cut the workpieces. The hacksaw blade is the main part of all components because without this part, the workpiece cannot be cut. The hacksaw blade also needs to be sharp and made of low-carbon steel which mostly used in every hacksaw. The advantage of using the semi-automatic hacksaw here already being stated that it helps in saving life with a lot of safety and protection factors installed inside the hacksaw. The price is surprisingly lower than other automated hacksaw which can target those people who love to bring their children to expose them with this kind of work and wants to have cheaper yet efficient hacksaw.

This semi-automatic hacksaw also can best describe as suitable for any ages starting from 12 to the old people because the height and the degree in handling the handle can be adjusted well enough. It also helps people in practising while doing work because it requires expertise and experience to use more advanced hacksaw. The faster the cutting motion of the hacksaw, the harder the hacksaw to be handled. The height of the table is high enough to avoid toddlers to reach the hacksaw while providing the suitable height for children to use it. Meaning that, with the functions specified applies into the semi-automatic hacksaw, the safety of children playing around the hacksaw can be improved as the height of the table protects them from reaching into the blade cutter.

Other than that, this semi-automatic hacksaw has a slider attached to the hacksaw blade which guides the hacksaw blade along its way. This process will improve the movement of the hacksaw during cutting process while avoiding the hacksaw to go sideways. The slider is made of material that withstand extreme activities and make the life span of the slider longer. Therefore, it is a very good product to sell in the market because it targets those who want a long-life product with a cheaper price.