PROTOTYPE DESIGN COLLECTION

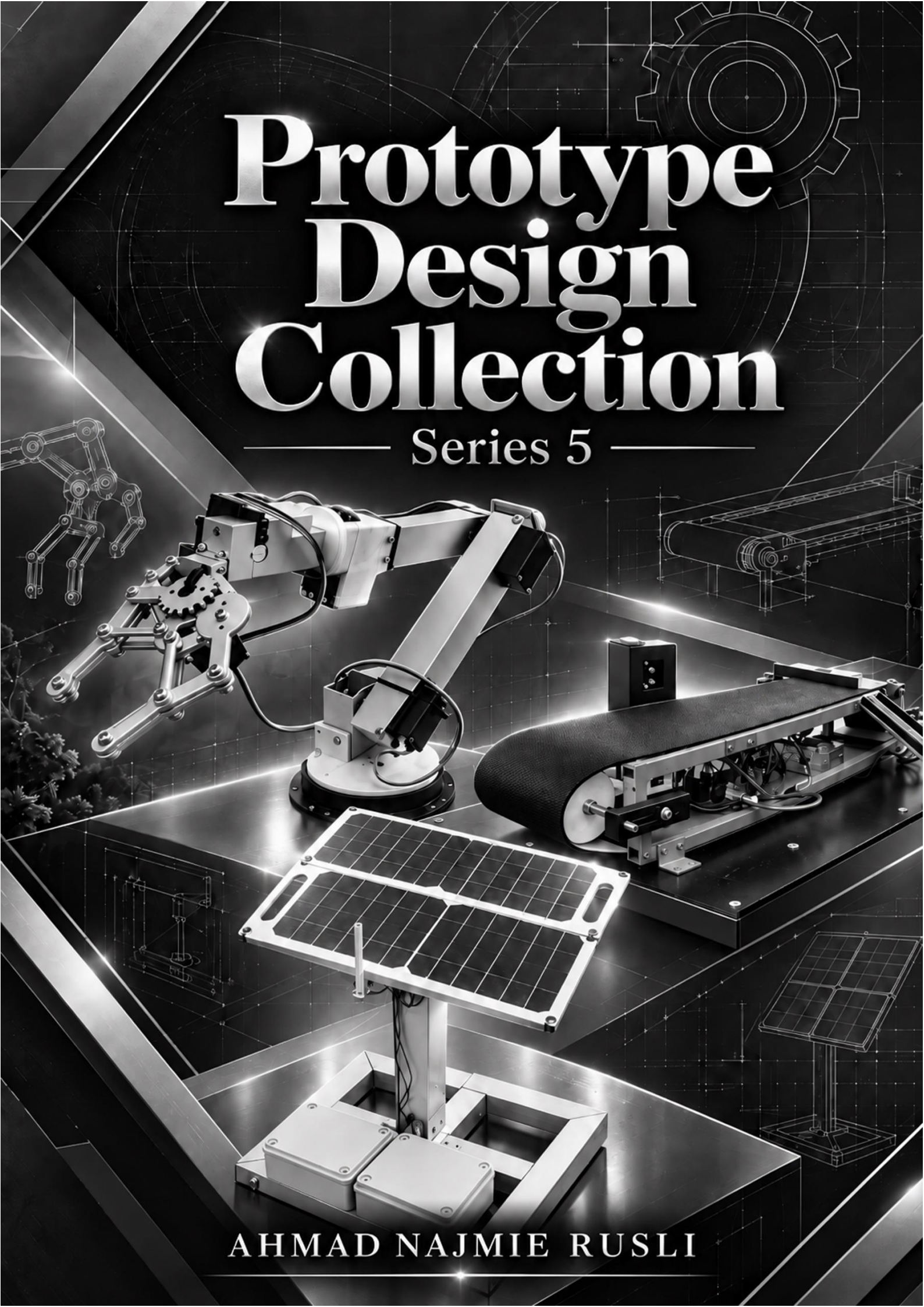
SERIES 5



UNIVERSITI TEKNOLOGI MARA JOHOR BRANCH

Prototype Design Collection

Series 5



AHMAD NAJMIE RUSLI

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Foreword

The *Prototype Design Collection Series 5 (PDC Series 5)* is a digital publication developed to serve as a valuable reference and learning resource for mechanical engineering students. This collection showcases a diverse range of innovative design projects that demonstrate the practical application of engineering knowledge, creativity and technical skills in prototype development.

Each project featured in this collection undergoes several stages of systematic design analysis and evaluation prior to prototype fabrication. The projects are presented with design parameters, recommended materials and detailed prototype dimensions. These elements provide readers with a clearer understanding of the design process, from conceptual development to the preparation of functional prototypes.

It is hoped that this publication will inspire and encourage students to explore new ideas, enhance their creativity and strengthen their technical competencies in engineering design. Ultimately, this collection aims to foster a culture of innovation and continuous learning, empowering future engineers and designers to transform creative concepts into meaningful and practical engineering solutions.

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CHAPTER 1

Automatic Blinds Project

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PROJECT DESCRIPTION

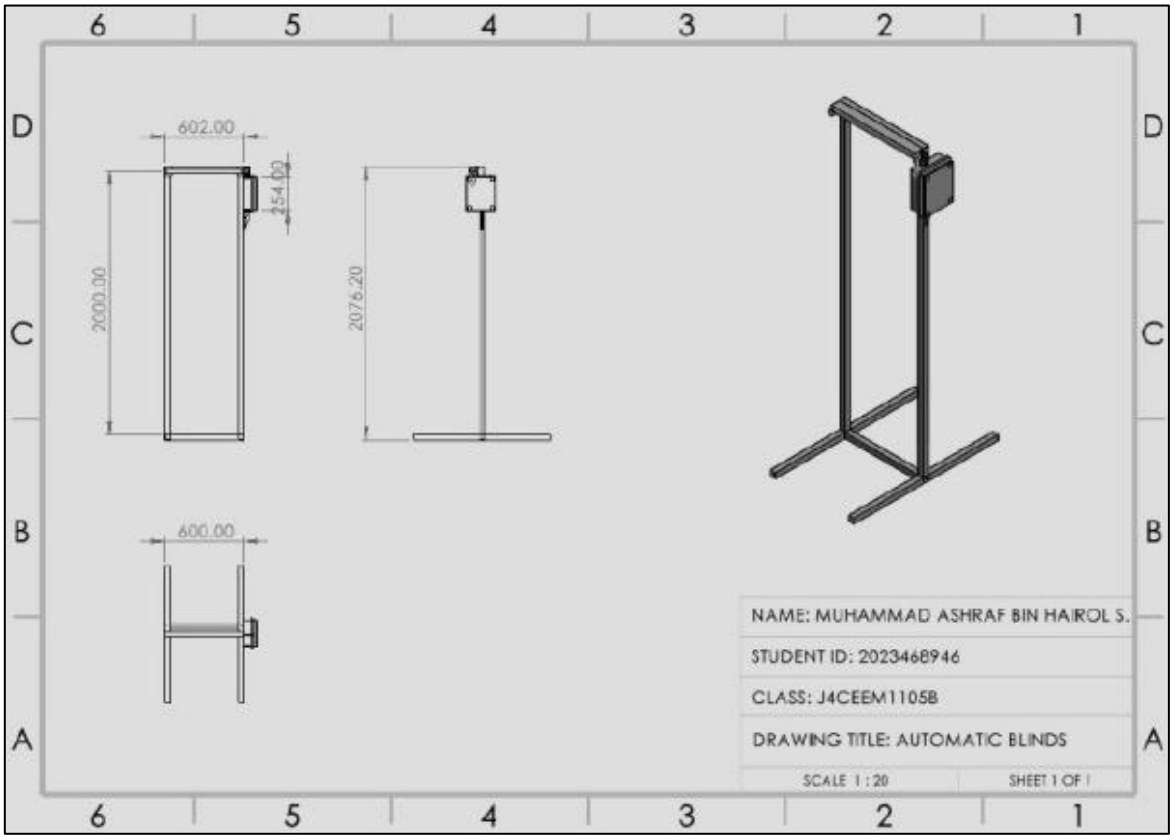
Blinds are a type of window covering made up of horizontal or vertical slats (usually plastic, wood, or metal) that can be tilted, raised, or lowered to control how much sunlight enters a room. Unlike curtains, blinds offer precise control over light, heat, and privacy. In today's modern lifestyle, manual blinds can be such a hassle to adjust throughout your daily basis, especially when you are too busy or forgotten about it. It can cause glare, heat buildup, and unnecessary energy usage overtime. This project objective is to solve that problem with a fully automated blind mechanism that adjusts in real time based on sunlight intensity, ensuring optimal indoor lighting all day long. The mechanism of this project focuses on two main components which are circuit & control system design, and mechanical construction. Nonetheless, this project is inspired by the concept of pulleys and rotational motion. With this instructed project, individuals or office workers would have no problem handling their work comfortably in their offices and let the blinds sooth the environment by itself with ease.

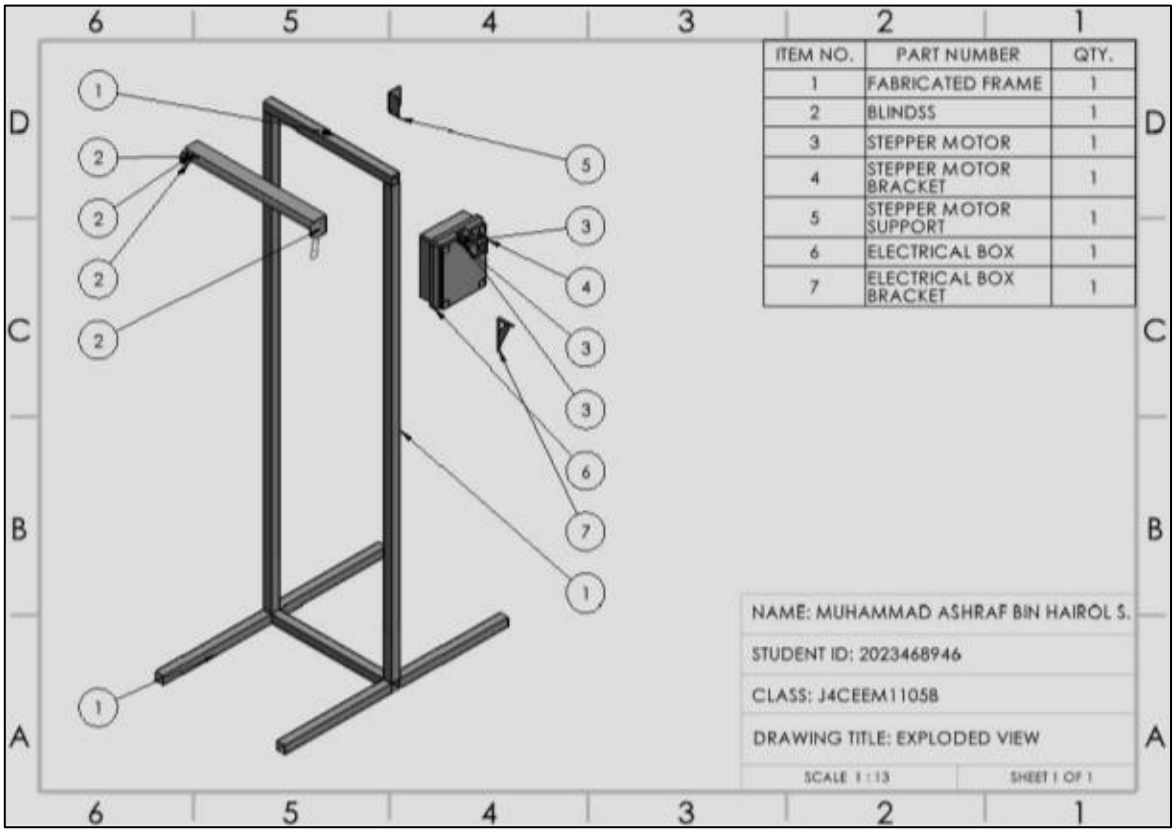
Keywords: *Automatic blinds, Ambient temperature*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 2

Design and Fabrication of Tapping Machine

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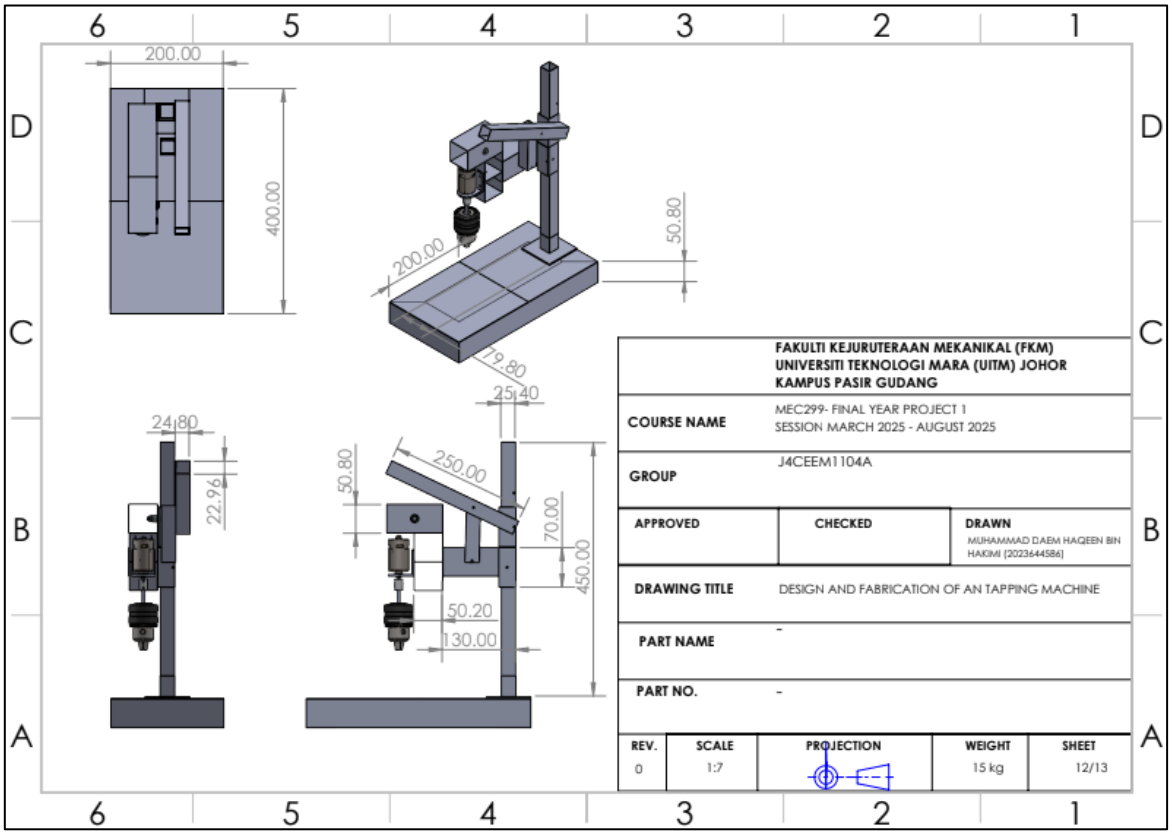
To meet the demands for precision and consistency in manufacturing, this project focuses on the design and fabrication of a motorized tapping machine for internal threading operations. Manual tapping is often time-consuming and prone to human error; therefore, this project proposes a mechanical system integrated with an electrical drive to simplify the threading task. The machine features a motor-driven tapping mechanism mounted on a stable frame with adjustable components to accommodate various workpiece sizes. The design prioritizes a compact, cost-effective footprint suitable for small-to-medium-scale industrial applications, incorporating user-friendly controls for basic operation. By utilizing a motorized unit, the system is engineered to provide a more stable and powerful threading method compared to hand-tapping. While the scope of this project is limited to the physical construction and assembly of the prototype, the finalized machine serves as a practical mechanical foundation for machining workshops. This project demonstrates the integration of hardware components to reduce worker fatigue and provides a viable blueprint for improving manufacturing output through specialized fabrication.

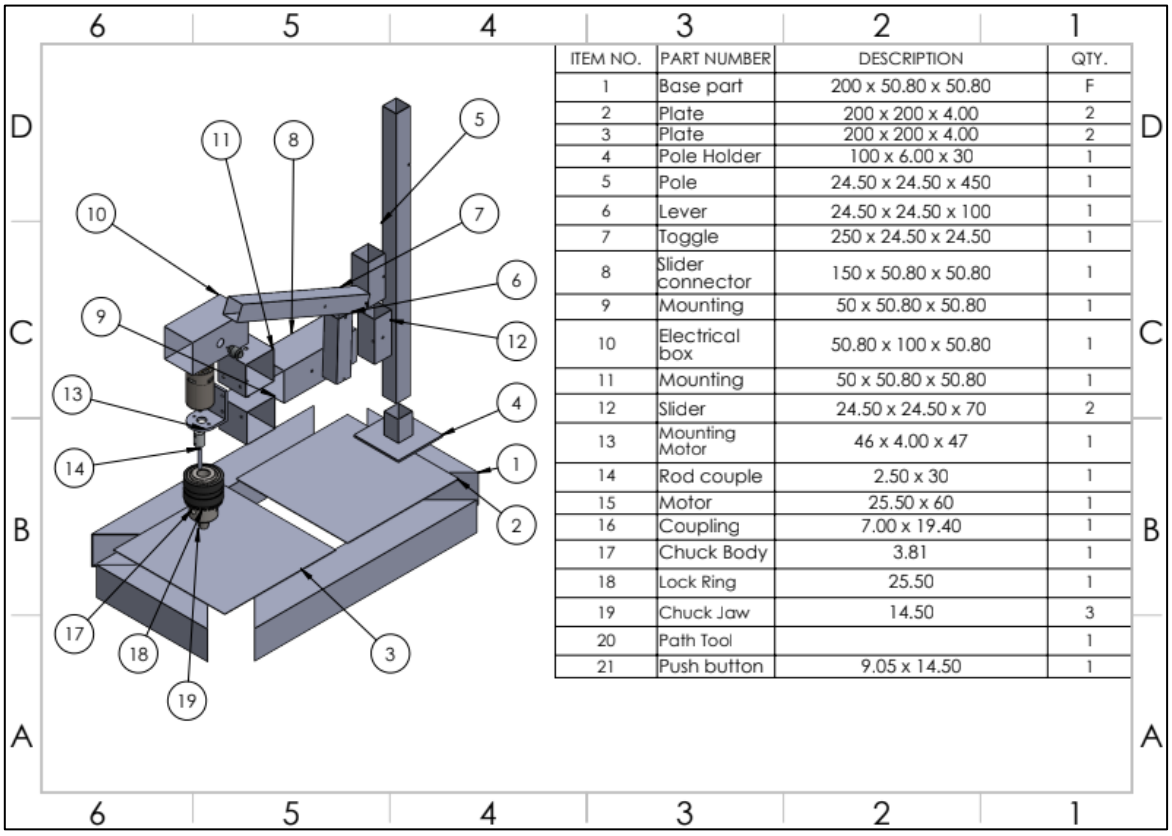
Keywords: *Mechanical fabrication, Motorized tapping*

PROTOTYPE



DESIGN PARAMETER





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Base part	200 x 50.80 x 50.80	F
2	Plate	200 x 200 x 4.00	2
3	Plate	200 x 200 x 4.00	2
4	Pole Holder	100 x 6.00 x 30	1
5	Pole	24.50 x 24.50 x 450	1
6	Lever	24.50 x 24.50 x 100	1
7	Toggle	250 x 24.50 x 24.50	1
8	Slider connector	150 x 50.80 x 50.80	1
9	Mounting	50 x 50.80 x 50.80	1
10	Electrical box	50.80 x 100 x 50.80	1
11	Mounting	50 x 50.80 x 50.80	1
12	Slider	24.50 x 24.50 x 70	2
13	Mounting Motor	46 x 4.00 x 47	1
14	Rod couple	2.50 x 30	1
15	Motor	25.50 x 60	1
16	Coupling	7.00 x 19.40	1
17	Chuck Body	3.81	1
18	Lock Ring	25.50	1
19	Chuck Jaw	14.50	3
20	Path Tool		1
21	Push button	9.05 x 14.50	1

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CHAPTER 3

Design and Fabrication of a Drying Clothing Rack for Home Use

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**Corresponding author (e-mail): miqdadkos@uitm.edu.my*

PROJECT DESCRIPTION

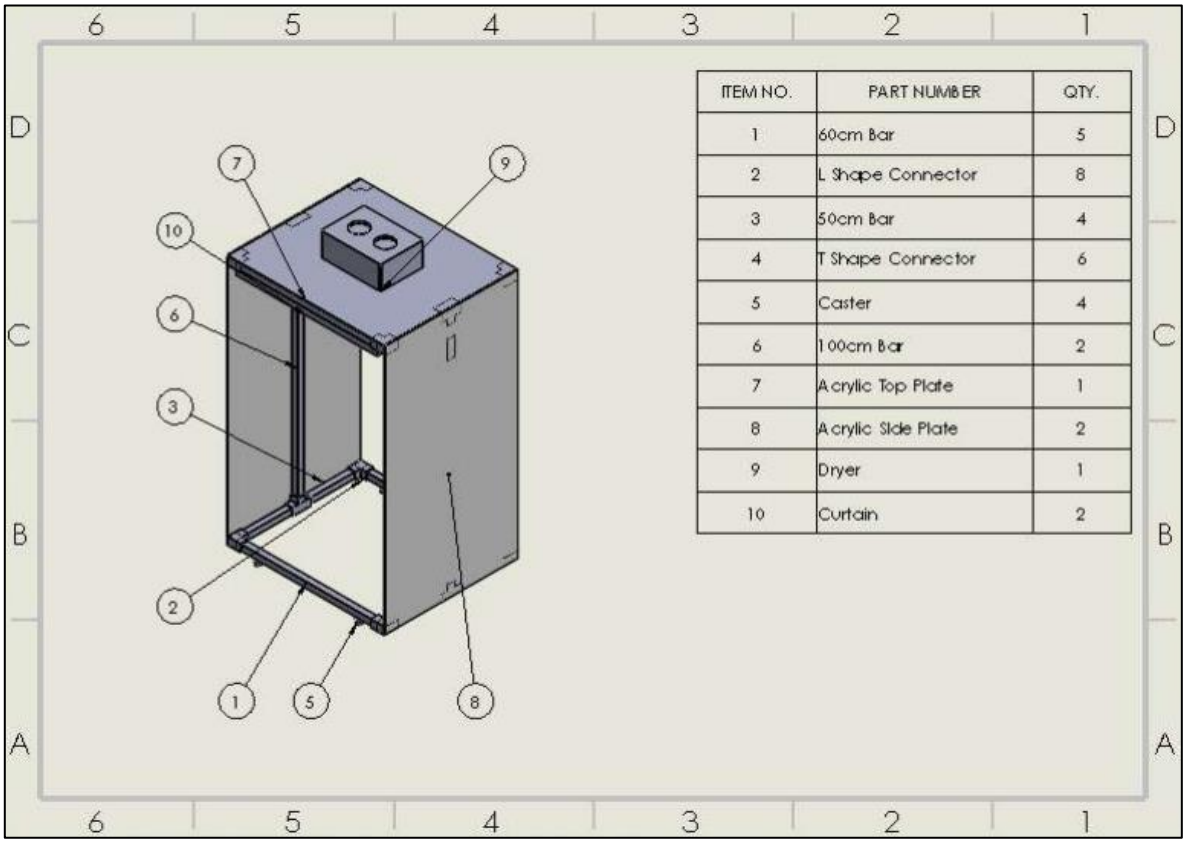
In Malaysia, the traditional practice of drying clothes via sunlight is frequently disrupted by monsoon seasons and the limited space inherent in high-rise living. This project involves the design and fabrication of a semi-automatic drying clothing rack developed to accelerate drying times regardless of weather conditions. Using SolidWorks for conceptual design, a prototype was constructed using a mild steel frame, acrylic plates, and a 600W portable heating dryer. The fabrication process involved precise measuring, cutting, and joining, with critical sections reinforced through welding to ensure structural integrity. Evaluation of the final prototype confirmed that both project objectives were achieved: the system successfully reduced drying times to less than 30 minutes, significantly outperforming traditional hanging methods which require over three hours. While the project serves as a functional proof of concept, recommendations for future iterations include stabilizing the base, increasing the 1000mm frame height to accommodate longer garments, and upgrading the DIY pulley system's 3V DC motor for improved mechanical efficiency. This project demonstrates a cost-effective, versatile solution for small-to-medium-scale domestic applications, costing approximately MYR 382.50.

Keywords: *Cloth drying, Heating mechanism*

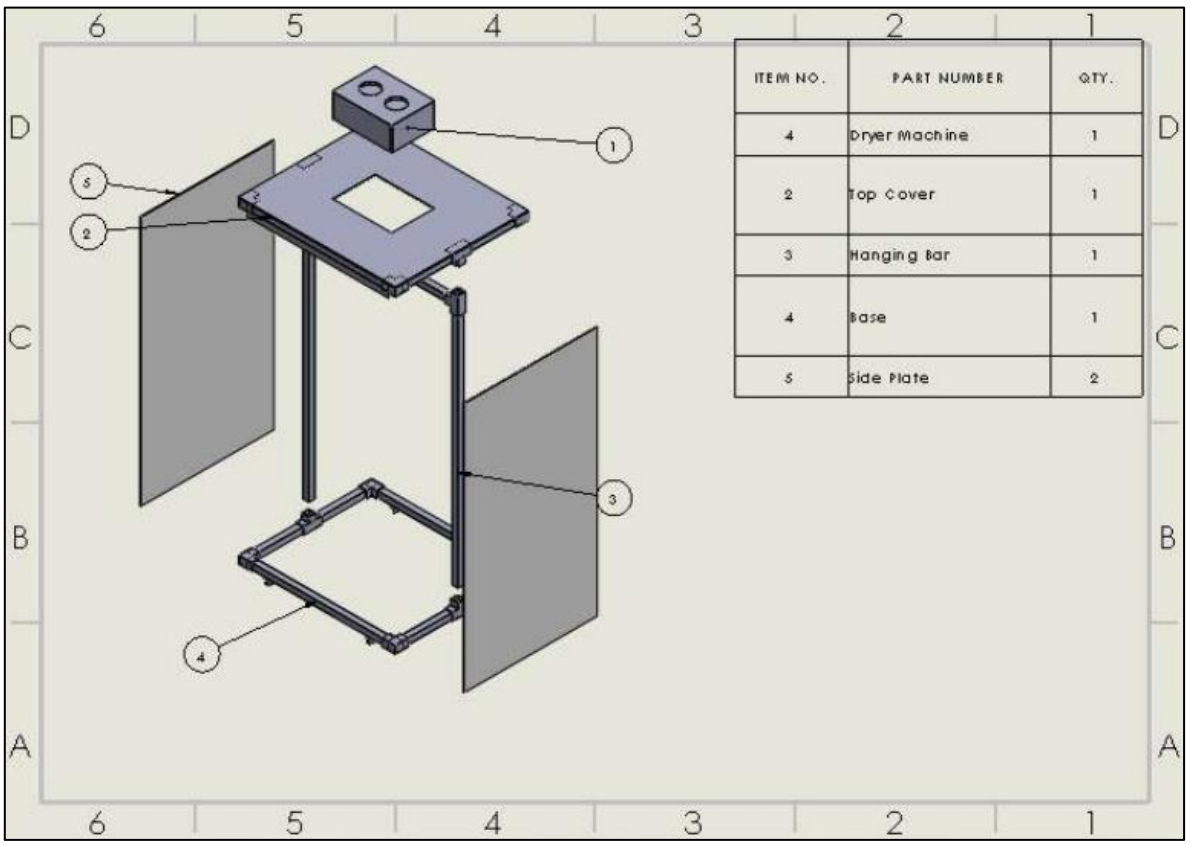
PROTOTYPE



DESIGN PARAMETER



ITEM NO.	PART NUMBER	QTY.
1	60cm Bar	5
2	L Shape Connector	8
3	50cm Bar	4
4	T Shape Connector	6
5	Caster	4
6	100cm Bar	2
7	Acrylic Top Plate	1
8	Acrylic Side Plate	2
9	Dryer	1
10	Curtain	2



ITEM NO.	PART NUMBER	QTY.
4	Dryer Machine	1
2	Top Cover	1
3	Hanging Bar	1
4	Base	1
5	Side Plate	2

CHAPTER 4

Vegetable Slicing Machine

Muhammad Afiq Mohd.Zani [1] and Mohd Fadzli Ismail [2*]

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**Corresponding author (e-mail): mohdfadzli@uitm.edu.my*

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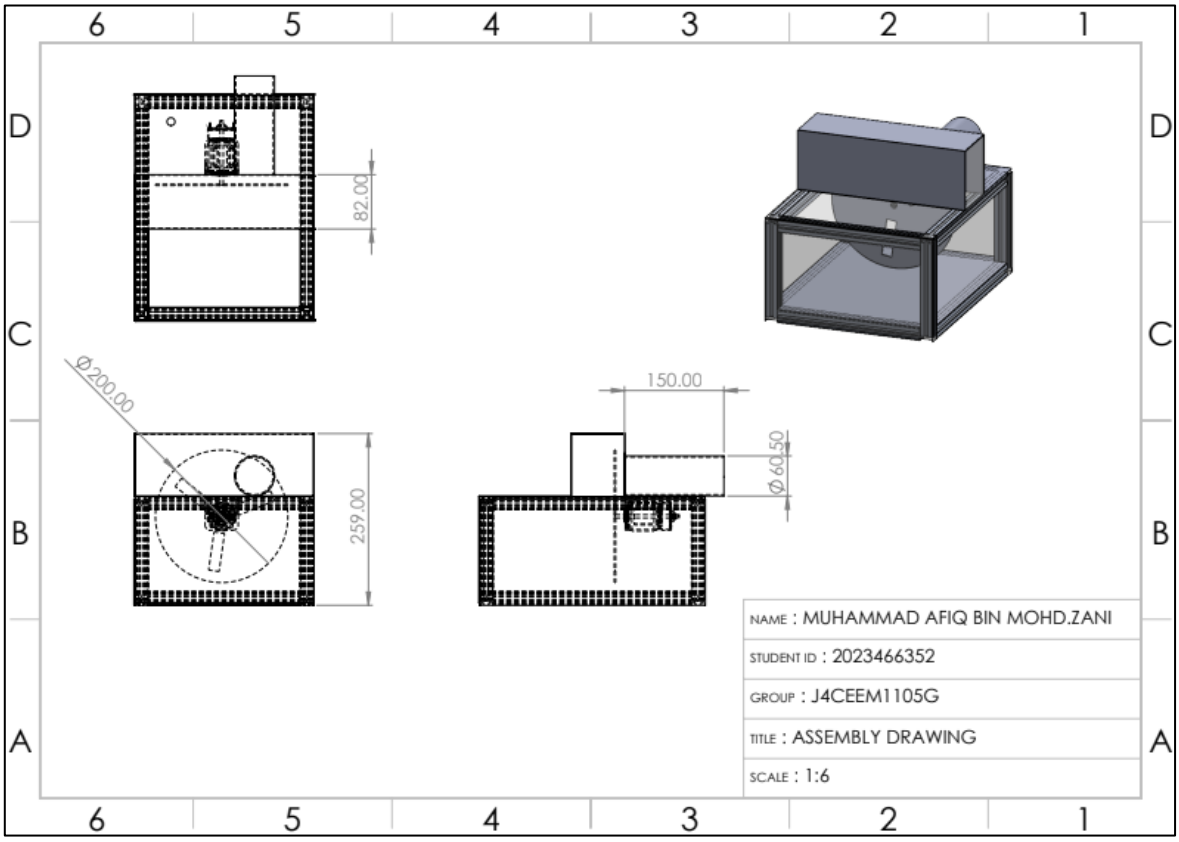
Manual vegetable slicing is a labor-intensive, time-consuming task that poses significant risks of kitchen-related injuries, which account for nearly 29.2% of domestic accidents in Malaysia. While industrial slicers exist, they are often bulky and prohibitively expensive for small-scale users. This project aims to design and fabricate a low-cost, portable, and automated vegetable slicing machine specifically for household and small-scale commercial use. The primary objectives were to design the machine using SolidWorks and to fabricate a functional prototype as a proof of concept. The methodology involved engineering analysis and material selection to ensure structural integrity and efficiency. The final design utilizes a 12V DC motor (150W, 6000 rpm) to drive a circular blade mechanism, providing sufficient torque (3 kg.cm) to slice firm vegetables like cucumbers and onions. Structural components were constructed using lightweight aluminium profiles and polycarbonate sheets to achieve portability while maintaining durability. Simulation analysis via SolidWorks validated that the acrylic blade holder operates safely under a 2.943 N load, with maximum stress levels significantly below the material's yield strength. The results demonstrate that the fabricated prototype successfully automates the slicing process, reducing manual effort and preparation time.

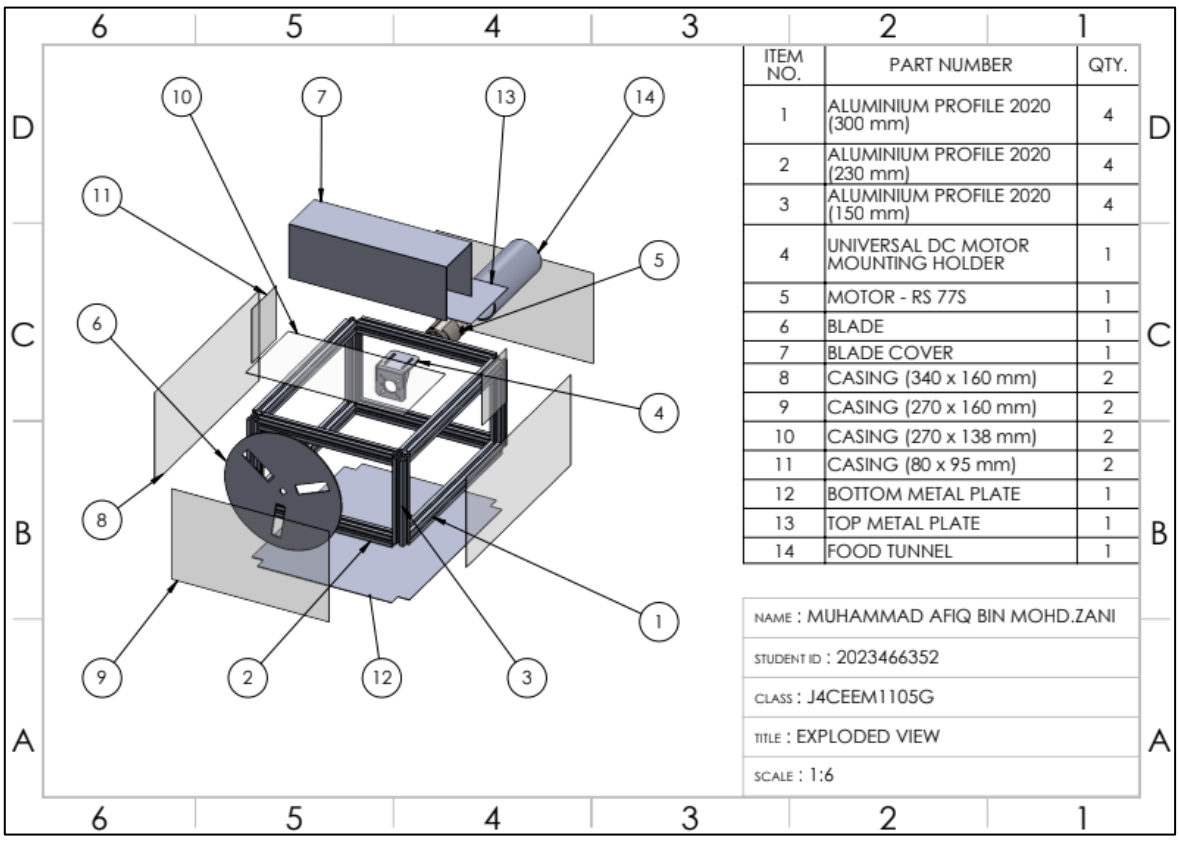
Keywords: *Vegetable slicing machine, , Automation*

PROTOTYPE



DESIGN PARAMETER





ITEM NO.	PART NUMBER	QTY.
1	ALUMINIUM PROFILE 2020 (300 mm)	4
2	ALUMINIUM PROFILE 2020 (230 mm)	4
3	ALUMINIUM PROFILE 2020 (150 mm)	4
4	UNIVERSAL DC MOTOR MOUNTING HOLDER	1
5	MOTOR - RS 77S	1
6	BLADE	1
7	BLADE COVER	1
8	CASING (340 x 160 mm)	2
9	CASING (270 x 160 mm)	2
10	CASING (270 x 138 mm)	2
11	CASING (80 x 95 mm)	2
12	BOTTOM METAL PLATE	1
13	TOP METAL PLATE	1
14	FOOD TUNNEL	1

CHAPTER 5

Rain-Sensing Clothesline

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**Corresponding author (e-mail): mohdfadzli@uitm.edu.my*

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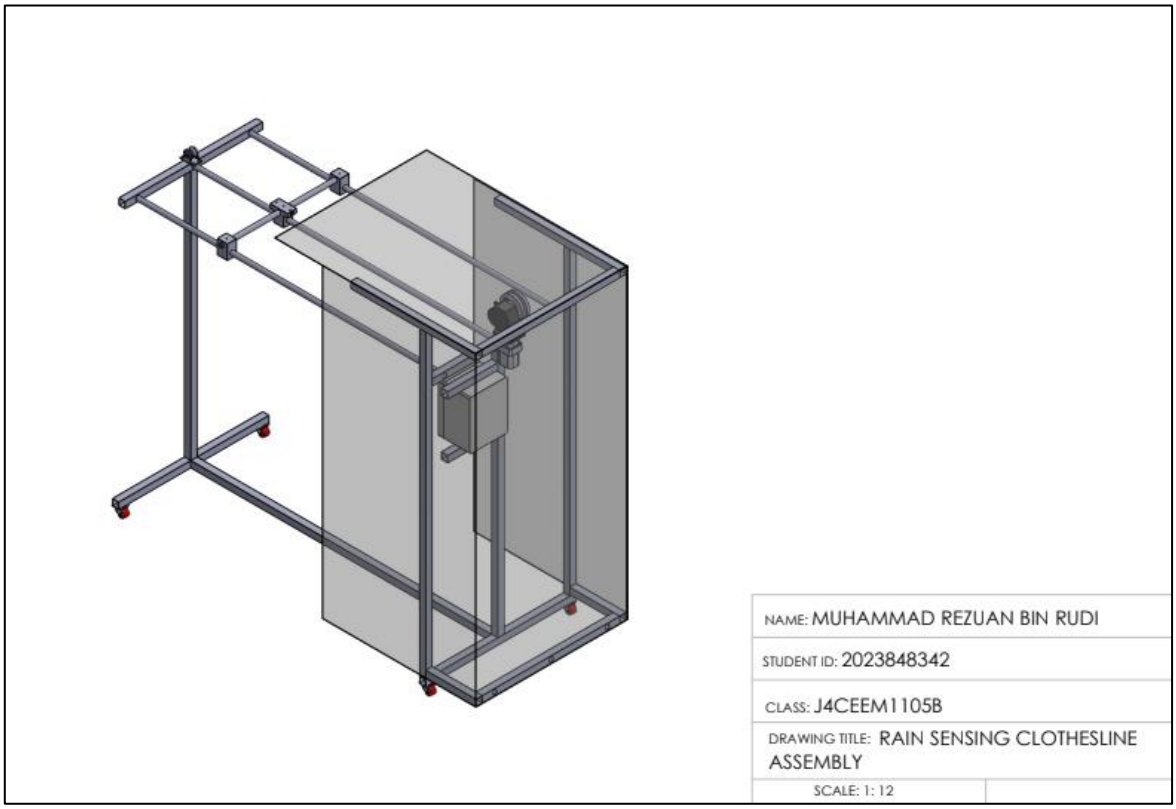
Drying clothes in natural sunlight is an eco-friendly and cost-effective traditional method, yet it remains highly susceptible to unpredictable weather changes. Unexpected rainfall often leads to the inconvenience of repeated washing and wasted energy. This project aims to design and fabricate an automated, rain-sensing clothesline system that provides a reliable and convenient solution for users who cannot constantly monitor their laundry. The primary objectives were to design an automatic drying system using appropriate sensors, then to fabricate a motorized mechanism capable of extending and retracting based on real-time weather conditions. The methodology involved integrating an Arduino UNO microcontroller as the system's brain, interfaced with an FC-37 rain sensor and a Light Dependent Resistor (LDR) sensor. Engineering calculations were performed to ensure that a high-torque power window motor could effectively move a maximum load of 3 kg of wet clothes via a pulley and arm-slider mechanism. The structural frame was fabricated from mild steel square hollows using MIG welding for durability, while IMPRA boards provided a sheltered area for garment protection. The results demonstrated that the prototype successfully responds to raindrops within 2 to 3 seconds, automatically retracting clothes to the sheltered area within 6 seconds. Testing confirmed that the system also retracts during dark conditions and extends during bright, dry periods without manual intervention.

Keywords: *Rain sensor, , Automation*

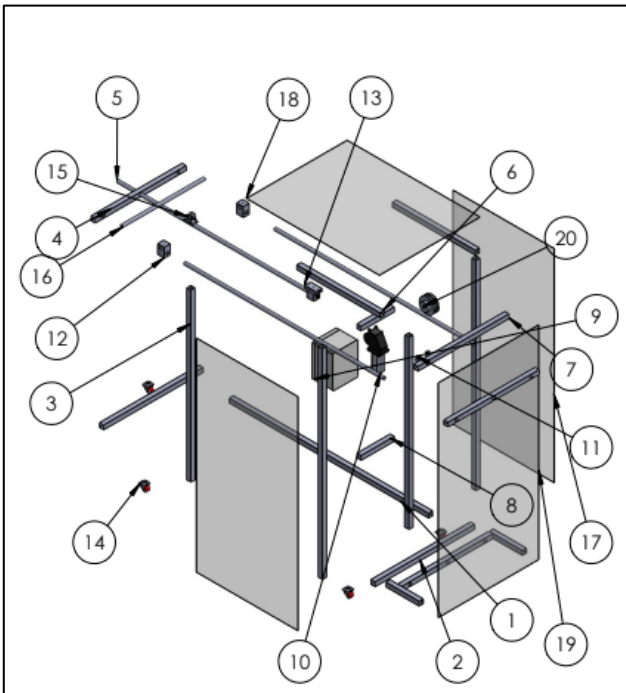
PROTOTYPE



DESIGN PARAMETER



NAME: MUHAMMAD REZUAN BIN RUDI
STUDENT ID: 2023848342
CLASS: J4CEEM1105B
DRAWING TITLE: RAIN SENSING CLOTHESLINE ASSEMBLY
SCALE: 1: 12



ITEM NO.	PART NUMBER	QTY.
1	HOLLOW STEEL 1200mm	3
2	HOLLOW STEEL 600mm	2
3	HOLLOW STEEL 1000mm	2
4	HOLLOW STEEL 549.2mm	3
5	CYLINDER ROD 1200mm	3
6	HOLLOW STEEL 500mm	2
7	HOLLOW STEEL 549.2	1
8	HOLLOW STEEL 200mm	4
9	PVC ELECTRICAL BOX	1
10	POWER WINDOW MOTOR	1
11	MOTOR HOLDER	1
12	ARM SLIDER PART 1	2
13	ARM SLIDER PART 2	1
14	CASTER WHEEL	4
15	GROOVE WHEEL	1
16	SLIDER HOLDER	1
17	IMPRA BOARD (1219mm X 610mm)	2
18	IMPRA BOARD(606mm X 690mm)	1
19	IMPRA BOARD (606mm X 1222mm)	1
20	PULLEY MOTOR	1

NAME: MUHAMMAD REZUAN BIN RUDI
STUDENT ID: 2023848342
CLASS: J4CEEM1105B
DRAWING TITLE: RAIN SENSING CLOTHESLINE EXPLODED VIEW
SCALE: 1: 18

eISBN: 978-967-0033-74-7

CHAPTER 6

Smart Clothes Drying Rack

Clarence Anak Stanley Mike Ajah [1] and Mohd Fadzli Ismail [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): mohdfadzli@uitm.edu.my*

PROJECT DESCRIPTION

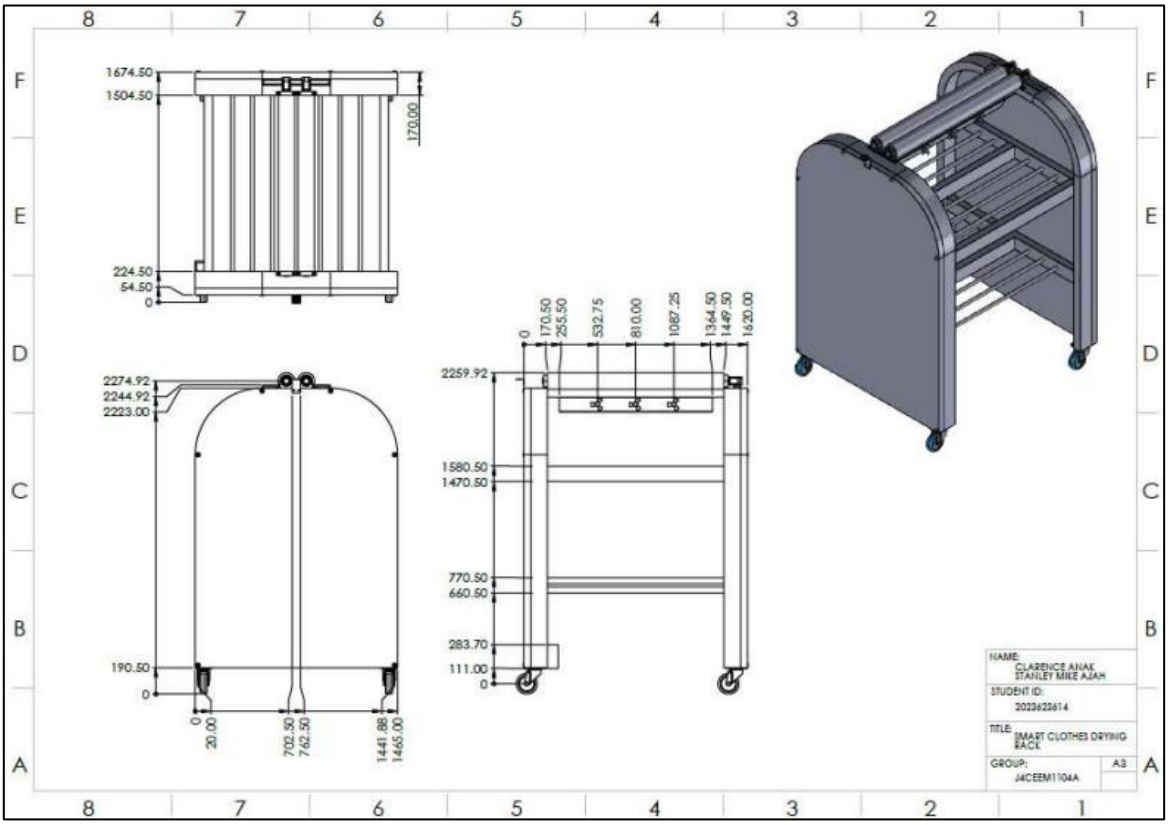
Outdoor clothes drying is a common household practice in Malaysia as it is cost-free and environmentally friendly. However, it remains highly vulnerable to sudden rainfall. This unpredictable weather often leads to laundry getting soaked, causing inconvenience and requiring re-washing. This project aims to address these issues by designing and fabricating a Smart Clothes Drying Rack that provides automatic rain protection without the need for manual monitoring. The primary objectives were to design an automated rack using Arduino technology and to fabricate a functional prototype capable of protecting clothes under various weather conditions. The methodology utilized an Arduino Uno microcontroller integrated with an analog rain sensor. The structural frame was fabricated from mild steel rectangular hollows, assembled using arc welding for maximum stability and durability. The protection mechanism consists of a motorized roll-down canvas with a PVC coating, controlled by a high-torque DC motor and an L298N motor driver. Additionally, transparent polycarbonate side panels and a built-in fan system were integrated to block wind and assist in drying during rainy periods. Testing results demonstrated that the system is highly responsive, with the moisture sensor typically triggering the motor in under five seconds. The prototype successfully transitions into a sheltered mode during simulated heavy rain, ensuring the laundry remains dry.

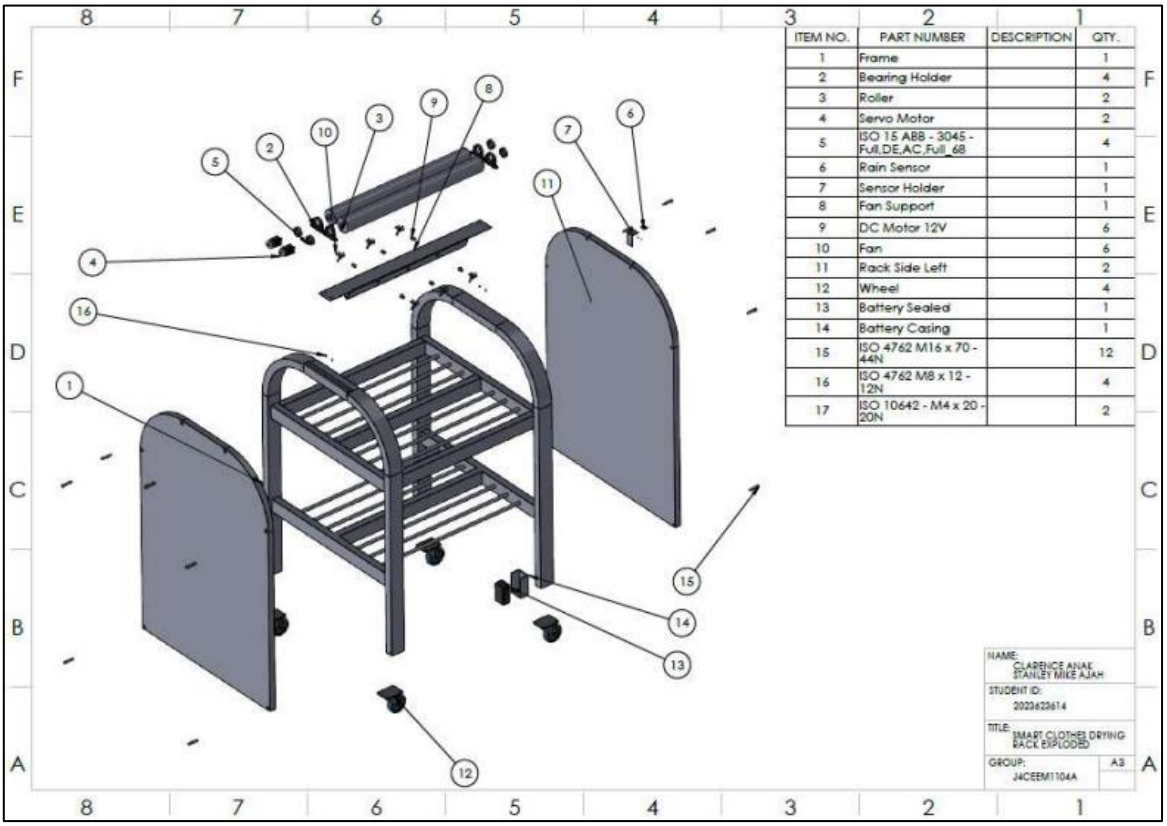
Keywords: *Rain sensor, , Arduino Uno*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 7

Automatic Pet Food Dispenser

Syabil Azfarhakim bin Syahrin Azri [1] and Mohd Fadzli Bin Ismail [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): mohdfadzli@uitm.edu.my*

PROJECT DESCRIPTION

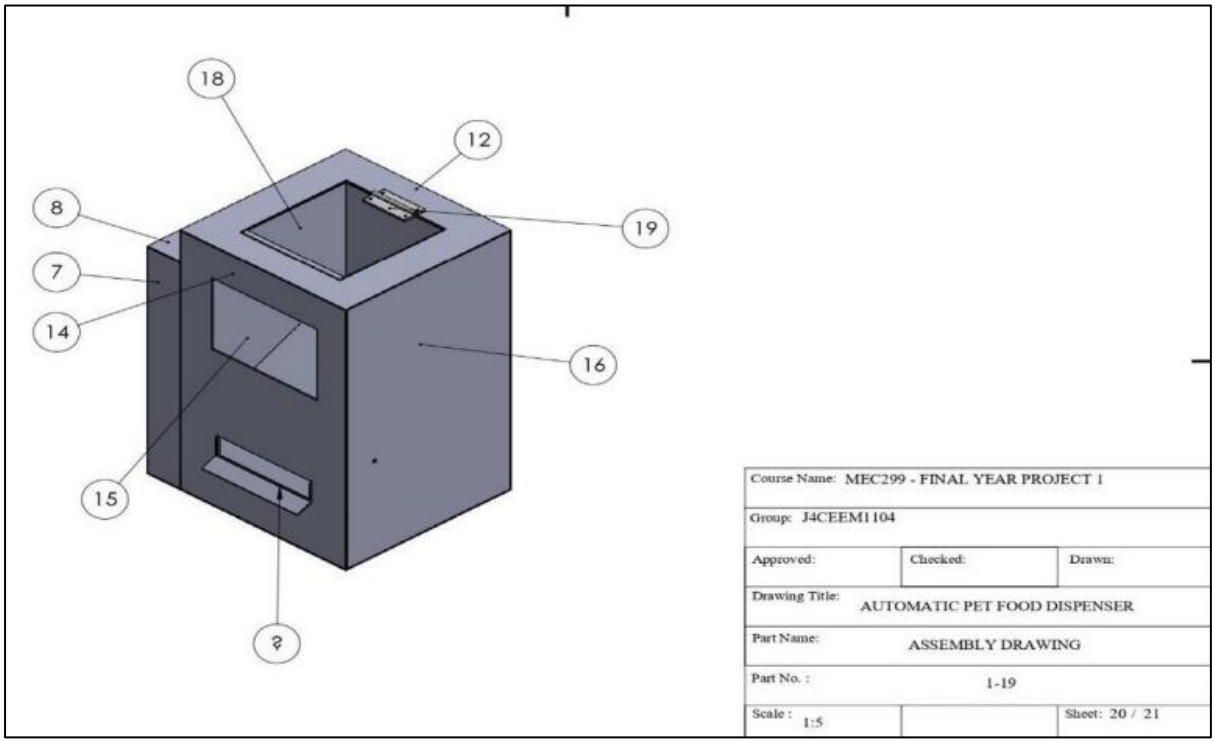
Owning a pet entails the responsibility of ensuring it is treated with care and compassion, particularly in providing proper nutrition to maintain its health. However, many pets suffer from underweight or obesity due to inconsistent feeding schedules by their owners, who may overfeed, underfeed, or forget to feed their pets due to their own time constraints. This project aims to design and fabricate an automatic pet food dispenser that offers an efficient and reliable solution for pet owners to ensure their pets receive timely and accurate feedings, even in their absence. The dispenser utilizes an Arduino UNO microcontroller, powered by a micro-USB, to control the opening of the food storage based on preset times. When the set time is reached, the machine will automatically dispenses the appropriate amount of food into the pet's bowl. The device is user-friendly, allowing owners to easily adjust the feeding schedule to meet their pets' specific needs. Consequently, this automatic pet food dispenser helps pet owners in maintaining their pets' health by ensuring consistent and appropriate feeding, promoting healthier lives for the pets.

Keywords: *Pet, Automatic pet food dispenser*

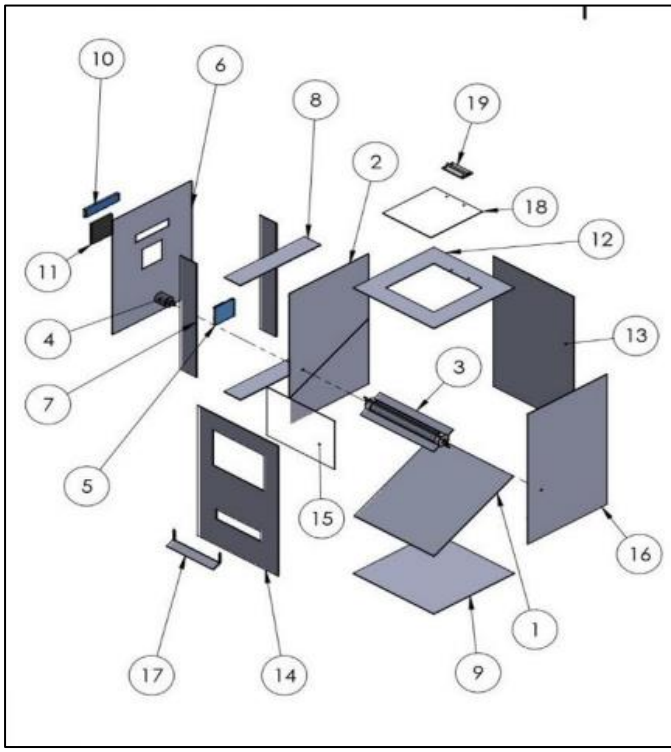
PROTOTYPE



DESIGN PARAMETER



Course Name: MEC299 - FINAL YEAR PROJECT 1		
Group: J4CEEM1104		
Approved:	Checked:	Drawn:
Drawing Title: AUTOMATIC PET FOOD DISPENSER		
Part Name: ASSEMBLY DRAWING		
Part No. : 1-19		
Scale : 1:5		Sheet: 20 / 21



BOM Table

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Leaning Plane	SHEET METAL	1
2	Left Plane	SHEET METAL	1
3	Dispenser shaft	PVC & PLASTICS	1
4	12V Motor	12V DC MOTOR	1
5	Arduino UNO	MICROCONTROLLER	1
6	Compartment Front Plane	SHEET METAL	1
7	Compartment Left-Right Plane	SHEET METAL	2
8	Compartment Top-Bottom Plane	SHEET METAL	2
9	Bottom Plane	SHEET METAL	1
10	LED Display	16*2 DISPLAY	1
11	Keypads	4*4 BUTTONS	1
12	Top Plane	SHEET METAL	1
13	Rear Plane	SHEET METAL	1
14	Front Plane	SHEET METAL	1
15	Acrylic Sheet	ACRYLIC SHEET	1
16	Right Plane	SHEET METAL	1
17	Exit Cover	SHEET METAL	1
18	Storage Cover	ACRYLIC SHEET	1
19	Steel Hinge	STEEL	1

Course Name: MEC299 - FINAL YEAR PROJECT 1		
Group: J4CEEM1104		
Approved:	Checked:	Drawn:
Drawing Title: AUTOMATIC PET FOOD DISPENSER		
Part Name: EXPLODED DRAWING		
Part No. : 1 - 19		
Scale : 1:10		Sheet: 21 / 21

eISBN: 978-967-0033-74-7

CHAPTER 8

Development of Supermarket Stocking Robot

Muhammad Aiman Harith Bin Razali [1] and Firdaus Sukarman [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): firdaus@uitm.edu.my*

PROJECT DESCRIPTION

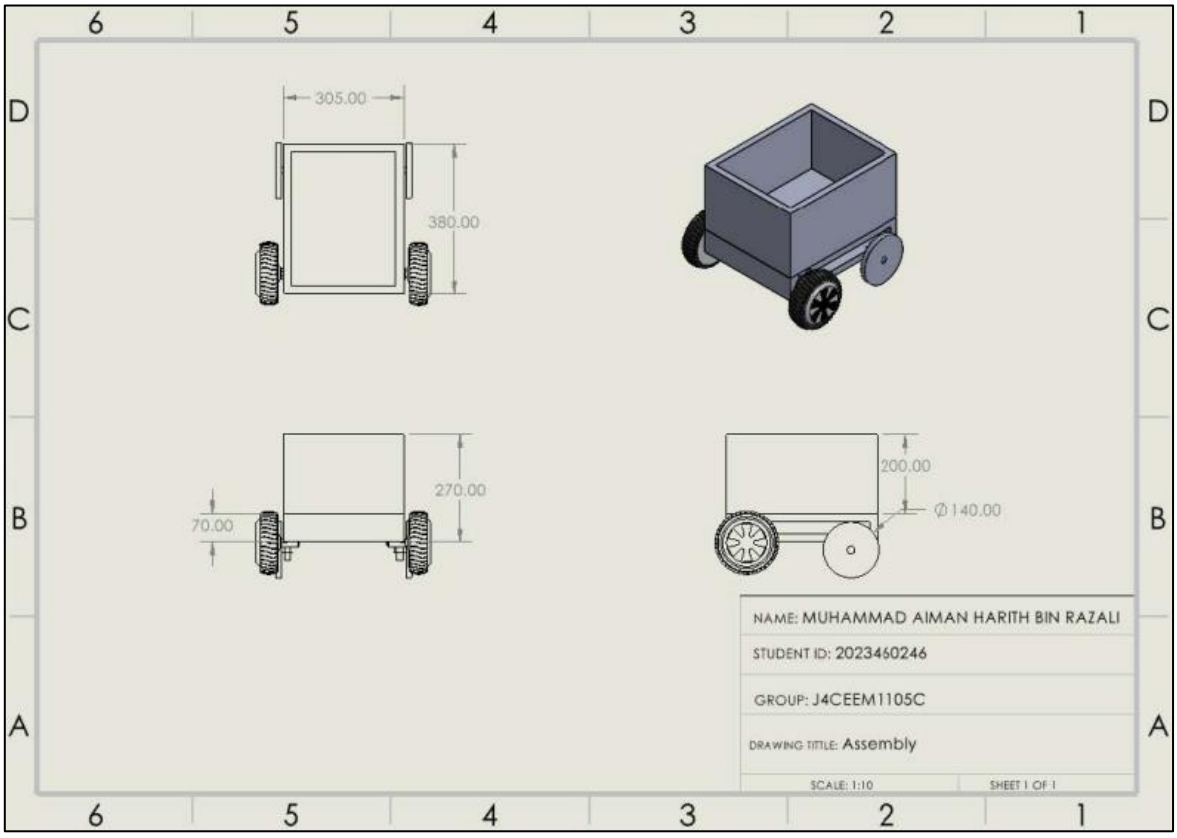
The conventional approach to restocking supermarket shelves is an inherently repetitive and physically demanding operation. Human workers are required to repeatedly walk substantial distances and lift various heavy items, which inevitably results in fatigue, especially when managing increased demand during peak shopping hours. This reliance on manual labor often leads to operational delays and contributes significantly to labor costs, prompting the need for more efficient alternatives. This project addresses these challenges by focusing on the design and subsequent development of a supermarket stocking robot, specifically engineered to streamline the restocking process safely and effectively. The primary goal is the successful fabrication of a robust, mobile robot capable of autonomous navigation through supermarket aisles. Its core function is to efficiently transport and place products from designated storage areas onto the appropriate shelves, thus substantially alleviating the physical burden placed upon human employees. The methodology employs the integration of a high-torque brushless motor for powerful drive and a precise servo motor for manipulation and control. All systems are powered by a reliable, rechargeable battery pack. Furthermore, a Wi-Fi module is incorporated, facilitating remote operation and monitoring capabilities. The project ultimately concludes that this stocking robot offers a practical, economically and viable solution.

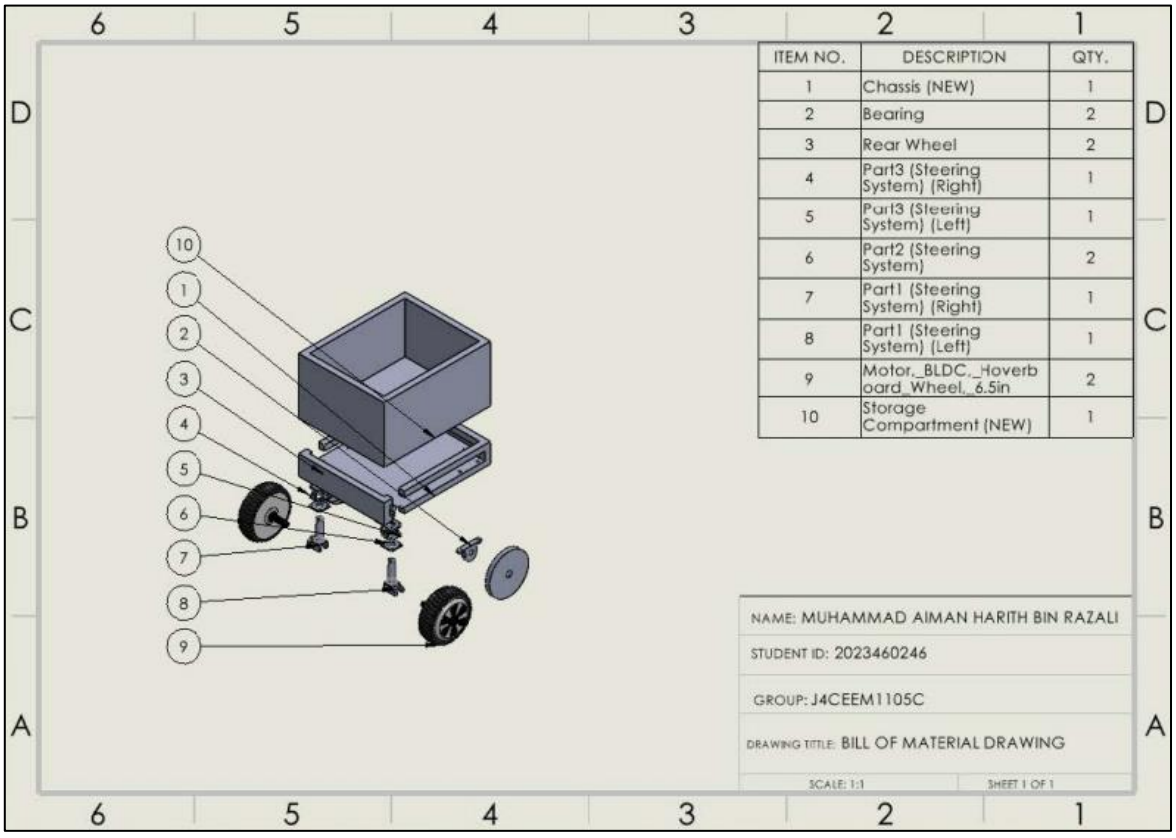
Keywords: *Supermarket stocking robot, Mobile robot*

PROTOTYPE



DESIGN PARAMETER





ITEM NO.	DESCRIPTION	QTY.
1	Chassis (NEW)	1
2	Bearing	2
3	Rear Wheel	2
4	Part3 (Steering System) (Right)	1
5	Part3 (Steering System) (Left)	1
6	Part2 (Steering System)	2
7	Part1 (Steering System) (Right)	1
8	Part1 (Steering System) (Left)	1
9	Motor,_BLDC,_Hoverboard_Wheel,_6.5in	2
10	Storage Compartment (NEW)	1

CHAPTER 9

Development of Prototype Home Safety Patrolling Robot

Muhammad Nur Eiman Nor Shamsul [1] and Firdaus Sukarman [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): firdaus@uitm.edu.my*

PROJECT DESCRIPTION

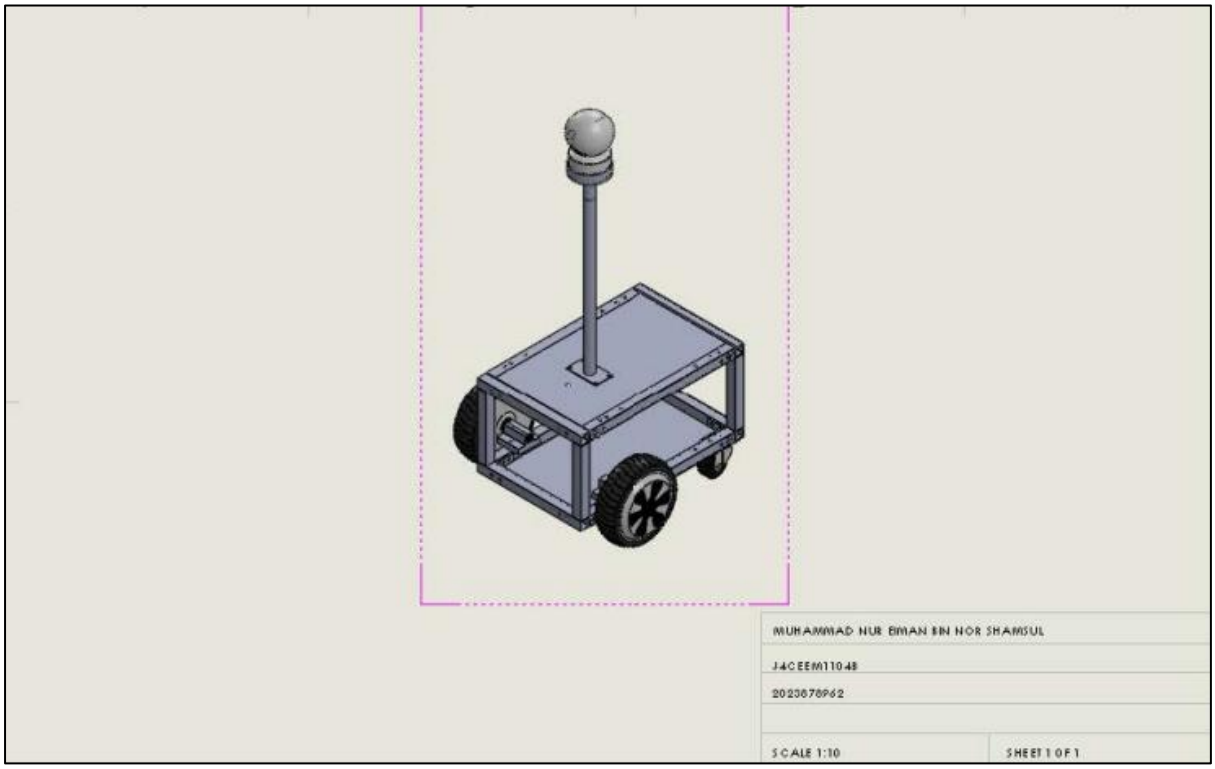
.The primary objective was to design and fabricate a mobile robot capable of manual patrolling and real-time residential monitoring via wireless control. The prototype was engineered integrating an ESP32 microcontroller, recycled brushless hoverboard motors for propulsion, caster wheel support, and a Baseus P1 Lite wireless pan-tilt camera for live video transmission. Control is managed through a dedicated smartphone application using Wi-Fi connectivity, allowing the user to remotely navigate the unit and observe surrounding areas in real-time. The methodology involved a sequential process: mechanical design and fabrication of a custom chassis, systematic integration of electrical and electronic components, system programming using the Arduino IDE, and comprehensive functional testing. Performance evaluation confirmed the prototype's ability to execute smooth movement, respond accurately to wireless commands, and maintain stable, real-time video feedback throughout operation. The robot successfully demonstrated its capability to patrol various household zones, effectively reducing surveillance blind spots and significantly improving the user's situational awareness.

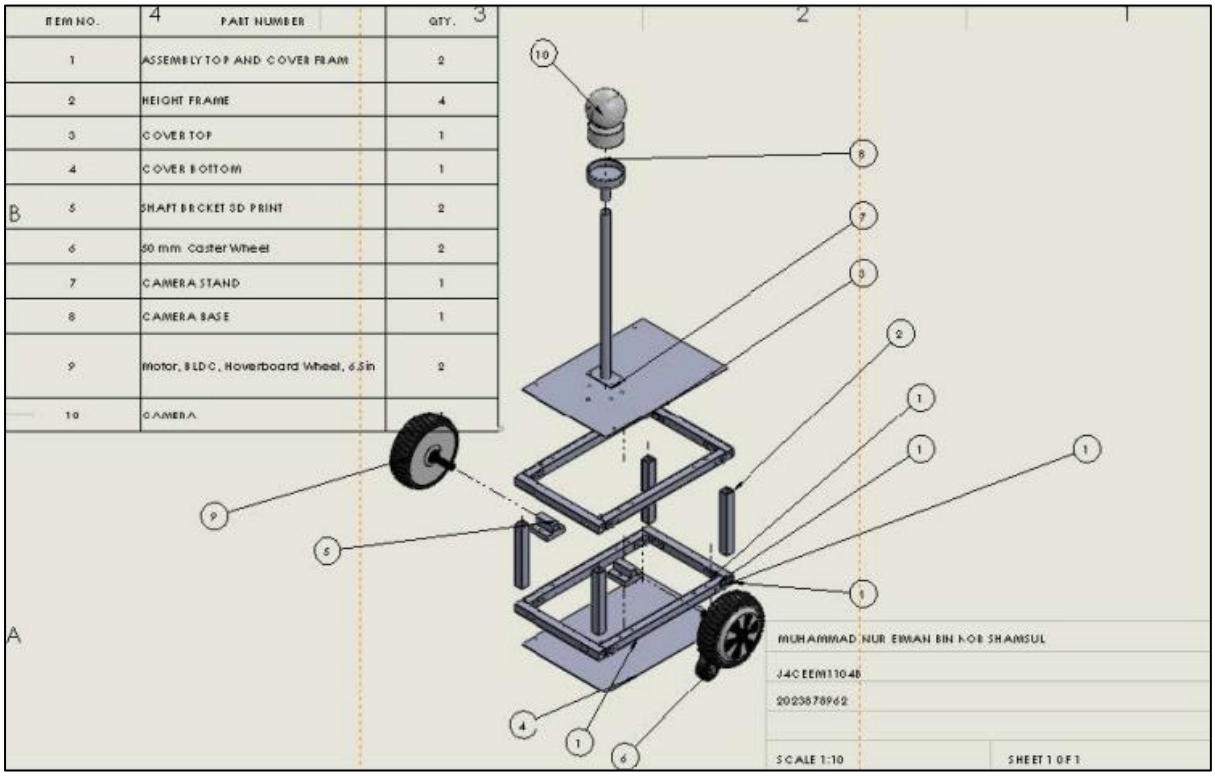
Keywords: *Home patrolling robot, Survelliance camera*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 10

Design and Fabrication of an Acrylic Edge Polishing Tool

Shakir Zufayri Bin Shamsuddin [1] and Miqdad Bin Khairulmaini [2*]

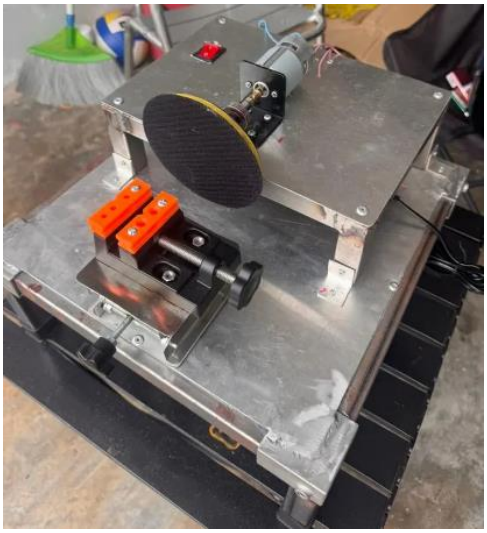
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): miqdadkos@uitm.edu.my*

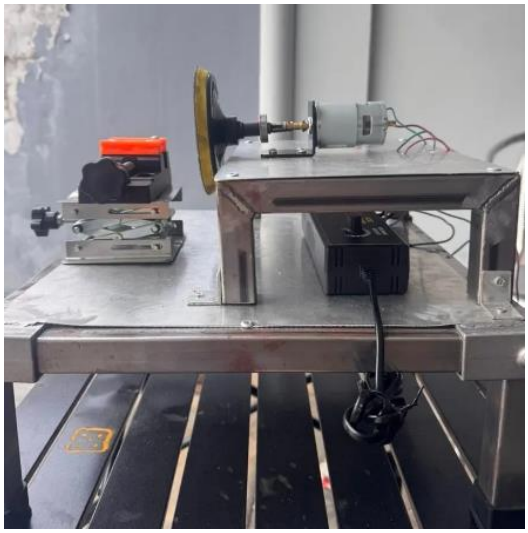
PROJECT DESCRIPTION

Acrylic is a popular choice for students because it makes their projects look clean and professional. To get the best look, the edges of the acrylic must be polished. Usually, this is done by hand, but manual polishing takes a long time and often leads to messy or uneven results. The objective of this project is to build a tool that polishes edges quickly and smoothly. SolidWorks was used to design the tool to be small and portable, with a compact size of only 40cm x 40cm. The body is built from a strong steel frame and aluminum plates, held together with rivets and fittings to keep it steady. A DC motor runs the tool at a steady speed of 1,200 rpm. To make the work more precise, a mechanical jack and a clamp was added to hold the acrylic firmly in place while it polishes. The result is a working tool that creates a smooth, glass-like finish. It is a safe, fast, and low-cost solution for schools and small workshops.

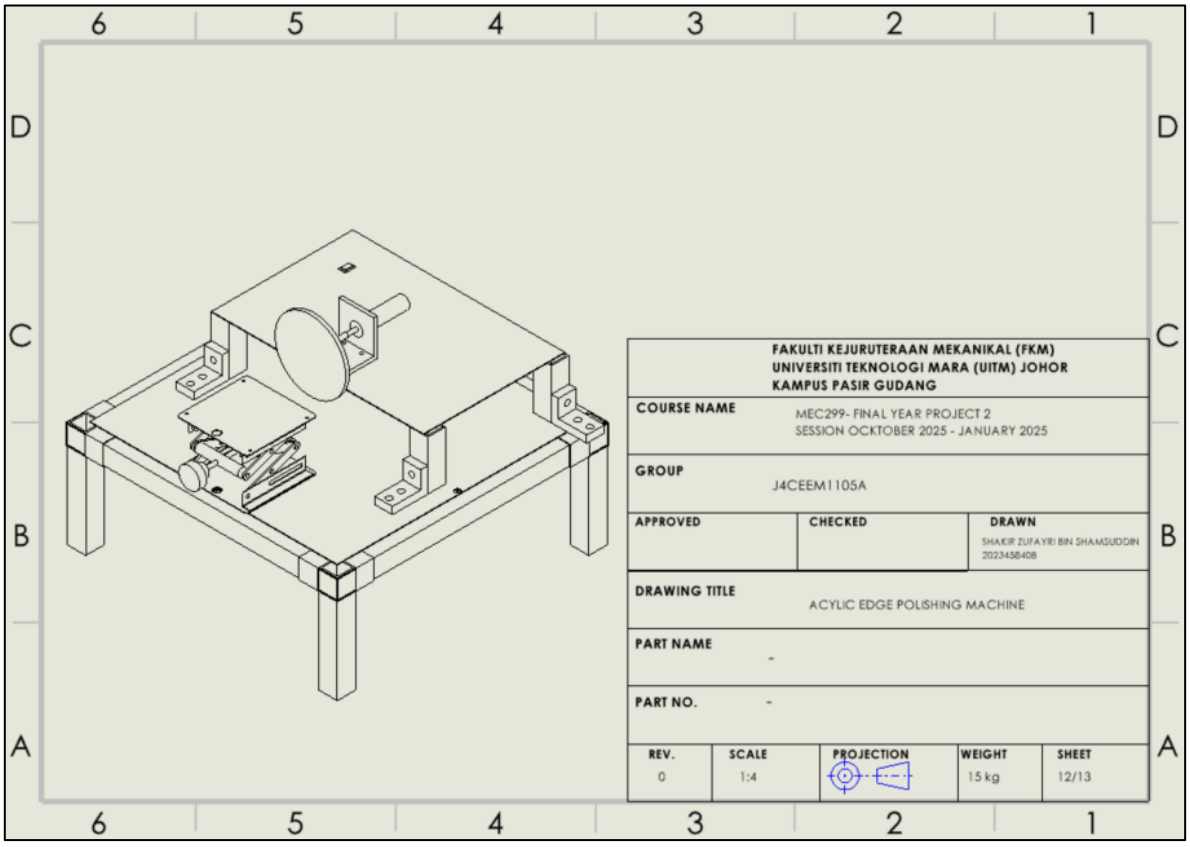
Keywords: *Acrylic edge, Polishing*

PROTOTYPE

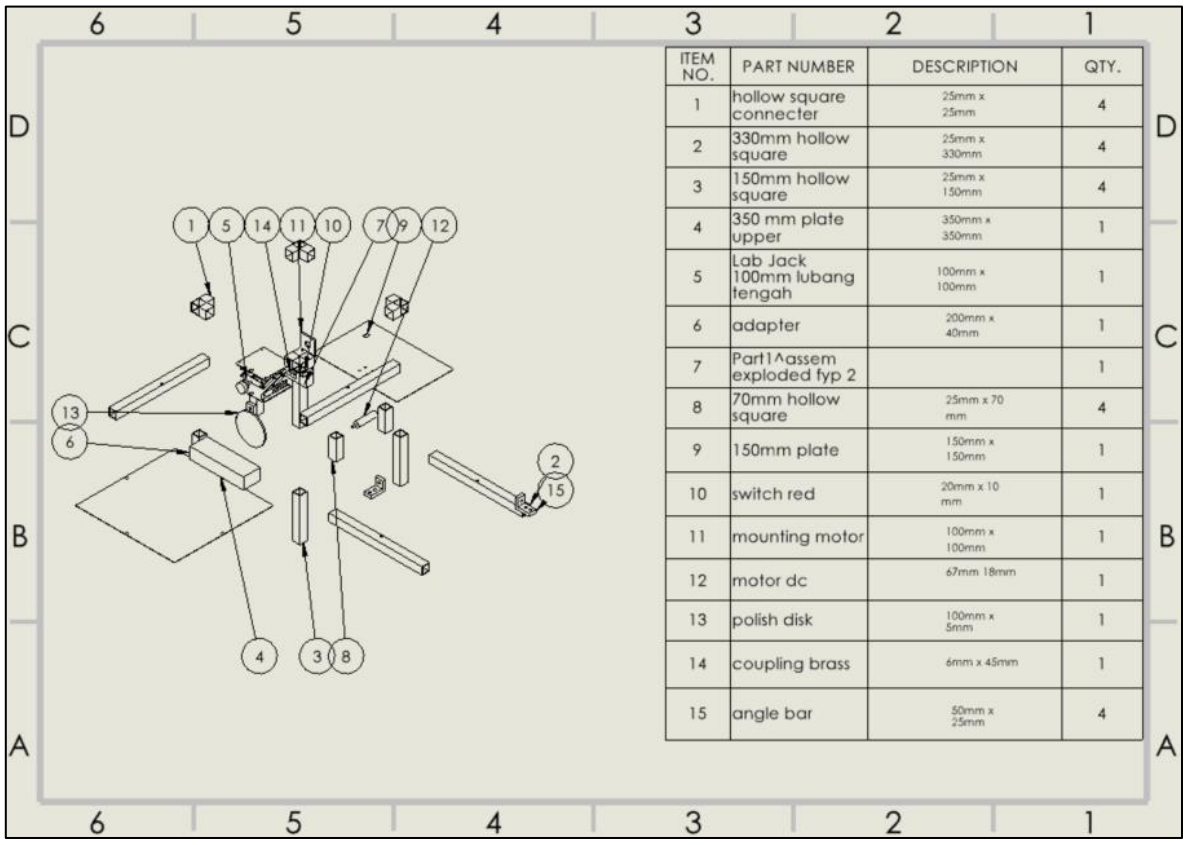




DESIGN PARAMETER



FAKULTI KEJURUTERAAN MEKANIKAL (FKM) UNIVERSITI TEKNOLOGI MARA (UITM) JOHOR KAMPUS PASIR GUDANG	
COURSE NAME	MEC299- FINAL YEAR PROJECT 2 SESSION OCKTOBER 2025 - JANUARY 2025
GROUP	J4CEEM1105A
APPROVED / CHECKED / DRAWN	DRAWN: SHAKIR ZUFAYRI BIN SHAMSUDDIN 2023458408
DRAWING TITLE	ACYLIC EDGE POLISHING MACHINE
PART NAME	-
PART NO.	-
REV. / SCALE / PROJECTION / WEIGHT / SHEET	0 / 1:4 / 15 kg / 12/13



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	hollow square connecter	25mm x 25mm	4
2	330mm hollow square	25mm x 330mm	4
3	150mm hollow square	25mm x 150mm	4
4	350 mm plate upper	350mm x 350mm	1
5	Lab Jack 100mm lubang tengah	100mm x 100mm	1
6	adapter	200mm x 40mm	1
7	Part1^assem exploded fyp 2		1
8	70mm hollow square	25mm x 70 mm	4
9	150mm plate	150mm x 150mm	1
10	switch red	20mm x 10 mm	1
11	mounting motor	100mm x 100mm	1
12	motor dc	67mm 18mm	1
13	polish disk	100mm x 5mm	1
14	coupling brass	6mm x 45mm	1
15	angle bar	50mm x 25mm	4

CHAPTER 11

Design and Fabricate a Low-Cost Acrylic Bending Machine

Mohammad Syafiq Danish Bin Mohd Nasharudin [1] and Miqdad Bin Khairulmaini [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): miqdadkos@uitm.edu.my*

PROJECT DESCRIPTION

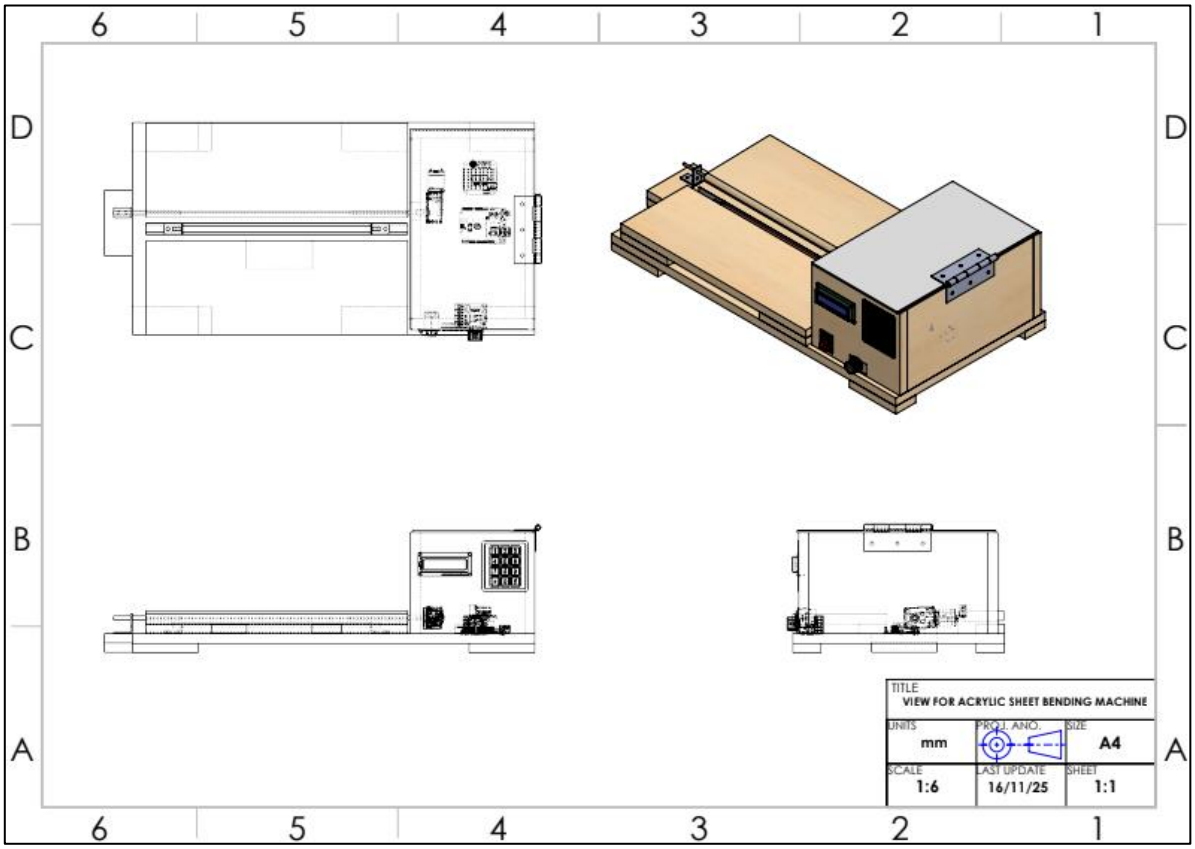
The development of acrylic sheet bending machine aims to provide a cost-effective, efficient, and user-friendly solution for shaping acrylic sheets, which are widely used in signage, displays, and fabrication industries. Traditional bending methods often involve manual heating and bending, leading to inconsistencies, material wastage, and safety hazards. This project proposes an automated machine that integrates precision heating, temperature control, and adjustable bending mechanisms to achieve uniform and repeatable bends. The machine will utilize electric heating elements to soften the acrylic along predefined bending lines, followed by a mechanical bending system to form accurate angles. Key features include adjustable temperature settings, a digital display for real-time monitoring, and a modular design to accommodate different sheet thicknesses. Safety measures such as thermal insulation and emergency shut off will be incorporated to prevent overheating and accidents. The proposed design emphasizes affordability, portability, and ease of operation, making it suitable for small workshops, educational institutions, and DIY enthusiasts. By automating the bending process, this machine reduces labour intensity, improves product consistency, and minimizes material defects. With its compact design, cost-efficiency, and ease of use, the machine holds strong potential for commercialization, particularly in local fabrication markets and small-scale production.

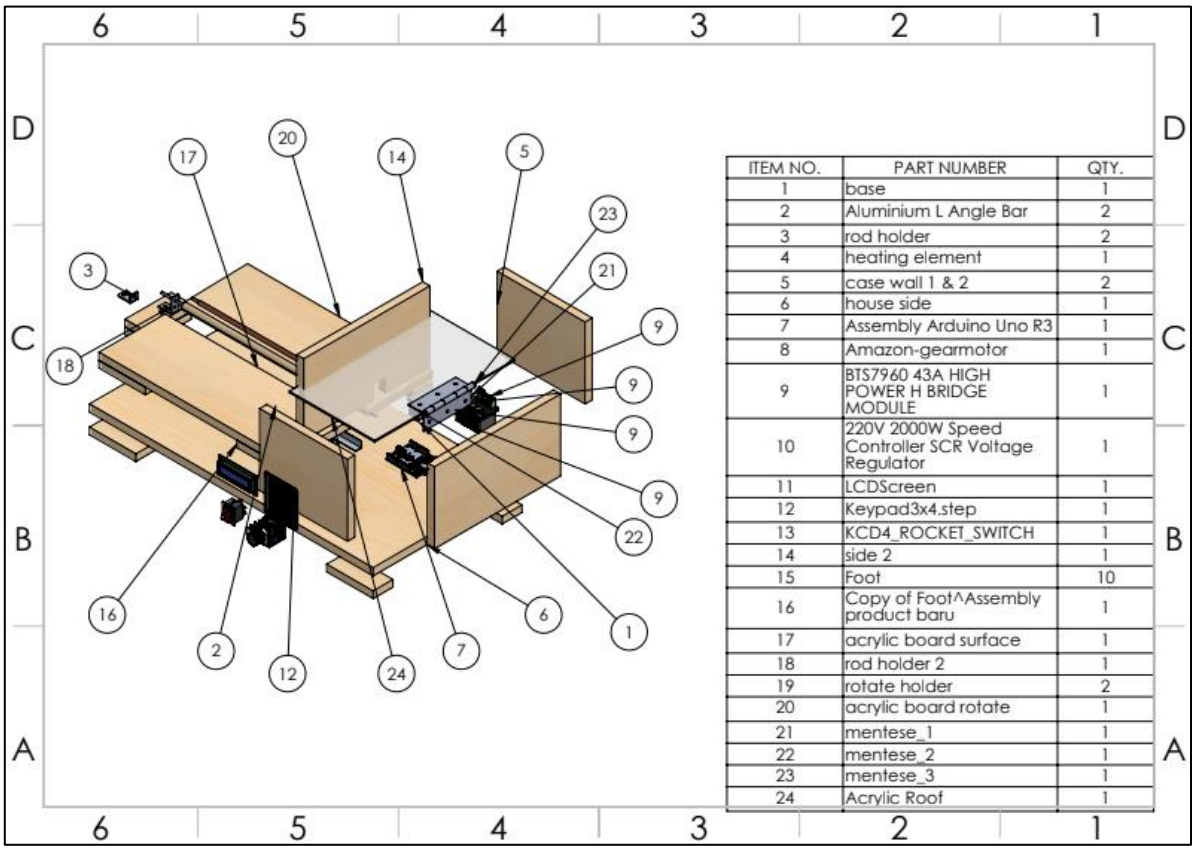
Keywords: *Acrylic, Bending*

PROTOTYPE



DESIGN PARAMETER





ITEM NO.	PART NUMBER	QTY.
1	base	1
2	Aluminium L Angle Bar	2
3	rod holder	2
4	heating element	1
5	case wall 1 & 2	2
6	house side	1
7	Assembly Arduino Uno R3	1
8	Amazon-gearmotor	1
9	BTS7960 43A HIGH POWER H BRIDGE MODULE	1
10	220V 2000W Speed Controller SCR Voltage Regulator	1
11	LCDScreen	1
12	Keypad3x4.step	1
13	KCD4_ROCKET_SWITCH	1
14	side 2	1
15	Foot	10
16	Copy of Foot^Assembly product baru	1
17	acrylic board surface	1
18	rod holder 2	1
19	rotate holder	2
20	acrylic board rotate	1
21	mentese_1	1
22	mentese_2	1
23	mentese_3	1
24	Acrylic Roof	1

eISBN: 978-967-0033-74-7

CHAPTER 12

Smart Motorized Floor Sweeper Mop

Muhammad Aiman Mohd Osman Jailani [1] and Suhadiyana Hanapi [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): suhadiyana@uitm.edu.my*

PROJECT DESCRIPTION

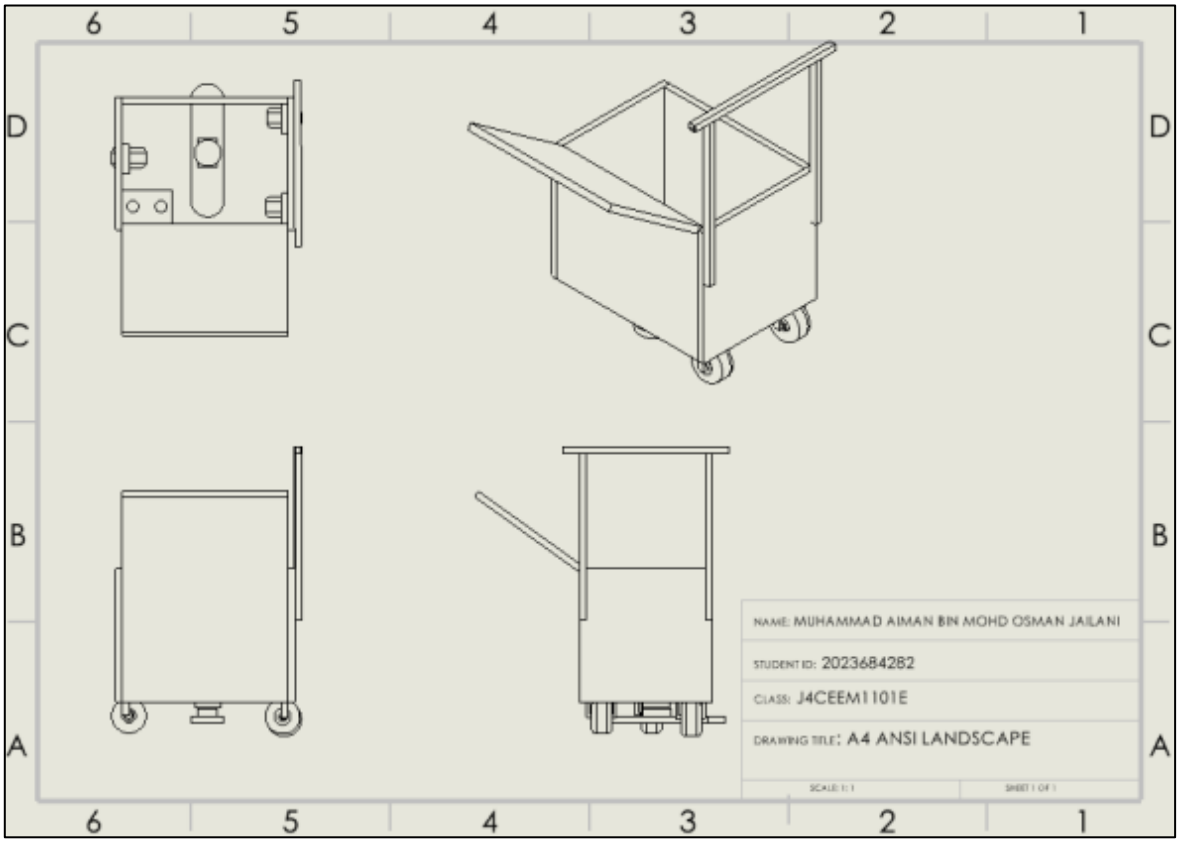
Maintaining cleanliness in large-scale environments such as residential areas and commercial spaces, including supermarkets, halls, corridors, and office areas, often requires considerable manpower and a significant amount of time. Conventional cleaning methods that rely on manual sweeping and mopping may result in inconsistent cleaning outcomes. This issue becomes more significant in large working areas where the cleaning process can be physically demanding for the users. This project focuses on the design and development of a low-cost motorized floor sweeping and mopping device intended to assist users in performing cleaning tasks more efficiently and quickly. The proposed device adopts a simple and user-friendly design powered by an electric motor that enables automatic forward movement while performing sweeping and mopping functions simultaneously. Unlike complex and expensive autonomous cleaning robots, the system is designed to operate along a straight cleaning path, making it suitable for use in large open spaces. The developed prototype demonstrates a practical balance between functionality, simplicity, and cost-effectiveness. By assisting the forward movement of the device, the system helps reduce the physical effort required from the user while maintaining ease of operation.

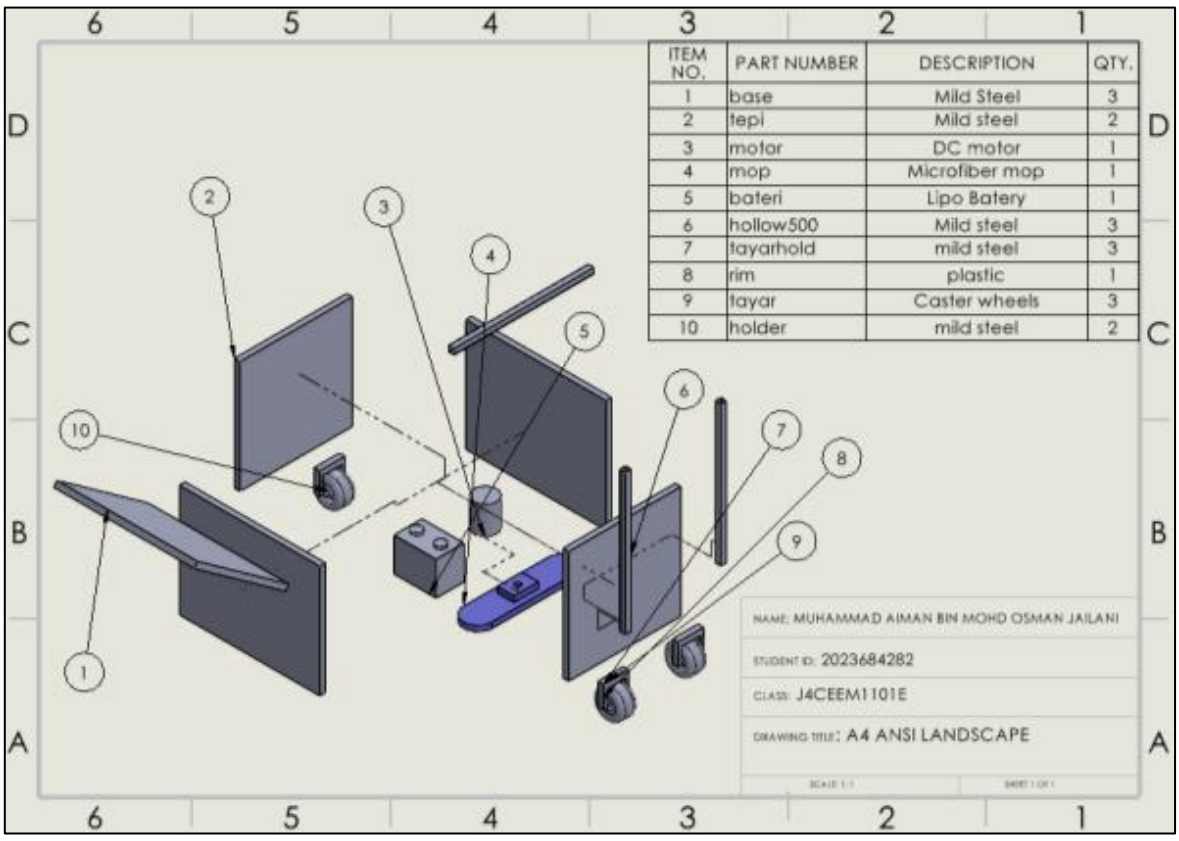
Keywords: *Motorized mop, Floor sweeper*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 13

Time Released Pill Dispenser

Muhammad Farhi Mohd Ashraf [1] and Suhadiyana Hanapi [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): suhadiyana@uitm.edu.my*

PROJECT DESCRIPTION

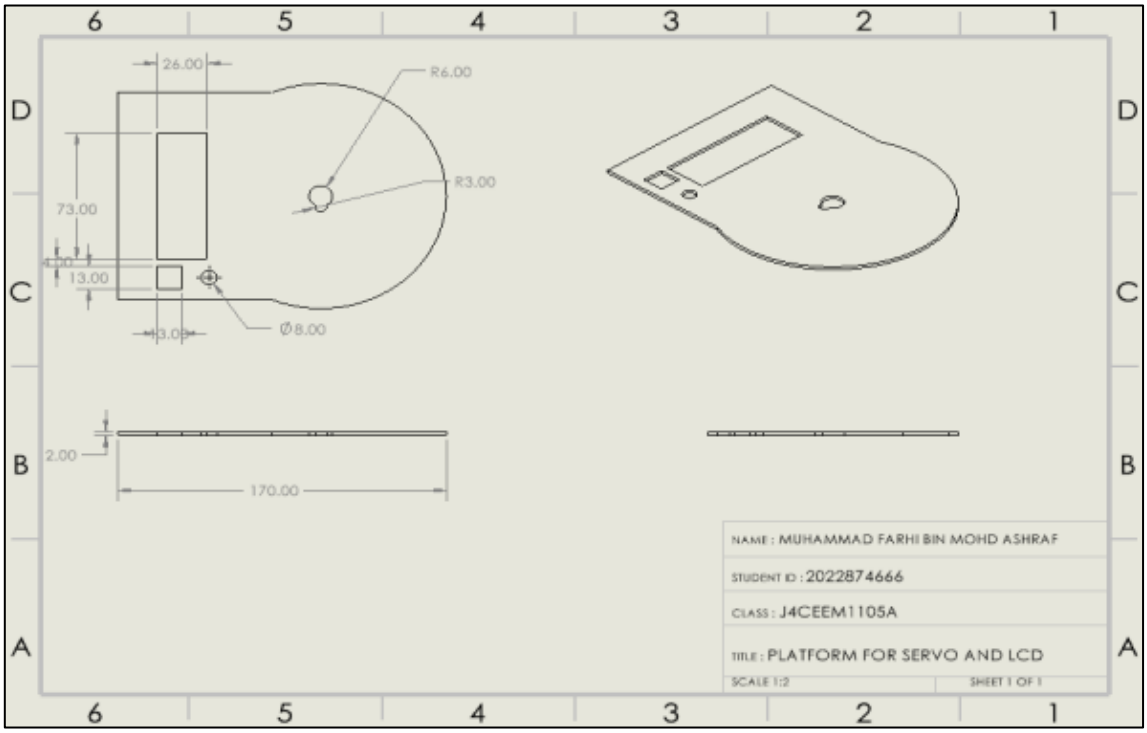
Medication adherence is an important factor in ensuring effective treatment, particularly for elderly individuals and patients who require regular medication. However, many people often forget to take their medication on time due to busy daily routines, lack of proper reminders, or poor medication management. This situation may lead to missed doses or incorrect medication intake, which can negatively affect a patient's health condition. This project focuses on the design and development of a compact and user-friendly pill dispenser to assist users in managing their medication schedule more effectively. The proposed device incorporates a buzzer-based reminder system that alerts users when it is time to take their medication. In addition, the system is designed to be small, portable, and convenient for daily use, allowing users to carry the device easily when needed. Compared with some existing pill dispensers that may be costly or complex to operate, the proposed system emphasizes simplicity, practicality, and affordability. The outcome of this project is a functional prototype that can help improve medication adherence while reducing the possibility of missed or incorrect doses. The developed device is expected to provide users with a simple and reliable solution for managing their daily medication routine. In future developments, additional features such as mobile application integration and caregiver notification systems may be incorporated to further enhance the functionality of the device.

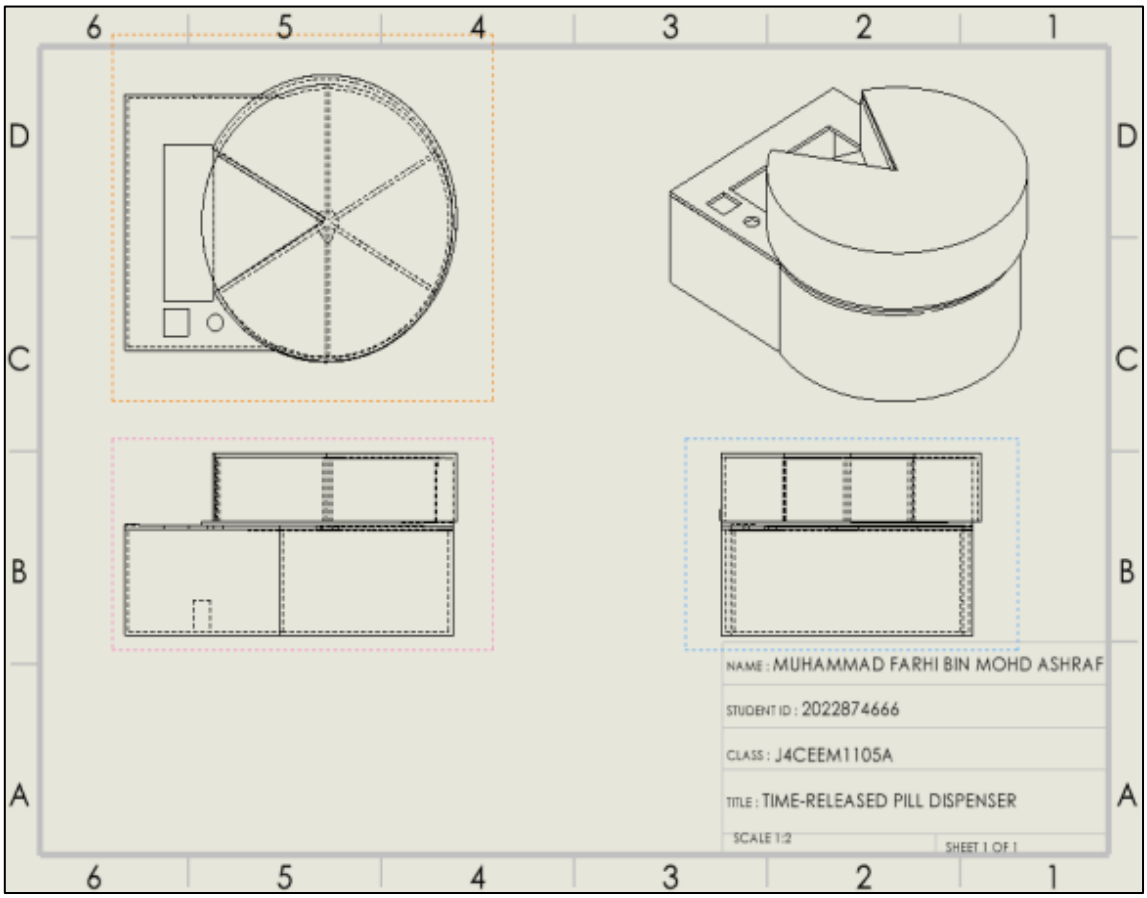
Keywords: *Smart pill dispenser, Medication adherence*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 14

Portable Coconut Grating Machine

Nurkhairina Izzati Ismail [1] and Suhadiyana Hanapi [2*]

[1,2]Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.
**Corresponding author (e-mail): suhadiyana@uitm.edu.my*

PROJECT DESCRIPTION

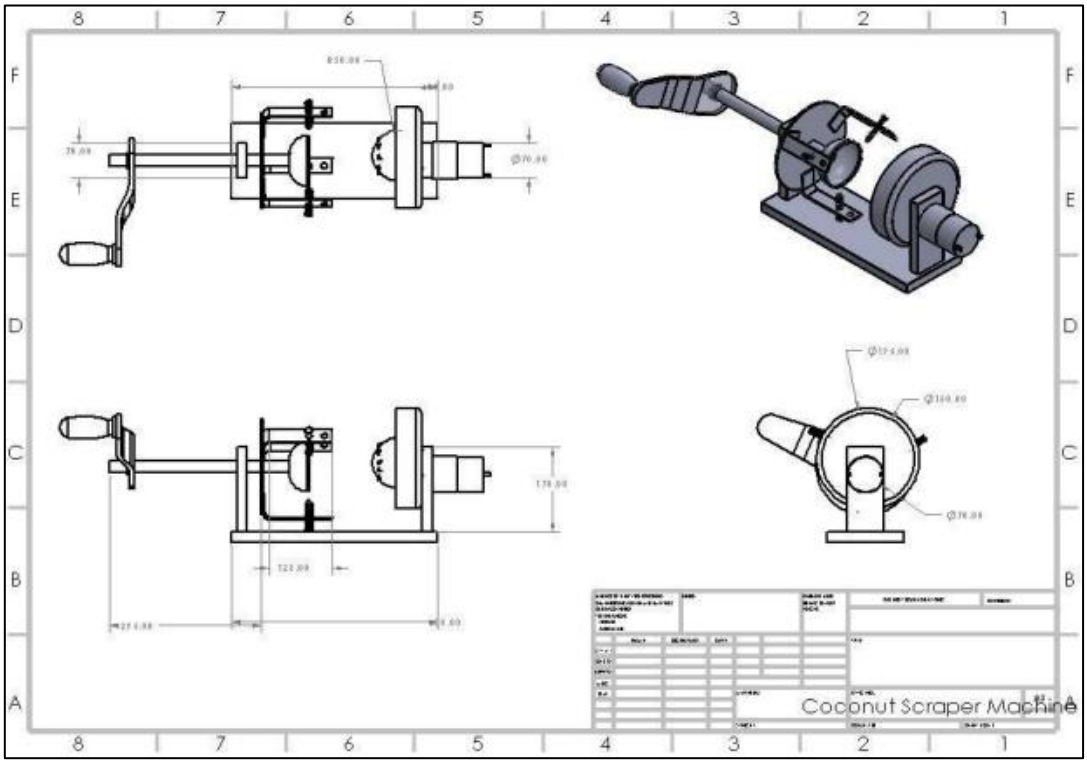
Coconut grating is a common activity in many households, particularly in food preparation that requires freshly grated coconut. However, most coconut grating machines available in the market require users to manually hold the coconut half-shell close to a rotating blade powered by an electric motor. This method can pose safety risks as the user's hands are positioned very near to the grating blade. In addition, many of the existing machines are relatively large in size and expensive, making them less suitable for regular household use. This project focuses on the design and development of a portable coconut grating machine intended for home applications. The proposed machine emphasizes safety, affordability, and ease of use. The design incorporates a safer grating mechanism that minimizes direct hand contact with the rotating blade while maintaining efficient grating performance. Furthermore, the compact structure of the device allows it to be easily used and stored in domestic environments. The fabricated prototype was developed based on the finalized design and evaluated in terms of its grating performance and operational safety. The results indicate that the machine is capable of producing a consistent grating rate while reducing the possibility of coconut breakage during operation. Overall, the developed portable coconut grating machine provides a safer and more practical alternative for household coconut grating activities.

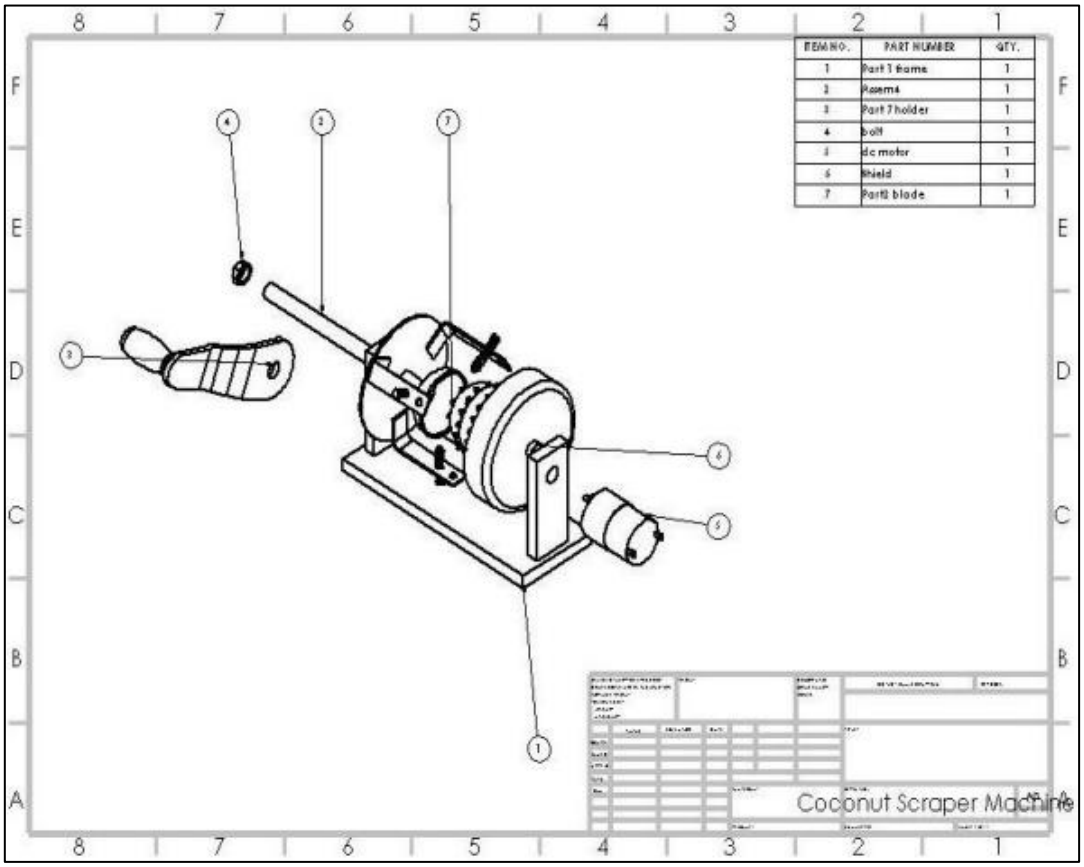
Keywords: *Portable coconut grater, Food processing machine*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 15

Heat-to-Mechanical Power Conversion With Stirling Engines : A Practical Learning Kit

Kim Lysandra Anak Paul Jenvinicco [1] and Zeno Michael [2*]

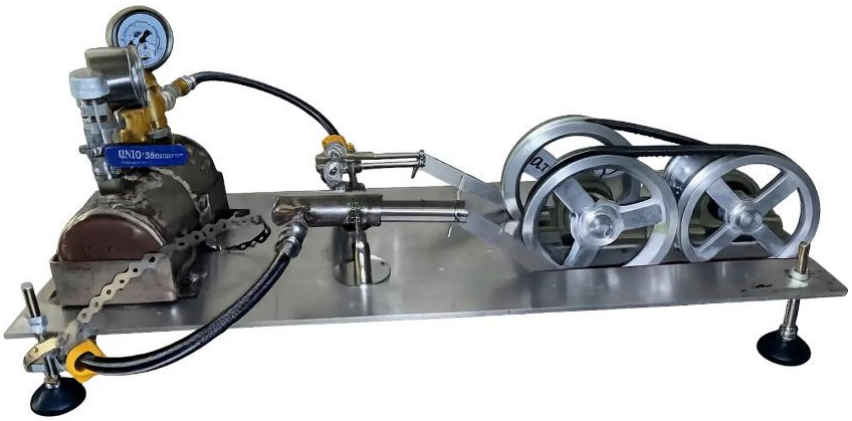
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): zenomichael@uitm.edu.my*

PROJECT DESCRIPTION

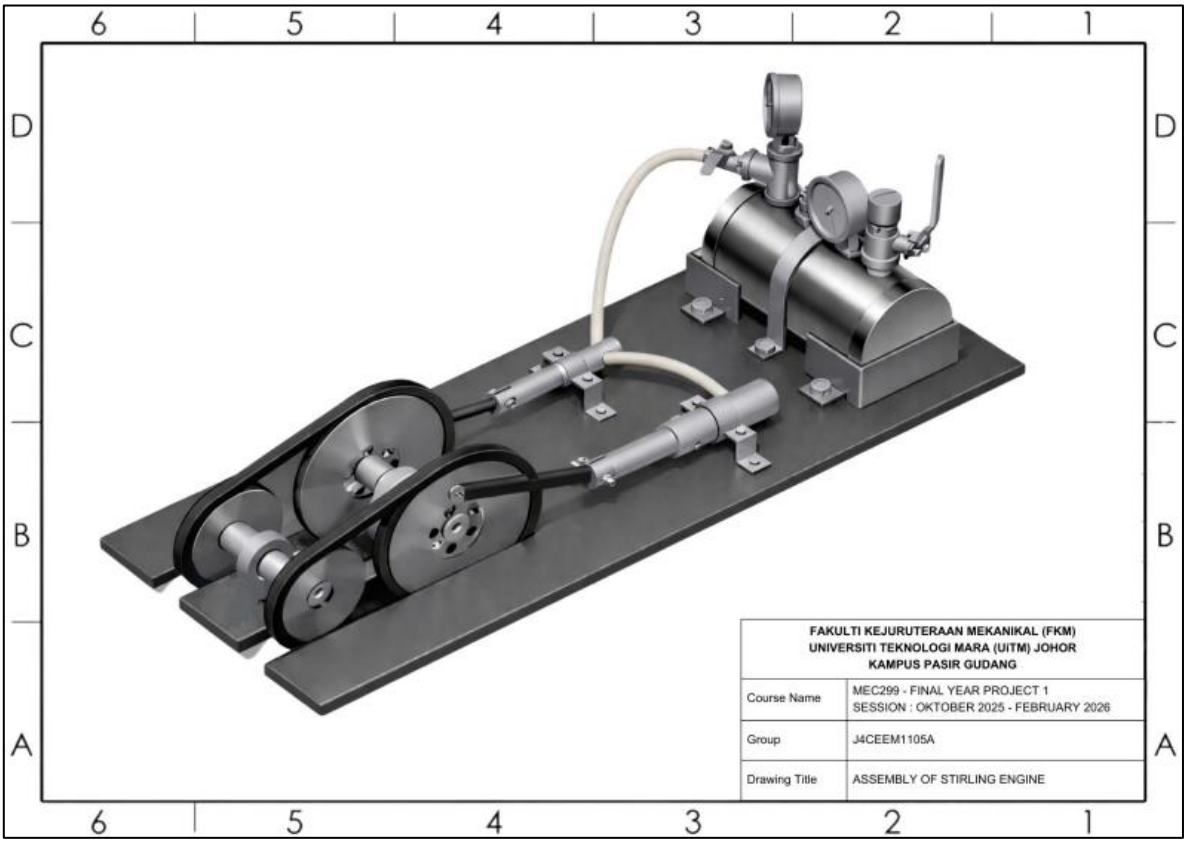
A practical Stirling engine kit is designed to demonstrate the conversion of heat energy into mechanical energy. In this system, water is heated to produce steam, which flows through connecting pipes into the cylinder. The increase in gas pressure pushes the power piston, causing it to move and generate rotational motion in the flywheel. Some Stirling engines previously developed for educational purposes are overly simple, unsafe, or fail to clearly demonstrate the conversion of heat energy into mechanical energy. Furthermore, many Stirling engine kits available on the market are expensive, making it difficult for educational institutions to provide sufficient units for effective learning. In addition, engineering students often struggle to connect theoretical concepts with real-life applications due to limited opportunities for hands-on practice. Therefore, this project focuses on developing a functional Stirling engine kit specifically for educational use. The kit serves as both a learning tool and an instructional aid, enabling students to better understand the principles of thermodynamics and the conversion of thermal energy into mechanical energy. The proposed kit is designed to be affordable, safe, and suitable for teaching purposes in educational institutions.

Keywords: *Stirling engines, Conversion energy*

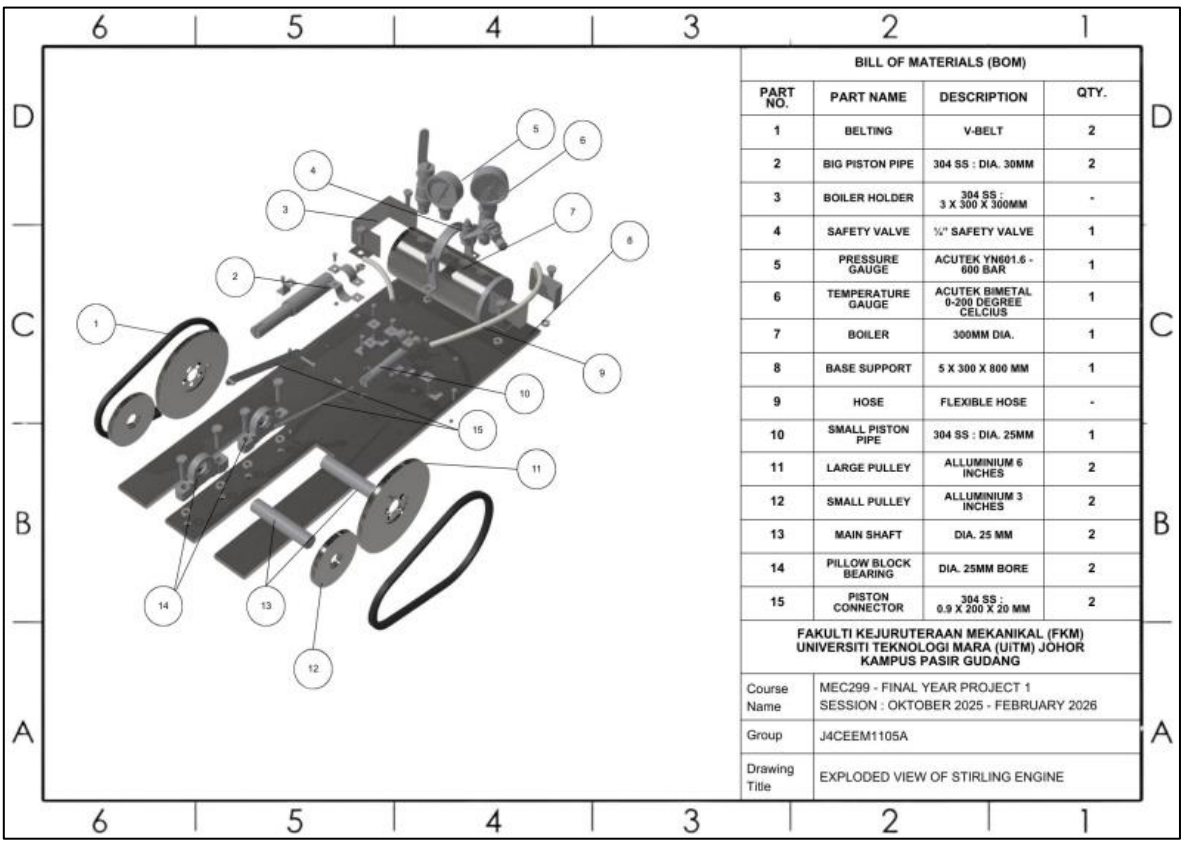
PROTOTYPE



DESIGN PARAMETER



FAKULTI KEJURUTERAAN MEKANIKAL (FKM) UNIVERSITI TEKNOLOGI MARA (UiTM) JOHOR KAMPUS PASIR GUDANG	
Course Name	MEC299 - FINAL YEAR PROJECT 1 SESSION : OKTOBER 2025 - FEBRUARY 2026
Group	J4CEEM1105A
Drawing Title	ASSEMBLY OF STIRLING ENGINE



BILL OF MATERIALS (BOM)

PART NO.	PART NAME	DESCRIPTION	QTY.
1	BELTING	V-BELT	2
2	BIG PISTON PIPE	304 SS : DIA. 30MM	2
3	BOILER HOLDER	304 SS : 3 X 300 X 300MM	-
4	SAFETY VALVE	¼" SAFETY VALVE	1
5	PRESSURE GAUGE	ACUTEK YN601.6 - 600 BAR	1
6	TEMPERATURE GAUGE	ACUTEK BIMETAL 0-200 DEGREE CELCIUS	1
7	BOILER	300MM DIA.	1
8	BASE SUPPORT	5 X 300 X 800 MM	1
9	HOSE	FLEXIBLE HOSE	-
10	SMALL PISTON PIPE	304 SS : DIA. 25MM	1
11	LARGE PULLEY	ALLUMINIUM 6 INCHES	2
12	SMALL PULLEY	ALLUMINIUM 3 INCHES	2
13	MAIN SHAFT	DIA. 25 MM	2
14	PILLOW BLOCK BEARING	DIA. 25MM BORE	2
15	PISTON CONNECTOR	304 SS : 0.9 X 200 X 20 MM	2

FAKULTI KEJURUTERAAN MEKANIKAL (FKM) UNIVERSITI TEKNOLOGI MARA (UiTM) JOHOR KAMPUS PASIR GUDANG	
Course Name	MEC299 - FINAL YEAR PROJECT 1 SESSION : OKTOBER 2025 - FEBRUARY 2026
Group	J4CEEM1105A
Drawing Title	EXPLODED VIEW OF STIRLING ENGINE

CHAPTER 16

Pneumatic Seat Lifter

Anis Sophia Binti Amir-Zaki [1] and Kamariah Binti Md Isa [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): kamariahisa@uitm.edu.my*

PROJECT DESCRIPTION

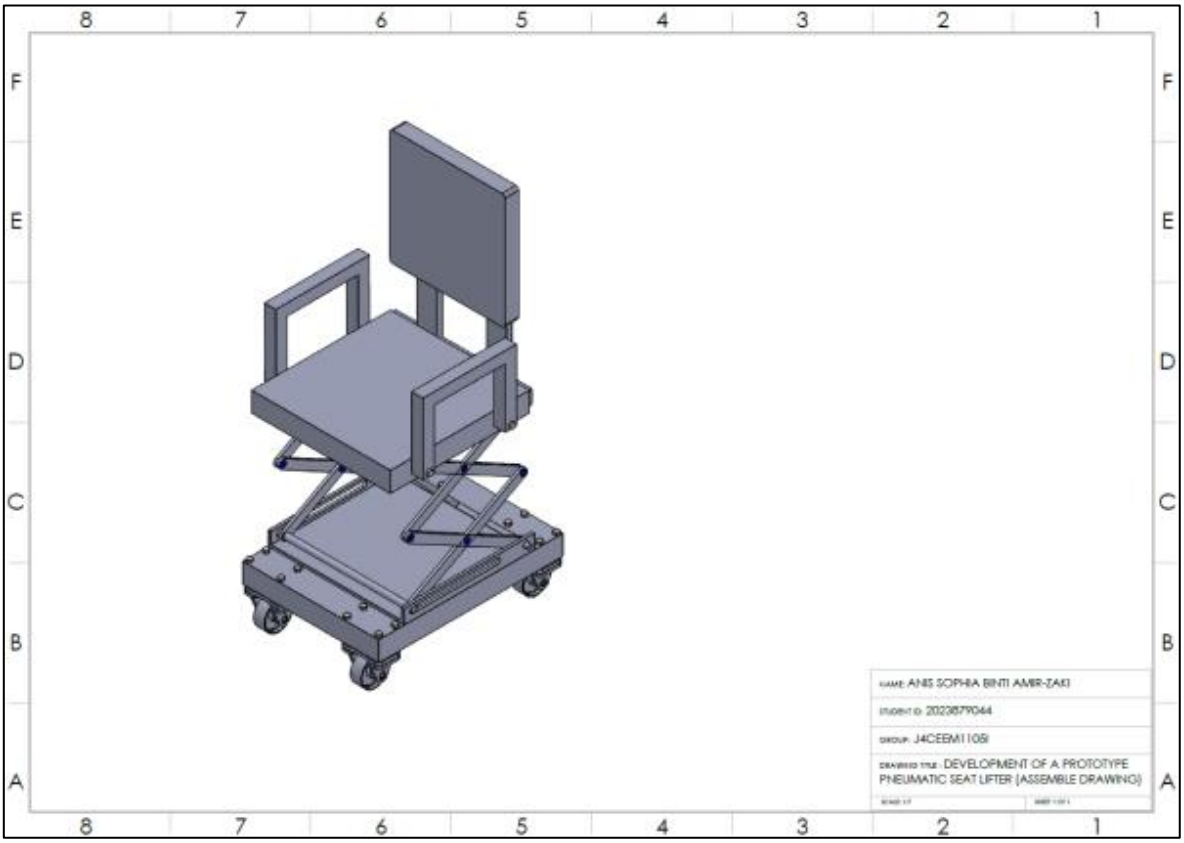
This project presented an adjustable lift wheelchair that used a simple scissor lift mechanism to raise the seat vertically and assist in transferring patients to higher surfaces. The study addressed the lack of lifting capability in standard wheelchairs, which often forced caregivers to perform manual lifting and increased the risk of injury, especially in low-resource settings with limited access to powered lift wheelchairs. A low-cost pneumatic scissor lift design was proposed as a non-electric solution to improve patient handling and reduce caregiver strain. Methodologies used for this project include computational modelling by using SolidWorks, following with fabrication processes such as welding, assembly, fastening, 3D-printing and so on. However, this project is shown through a proof-of-concept scissor cut lift using a syringe system to demonstrate stable and smooth vertical lifting, validating the practicability of the design, although challenges such as installation errors, material strength limitations, and structural instability were encountered.

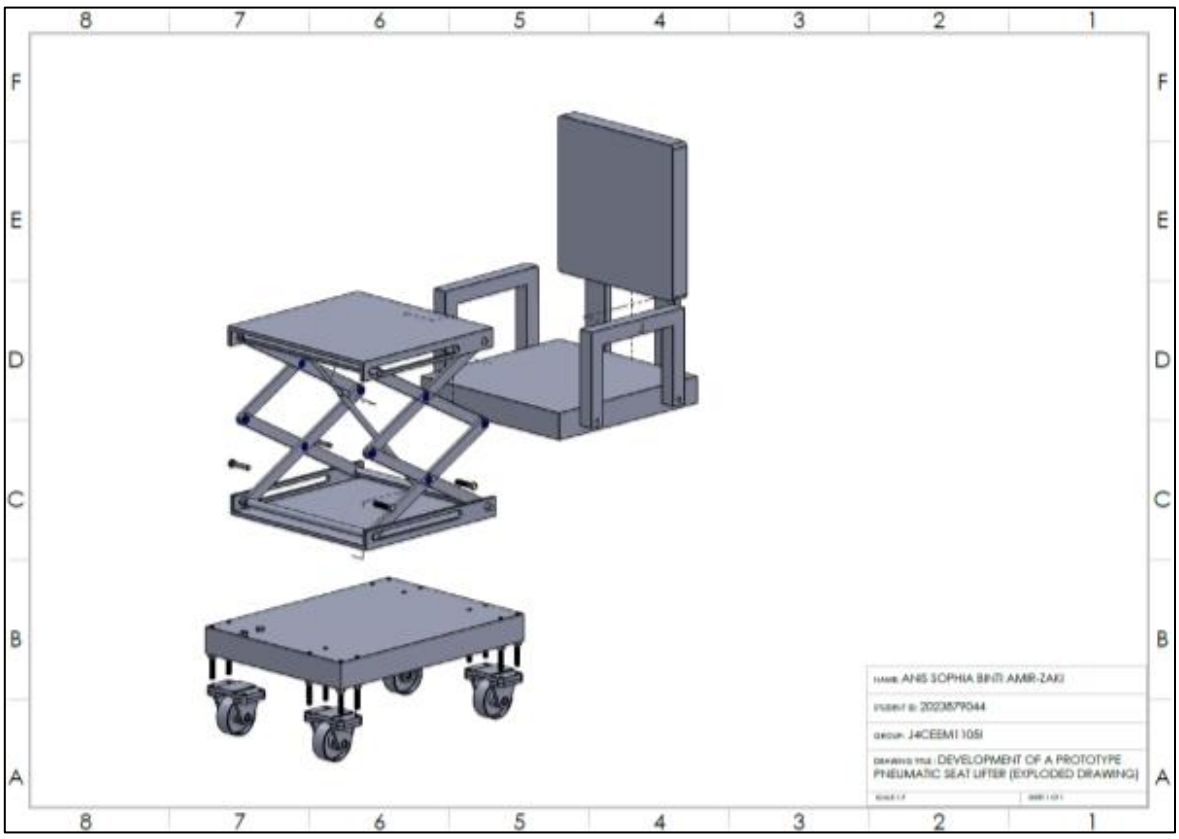
Keywords: *Lift wheelchair, Scissor cut lift*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 17

Automatic Cat Feeding Machine

Arif Mukhriz Bin Maizuazlan [1], Nurul 'Ain Haris [2*] and Adila Nalisa Mohd Roslan [3]

[1,2]Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.
[3]Faculty of Mechanical Engineering, Universiti Teknologi MARA Terengganu Branch, Bukit Besi Campus, 23200 Dungun Terengganu Darul Iman
**Corresponding author (e-mail): nurul6008@uitm.edu.my*

PROJECT DESCRIPTION

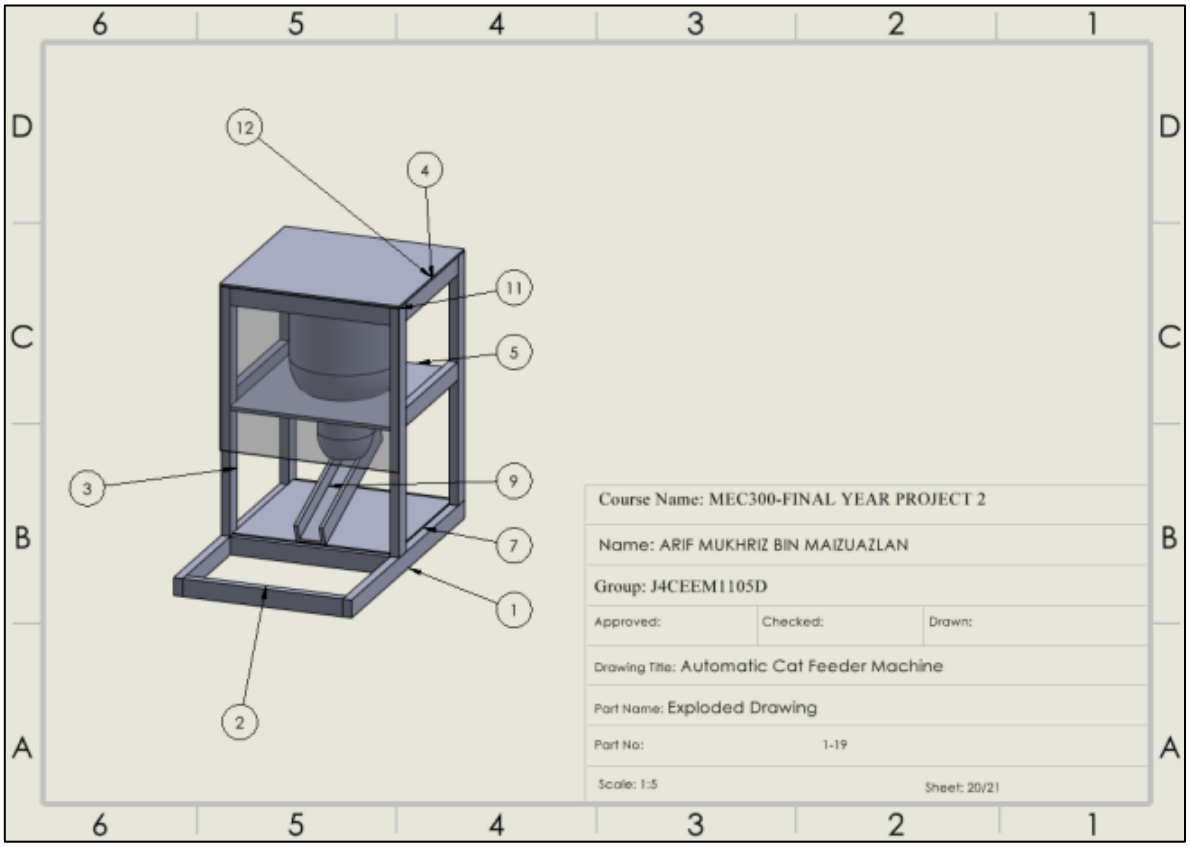
This project was developed to address the challenges faced by busy pet owners who are unable to feed their cats consistently on schedule. Irregular feeding times may lead to food spoilage, contamination, and potential health issues, ultimately compromising the well-being of the pet. The primary objective of this project is to design and develop an automated feeding system capable of dispensing food at predetermined times in a hygienic and controlled manner. The system integrates an Arduino microcontroller, a servo motor, and multiple sensors to regulate food dispensing and detect the presence of the cat. The mechanical structure consists of a food storage container enclosed within a housing fabricated from aluminium composite panel (ACP) and wood, with overall dimensions of approximately 400 mm × 240 mm × 330 mm. To enhance user convenience, the system is connected to a smartphone application that enables remote scheduling, monitoring, and control of feeding operations. This integration allows pet owners to manage feeding routines efficiently, even when away from home. In conclusion, the proposed system offers a practical, hygienic, and time-efficient solution for modern pet owners, contributing to improved pet care management and overall animal health.

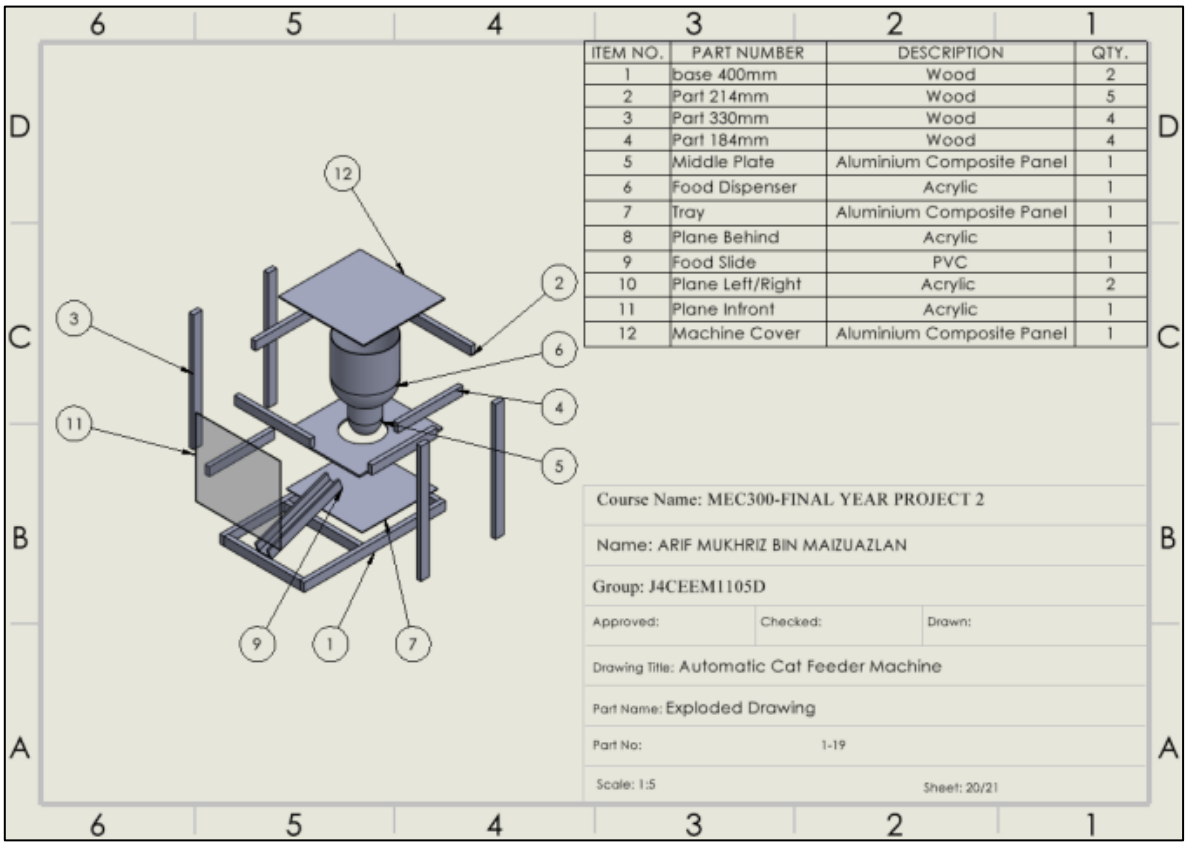
Keywords: *Automatic cat feeding, Pet care*

PROTOTYPE



DESIGN PARAMETER





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	base 400mm	Wood	2
2	Part 214mm	Wood	5
3	Part 330mm	Wood	4
4	Part 184mm	Wood	4
5	Middle Plate	Aluminium Composite Panel	1
6	Food Dispenser	Acrylic	1
7	Tray	Aluminium Composite Panel	1
8	Plane Behind	Acrylic	1
9	Food Slide	PVC	1
10	Plane Left/Right	Acrylic	2
11	Plane Infront	Acrylic	1
12	Machine Cover	Aluminium Composite Panel	1

eISBN: 978-967-0033-74-7

CHAPTER 18

Low-Cost Automated Footwear Cleaning System for Improving Indoor Hygiene

Nazsrul Daniel Zainal [1] and Mazleenda Mazni [2*]

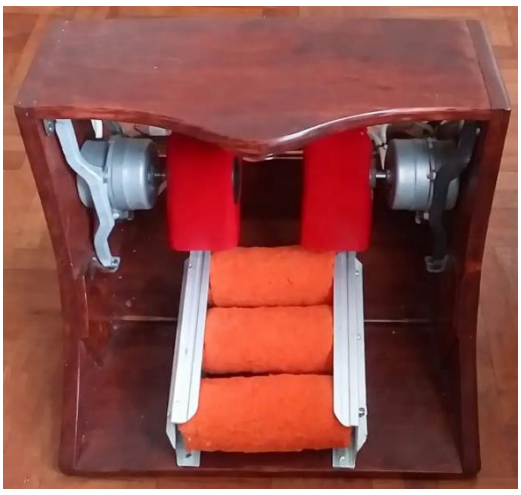
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): mazleenda@uitm.edu.my*

PROJECT DESCRIPTION

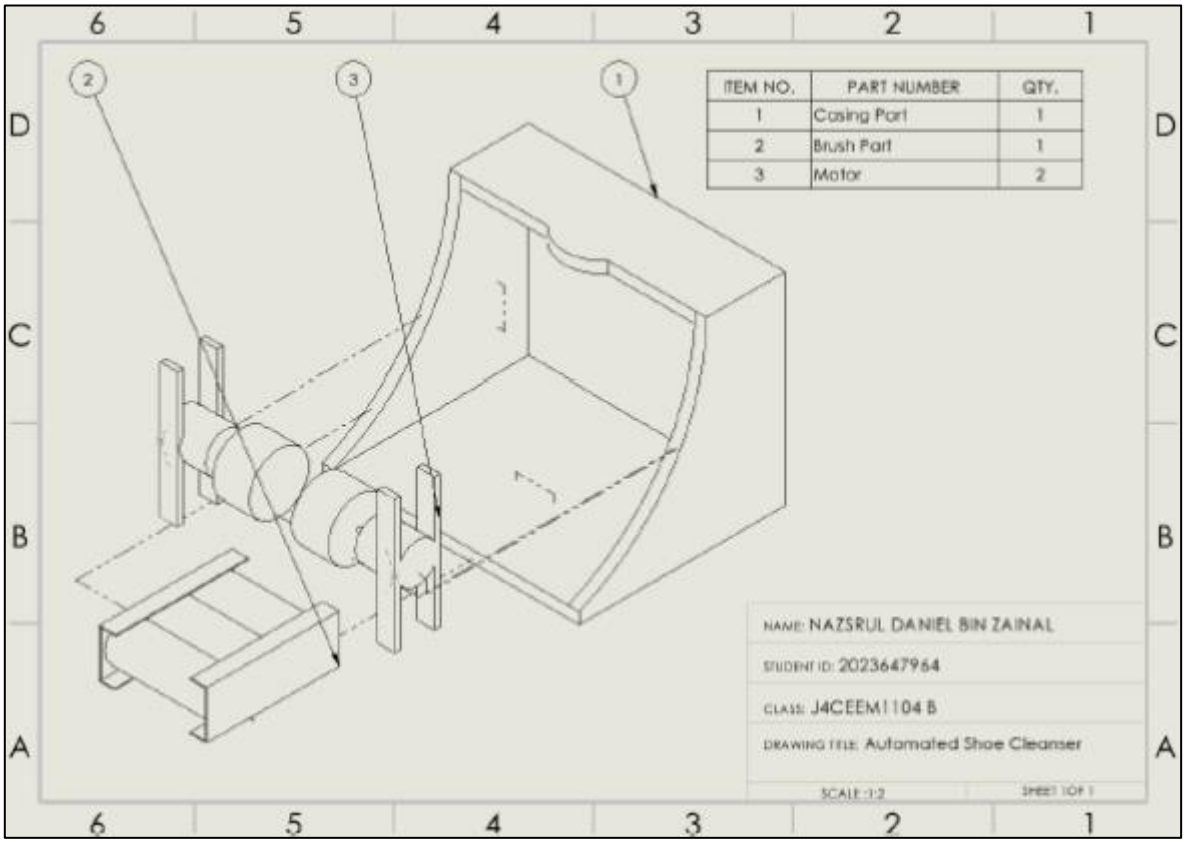
The increasing need for improved hygiene at building entry points has driven the development of compact and automated cleaning devices for footwear decontamination. This project focuses on the design and fabrication of a low-cost automated shoe cleaning system intended for high-traffic indoor environments such as laboratories, clinics, offices, and educational facilities. The proposed system integrates mechanical brushing mechanisms and automated activation to remove dirt and surface contaminants from footwear soles before entry into controlled spaces. The design process involved 3D modelling, material selection, and fabrication using readily available components to achieve a durable yet cost-effective structure. Basic engineering analysis was conducted to evaluate structural stability, load-bearing capability, and operational reliability under repeated use. Experimental evaluation showed that the system is capable of removing surface debris effectively during short cleaning cycles and maintaining stable operation. However, further improvements in brush durability, splash protection, and enclosure design are recommended to enhance long-term performance and user safety. This project demonstrates the feasibility of developing an automated footwear cleaning device as a practical and affordable solution for improving indoor hygiene in high-traffic areas.

Keywords: *Automated footwear cleaning, Entryway hygiene*

PROTOTYPE



DESIGN PARAMETER



CHAPTER 19

Eco Waste: Prototype of a Recycled Bottle Keychain Machine

Nuraliyah Binti Mohd Shaili [1] and Ahmad Najmie Rusli [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): ahmad7586@uitm.edu.my*

PROJECT DESCRIPTION

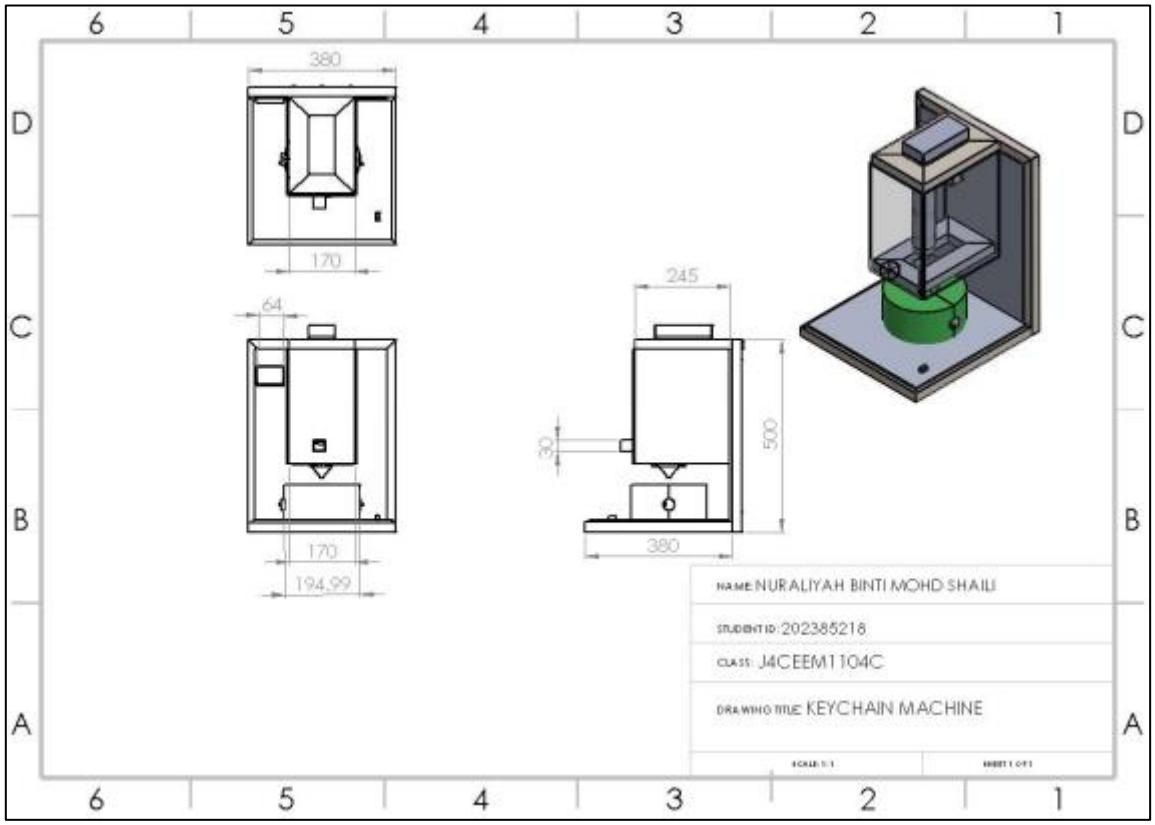
Plastic waste, particularly discarded polyethylene terephthalate (PET) bottles, poses a significant environmental challenge. This project aims to develop a small-scale machine designed to transform recycled PET plastic into useful keychains. The project involves designing the machine using SolidWorks, conducting structural analysis and fabricating a functional prototype. The machine consists of a mild steel frame, a heating element, an aluminium mould and a 12 V electric linear actuator. Its operating process involves heating prepared PET plastic filament and using the linear actuator to push the softened material into the mould, where it cools and solidifies into the desired shape. Finite element analysis (FEA) was conducted to evaluate the structural integrity of the prototype. The completed prototype demonstrates the potential to convert plastic waste into value-added products while promoting recycling awareness and sustainable manufacturing. It may also support educational activities and small-scale entrepreneurship.

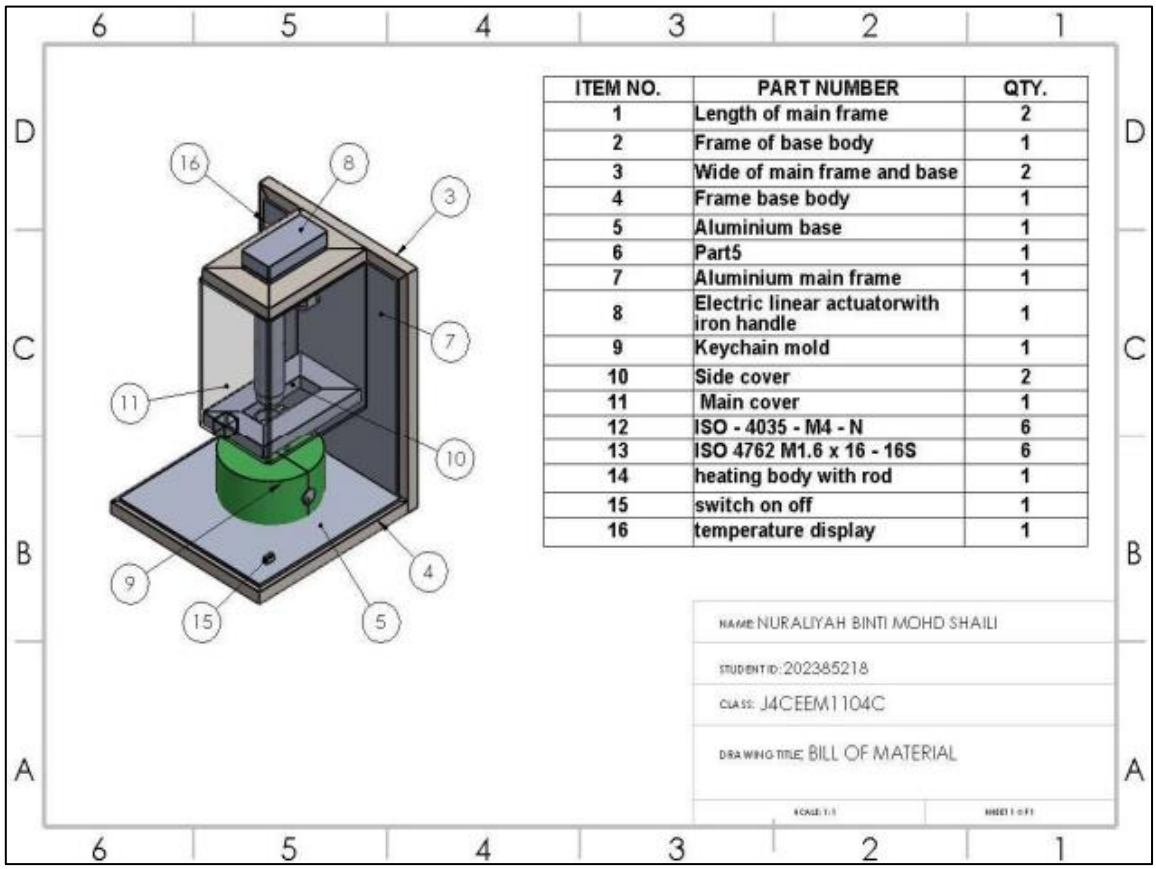
Keywords: *PET recycling, Keychain machine*

PROTOTYPE



DESIGN PARAMETER





ITEM NO.	PART NUMBER	QTY.
1	Length of main frame	2
2	Frame of base body	1
3	Wide of main frame and base	2
4	Frame base body	1
5	Aluminium base	1
6	Part5	1
7	Aluminium main frame	1
8	Electric linear actuatorwith iron handle	1
9	Keychain mold	1
10	Side cover	2
11	Main cover	1
12	ISO - 4035 - M4 - N	6
13	ISO 4762 M1.6 x 16 - 16S	6
14	heating body with rod	1
15	switch on off	1
16	temperature display	1

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CHAPTER 20

Prototype of a Smart Dimension Scanner

Muhammad Nazhan Bin Nazri [1] and Ahmad Najmie Rusli [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): ahmad7586@uitm.edu.my*

PROJECT DESCRIPTION

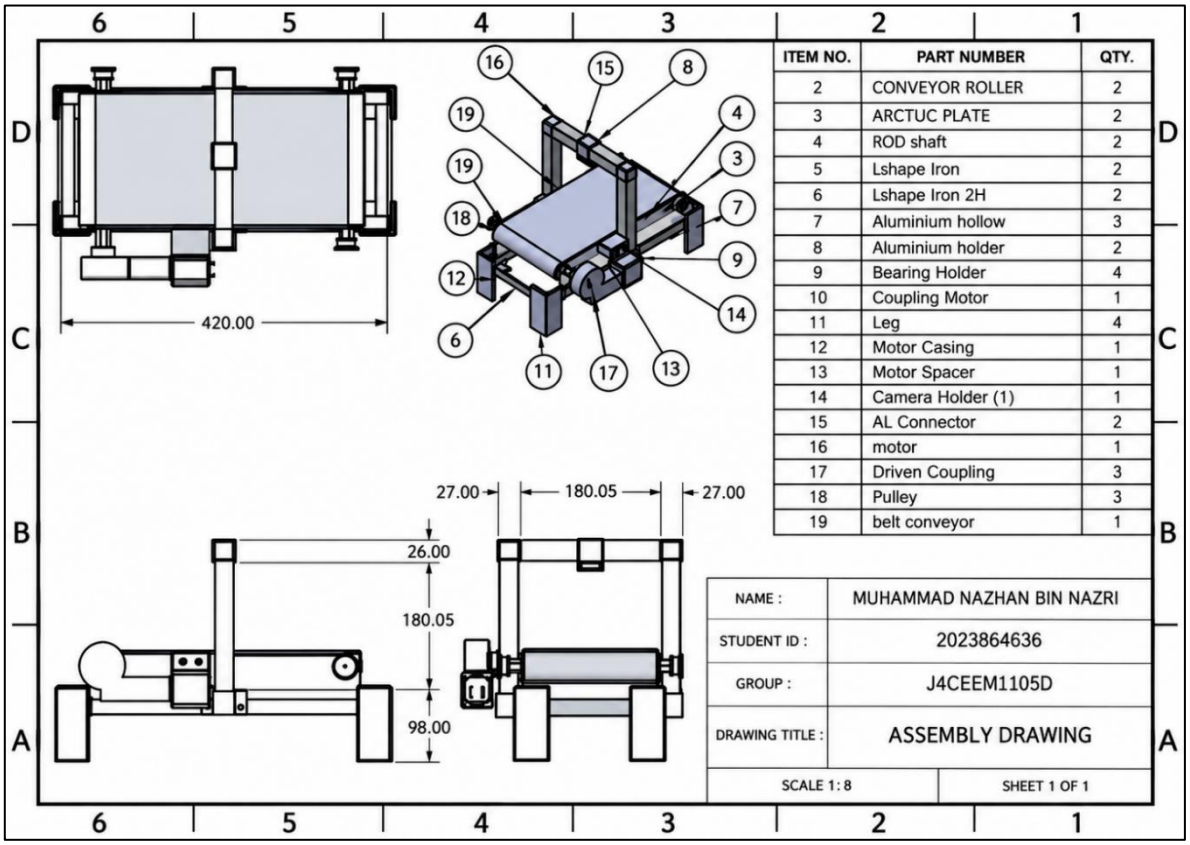
Conventional methods of measuring object dimensions often require considerable time and manual effort, increasing the risk of human error and inconsistent measurements. This project aims to design and fabricate a Smart Dimension Scanner that automates the measurement of objects using computer vision technology. The machine was designed using SolidWorks and fabricated as a proof of concept. The prototype consists of a conveyor system driven by a 30 RPM DC motor, a camera, and a Raspberry Pi 4B for image processing and dimension calculation. During operation, objects are transported along the conveyor while the camera captures their images. The Raspberry Pi processes the images and displays the measured dimensions on a screen in centimetres. The prototype was fabricated using steel, acrylic, and aluminium components, with selected parts produced through 3D printing. The completed prototype demonstrates the feasibility of automated. However, the current system is limited to rectangular and square objects and cannot measure thickness. Further improvements in camera calibration, image processing, and object-size capability are recommended to enhance measurement accuracy and expand its applications.

Keywords: *Smart dimension scanner, Automated measurement*

PROTOTYPE

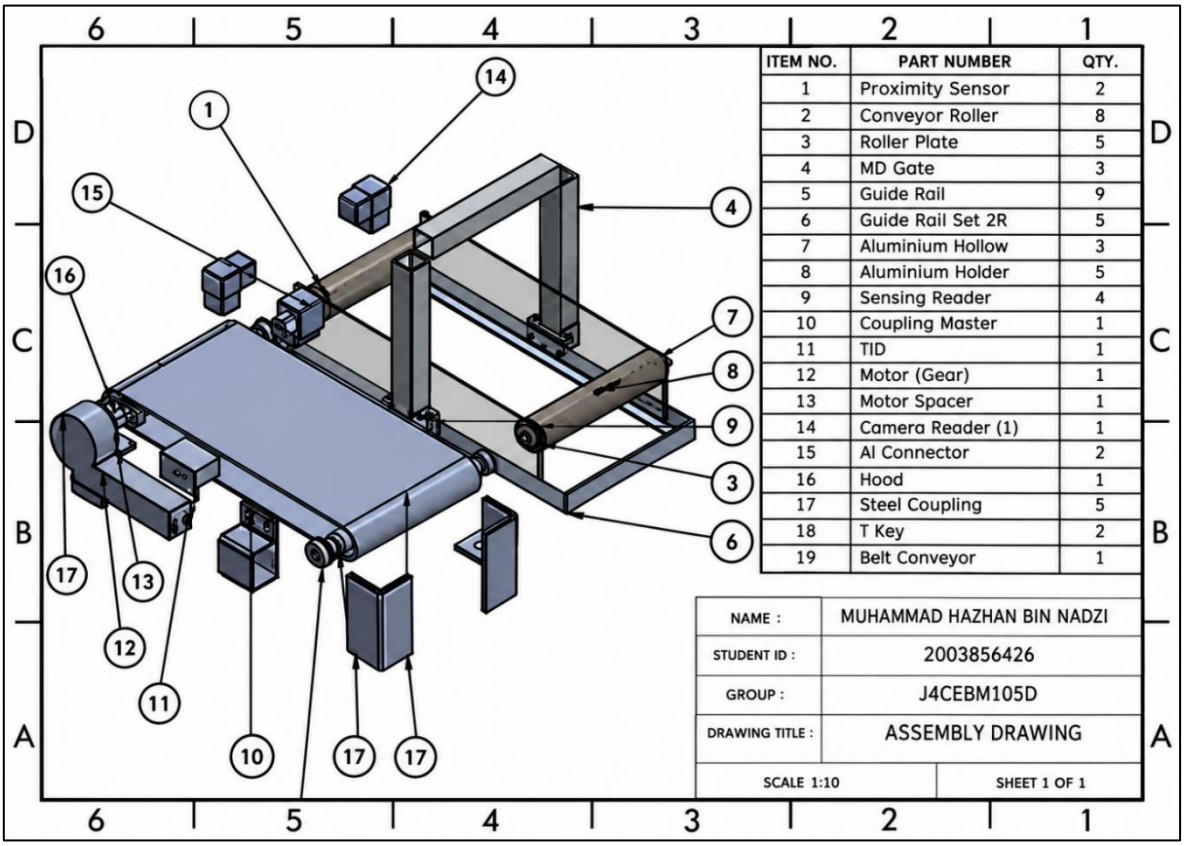


DESIGN PARAMETER



ITEM NO.	PART NUMBER	QTY.
2	CONVEYOR ROLLER	2
3	ARCTUC PLATE	2
4	ROD shaft	2
5	Lshape Iron	2
6	Lshape Iron 2H	2
7	Aluminium hollow	3
8	Aluminium holder	2
9	Bearing Holder	4
10	Coupling Motor	1
11	Leg	4
12	Motor Casing	1
13	Motor Spacer	1
14	Camera Holder (1)	1
15	AL Connector	2
16	motor	1
17	Driven Coupling	3
18	Pulley	3
19	belt conveyor	1

NAME :	MUHAMMAD NAZHAN BIN NAZRI
STUDENT ID :	2023864636
GROUP :	J4CEEM1105D
DRAWING TITLE :	ASSEMBLY DRAWING
SCALE 1:8	SHEET 1 OF 1



ITEM NO.	PART NUMBER	QTY.
1	Proximity Sensor	2
2	Conveyor Roller	8
3	Roller Plate	5
4	MD Gate	3
5	Guide Rail	9
6	Guide Rail Set 2R	5
7	Aluminium Hollow	3
8	Aluminium Holder	5
9	Sensing Reader	4
10	Coupling Master	1
11	TID	1
12	Motor (Gear)	1
13	Motor Spacer	1
14	Camera Reader (1)	1
15	Al Connector	2
16	Hood	1
17	Steel Coupling	5
18	T Key	2
19	Belt Conveyor	1

NAME :	MUHAMMAD HAZHAN BIN NADZI
STUDENT ID :	2003856426
GROUP :	J4CEBM105D
DRAWING TITLE :	ASSEMBLY DRAWING
SCALE 1:10	SHEET 1 OF 1

CHAPTER 21

Design and Fabrication of Mini Sanding Machine for Educational Purpose

Aiman Zafran Dzulbaharin [1], Nurul Hanna Mas'aud [2*] and Norjasween Abdul Malik [3]

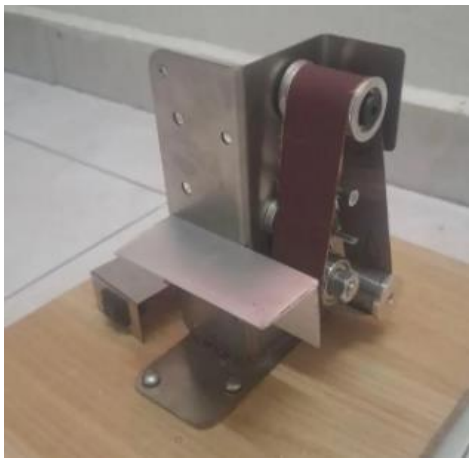
[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): nurul989@uitm.edu.my*

PROJECT DESCRIPTION

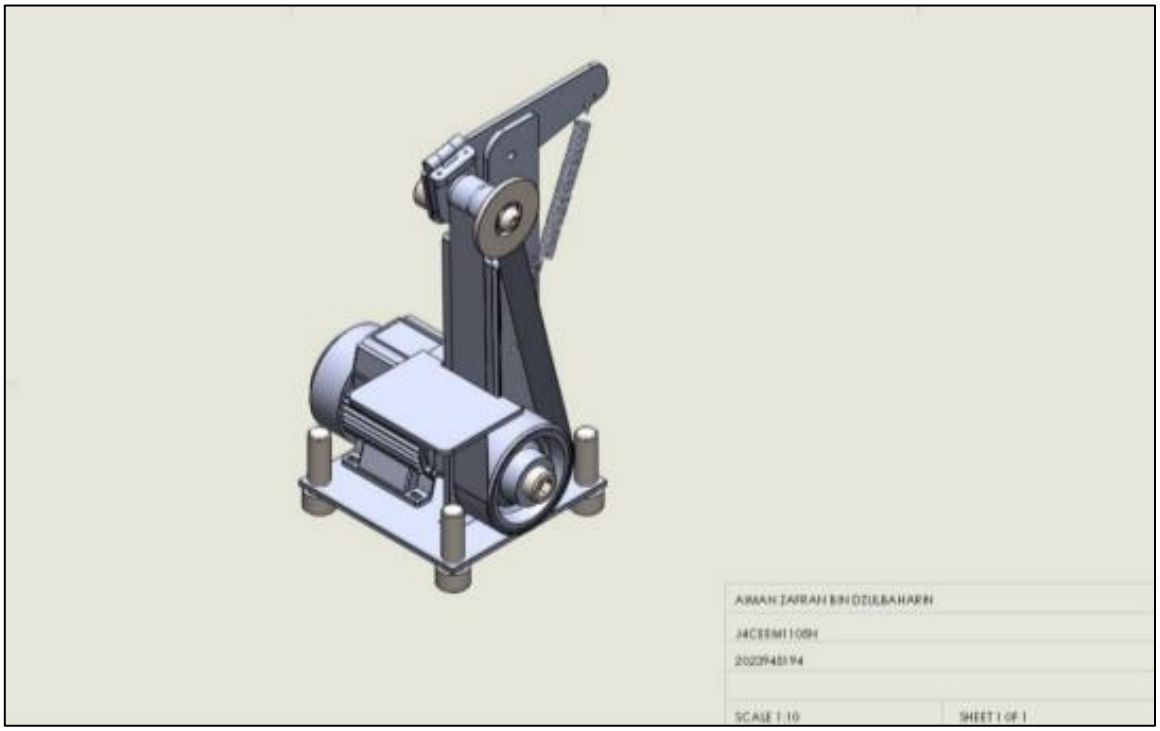
Sanding is a fundamental process in woodworking and metalworking for achieving smooth surface for finishing process. However, practical hands on to sanding operations in teaching and learning process are limited. It is due to large scale and operational complex. The main objective of this study is to design a mini sanding machine for educational purposes, which offer low-cost, portable motorized sanding machine, as well as to provide a safe, compact, and accessible alternative that enables students to explore more and gain practical experience prior to operating full-scale industrial equipment. A structured design methodology was conducted, including problem identification, concept generation using morphological chart, and design selection using pugh chart. Next, proceed with conceptual modelling using solidwork, material selection, and finally fabrication process. The fabrication process was conducted through conventional workshop processes cush as cutting, drilling, welding and mechanical assembly. The complete prototype was evaluated for functional performance, operational stability, and safety compliance within a laboratory setting. Result found that the developed mini sanding machine satisfied essential operational requirements while maintaining affordability and user safety. Its integration into classroom activities is expected to enhance experiential learning, improve technical competency, reduce the risk of injury associated with early exposure to industrial-scale machinery, and build student confidence in machining processes.

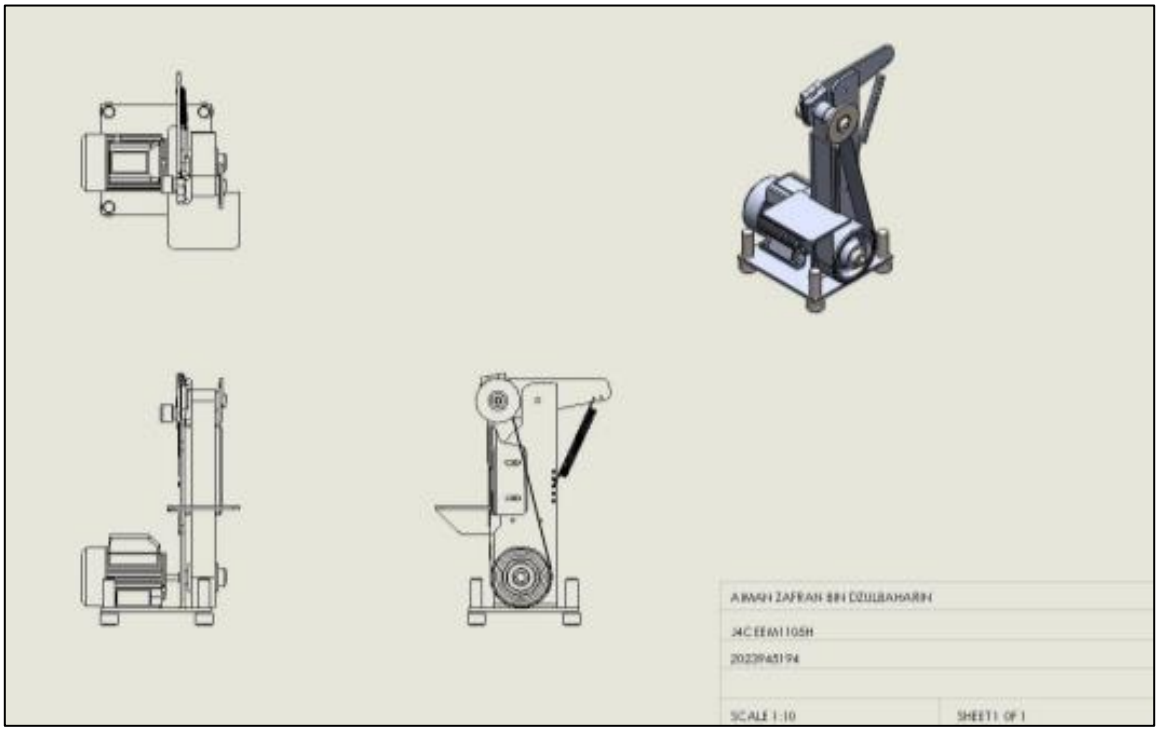
Keywords: *Mini sanding machine, Sanding process*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 22

Design and Fabrication of Automated Rotating Storage Platform for Kitchenware Access

Dania Syafiah Binti Yahya [1], Liyana Binti Roslan [2*] and Nurul Hanna Mas'aud [3]

[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): liyana0075@uitm.edu.my*

PROJECT DESCRIPTION

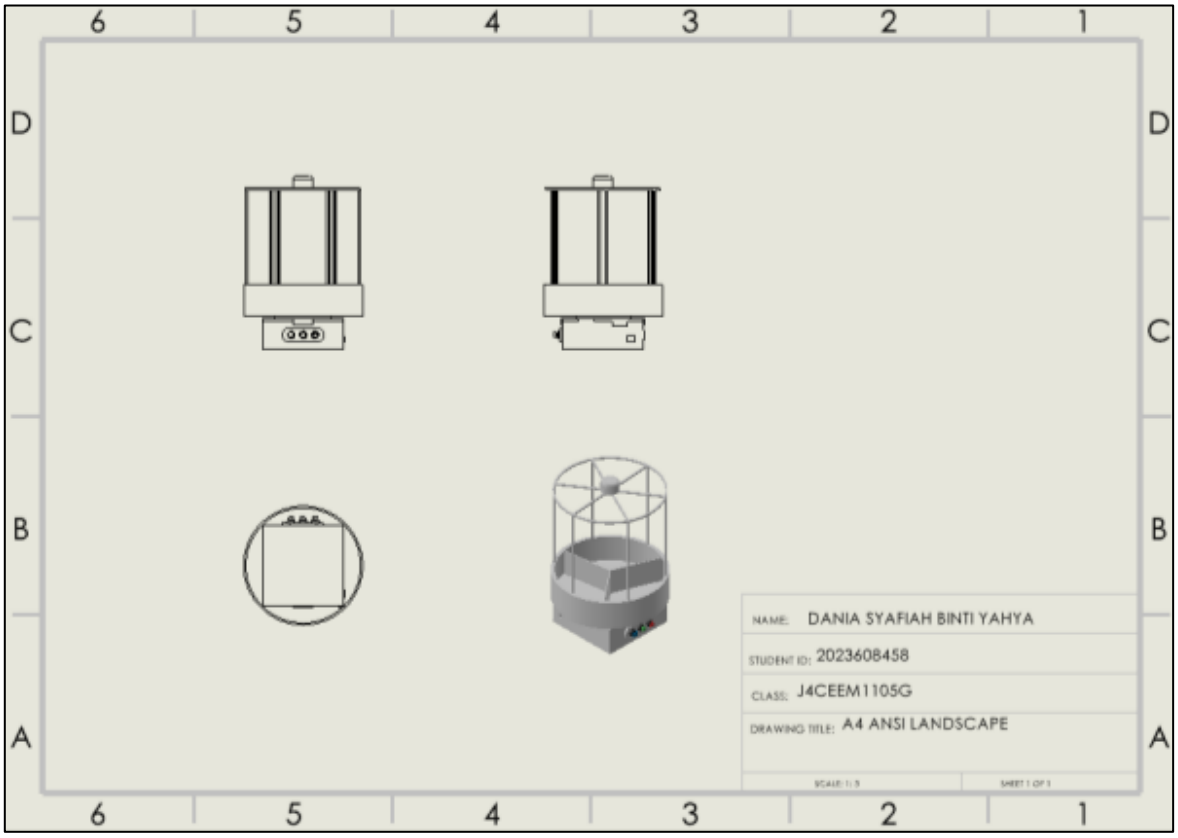
This project addresses the challenge of limited accessibility in conventional kitchen storage systems, especially for items located at the back of cabinets. An automated rotating storage platform was created to improve convenience and accessability, particularly for elderly users and individuals with limited mobility who face difficulty reaching stored kitchenware. This prototype has a circular acrylic tray with a diameter of 290 mm, comprising three compartments that are designed to rotate automatically to predefined positions at 120° intervals. The system integrates a NEMA 17 stepper motor controlled by an Arduino Nano microprocessor, with user interaction facilitated through three uniquely designed push buttons for seamless operation. A Hall effect sensor utilizing neodymium magnets provides precise positional feedback, ensuring correct alignment at every stop. The rotating mechanism is facilitated by a turntable bearing positioned beneath the acrylic platform, allowing for seamless rotation with reduced friction. The fabrication process involved the creation of laser-cut acrylic components for the structural elements, alongside 3D-printed PLA parts designated for custom fixtures such as the motor shaft coupler and button housings. The engineering analysis conducted through SolidWorks simulation validated the structural integrity under load, revealing a maximum von Mises stress of 98.46 MPa, which is significantly lower than the material yield strength, alongside a minimal deflection of 0.89 mm. The evaluation confirmed the capability of the prototype to sustain loads of up to 3 kg while maintaining rotation accuracy.

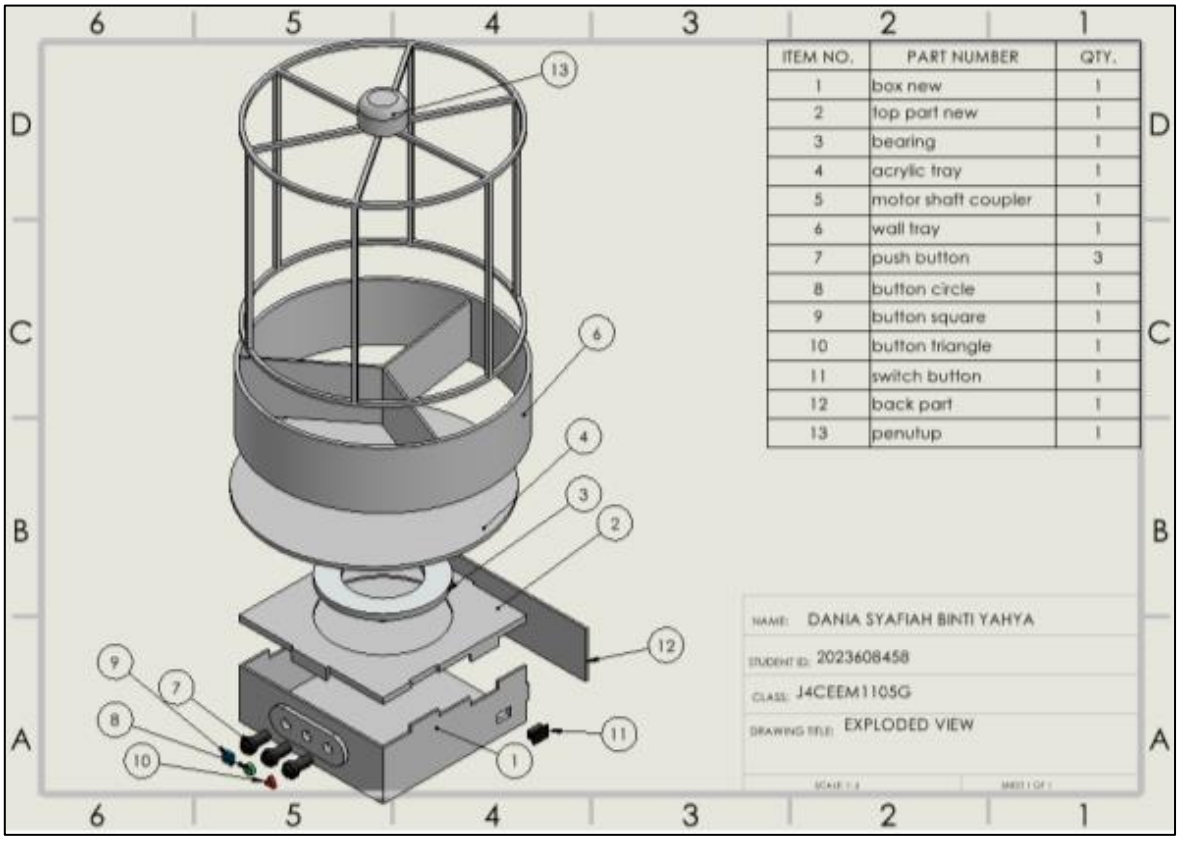
Keywords: *Automated storage, Rotating platform*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 23

Development of a Prototype Ferris Wheel Workshop Organizer

Muhammad Aqil Bin Zulkarnain [1], Liyana Binti Roslan [2*] and Norjasween Abdul Malik [3]

[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): liyana0075@uitm.edu.my*

PROJECT DESCRIPTION

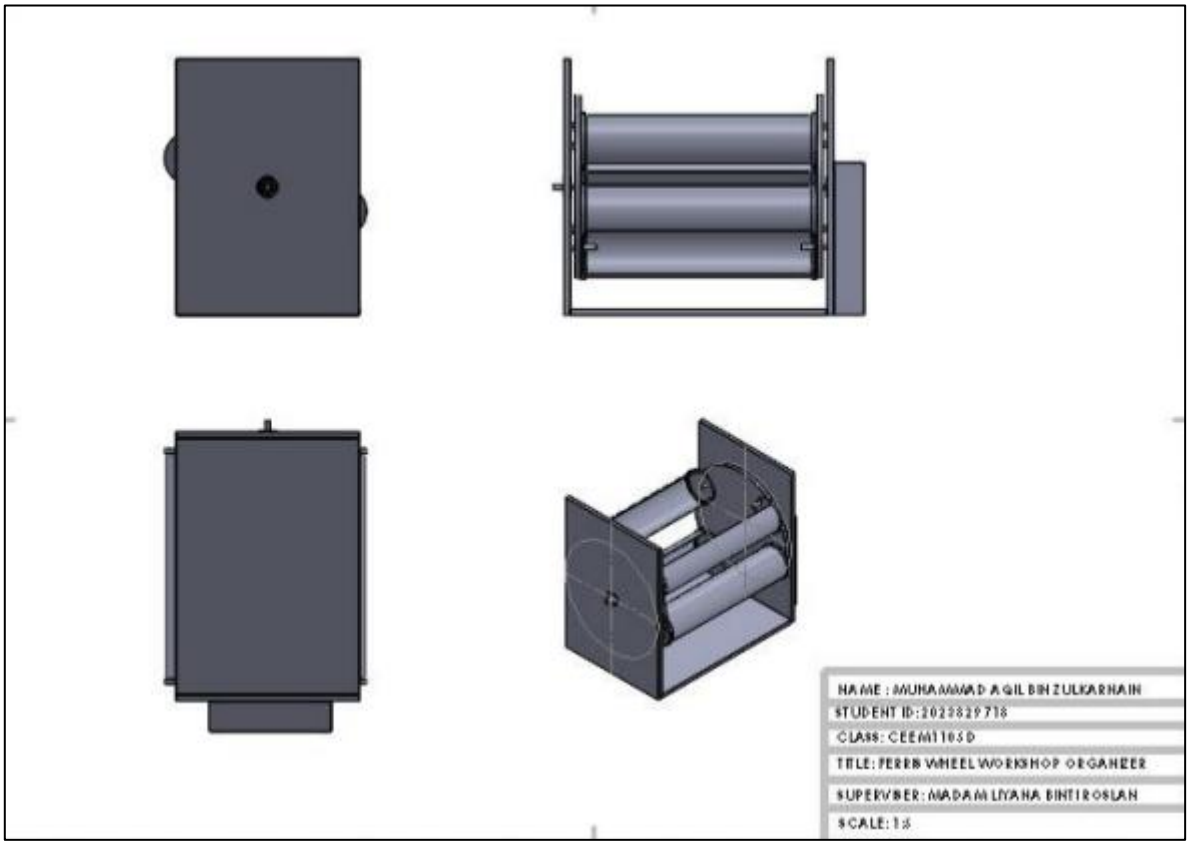
Workshop environment require effective storage to maintain organization and accessability of tools and components. Conventional stationary racks occupy excessive floor space and demonstrate insufficient flexibility for limited workspaces. This project presents an innovative Ferris wheel workshop organizer, a compact and motorized rotary storage prototype aimed at maximizing space efficiency and improving tools accessability in workshop setting. The methodology encompassed conceptual design, detailed 3D model using SolidWorks, careful material selection, engineering calculations, and structured prototype fabrication. The structural evaluation including torque, power, and stress computations confirmed the integrity of the design and its operational safety. The prototype utilizes acrylic sheets for the frame structure, PVC pipes for storage compartments, a steel shaft for structural support, precision bearings, and 24V DC motor that facilitates automatic rotation. Performance testing demonstrated smooth rotation when subjected to a maximum load of 8 kg, with power requirements estimated around 50.94 watt. Stress analysis confirmed that the shaft operates within acceptable operational limit when subjected to applied loads. This prototype offers a compact and effective storage alternative for small-scale workshops and home users. Future improvements including variable speed control, position locking mechanisms, emergency stop feature, and protective safety enclosures that would significantly improve its functionality and safety.

Keywords: *Rotary storage, Workshop organization*

PROTOTYPE



DESIGN PARAMETER



CHAPTER 24

Design and Fabrication of a Motorized Hacksaw Machine

Ammar Anaqqy Bin Mohd Zakky [1], Norjasween Abdul Malik [2*] and Mazleenda Mazni [3]

[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): norjasween@uitm.edu.my*

PROJECT DESCRIPTION

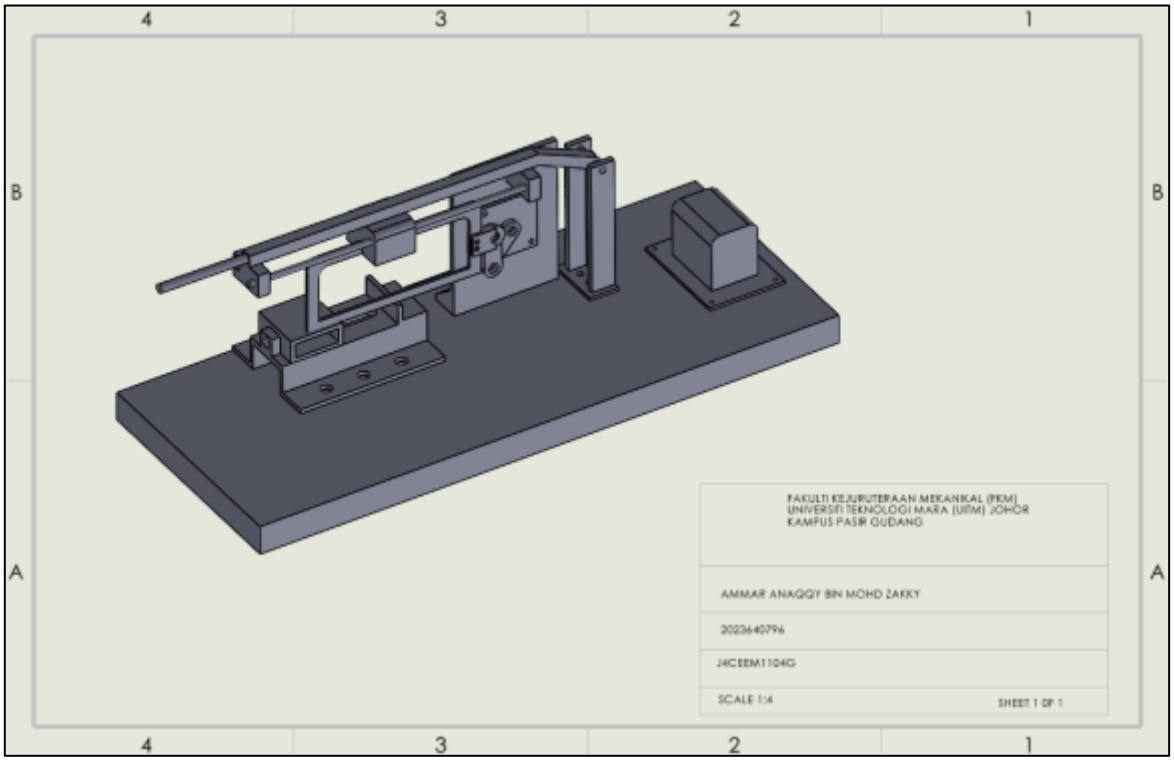
Manual cutting using a conventional hacksaw requires significant time, physical effort, and often results in inconsistent cutting accuracy. Normally, small-scale workshops often face productivity limitations due to the inefficiency of traditional cutting methods. The objectives of this study are to design a functional model of a motorized hacksaw using SolidWorks and to fabricate the motorized hacksaw based on the finalized design. This project presents the design, analysis, and fabrication of a low-cost motorized hacksaw machine that converts rotary motion into reciprocating motion through a crank and chain mechanism. The manufacturing process involved material selection, cutting, drilling, welding, machining, and assembly of key components including the motor mount, sprocket and chain system, crank mechanism, frame structure, and workpiece holding base. The fabricated system enables automatic back-and-forth blade movement, reducing operator fatigue while improving cutting precision and stability. Experimental testing demonstrates a noticeable reduction in cutting time compared to manual operation, along with improved cut consistency and reduced material wastage. Experimental testing showed that this machine reduced cutting time from approximately 5 minutes from manual cutting to 2 minutes per workpiece, representing a 60% improvement in productivity.

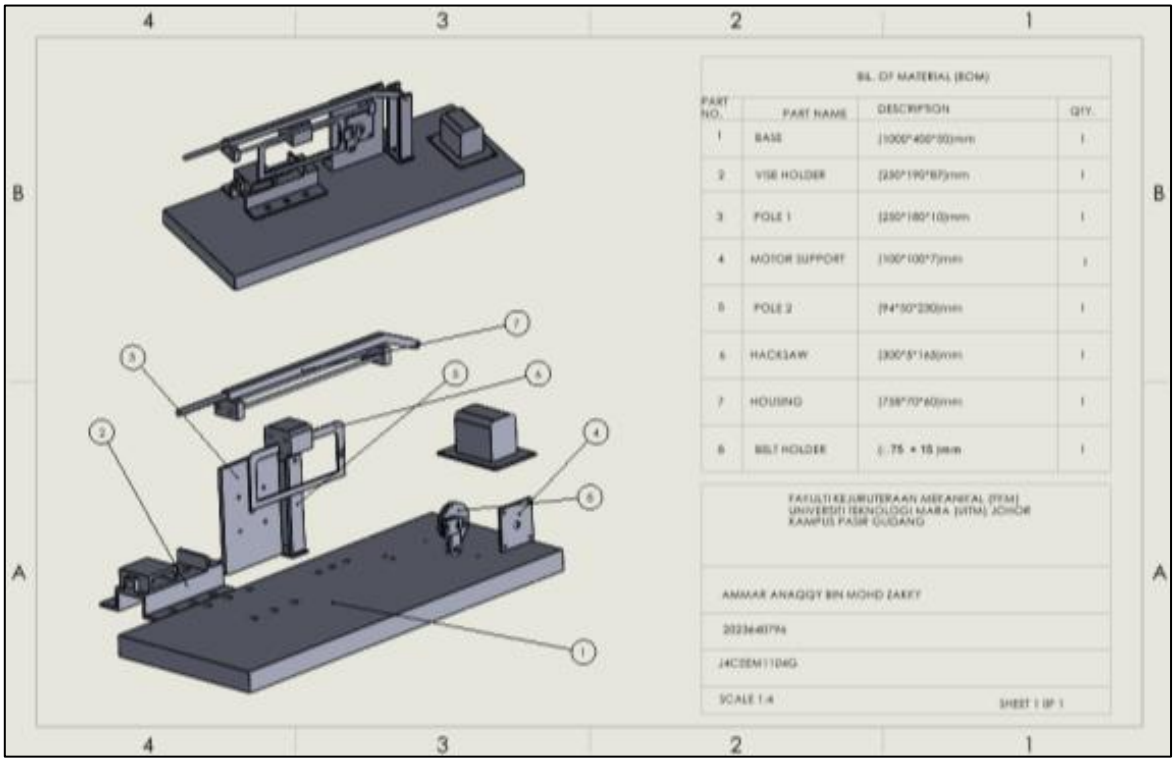
Keywords: *Motorized hacksaw, Crank and chain mechanism*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 25

Development of a Prototype Motorized Pineapple Peeling Machine for Small Scale Food Processing

Muhammad Haziq Bin Hamdan [1], Norjasween Abdul Malik [2*] and Liyana Binti Roslan [3]

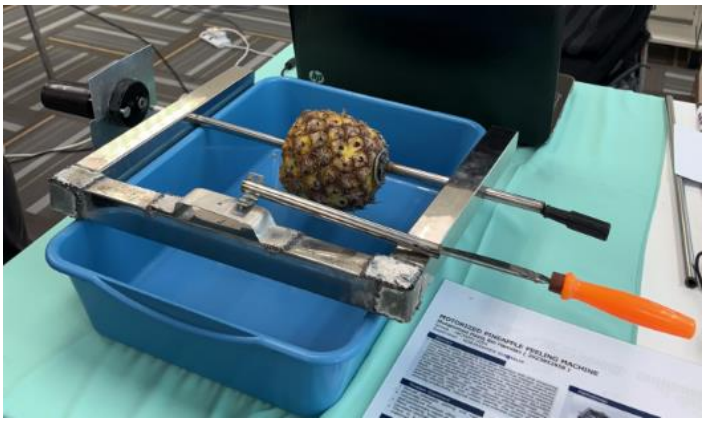
[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): norjasween@uitm.edu.my*

PROJECT DESCRIPTION

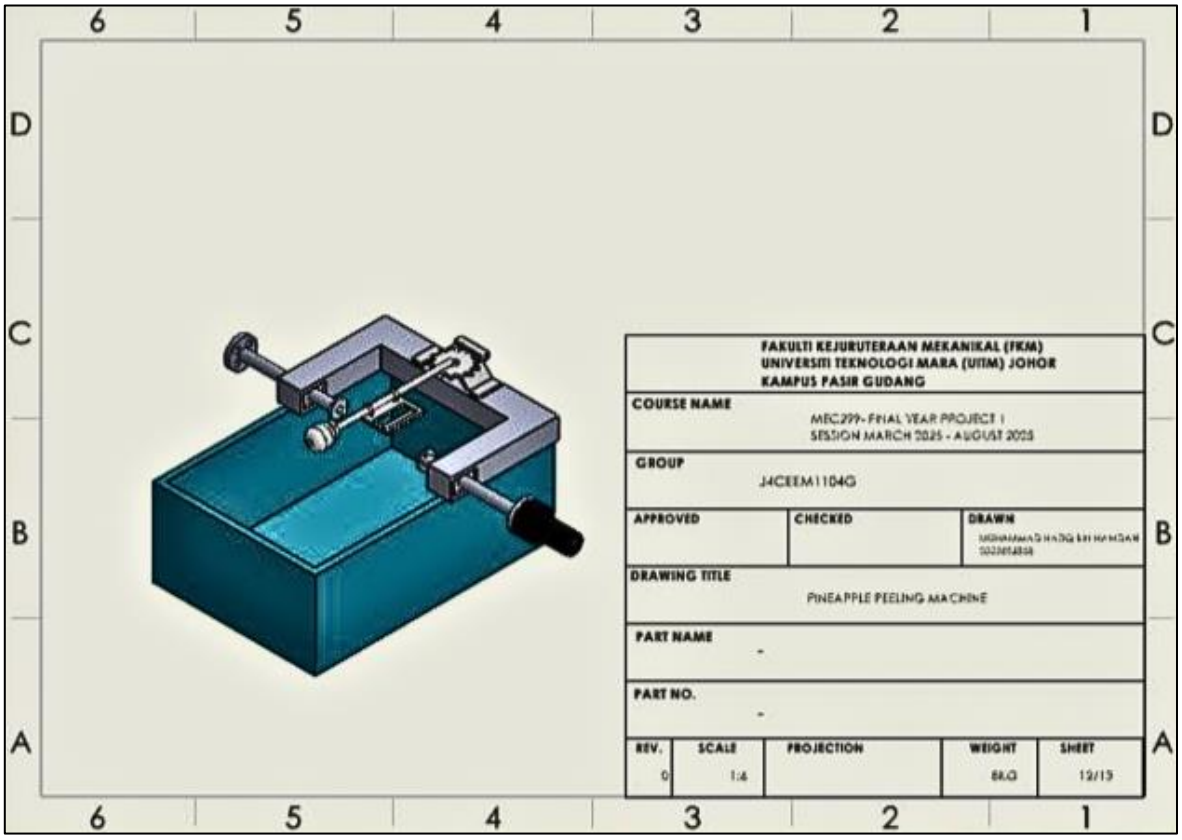
Pineapple is one of the most commonly tropical fruits in Malaysia, with significant demand from small-scale fruit vendors and local food enterprises. However, manual peeling remains a labor intensive and time-consuming process and often results in uneven peeling, fruit wastage, and safety risks. Thus, all the posing challenges for small and medium sized fruit vendors and local enterprises. The objectives of this project are to design and fabricate a prototype of motorized pineapple peeling machine with simple mechanical components. The machine operates by clamping the pineapple with a spike and rotating it using a slow speed electric motor, while a fixed or hand guided adjustable blade removes the skin evenly so that it will minimizing wastage. The mechanical design of the machine was developed using SolidWorks computer-aided design (CAD) software. Fabrication process involved the assembly of basic mechanical components, including a frame, clamping mechanism, rotating shaft, and adjustable peeling blade. The prototype was successfully fabricated based on the proposed design, followed by experimental testing to evaluate its performance. Experimental testing showed that the proposed motorized peeling machine reduced the peeling time to approximately 1.5 minutes per fruit, demonstrating improved efficiency compared to manual methods.

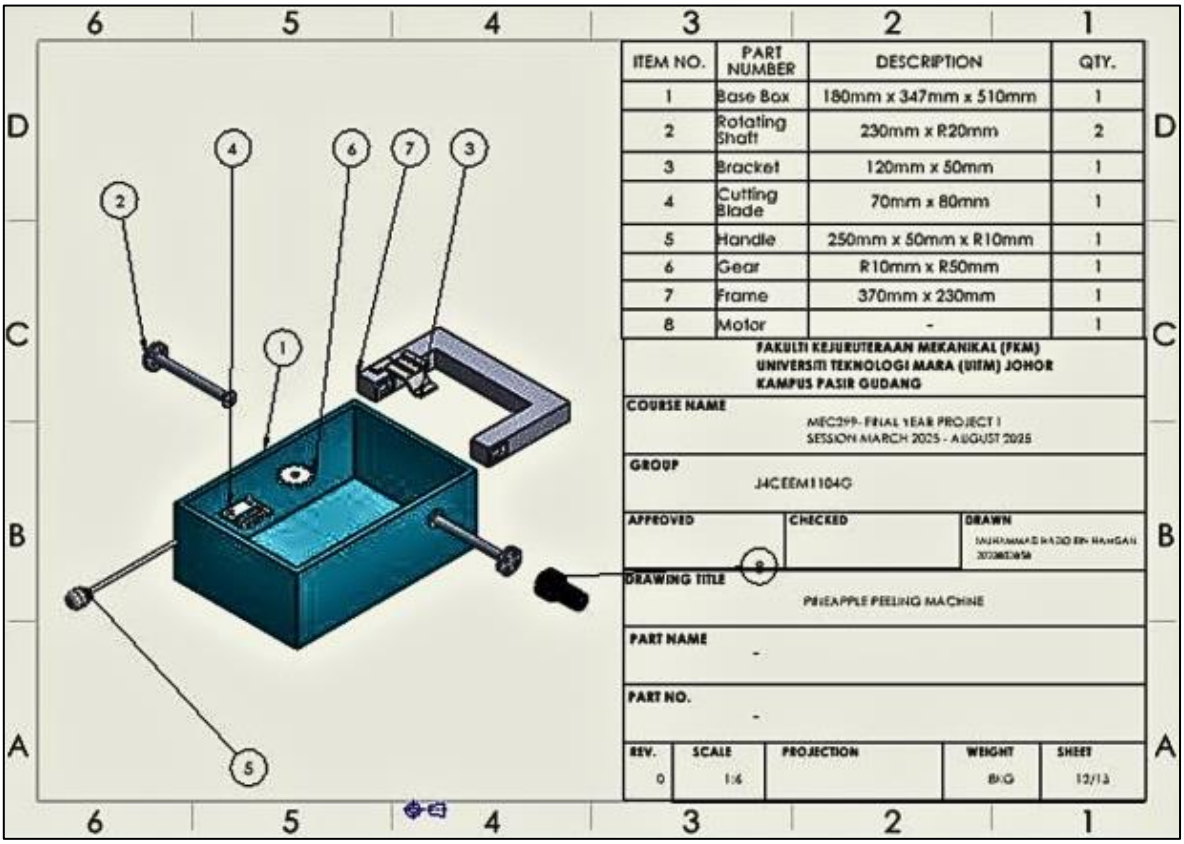
Keywords: *Motorized prototype, Peeling machine*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 26

Actuator-Driven Motorcycle Lift System

Muhammad Adry Firdee Bin Aidi Razi [1] and Nurrul Amilin Binti Zainal Abidin [2*]

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**Corresponding author (e-mail): nurrul0230@uitm.edu.my*

PROJECT DESCRIPTION

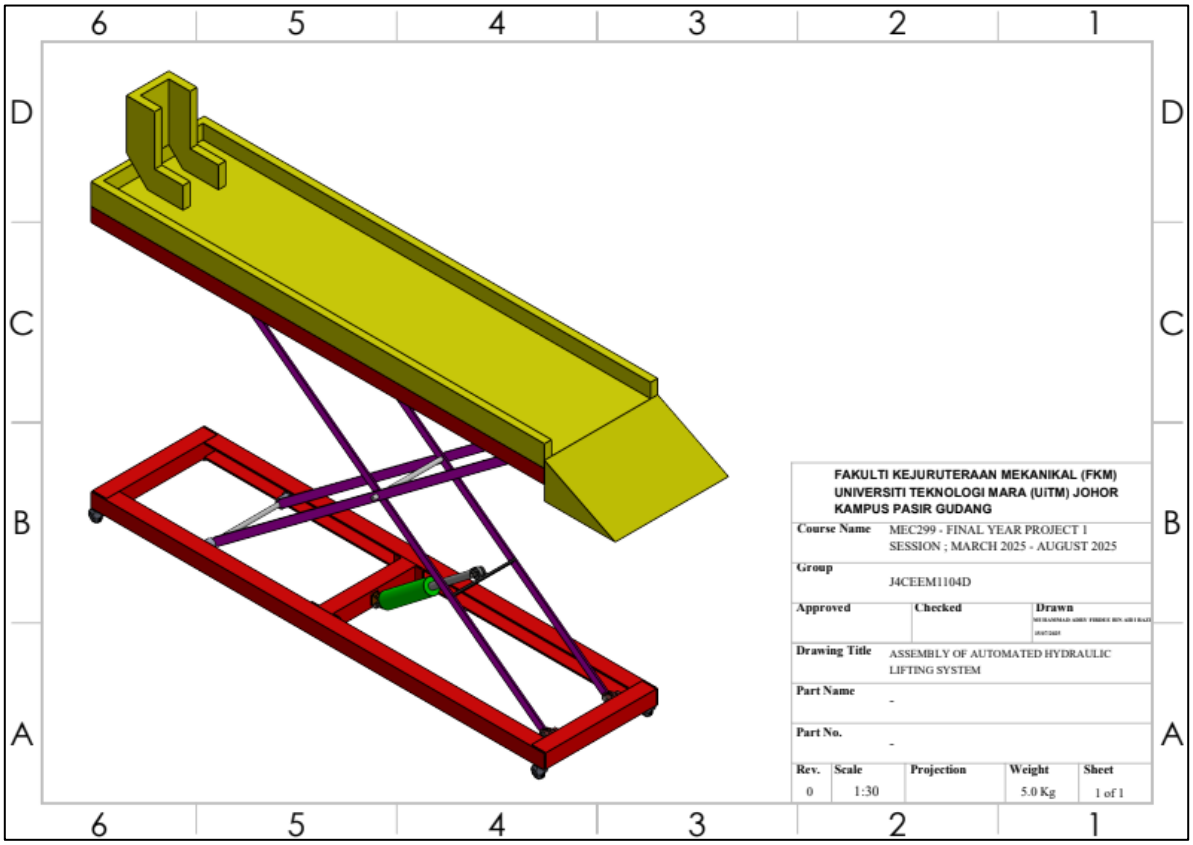
This study presents the design, fabrication, and evaluation of a motorcycle lifting system driven by a linear actuator for maintenance and repair applications. The aim is to establish a safe, user-friendly, and efficient lifting solution suitable for small workshops and individual users. The proposed system employs an electromechanical linear actuator as the core lifting mechanism, which converts electrical energy into controlled linear motion to achieve smooth and stable vertical displacement. Performance testing was conducted to assess lifting stability, load handling capability, and operational consistency. Experimental results demonstrate that the developed system can elevate a motorcycle steadily and safely within the intended load range, with reliable and repeatable motion control. These findings indicate that the proposed design is a practical and cost-effective alternative to traditional lifting systems for light-duty service environments. Recommendations for future work include structural optimization, automated control integration, and extended load testing to further enhance system robustness and functionality.

Keywords: *Actuator-drive, Lifitng system*

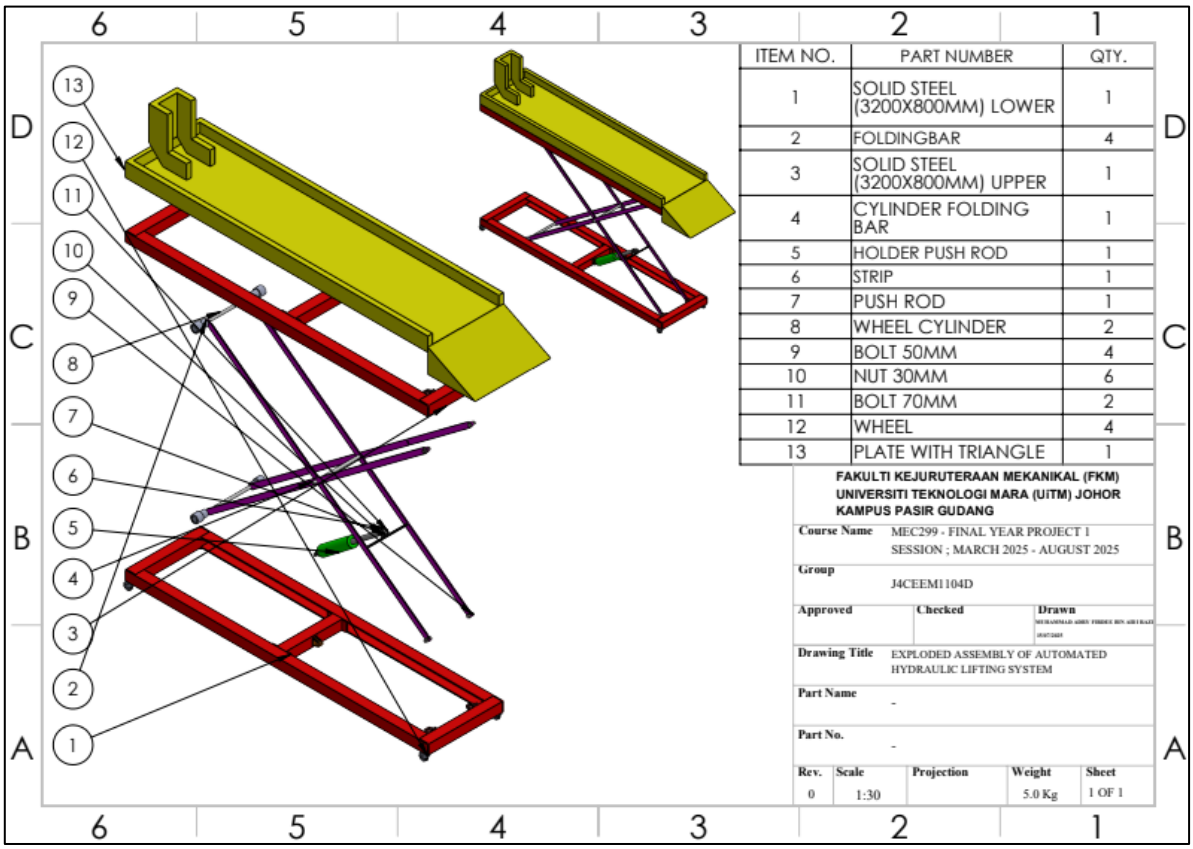
PROTOTYPE



DESIGN PARAMETER



FAKULTI KEJURUTERAAN MEKANIKAL (FKM) UNIVERSITI TEKNOLOGI MARA (UiTM) JOHOR KAMPUS PASIR GUDANG	
Course Name	MEC299 - FINAL YEAR PROJECT 1 SESSION ; MARCH 2025 - AUGUST 2025
Group	J4CEEM1104D
Approved / Checked / Drawn	
Drawing Title	ASSEMBLY OF AUTOMATED HYDRAULIC LIFTING SYSTEM
Part Name	-
Part No.	-
Rev. / Scale / Projection / Weight / Sheet	0 / 1:30 / / 5.0 Kg / 1 of 1



ITEM NO.	PART NUMBER	QTY.
1	SOLID STEEL (3200X800MM) LOWER	1
2	FOLDINGBAR	4
3	SOLID STEEL (3200X800MM) UPPER	1
4	CYLINDER FOLDING BAR	1
5	HOLDER PUSH ROD	1
6	STRIP	1
7	PUSH ROD	1
8	WHEEL CYLINDER	2
9	BOLT 50MM	4
10	NUT 30MM	6
11	BOLT 70MM	2
12	WHEEL	4
13	PLATE WITH TRIANGLE	1

FAKULTI KEJURUTERAAN MEKANIKAL (FKM) UNIVERSITI TEKNOLOGI MARA (UiTM) JOHOR KAMPUS PASIR GUDANG	
Course Name	MEC299 - FINAL YEAR PROJECT 1 SESSION ; MARCH 2025 - AUGUST 2025
Group	J4CEEM1104D
Approved / Checked / Drawn	
Drawing Title	EXPLODED ASSEMBLY OF AUTOMATED HYDRAULIC LIFTING SYSTEM
Part Name	-
Part No.	-
Rev. / Scale / Projection / Weight / Sheet	0 / 1:30 / / 5.0 Kg / 1 OF 1

eISBN: 978-967-0033-74-7

CHAPTER 27

Prototype Development of an Automated Shoe Cleaning Device

Muhammad Aiman Mustaqim Bin Azman [1] and Nurrul Amilin Binti Zainal Abidin [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): nurrul0230@uitm.edu.my*

PROJECT DESCRIPTION

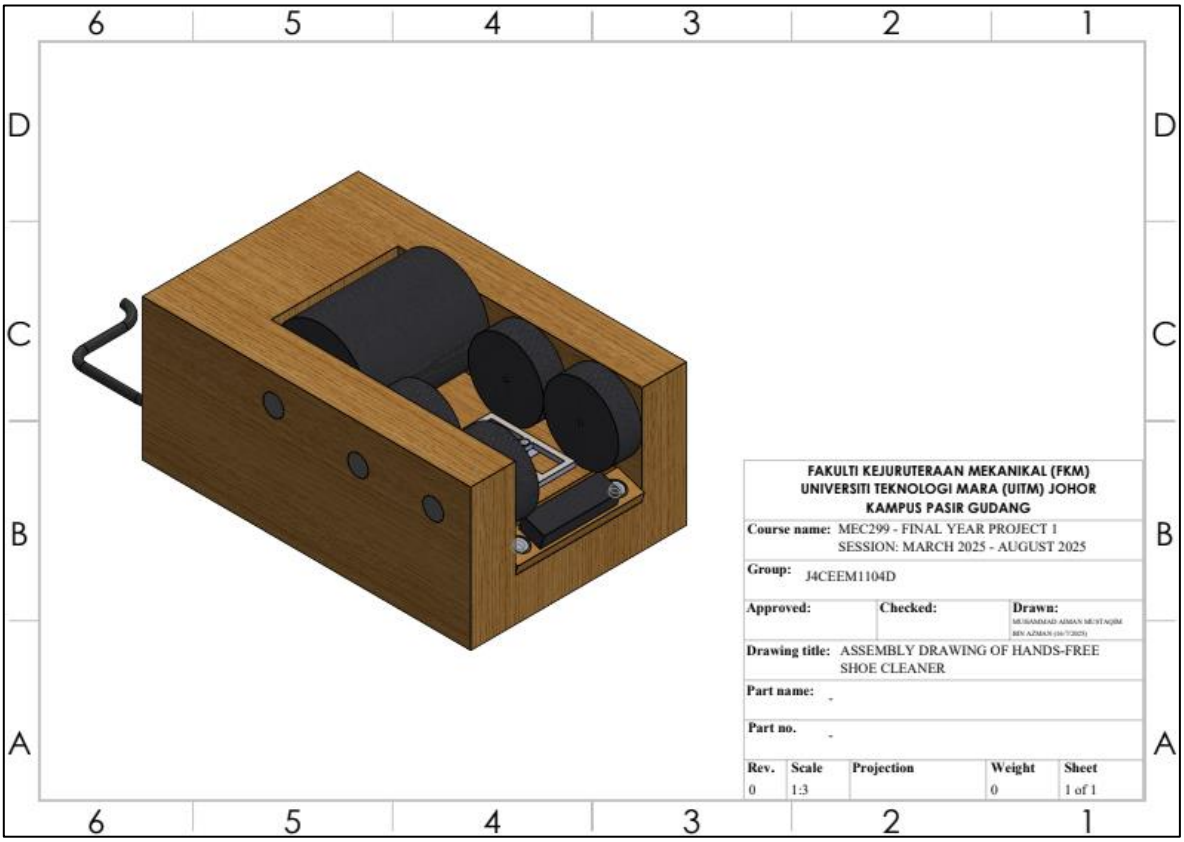
This study presents the design and development of a compact, hands-free shoe cleaning machine aimed at enhancing hygiene in Malaysia. The initial design employs five individual motors to drive the brushes simultaneously. However, this approach was later replaced with a gear train mechanism, powered by a single motor to reduce electrical circuit complexity and simplify the overall system. The stepper mechanism proposed in the preliminary design was also excluded from the final assembly due to integration challenges, particularly in accommodating the control button system. Despite these adjustments, the fundamental concept and operational principle of the prototype remain unchanged, as the selected initial design continued to serve as the benchmark for the final development of the shoe cleaning machine. Nevertheless, strengthening the operational efficiency, safety and long-term sustainability can be implemented for further future development. Incorporating a dedicated sole brush would also improve cleaning effectiveness on the underside of shoes, with adjustable nylon brush mechanism to accommodate the different shoe sizes and shapes.

Keywords: *Automated shoe cleaning, Hands-free shoe cleaning*

PROTOTYPE

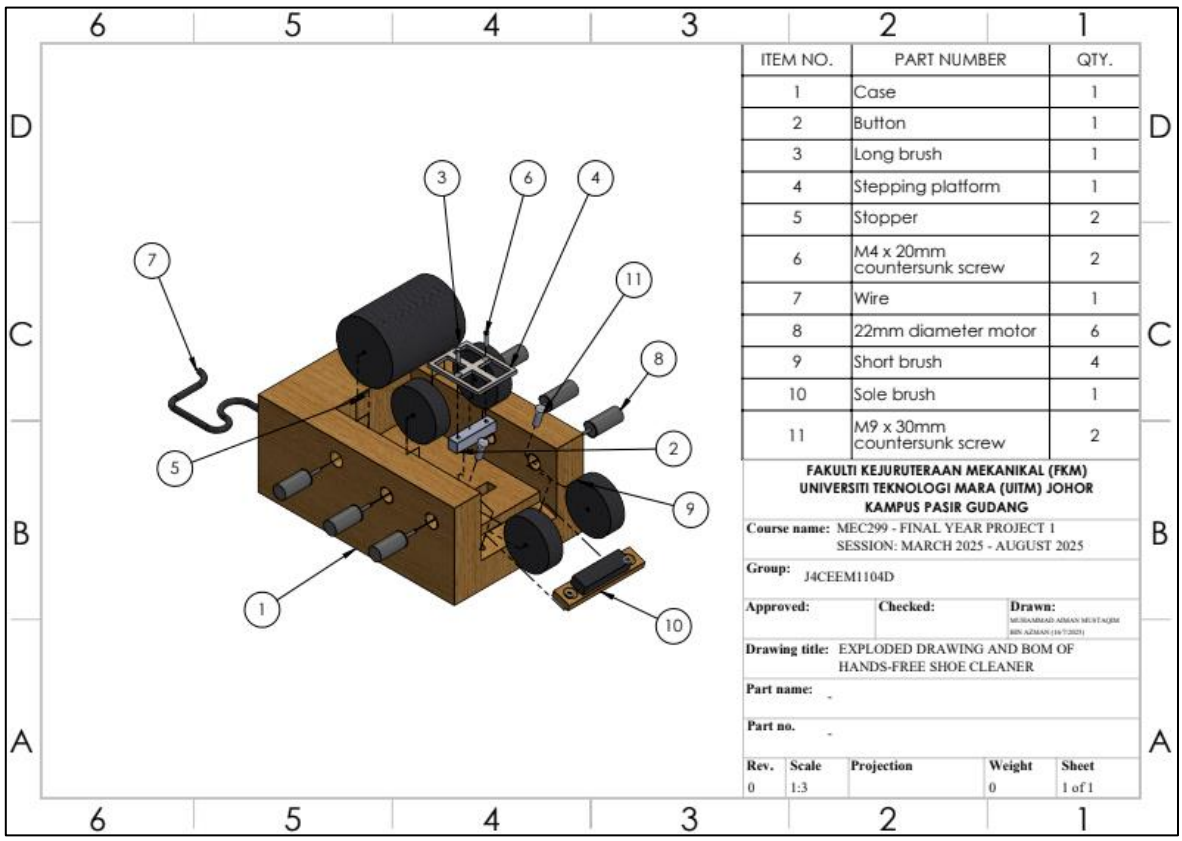


DESIGN PARAMETER



FAKULTI KEJURUTERAAN MEKANIKAL (FKM) **UNIVERSITI TEKNOLOGI MARA (UITM) JOHOR** **KAMPUS PASIR GUDANG**	
Course name:	MEC299 - FINAL YEAR PROJECT 1 SESSION: MARCH 2025 - AUGUST 2025
Group:	J4CEEM1104D
Approved: / **Checked:** / **Drawn:**	MUHAMMAD AIMAN MUSTAQIM BIN AZMAN (16/7/2025)
Drawing title:	ASSEMBLY DRAWING OF HANDS-FREE SHOE CLEANER
Part name:	-
Part no.	-

Rev.	Scale	Projection	Weight	Sheet
0	1:3		0	1 of 1



ITEM NO.	PART NUMBER	QTY.
1	Case	1
2	Button	1
3	Long brush	1
4	Stepping platform	1
5	Stopper	2
6	M4 x 20mm countersunk screw	2
7	Wire	1
8	22mm diameter motor	6
9	Short brush	4
10	Sole brush	1
11	M9 x 30mm countersunk screw	2

FAKULTI KEJURUTERAAN MEKANIKAL (FKM) **UNIVERSITI TEKNOLOGI MARA (UITM) JOHOR** **KAMPUS PASIR GUDANG**	
Course name:	MEC299 - FINAL YEAR PROJECT 1 SESSION: MARCH 2025 - AUGUST 2025
Group:	J4CEEM1104D
Approved: / **Checked:** / **Drawn:**	MUHAMMAD AIMAN MUSTAQIM BIN AZMAN (16/7/2025)
Drawing title:	EXPLODED DRAWING AND BOM OF HANDS-FREE SHOE CLEANER
Part name:	-
Part no.	-

Rev.	Scale	Projection	Weight	Sheet
0	1:3		0	1 of 1

Prototype Design Collection Series 5
eISBN: 978-967-0033-74-7

CHAPTER 28

One Push Motorized Cat Litter Disposal Machine

Ahmad Danish Bin Mohamed Rohaizat [1] and Nur Aini Sabrin Binti Manssor [2*]

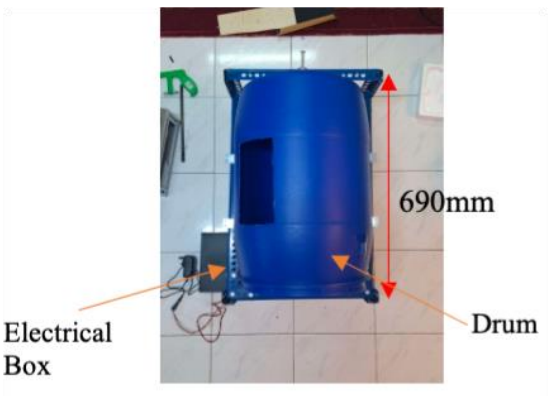
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): nuraini0175@uitm.edu.my*

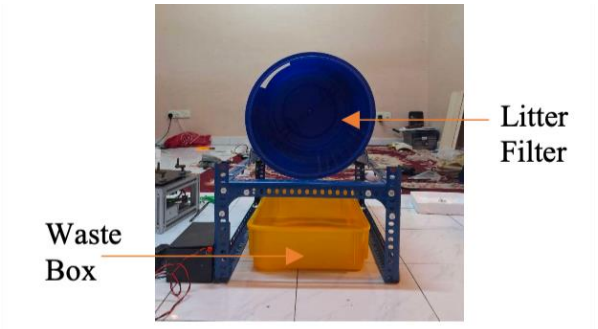
PROJECT DESCRIPTION

The increasing population of domestic cats in Malaysia has intensified the need for efficient, hygienic, and user-friendly litter management systems. Conventional manual cleaning exposes owners to bacterial contamination and prolonged inhalation of ammonia fumes, potentially leading to respiratory discomfort and other health risks. Although automatic litter boxes are commercially available, many designs are expensive, mechanically complex, and require frequent maintenance, limiting their accessibility and practicality. This project presents the development of a One Push Motorized Cat Litter Disposal Machine aimed at providing a cost-effective and simplified alternative. The system operates using a single-button mechanism that activates a 12 V geared DC motor (160 RPM) to rotate a 50 L plastic drum for controlled waste separation and discharge. The final fabricated prototype measures 420 mm × 690 mm × 418 mm and utilizes a lightweight, fully bolted frame structure to enhance portability and ease of assembly. A sensor integrated with magnets ensures accurate position detection, while an Arduino Uno microcontroller governs motor operation and process control. The project encompasses mechanical design validation, material selection, automation integration, and prototype fabrication, with structural modeling performed using SolidWorks. The resulting prototype demonstrates effective waste separation, reduced odor accumulation, and minimized direct human contact with litter waste. Overall, the system offers a practical and affordable solution for improved domestic hygiene and convenient litter management.

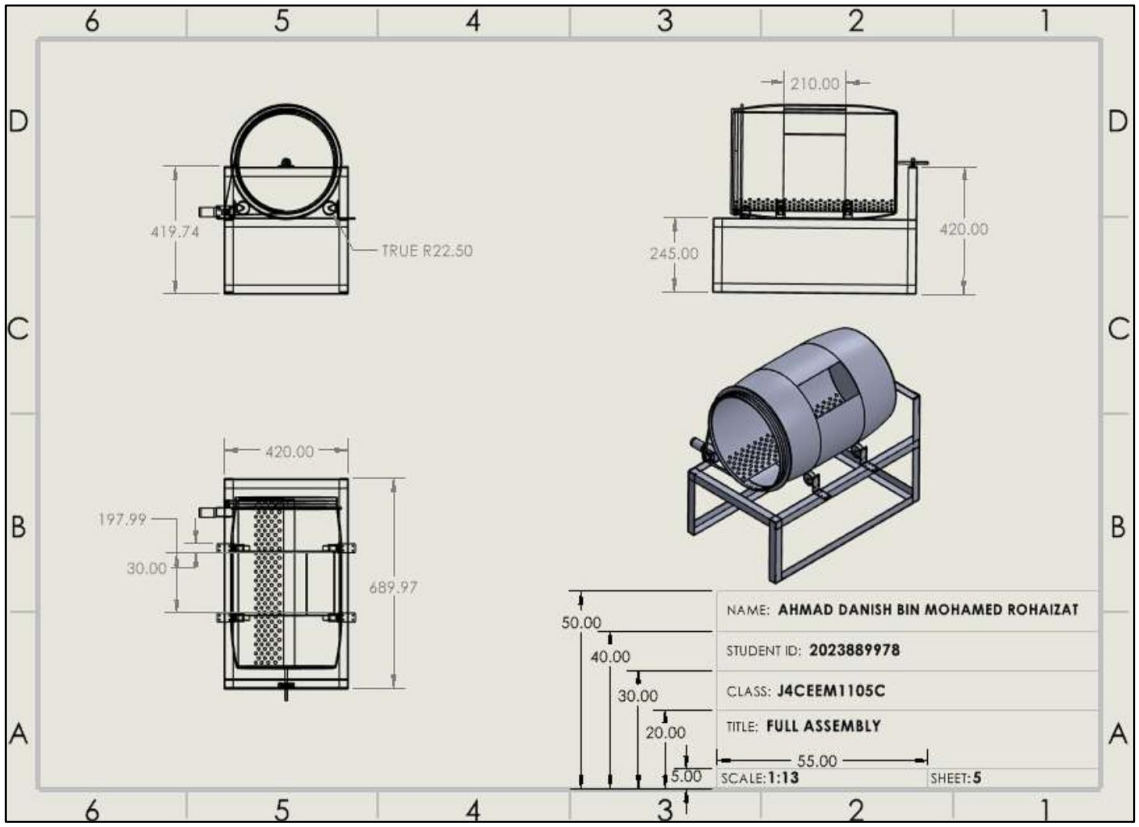
Keywords: *Motorized litter disposal system, Hygienic pet waste management*

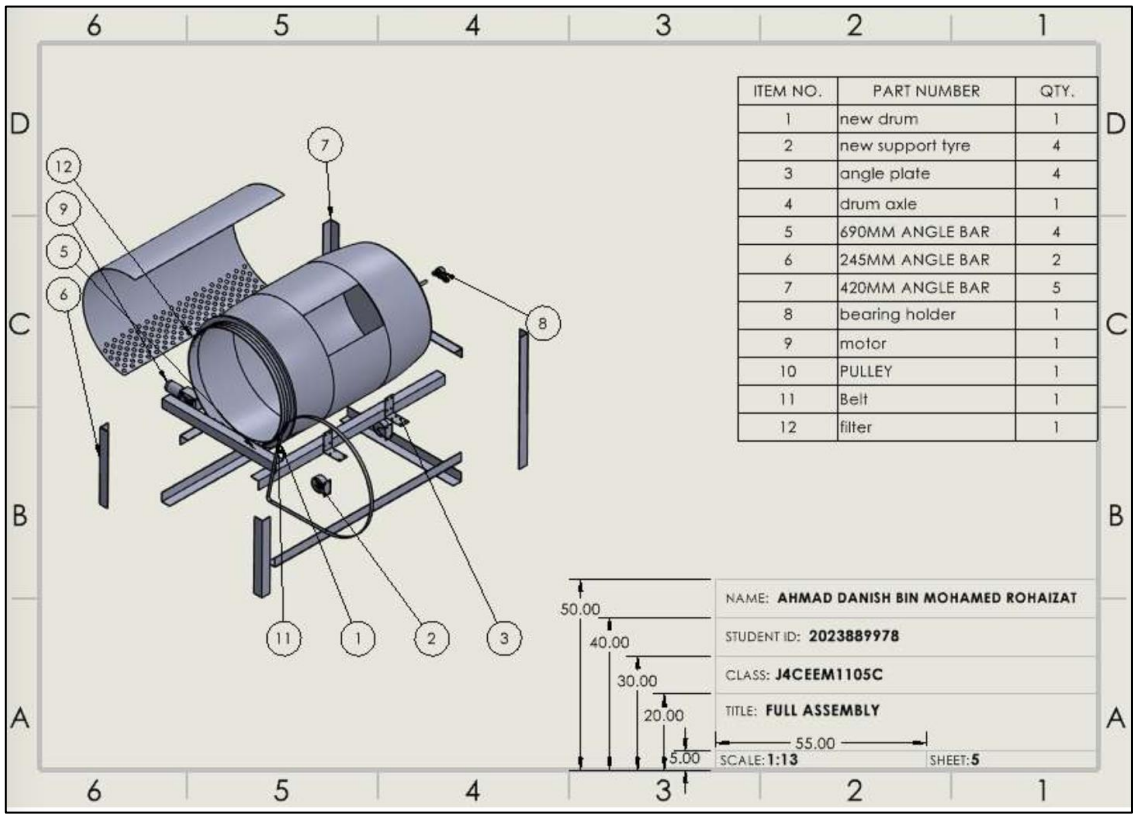
PROTOTYPE





DESIGN PARAMETER





Prototype Design Collection Series 5
eISBN: 978-967-0033-74-7

CHAPTER 29

Mini Portable Vented Dryer Machine

Muhammad Zinnun Bin Ismail [1] and Nur Aini Sabrin Binti Manssor [2*]

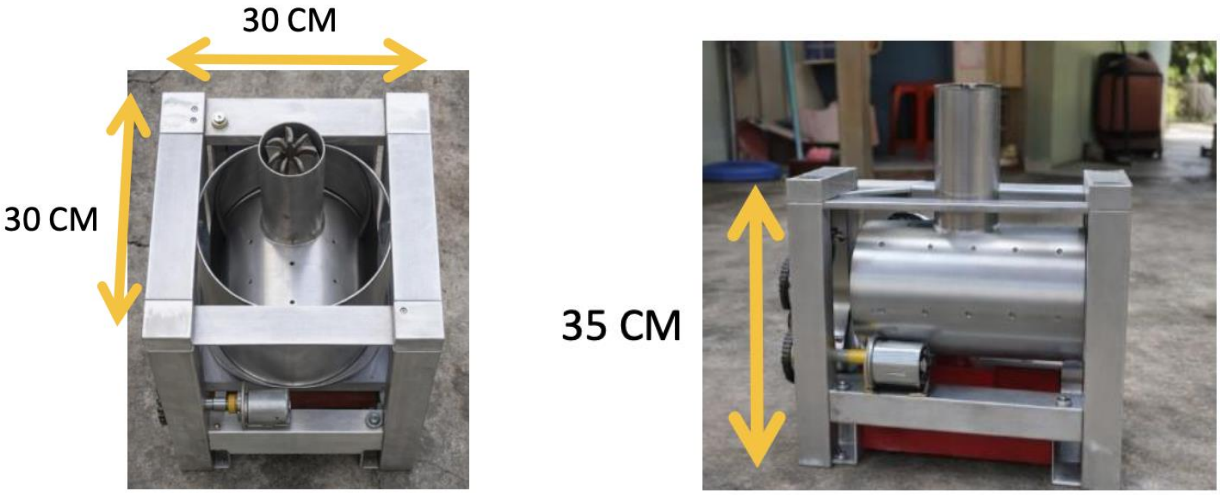
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): nuraini0175@uitm.edu.my*

PROJECT DESCRIPTION

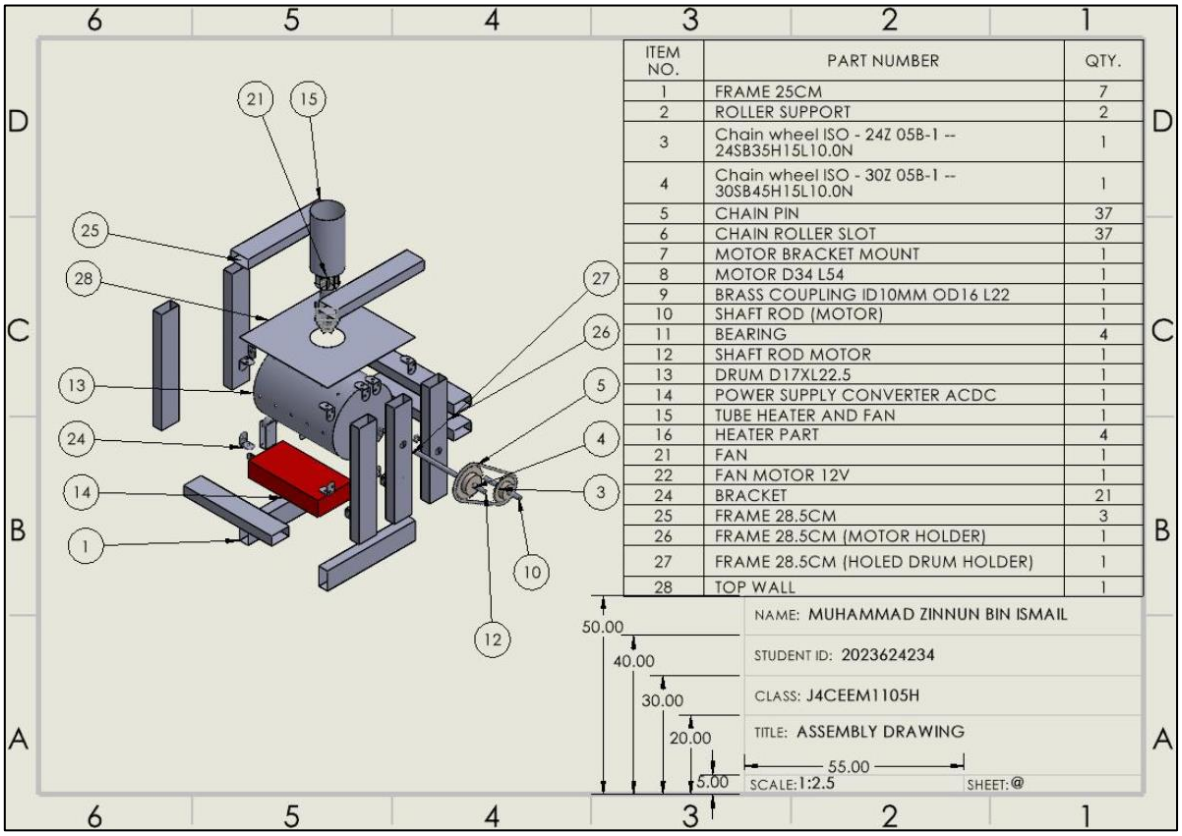
In densely populated urban environments, residential units are increasingly limited in size, requiring space saving and time efficient laundry systems. Conventional dryers are typically bulky and consume significant electrical power, making them less practical for small households, shared accommodations, or solo travelers who wash limited quantities of clothing. This project focuses on the design and fabrication of a Mini Portable Vented Dryer Machine aimed at addressing these limitations. The system is developed to provide effective drying performance while minimizing space requirements and energy consumption. The final fabricated prototype consists of an aluminium and mild steel structural frame assembled using screw, nut, and rivet fasteners to enhance modularity and ease of maintenance. A chain and sprocket drive mechanism is employed to transmit torque from the motor to the rotating drum, ensuring stable and controlled rotational motion. The development process incorporates computer aided design and iterative performance evaluation of the drum rotation system, vented panels, heating element, and airflow distribution. Experimental observations indicate improved drying uniformity and reduced operational footprint.

Keywords: *Portable vented type dryer, Space saving household equipment*

PROTOTYPE



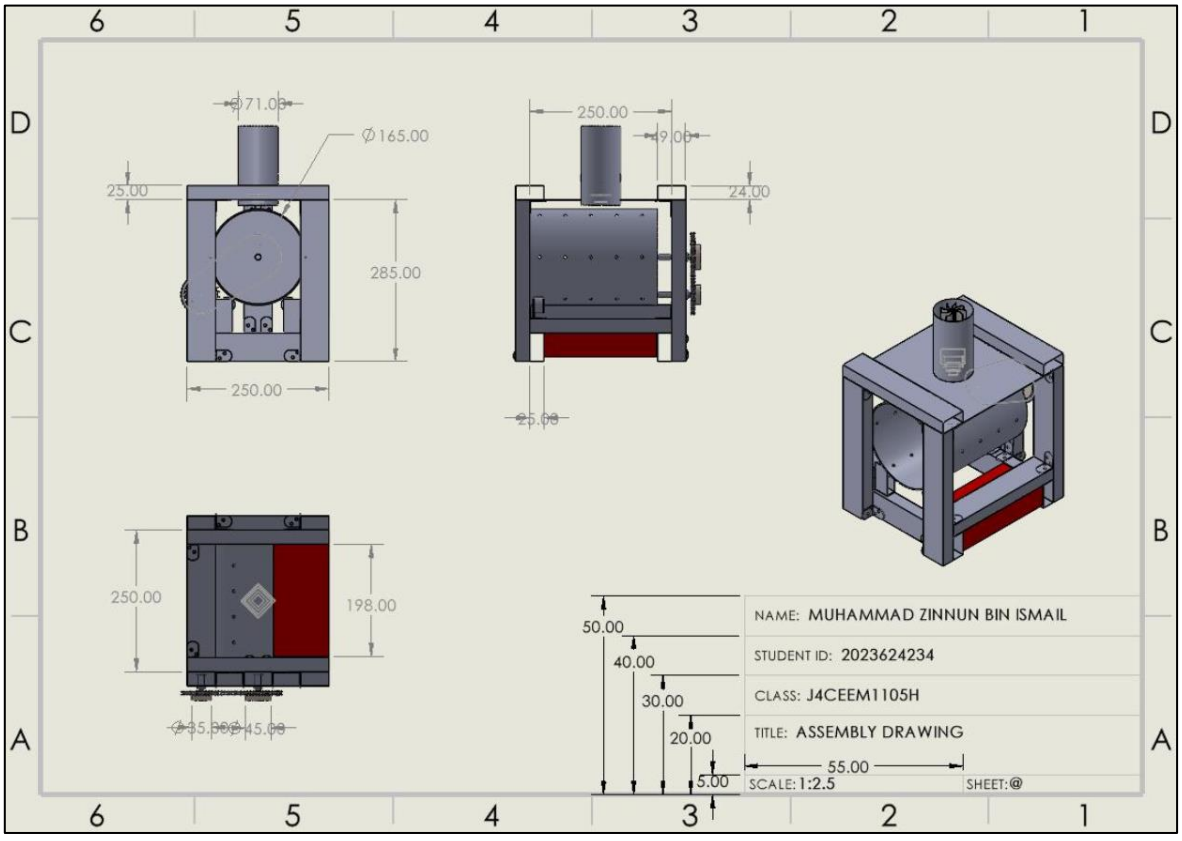
DESIGN PARAMETER



ITEM NO.	PART NUMBER	QTY.
1	FRAME 25CM	7
2	ROLLER SUPPORT	2
3	Chain wheel ISO - 24Z 05B-1 -- 24SB35H15L10.0N	1
4	Chain wheel ISO - 30Z 05B-1 -- 30SB45H15L10.0N	1
5	CHAIN PIN	37
6	CHAIN ROLLER SLOT	37
7	MOTOR BRACKET MOUNT	1
8	MOTOR D34 L54	1
9	BRASS COUPLING ID10MM OD16 L22	1
10	SHAFT ROD (MOTOR)	1
11	BEARING	4
12	SHAFT ROD MOTOR	1
13	DRUM D17XL22.5	1
14	POWER SUPPLY CONVERTER ACDC	1
15	TUBE HEATER AND FAN	1
16	HEATER PART	4
21	FAN	1
22	FAN MOTOR 12V	1
24	BRACKET	21
25	FRAME 28.5CM	3
26	FRAME 28.5CM (MOTOR HOLDER)	1
27	FRAME 28.5CM (HOLED DRUM HOLDER)	1
28	TOP WALL	1

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NAME: MUHAMMAD ZINNUN BIN ISMAIL
STUDENT ID: 2023624234
CLASS: J4CEEM1105H
TITLE: ASSEMBLY DRAWING
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STUDENT ID: 2023624234
CLASS: J4CEEM1105H
TITLE: ASSEMBLY DRAWING
SCALE: 1:2.5
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CHAPTER 30

Development of a Scattering-Mechanism Fish Feeder using Arduino-Based Automated Feeding System

Sulfikar Bin Sapar [1] and Muhamad Faris Syafiq Bin Khalid [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): mfarissyafiq@uitm.edu.my*

PROJECT DESCRIPTION

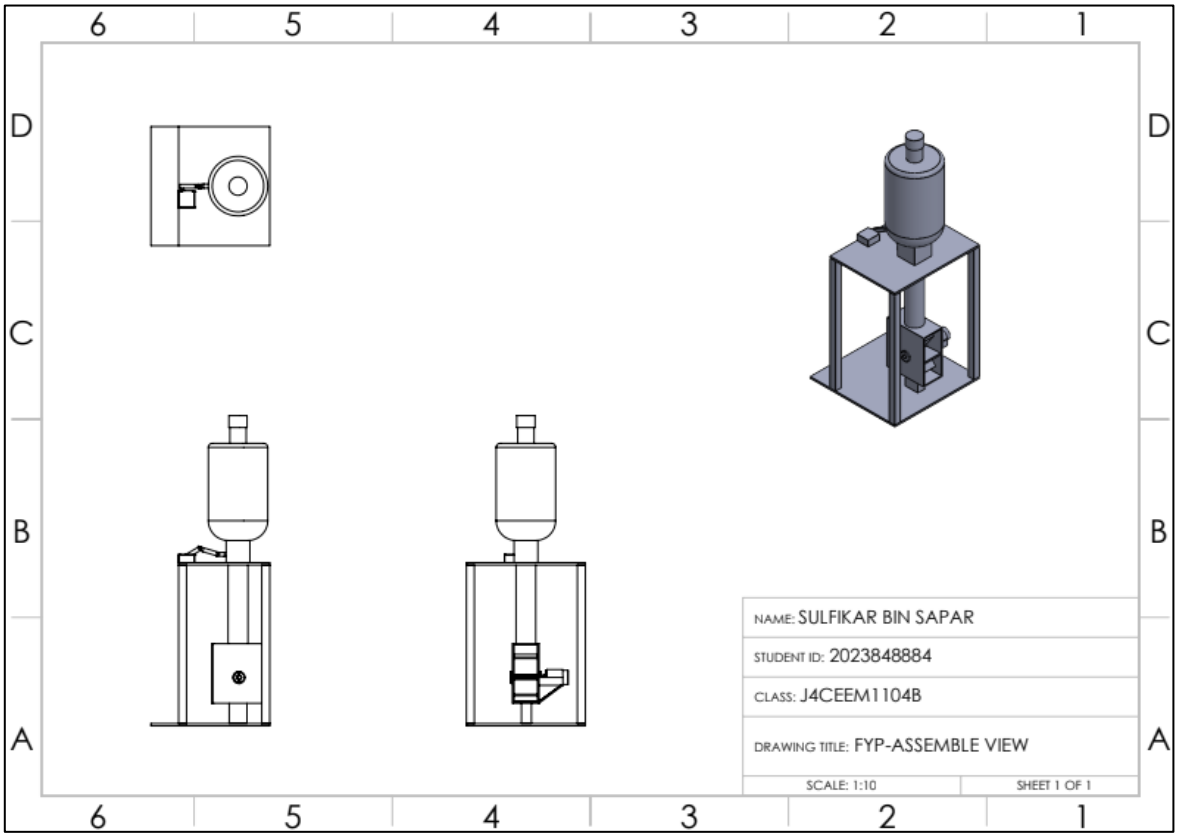
In modern aquaculture, manual feeding remains a significant bottleneck, often leading to inconsistent nutritional delivery, labour inefficiency, and environmental degradation. This study presents the design and fabrication of an automated "Smart Feeder" engineered to address the limitations of conventional one-spot feeding methods, which frequently cause uneven fish growth and localized water pollution. The system utilizes an Arduino Uno microcontroller integrated with a Real-Time Clock (RTC) module to execute a precise, twice-daily feeding schedule. Unlike standard feeders, this prototype employs a specialized "beating blade" mechanism driven by a DC motor to scatter pellets across a wider surface area. This decentralized distribution reduces intra-species competition and minimizes feed waste. The hardware architecture consists of a robust mild steel square hollow frame and 3D-printed GPM components, ensuring structural stability and cost-effectiveness. Validation of the prototype demonstrates that the scattering method optimizes resource use and supports healthier aquatic environments by preventing the accumulation of uneaten feed. This project offers a scalable solution for small-to-medium scale fish farmers, contributing to the broader goals of sustainable food production and technological integration in rural aquaculture.

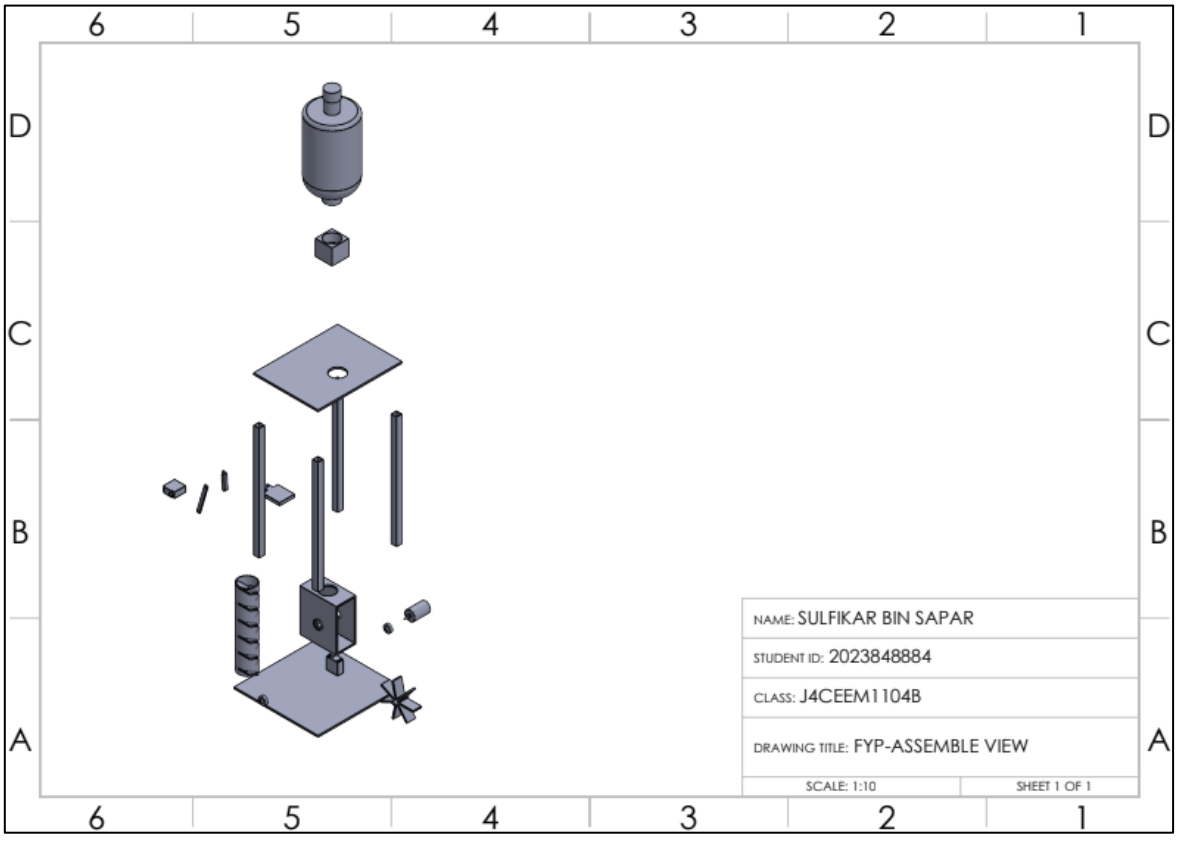
Keywords: *Aquaculture automation, Sustainable fish farming*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 31

Smart Domestic Infrastructure: Engineering Autonomous Weather-Responsive Laundry Systems

Adib Zafran Bin Azuan [1] and Muhamad Faris Syafiq Bin Khalid [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): mfarissyafiq@uitm.edu.my*

PROJECT DESCRIPTION

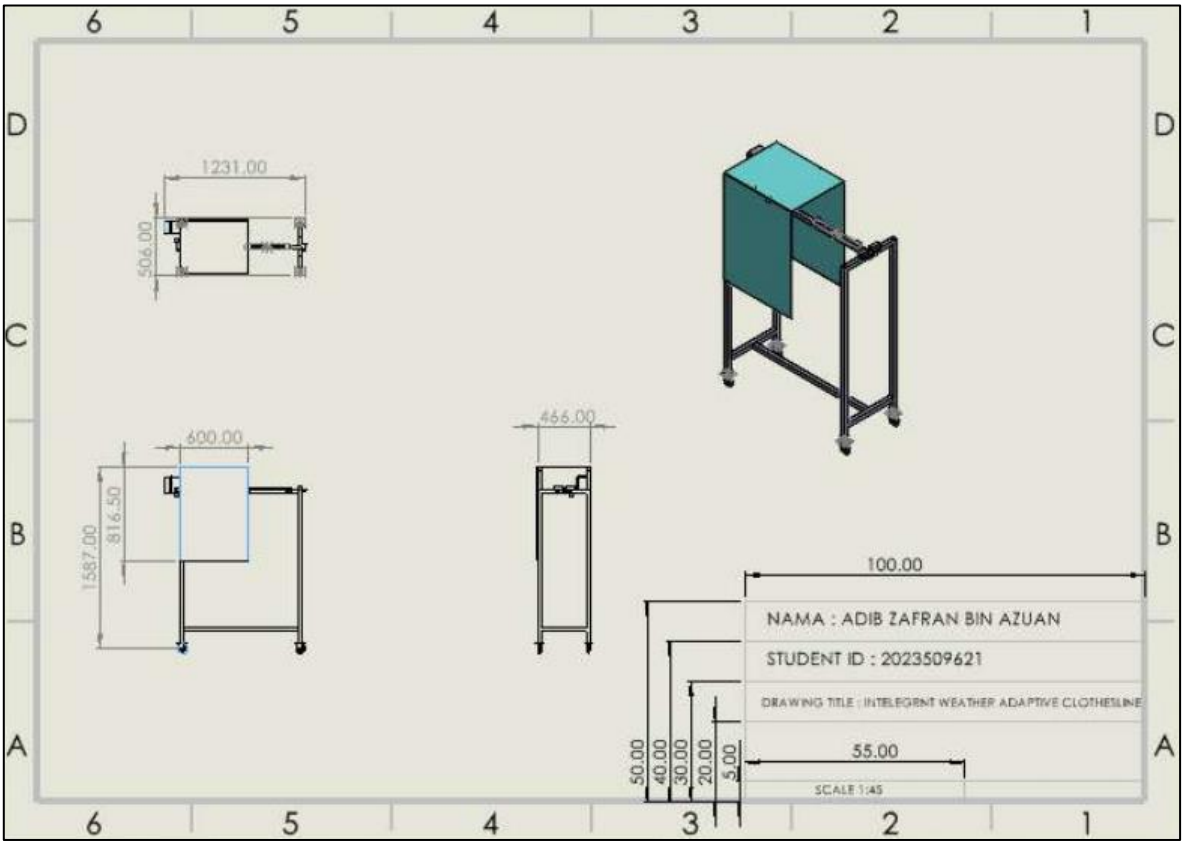
Traditional laundry drying practices face a significant dichotomy between inefficient, weather-dependent manual methods and high-cost, energy-intensive mechanical dryers. Gas and electric dryers, while reliable, significantly increase household utility costs and accelerate garment wear through high heat exposure. The system architecture is built around an Arduino Uno R3 microcontroller, integrated with rain-drop sensors and Light Dependent Resistor (LDR) modules to continuously monitor ambient conditions. When moisture or nightfall is detected, the Arduino processes these signals to trigger a 12V DC gear motor. Through a timing belt and slider mechanism, the system automatically retracts clothes into a sheltered area protected by Impra board. Structural integrity was validated using SolidWorks 2024, with stress analysis confirming that the mild steel frame can withstand a simulation load of 98N without failure. Results demonstrate that the integration of automation into domestic chores can significantly reduce labor requirements and energy consumption, contributing to the development of intelligent ecosystems in smart home environments.

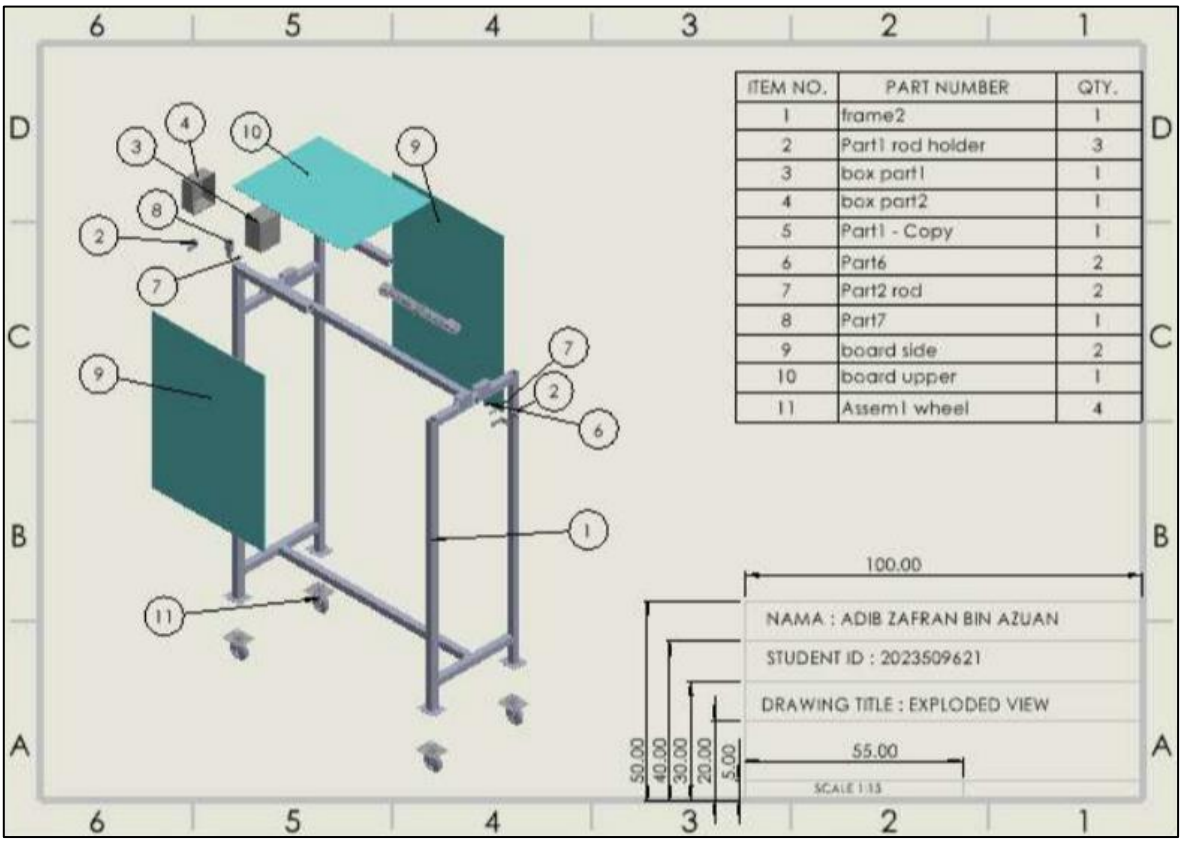
Keywords: *Weather-adaptive technology, Sustainable living*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 32

Development of a Semi-Automatic Portable Forklift

Afif Zahran Zainudin [1], Najibah Ab Latif [2*] and Ainaa Maya Munira Binti Ismail [3]

[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): najibahlatif@uitm.edu.my*

PROJECT DESCRIPTION

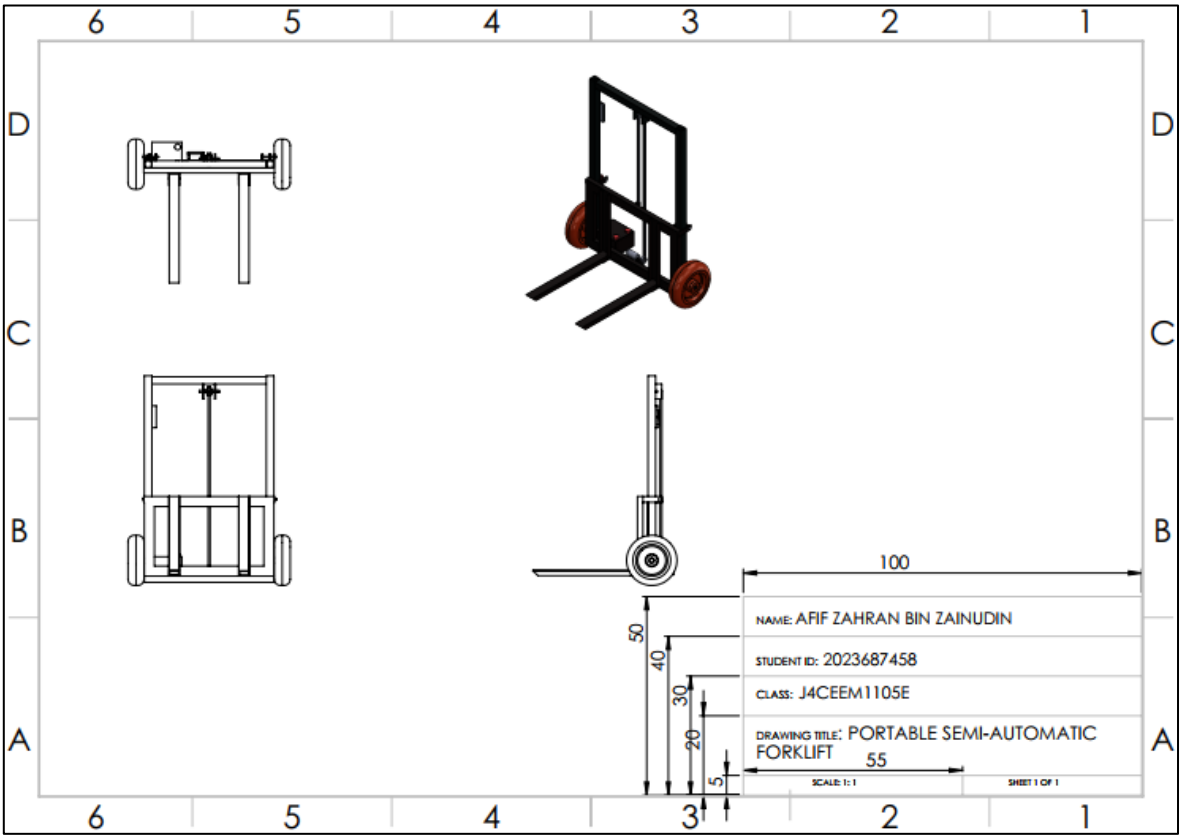
Manual forklift such as hand pallet jacks or hydraulic stackers which are fundamental of human -powered material handling tools designed to lift and transport goods in cofined spaces. However, the use of manual forklifts presents a high risk of operator injury, operational in efficiencies and potential damage to cargo due to reliance on physical labor and poor ergonomics. The obejctives of this project are to design and fabricate the semi automatic portable forklift to address these issues. The methodolgy include conceptual design using SolidWorks modeling, material selection for the fabrication process and the development of a mechanical lifting mechanism for transporting goods. The outcome of the project is a compact and foldable forklift design that integrates a motor-controlled lifting mechanism. Conclusions, the proposes design successfully achieves a balance between cost effectiveness, ease of use and operational reliability, making it an ideal solution for small-scale lifting tasks in constrainted environments

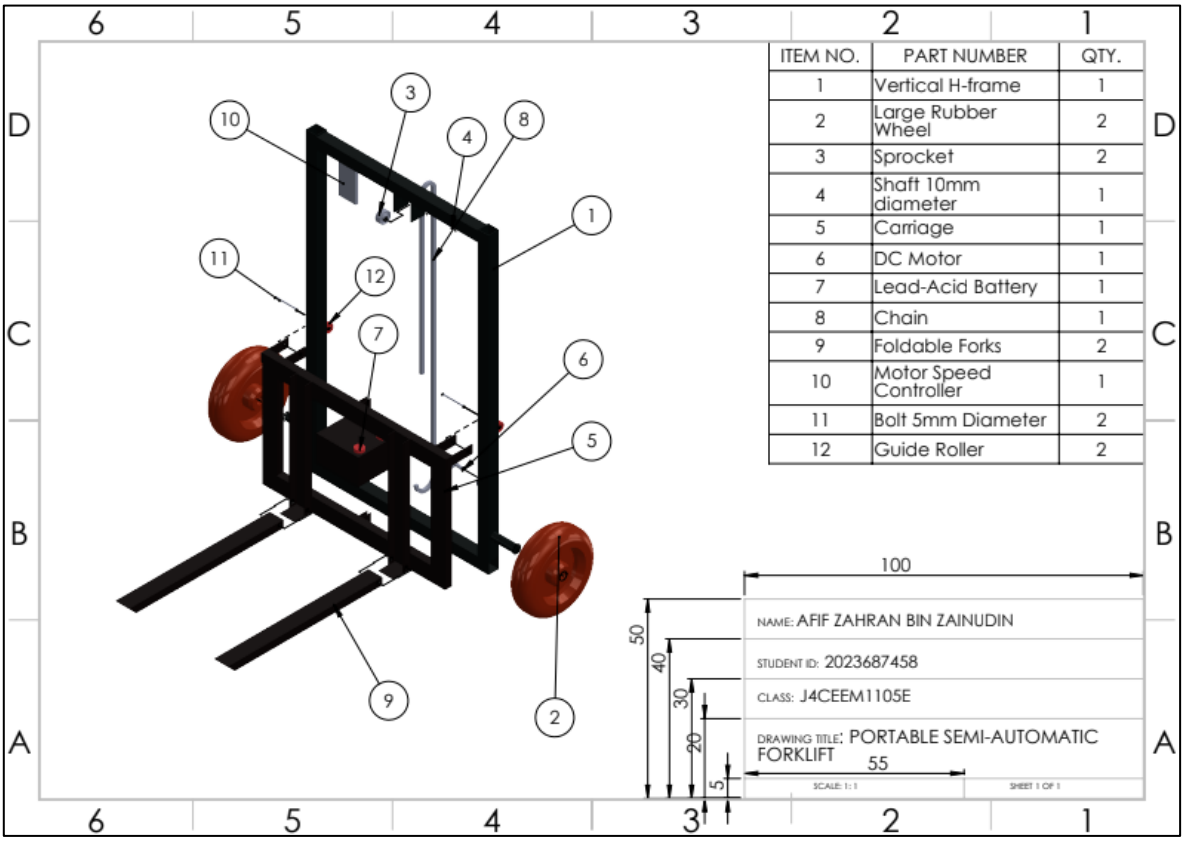
Keywords: *Forklift, Portable*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 33

Mini Pick and Place System

Nik Muhammad Afiq Iqbal Bin Nik Areez [1],Najibah Ab Latif [2*]and Ainaa Maya Munira Binti Ismail [3]

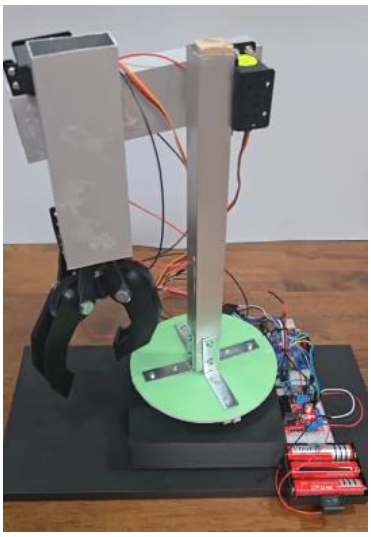
[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): najibahlatif@uitm.edu.my*

PROJECT DESCRIPTION

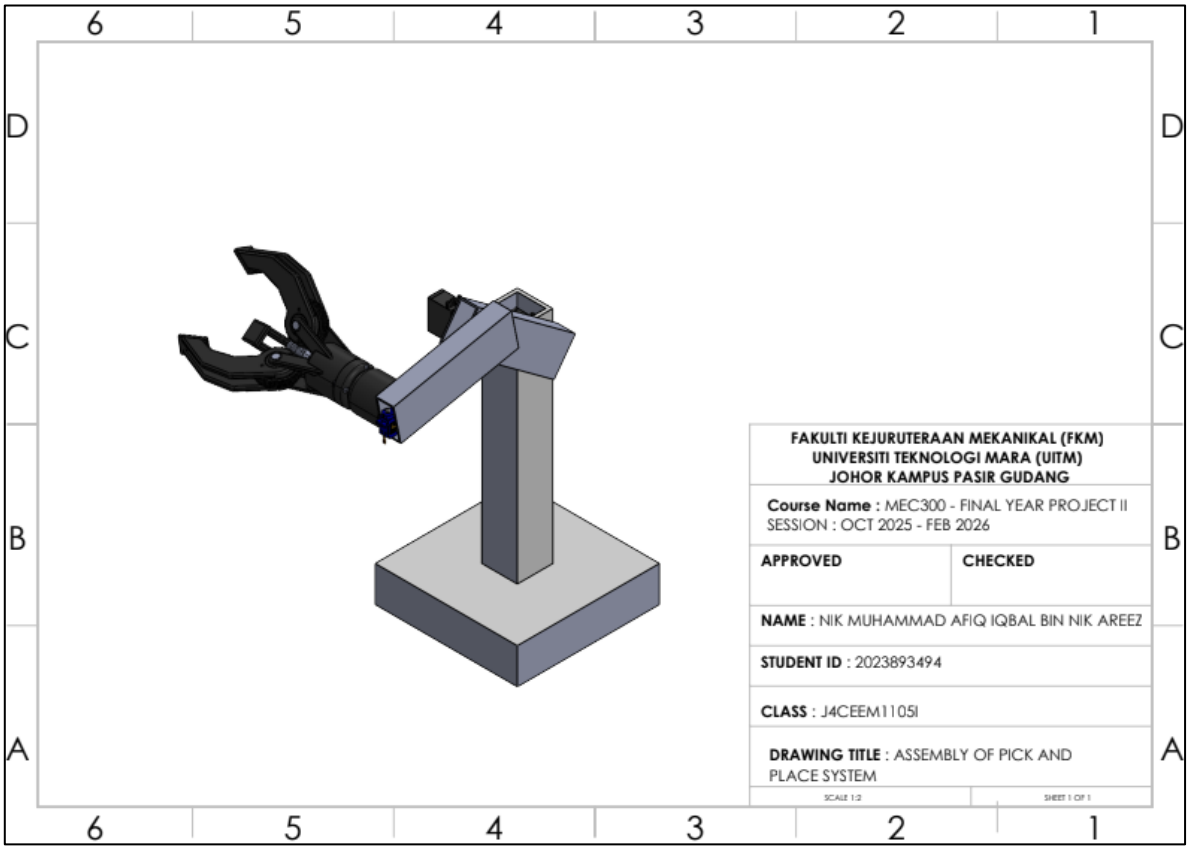
In this era , pick and place robot are widely used in various types of industrial sectors, functioning in assembly system , packaging processes and items sorting operations. Many industries adopt pick and place robot to reduce worker energy consumption and shorten production time. However, fully automatic pick and place robot especially those used in the automotive and electronics industries are often expensive and not suitable for small scale industries. This issue can be addressed by developing an affordable , efficient, compact design and safe pick and place system that can be adapted to specific user needs.The objective of this project is to design and fabricate pick and place system using servo motors, an Arduino microcontroller and a wireless controll system operated via a samrtphone. The fabrication processes involved include material cutting, component assembly using bolts and nuts, and the development of a mobile application to control system wirelessly. The final outcome is a successfully fabricated prototype that demonstrates improved efficiency and accuracy in pick and place operations. In conclusion , the development an affordable pick and place system ensures high-quality performance while reducing worker energy consumption during industrial tasks.

Keywords: *Robot, Microcontroller*

PROTOTYPE



DESIGN PARAMETER



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UNIVERSITI TEKNOLOGI MARA (UITM)
JOHOR KAMPUS PASIR GUDANG

Course Name : MEC300 - FINAL YEAR PROJECT II
SESSION : OCT 2025 - FEB 2026

APPROVED	**CHECKED**

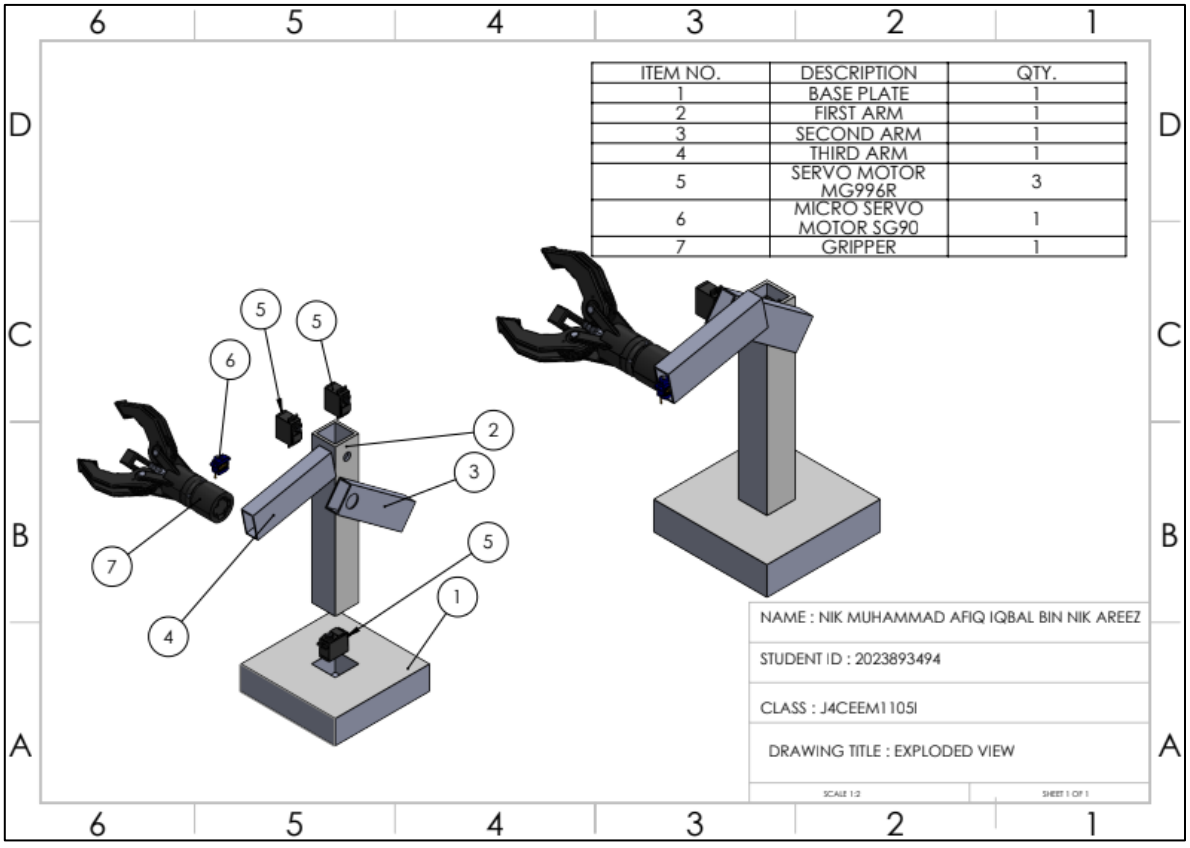
NAME : NIK MUHAMMAD AFIQ IQBAL BIN NIK AREEZ

STUDENT ID : 2023893494

CLASS : J4CEEM1105I

DRAWING TITLE : ASSEMBLY OF PICK AND PLACE SYSTEM

SCALE 1:2 SHEET 1 OF 1



ITEM NO.	DESCRIPTION	QTY.
1	BASE PLATE	1
2	FIRST ARM	1
3	SECOND ARM	1
4	THIRD ARM	1
5	SERVO MOTOR MG996R	3
6	MICRO SERVO MOTOR SG90	1
7	GRIPPER	1

NAME : NIK MUHAMMAD AFIQ IQBAL BIN NIK AREEZ

STUDENT ID : 2023893494

CLASS : J4CEEM1105I

DRAWING TITLE : EXPLODED VIEW

SCALE 1:2 SHEET 1 OF 1

eISBN: 978-967-0033-74-7

CHAPTER 34

The Auto Lemang Roasting Machine

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**Corresponding author (e-mail): najibahlatif@uitm.edu.my*

PROJECT DESCRIPTION

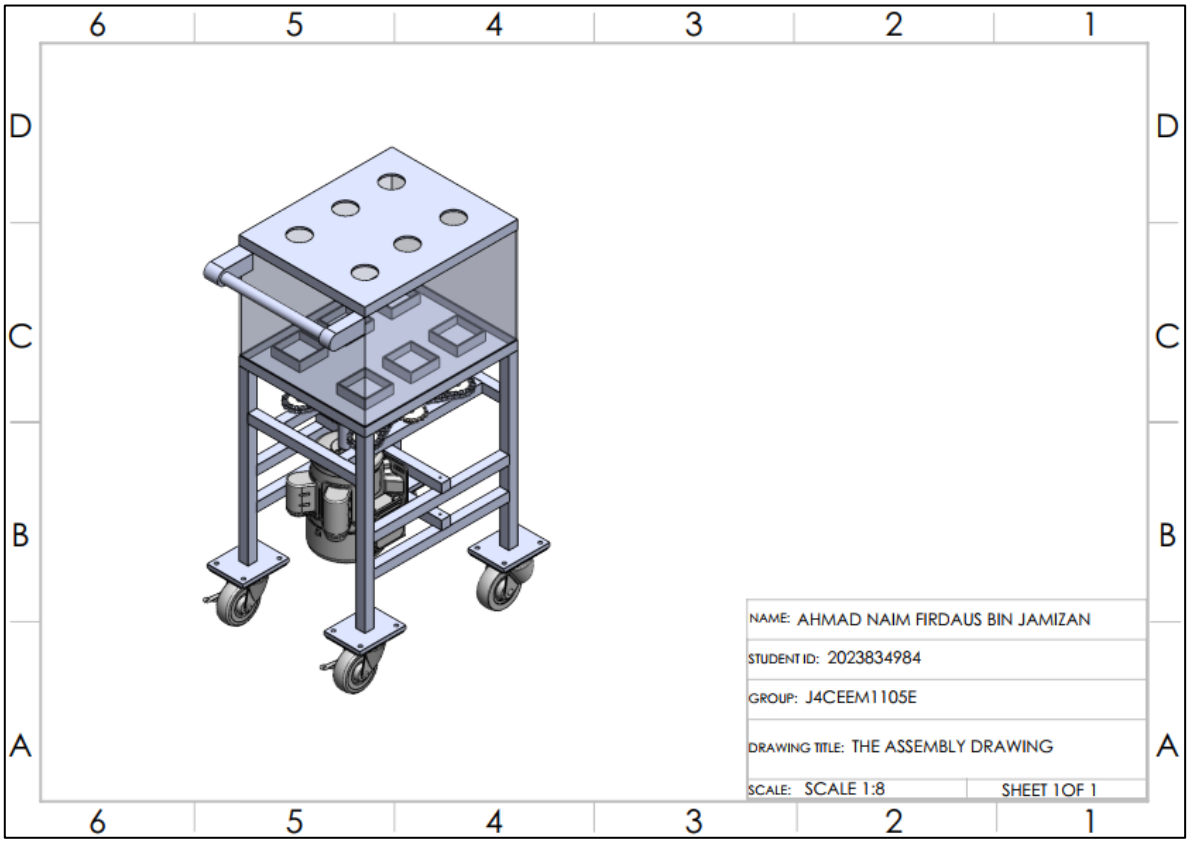
Traditional lemang roasting methods are time-consuming, labor-intensive, and often lack portability, making them impractical for modern use, especially in urban or small-space environments. Lemang, a traditional Malaysian dish made of glutinous rice, coconut milk, and salt, is typically cooked in bamboo over an open flame. This process requires constant monitoring and a large setup, posing challenges in terms of efficiency, consistency, and mobility. The objective of this project is to design and develop an auto roasting lemang machine that retains the authentic cooking method while enhancing convenience and usability. The proposed design incorporates a compact, lightweight structure equipped with an even heat distribution system using charcoal and a rotating mechanism to ensure uniform cooking. Methodologies include conceptual design through SolidWorks modeling, material selection based on heat resistance and portability, fabrication using lightweight metal components and performance testing under various cooking conditions. The outcome is a functional prototype has been offers a consistent roasting process with minimal manual intervention, making lemang preparation more accessible for both commercial vendors and home users. Conclusions, the machine can bridge cultural heritage with modern engineering solutions, promoting traditional cuisine through innovative design.

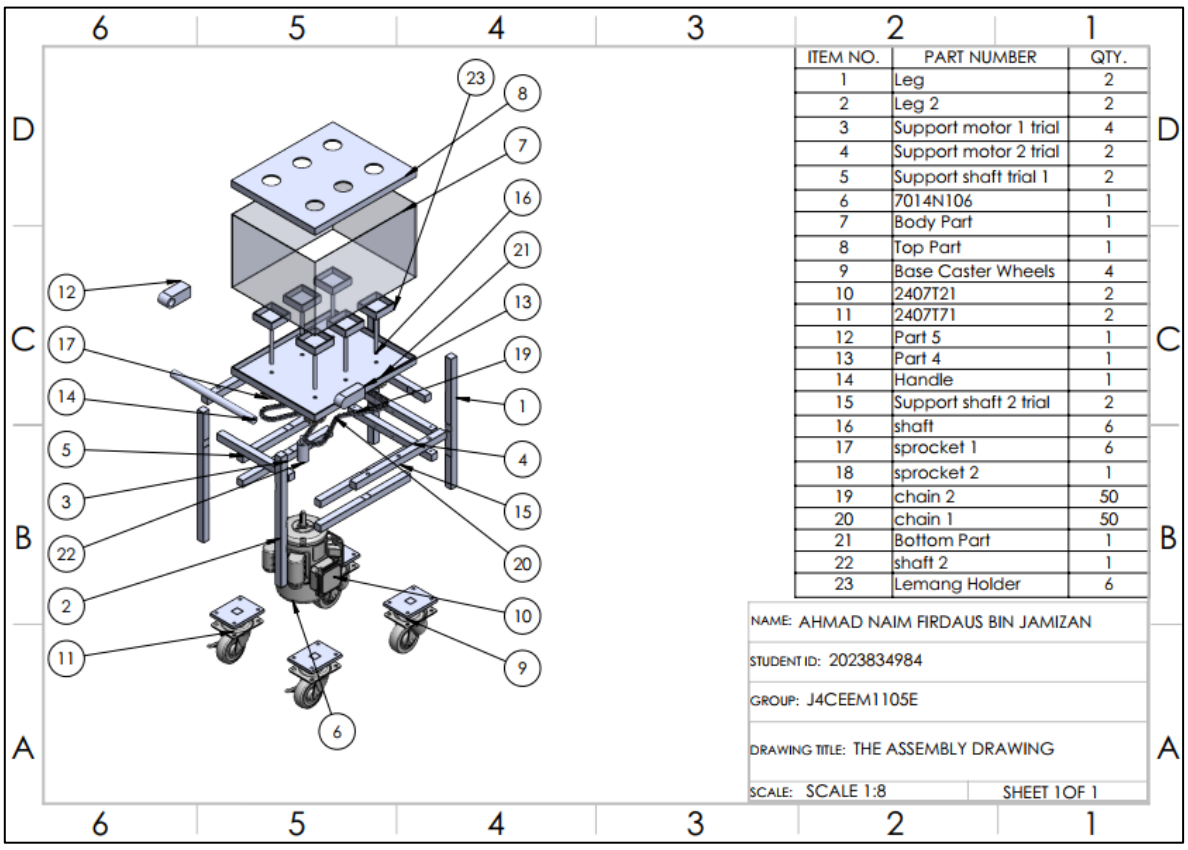
Keywords: *Lemang, Machine*

PROTOTYPE



DESIGN PARAMETER





ITEM NO.	PART NUMBER	QTY.
1	Leg	2
2	Leg 2	2
3	Support motor 1 trial	4
4	Support motor 2 trial	2
5	Support shaft trial 1	2
6	7014N106	1
7	Body Part	1
8	Top Part	1
9	Base Caster Wheels	4
10	2407T21	2
11	2407T71	2
12	Part 5	1
13	Part 4	1
14	Handle	1
15	Support shaft 2 trial	2
16	shaft	6
17	sprocket 1	6
18	sprocket 2	1
19	chain 2	50
20	chain 1	50
21	Bottom Part	1
22	shaft 2	1
23	Lemang Holder	6

eISBN: 978-967-0033-74-7

CHAPTER 35

Fabrication of a Portable 3D Hologram Projector

Aiesyah Sofiea Binti Mohd Supli [1] and Nurulsaidatulsyida Sulong [2*]

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**Corresponding author (e-mail): saidatulsyida@uitm.edu.my*

PROJECT DESCRIPTION

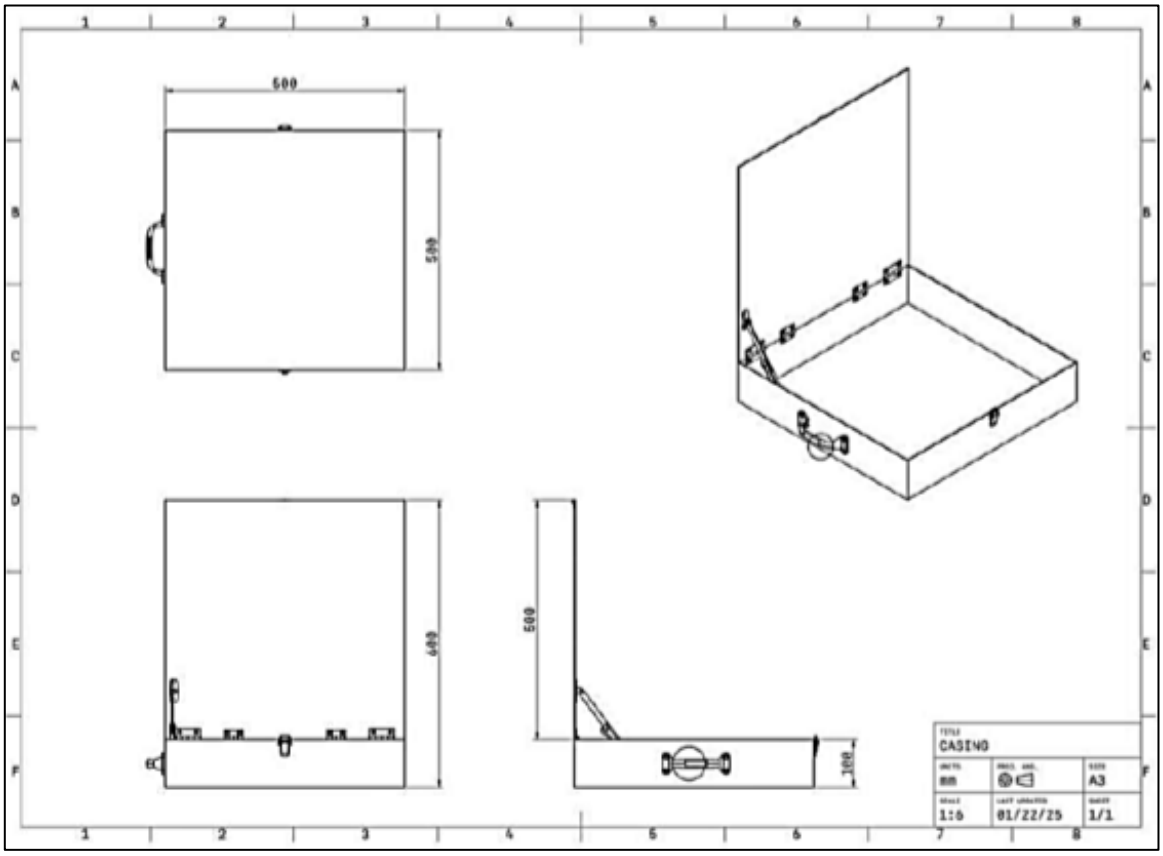
This project explores the development of portable 3D hologram projector to increase students' engagement and interest in learning. Traditional 3D projectors are bulky and heavy, making them difficult to port and install. Setting up projector requires significant effort and technical knowledge, which limits their usability in various environments. The aim of this project is to develop and manufacture a compact and user-friendly 3D hologram projector. This device can display high quality 3D images, constructed with sturdy yet lightweight 1100 aluminum alloy as the casing, which promises easy transportation and installation. This innovative solution aims to overcome the limitations of traditional 3D projectors and make them suitable for education, training and marketing applications.

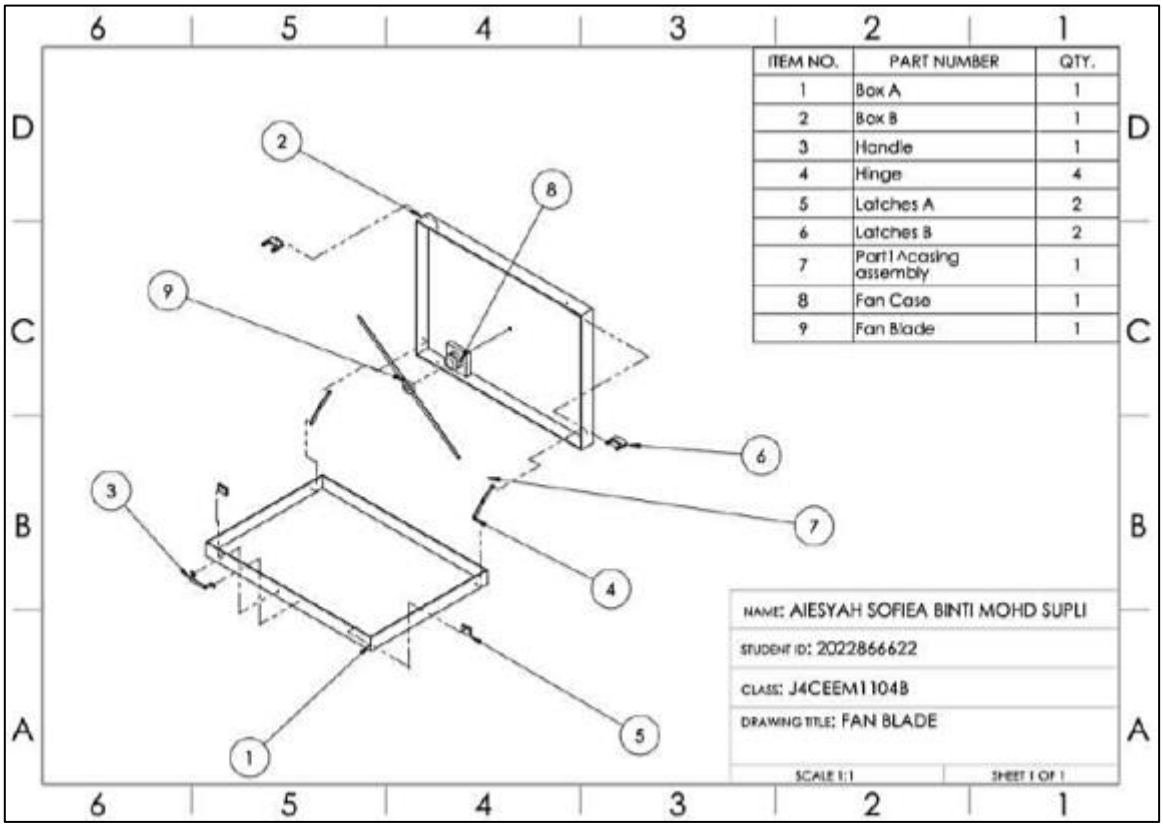
Keywords: *3D hologram projector , 3D images*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 36

Potato Peeler Machine

Sheikh Amir Safwan Bin Sheikh Abu Talib [1] and Nurulsaidatulsyida Sulong [2*]

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**Corresponding author (e-mail): saidatulsyida@uitm.edu.my*

PROJECT DESCRIPTION

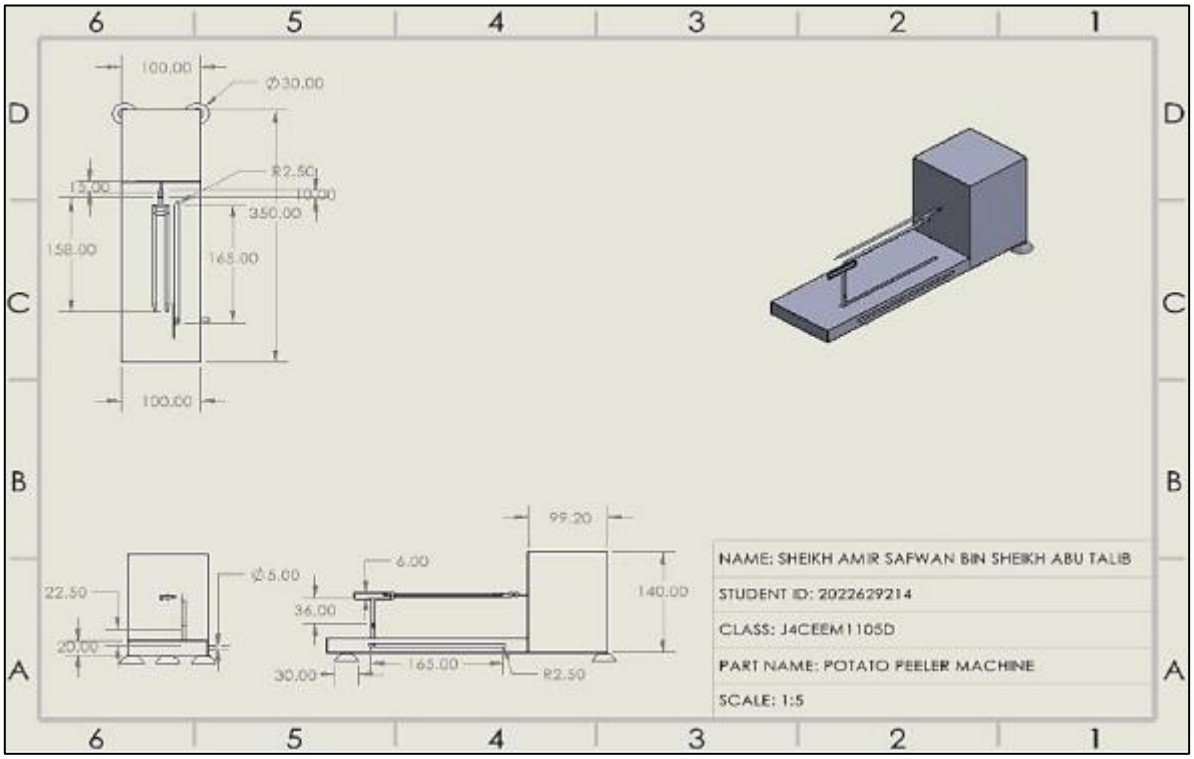
An essential tool in commercial and industrial food processing, the potato peeler machine is made to remove the skin from potatoes quickly and evenly. Foodservice establishments and production facilities can save a significant amount of time and labor by using this automated device to streamline the labor-intensive task of hand peeling. The potato peeler that is available now is big and heavy. It is only suitable for big industries. The objective of this project is to make a potato peeler that is not so big and not heavy so it can be use at home for cooking purposes. Potato peelers efficiently remove the outer skin from potatoes while preserving the vegetable's texture and reducing waste by using abrasive surfaces or revolving blades. Potato peeling machines with advanced models can be customized to meet specific needs by adjusting the thickness of the peeling. Features like safety mechanisms to prevent accidents and adjustable peeling thickness are common in modern potato peeler machines. As a result, this project will help people who want to cook at home. They will have easier time cooking potatoes because this potato peeler machine can peel more than one potato at a time without consume any human energy.

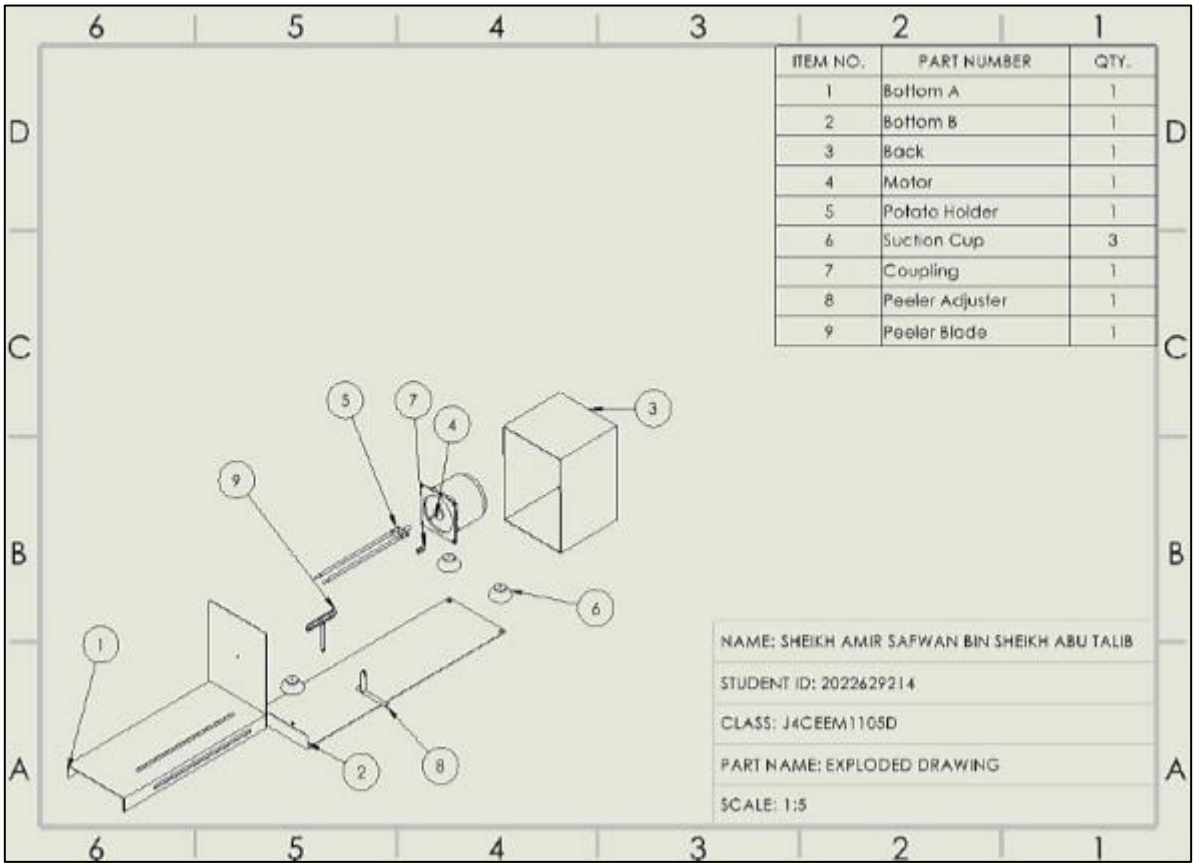
Keywords: *Potato peeler machine , Food processing*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 37

Pedal to Planet-Friendly Power: The Green EV Bicycle

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**Corresponding author (e-mail): saidatulsyida@uitm.edu.my*

PROJECT DESCRIPTION

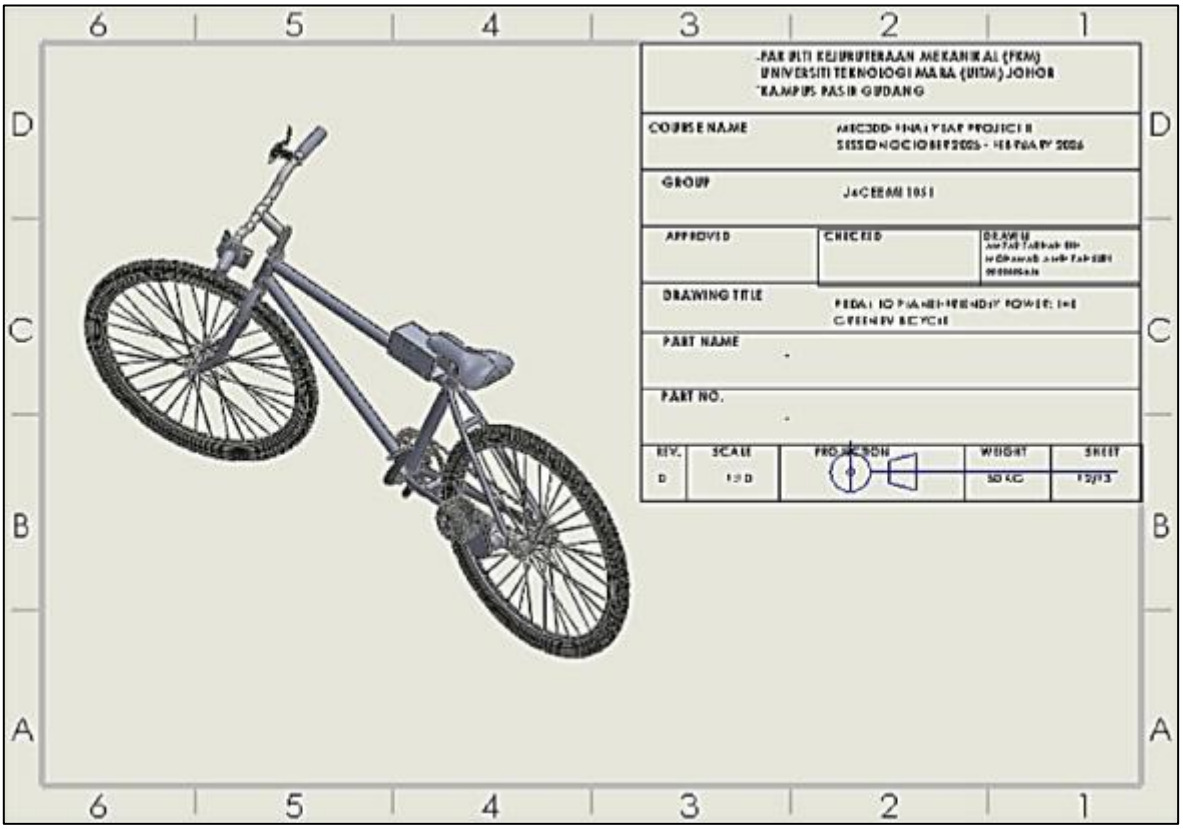
This project focuses on the design and fabrication of an electric bicycle (EV bicycle) to reduce human effort while riding and to support green transportation. The bicycle is designed using a mild steel frame to ensure strength, durability, and low cost, making it suitable for students and short-distance travel around campus. The EV bicycle is powered by a 24V, 350W DC motor and a 24V, 20000mAh lithium-ion battery. A motor controller and a thumb throttle are used to control the power supply and speed of the bicycle. The performance of the EV bicycle was tested through several quantitative evaluations. The bicycle achieved a maximum speed of approximately 28 km/h on flat road conditions. Based on battery and motor analysis, the operating runtime of the bicycle was about 1.37 hours under continuous load. With this runtime and average riding speed, the estimated travel range of the EV bicycle is approximately 35–38 km per full charge, depending on riding conditions. Load testing was conducted with a total load of 73 kg (including rider and bicycle weight), and the bicycle was able to operate smoothly without structural failure or motor malfunction. The results show that the EV bicycle can travel faster and with less effort compared to normal cycling.

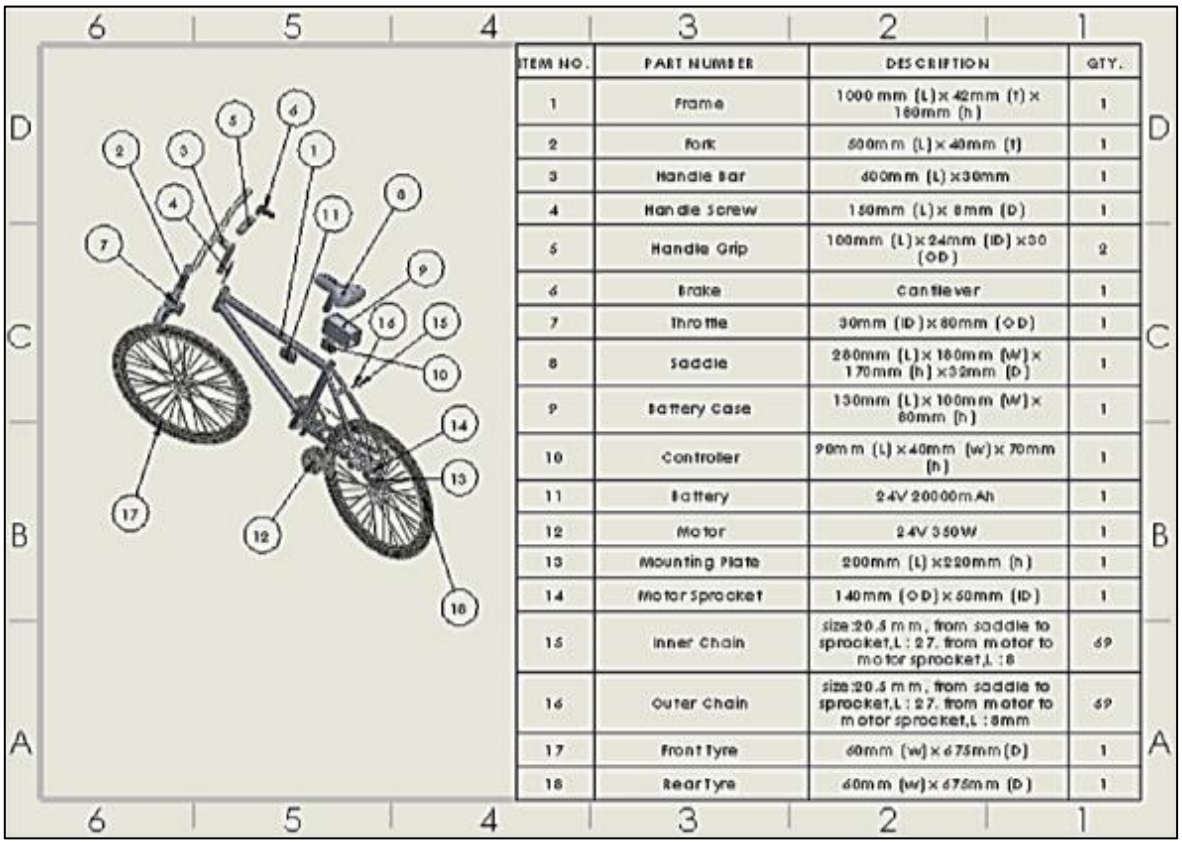
Keywords: *EV bicycle , Thumb throttle*

PROTOTYPE



DESIGN PARAMETER





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Frame	1000 mm (L) x 42mm (t) x 180mm (h)	1
2	Fork	500mm (L) x 40mm (t)	1
3	Handle Bar	600mm (L) x30mm	1
4	Handle Screw	150mm (L) x 8mm (D)	1
5	Handle Grip	100mm (L) x 24mm (ID) x30 (OD)	2
6	Brake	Cantilever	1
7	Throttle	30mm (ID) x 80mm (OD)	1
8	Saddle	280mm (L) x 180mm (W) x 170mm (h) x32mm (D)	1
9	Battery case	130mm (L) x 100mm (W) x 80mm (h)	1
10	Controller	90mm (L) x 40mm (w) x 70mm (h)	1
11	Battery	24V 20000mAh	1
12	Motor	24V 350W	1
13	Mounting Plate	200mm (L) x220mm (h)	1
14	Motor Sprocket	140mm (OD) x 60mm (ID)	1
15	Inner Chain	size:20.5 mm, from saddle to sprocket,L : 27. from motor to motor sprocket,L : 8	69
16	Outer Chain	size:20.5 mm, from saddle to sprocket,L : 27. from motor to motor sprocket,L : 8mm	69
17	Front Tyre	60mm (w) x 675mm (D)	1
18	Rear Tyre	60mm (w) x 675mm (D)	1

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CHAPTER 38

Fresh Lid: A Gas Sensor-Enabled Smart Serving Lid for Food Spoilage

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**Corresponding author (e-mail): saidatulsyida@uitm.edu.my*

PROJECT DESCRIPTION

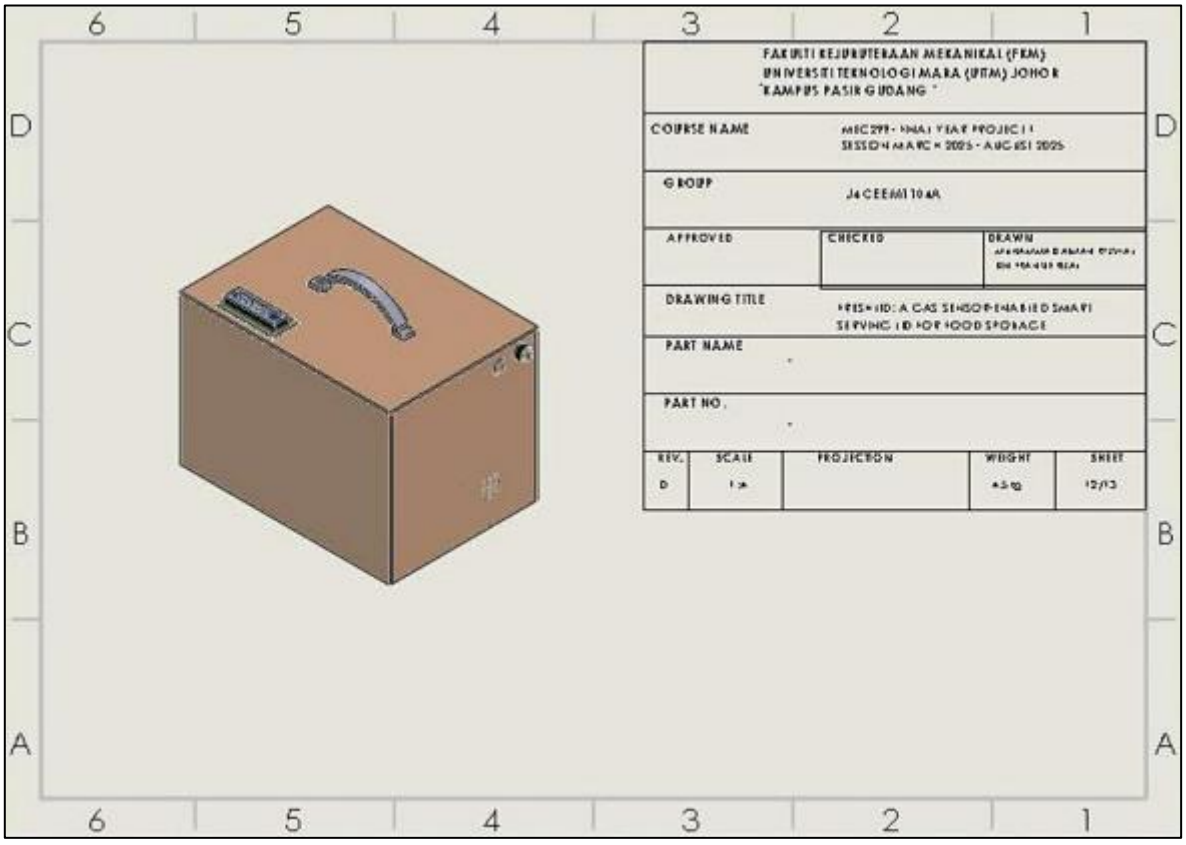
This project presents the development of a serving lid designed to detect food spoilage using a gas sensor, aiming to enhance food safety awareness and minimize waste. The lid is fabricated using Acrylic sheets, providing a durable and hygienic enclosure suitable for real world use. The system incorporates the MQ-135 gas sensor, which detects gases such as ammonia and carbon dioxide commonly released by spoiling food. Integrated with an Arduino Uno and a basic alert mechanism like LCD display and buzzer, the lid provides real time feedback on food freshness. The methodology involves embedding the sensor and electronics into the custom-made steel lid, reading analog gas values, and interpreting the data to alert users when spoilage is detected. The target audience include households interested in food safety and low-cost kitchen solutions. In conclusion, the smart lid offers a practical, educational, and scalable solution for monitoring food spoilage using accessible sensor technology and safe materials.

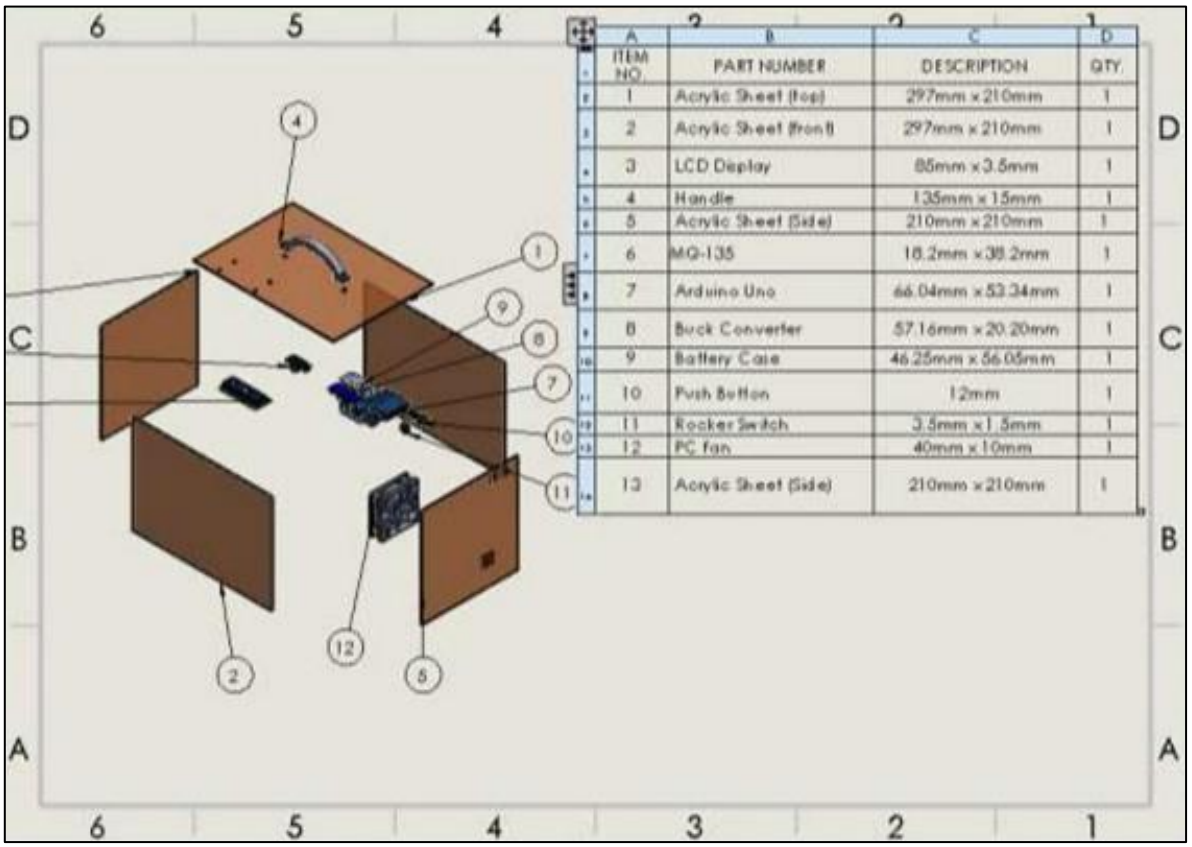
Keywords: *Gas sensor , Serving lid*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 39

Design and Fabrication of Indoor Furniture Mover

Muhammad Nurqayyum Mirza Bin Abdul Razak [1] and Nurulsaidatulsyida Sulong [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): saidatulsyida@uitm.edu.my*

PROJECT DESCRIPTION

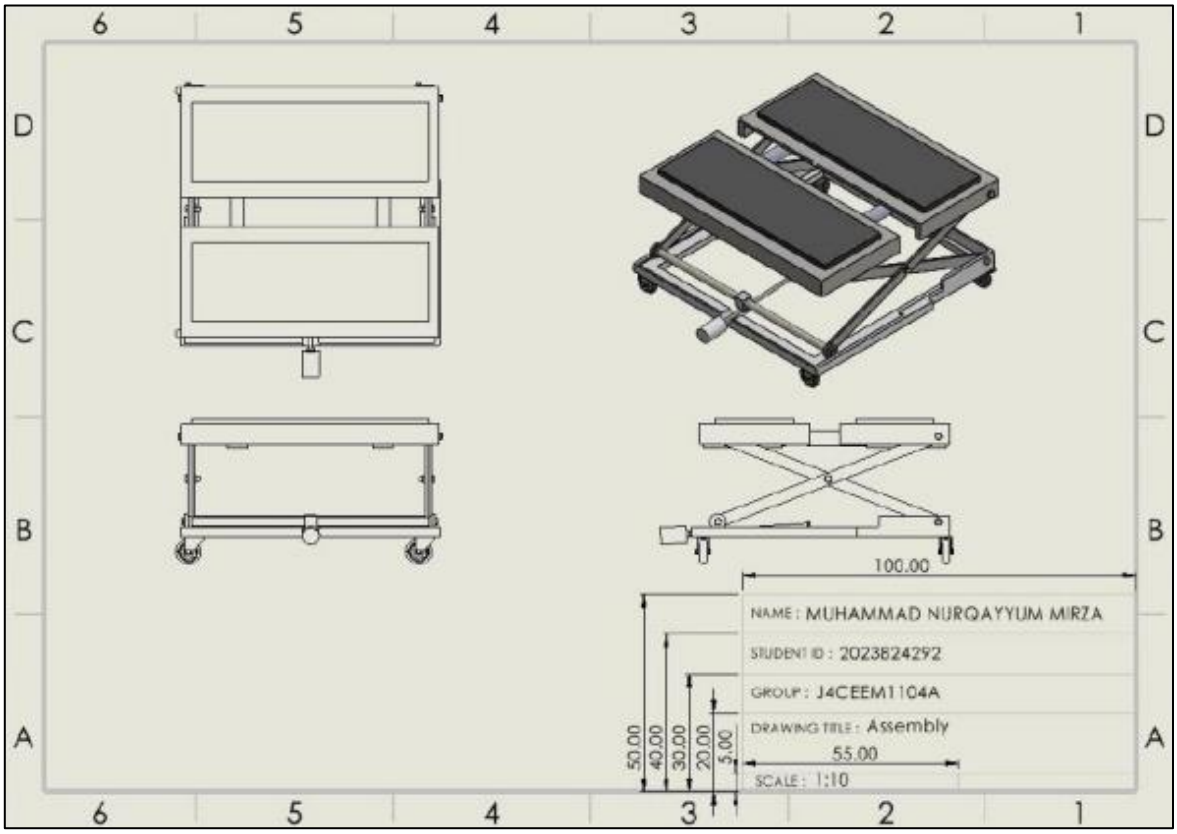
When lifting heavy objects, sometimes it requires more than one person, which can cause a strain on a person's body and an injury. Advances in technology have tackled this problem by inventing a lifting mechanism to help transport heavy objects to the required places efficiently. One of the problems is that, within households, during celebrations, people tend to arrange furniture around the house. This action has raised a problem, such as requiring more manpower when lifting heavy objects and moving the furniture in tight spaces. The objective of this project is to design and fabricate a mechanical lifting trolley that can help transport heavy objects from one place to another without the need for extra manpower. The project involves designing, modeling and. fabrication of the mechanical lifting trolley using a scissor lifting mechanism. In conclusion, the expected results of this project are that it can withstand heavy and lift the objects that have been put onto it and can move and maneuver easily.

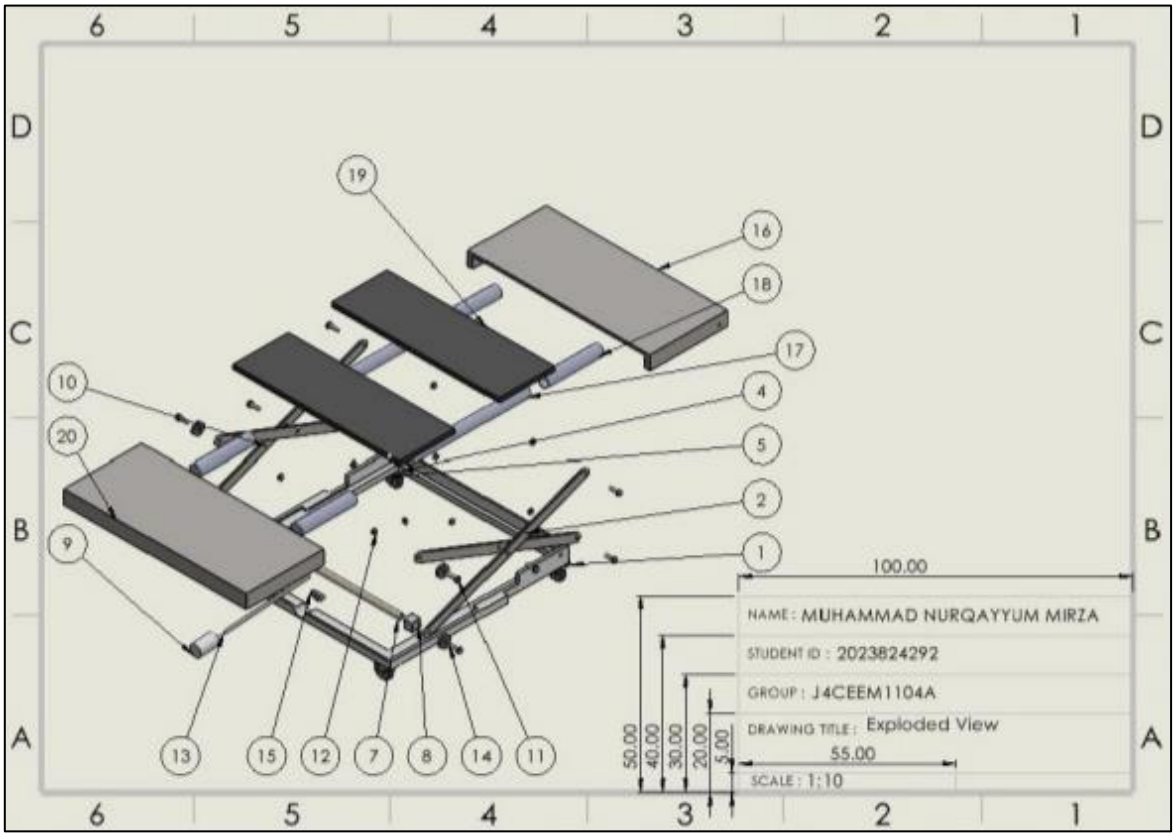
Keywords: *Heavy objects , Lifting trolley*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 40

Adjustable Motorized Desk for Ergonomic Workplace Application

Izz Haziq Abdul Ghani Liew [1] and R. M. Aslam Raja Arif [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
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PROJECT DESCRIPTION

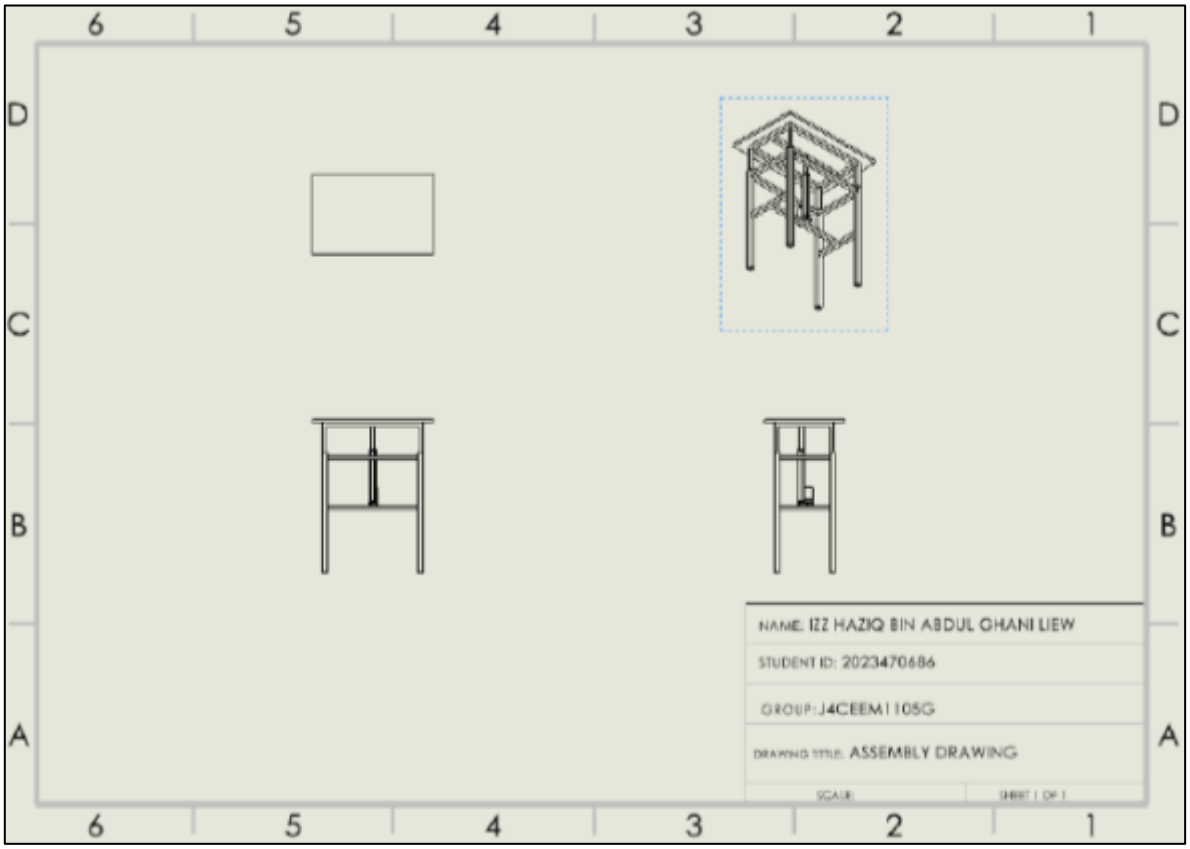
Prolonged sitting in office and study environments has been associated with musculoskeletal discomfort, poor posture, and long-term health risks. While adjustable desks provide ergonomic benefits by enabling users to alternate between sitting and standing positions, most affordable options rely on manual cranking mechanisms that discourage frequent adjustment. Conversely, commercial motorized desks often include advanced features such as memory presets and anti-collision systems, which significantly increase cost and complexity. This project aims to design and fabricate a simplified, cost-effective motorized adjustable desk that focuses solely on essential height adjustment functionality. The desk was designed using SolidWorks and constructed using mild steel for the frame and medium-density fiberboard (MDF) for the tabletop. A 12V linear actuator controlled by a rocker switch was implemented to provide vertical motion within a height range of approximately 700 mm to 1000 mm. Engineering calculations were performed to evaluate motor torque, lifting force, and load capacity. The system was designed to safely lift up to 5 kg, suitable for light office or student use. The fabricated prototype demonstrated stable vertical motion and reliable operation during functional testing.

Keywords: *Adjustable desk, Ergonomic, Liner actuator*

PROTOTYPE



DESIGN PARAMETER



CHAPTER 41

Design, Fabrication and Performance Analysis of a Smart Waste Segregator

Jayden Benedict Jipiu [1], Ainaa Maya Munira Binti Ismail [2*] and Najibah Ab Latif [3]

[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): ainaa7609@uitm.edu.my*

PROJECT DESCRIPTION

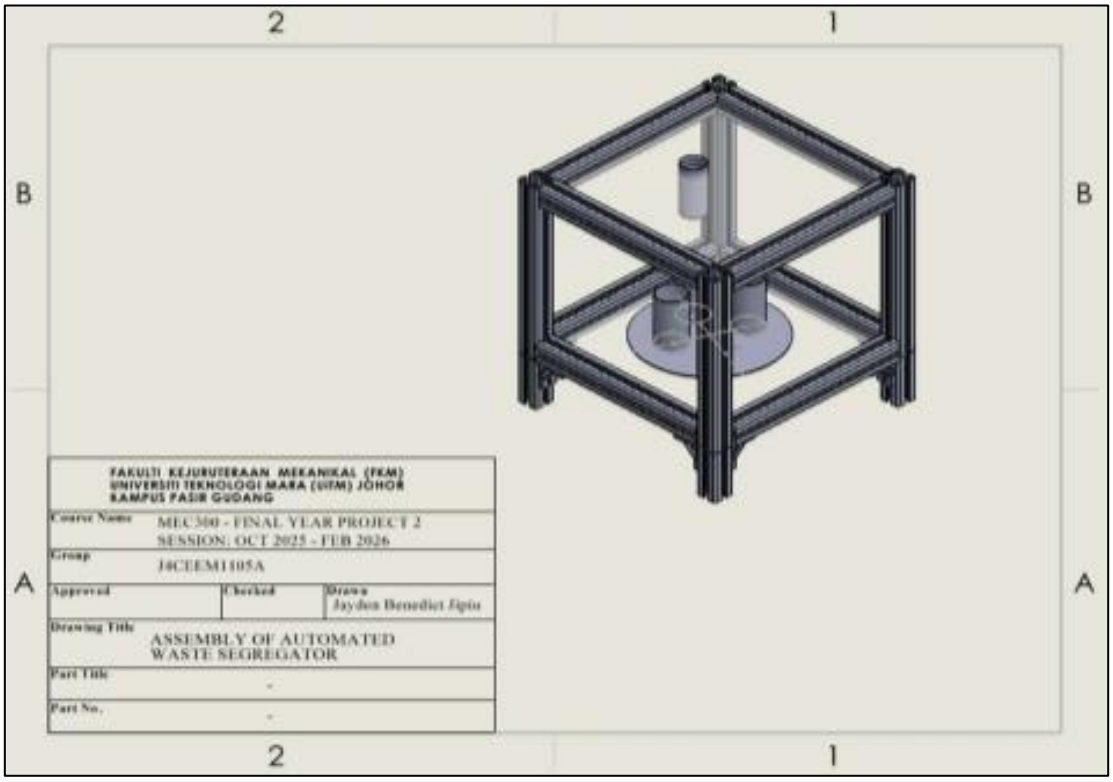
Effective waste management is essential for addressing the global challenge of daily waste generation, which currently exceeds 2 billion tons annually and continues to rise with population growth. In Malaysia, the 3R approach (Reduce, Reuse, Recycle) encourages sustainable waste practices; however, inadequate segregation often results in contamination, reducing recycling efficiency and limiting the effectiveness of waste management systems. This study presents a smart waste segregator designed, fabricated, and evaluated to automate the separation of plastic, paper, and metal waste. The system integrates an Arduino microcontroller with inductive proximity sensors for precise metal detection and infrared sensors for the identification of general waste types. Servo-controlled movable chambers direct each waste category into designated compartments, ensuring accurate and reliable sorting. A comprehensive performance analysis was conducted to evaluate sorting accuracy, operational efficiency, and reliability under various waste input conditions. Results indicate that the system consistently achieves accurate segregation across all targeted categories, significantly reducing contamination risks associated with manual handling.

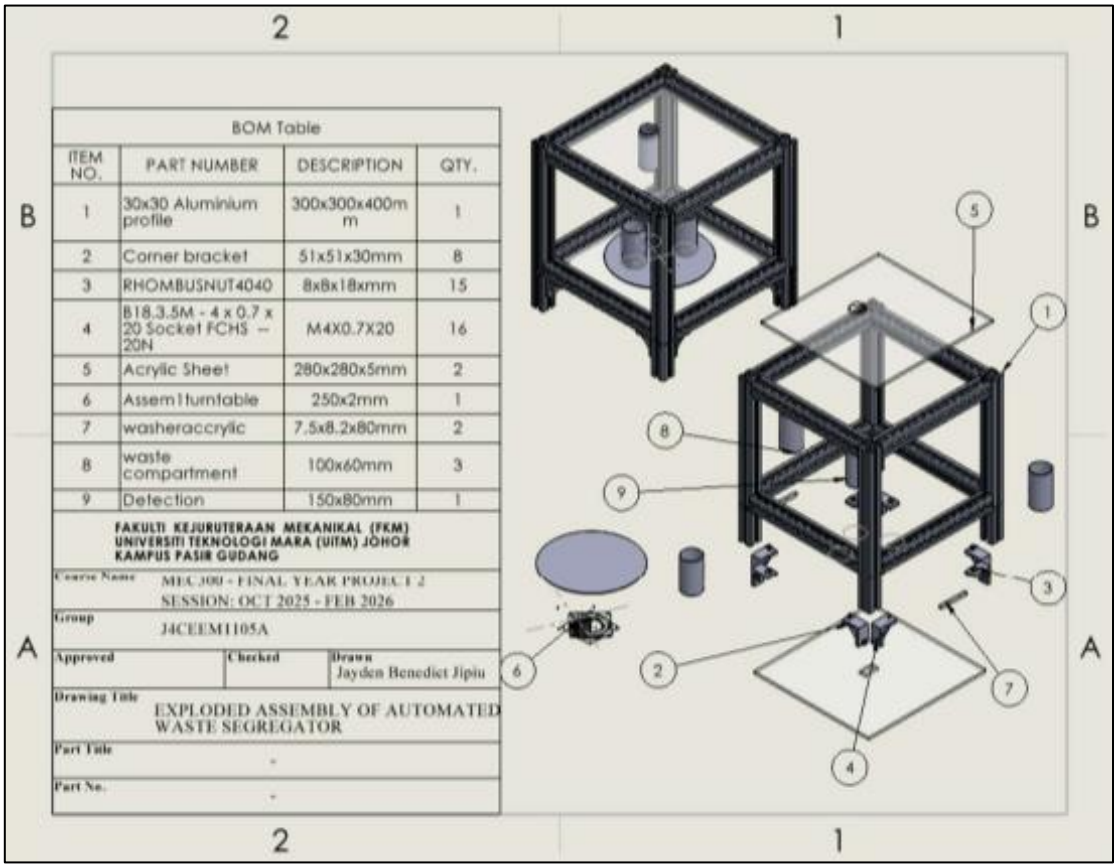
Keywords: *Smart waste segregato, Recycling efficiency*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 42

Design and Fabrication of Engine Mounting, Shifter and Throttle Controller for Petrol Combustion Engine

Muhammad Arif Zuhair Bin Mohamad Fadzil [1] and Ab Aziz Bin Mohd Yusof [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): abaziz86@uitm.edu.my*

PROJECT DESCRIPTION

This project presents the design and fabrication of a custom engine mount, gear shifter, and throttle controller for a petrol combustion engine in a modified vehicle chassis. These components were developed to address the lack of ready-made solutions for unique engine-chassis configurations. The design process utilized 3D CAD modeling and structural stress analysis, while fabrication focused on cost-effective methods, including SMAW and MIG welding and the use of recycled mild steel. Results demonstrate that the engine mounting beam successfully secured the engine to the chassis, though direct welding resulted in some vibration dissipation throughout the frame. The custom gear shifter, redesigned with a door-hinge slider mechanism for cost-efficiency, provided the necessary travel for neutral and reverse shifting. Prototype testing confirmed that the integrated system is mechanically stable and ergonomically optimized for driver reach. While the project achieved high environmental sustainability through material recycling, future iterations could further enhance performance by incorporating hydraulic damping for vibration control and electronic fuel injection for improved throttle precision.

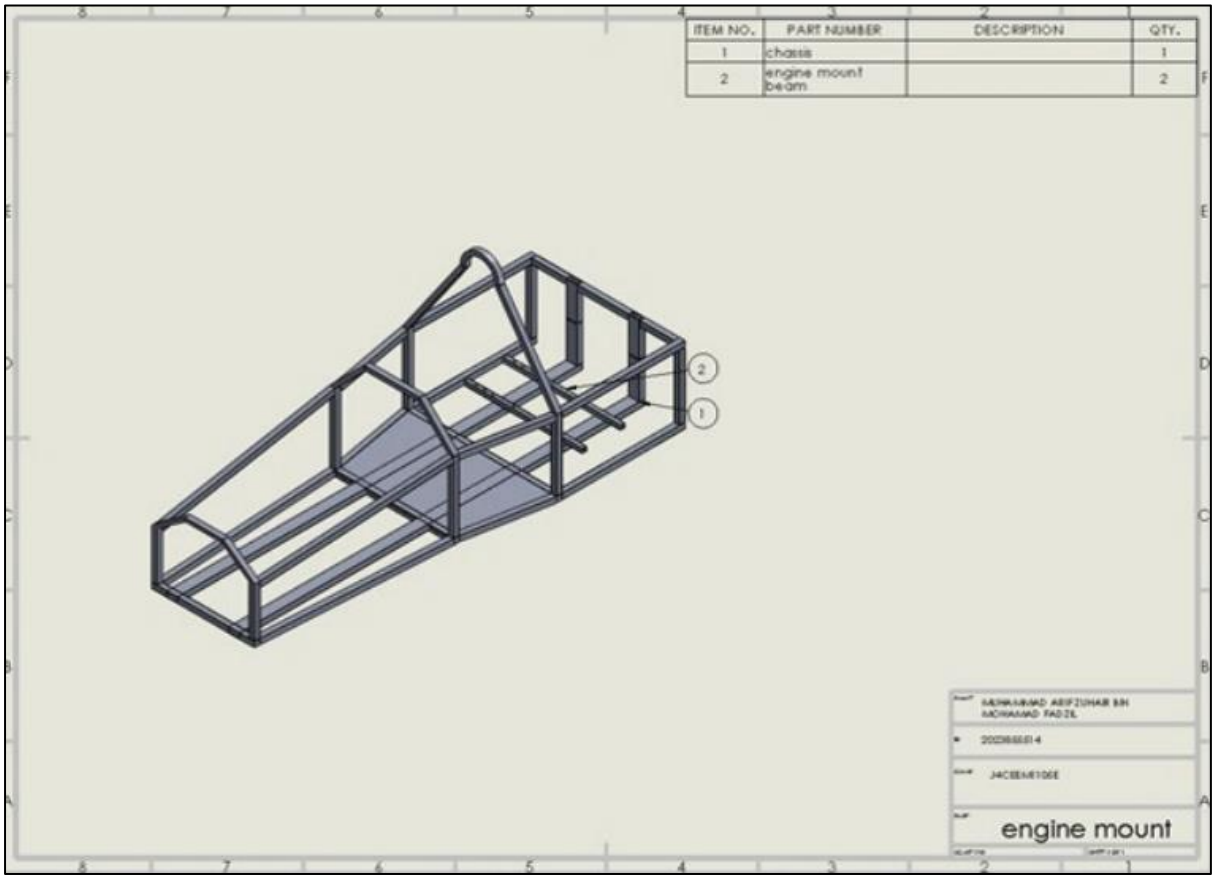
Keywords: *Car Engine, Mountingl*

PROTOTYPE





DESIGN PARAMETER



eISBN: 978-967-0033-74-7

CHAPTER 43

Design and Fabrication of Forward and Reverse Manual Transmission and Power Delivery System

Harith Harry Bin Muzaini [1] and Ab Aziz Bin Mohd Yusof [2*]

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**Corresponding author (e-mail): abaziz86@uitm.edu.my*

PROJECT DESCRIPTION

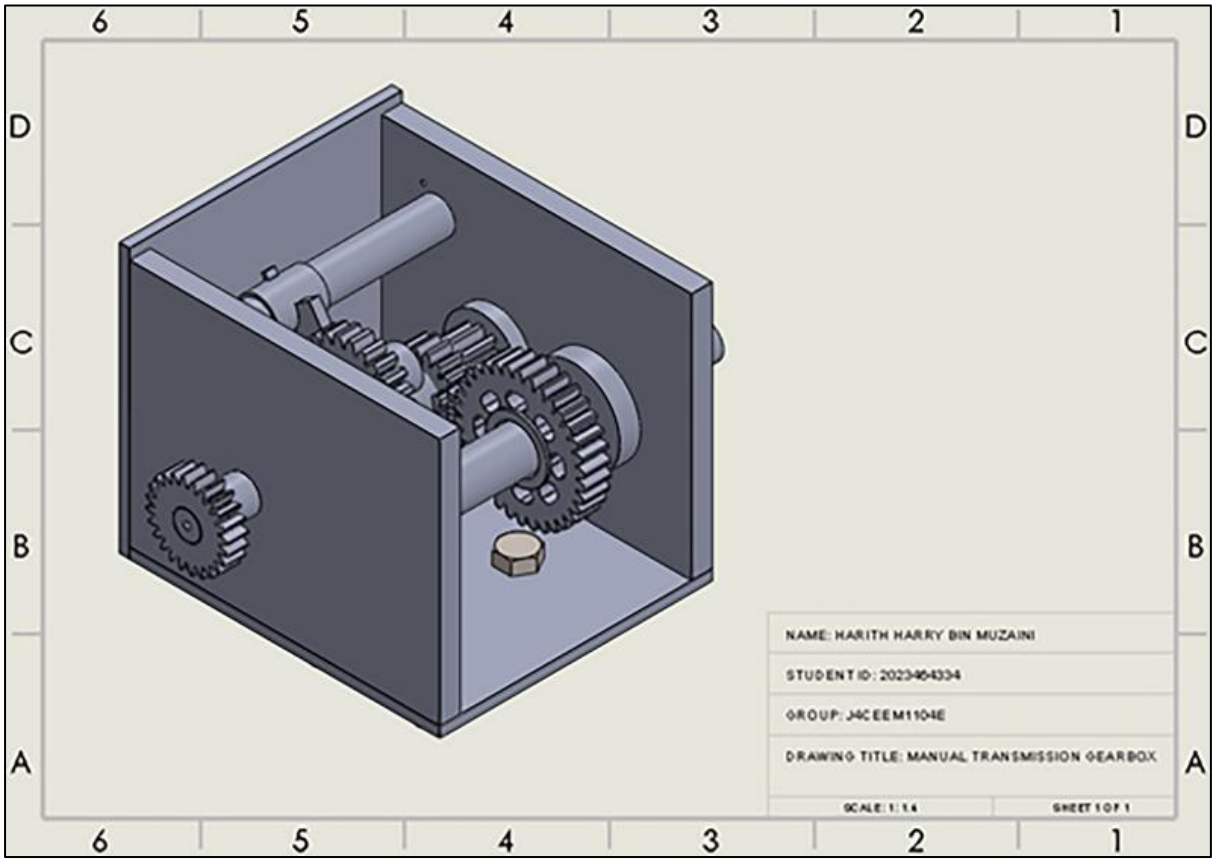
A gearbox functions as a transmission system for a vehicle as it transfers the power generated from the engine to the wheels. It is a mechanical device that utilizes different gear ratios to change its speed and movement direction such as to accelerate, decelerate or move in reverse. This project focuses on understanding the importance of the angle of rotation in relation to the car handling system used. The main objective of this project is to design and fabricate a working car handling system, drive system, and brake system based on proposed ideas and prototype designs. Among the designs developed, the most suitable car handling system will be selected through simulation and testing to improve overall vehicle efficiency. The methodology in this project begins with a conceptual design phase, where different car handling mechanisms are studied and sketched based on steering geometry and angle of rotation requirements. This is followed by the selection of suitable materials and components for the handling, drive, and brake systems. Computer-aided design (CAD) and simulation software are used to analyse steering angles, turning behaviour, and system performance. After simulation, a prototype is fabricated and tested under controlled conditions to evaluate steering response, power transmission efficiency, and braking performance. The results will be obtained from simulation and physical testing show that the selected car handling design provides better steering accuracy and smoother turning behaviour compared to other proposed designs. Overall, the integrated systems function as intended and meet the project objectives.

Keywords: *Car transmission, Manual*

PROTOTYPE



DESIGN PARAMETER



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CHAPTER 44

Design and Fabrication of Car Handling, Drive and Brake System

Muhamad Abrisamuddin bin Tajuddin [1] and Ab Aziz Bin Mohd Yusof [2*]

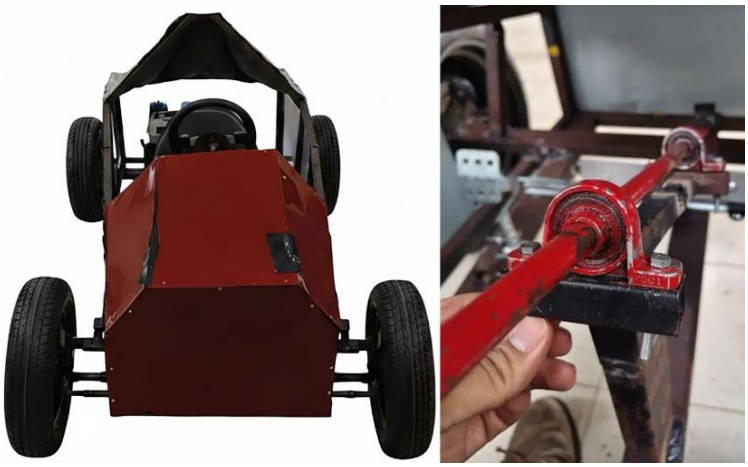
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): abaziz86@uitm.edu.my*

PROJECT DESCRIPTION

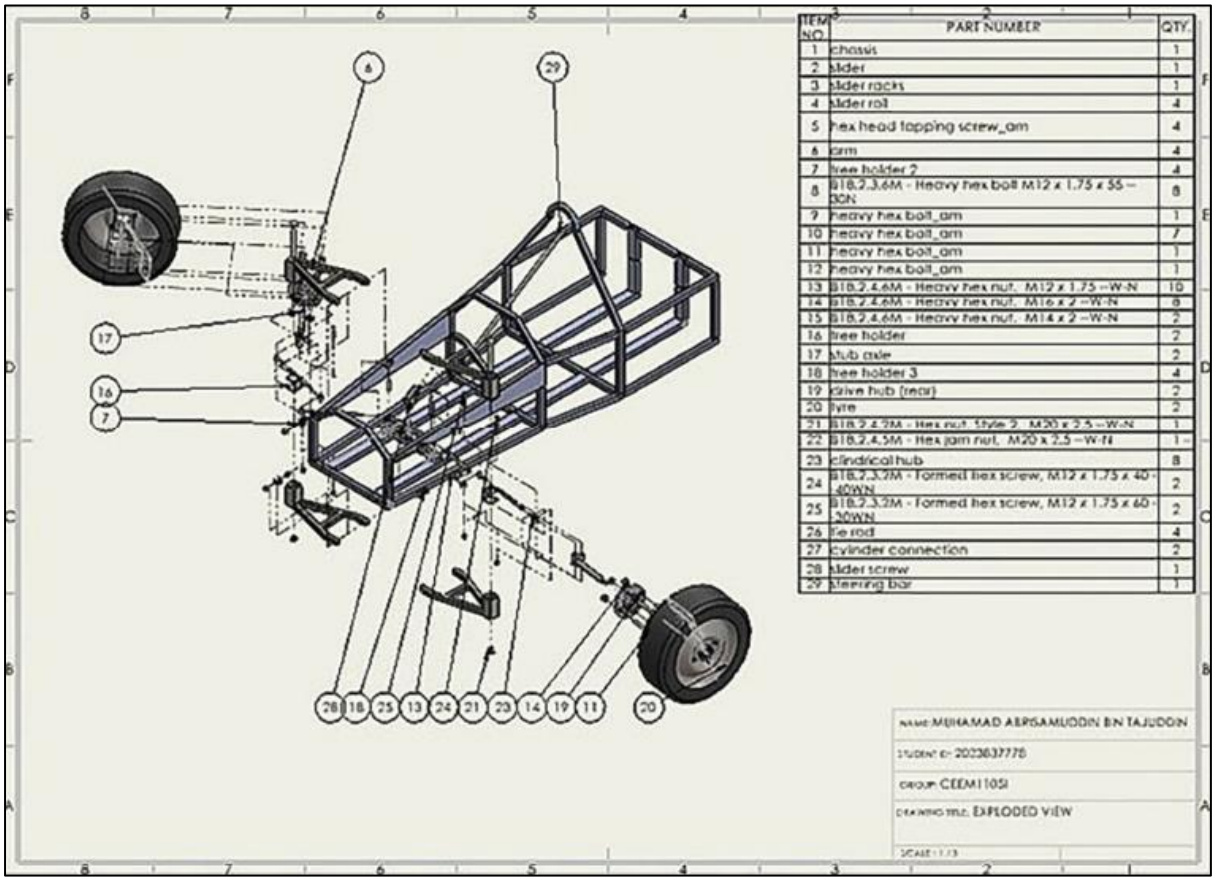
Car handling systems are an important aspect that must always be considered when building a car, as they determine the vehicle's ability to rotate to the left or right effectively. The main objective of this project is to design and fabricate a working car handling system, drive system, and brake system based on proposed ideas and prototype designs. The methodology in this project begins with a conceptual design phase, where different car handling mechanisms are studied and sketched based on steering geometry and angle of rotation requirements. This is followed by the selection of suitable materials and components for the handling, drive, and brake systems. Computer-aided design (CAD) and simulation software are used to analyse steering angles, turning behaviour, and system performance. After simulation, a prototype is fabricated and tested under controlled conditions to evaluate steering response, power transmission efficiency, and braking performance. The results will be obtained from simulation and physical testing show that the selected car handling design provides better steering accuracy and smoother turning behaviour compared to other proposed designs. The optimized angle of rotation improves vehicle stability during cornering. The drive system effectively transfers power to the wheels with minimal losses, while the brake system demonstrates reliable stopping performance and consistent response. Through systematic design, simulation, and testing, an efficient car handling system was developed and selected.

Keywords: *Car handling, Drive*

PROTOTYPE



DESIGN PARAMETER



CHAPTER 45

Design and Fabrication Car Chassis and Body for Better Stiffness and Aerodynamic

Muhammad Shahazim Bin Shamsul Nahar [1] and Ab Aziz Bin Mohd Yusof [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): abaziz86@uitm.edu.my*

PROJECT DESCRIPTION

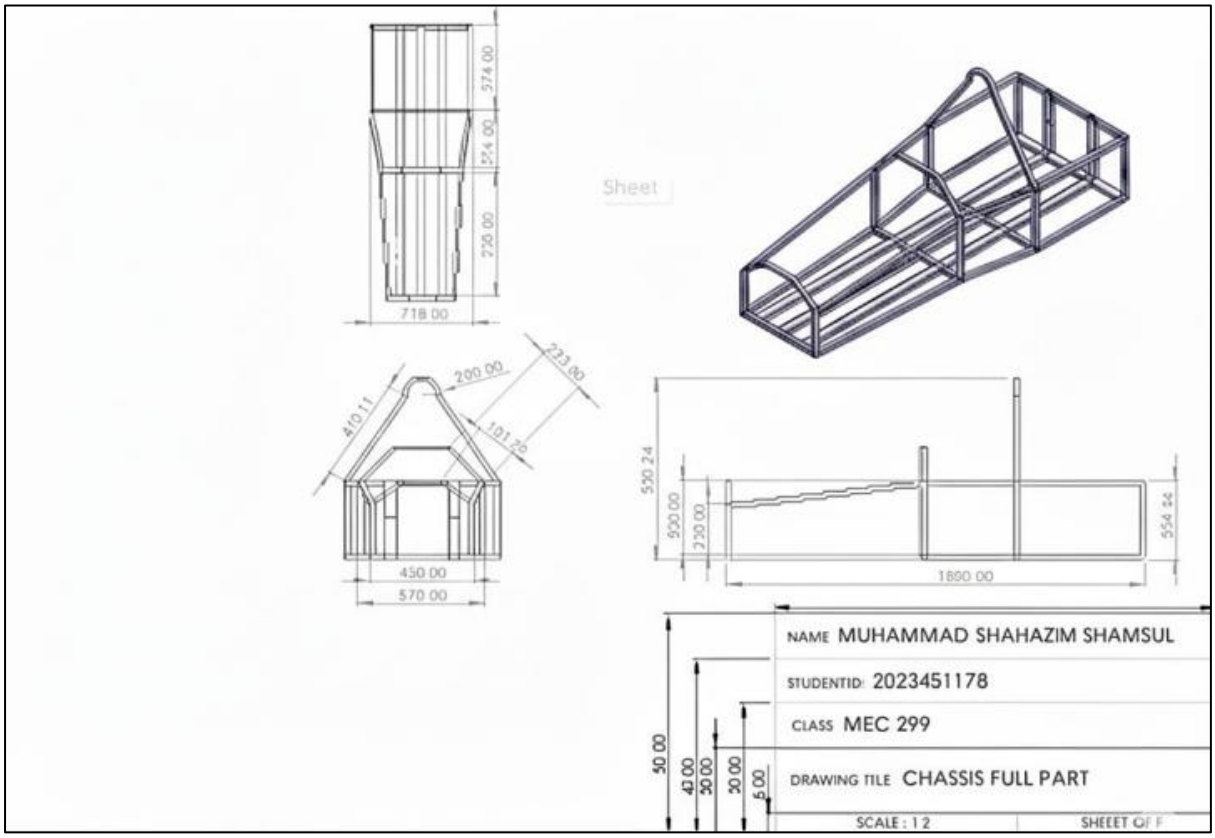
Aerodynamic and rigid cars are four-wheeled vehicles commonly used in recreational and competitive motorsports. A critical challenge in car design is ensuring the chassis possesses adequate strength and rigidity to safely support the driver and withstand the dynamic forces encountered during operation. Many entry-level car projects suffer from using materials with insufficient strength or improper grades, resulting in low load-bearing capacity, excessive deformation, and compromised safety. The aim of this project is to design and fabricate a prototype of chassis and body cover for a car. These shortcomings often arise from inadequate structural analysis, insufficient use of simulation tools such as CAD or FEA, and a lack of proper consideration for stress distribution and safety factors. The main objectives of this project are to design and fabricate a car chassis that can reliably support the driver's weight, endure operational stresses with minimal deformation, and meet all safety requirements. As a result of this the work, the car has a sturdy chassis that can support the weight of the driver without bending excessively, and its body is well covered on all sides, which reduces drag in comparison to earlier designs. Additionally, the project will improve practical engineering abilities in fabrication, analysis, and design. In summary, the prototype is in line with the SolidWorks analysis and accomplishes the goals.

Keywords: *Car chassis, Prototype*

PROTOTYPE



DESIGN PARAMETER



CHAPTER 46

Design and Fabrication of Crash Box and Anti Penetration Plate for Safety Purposes Formula Student Racing Car

Franz Evans Fancey Sami [1] and Hazim Sharudin [2*]

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**Corresponding author (e-mail): hazim@uitm.edu.my*

PROJECT DESCRIPTION

Safety is a critical aspect in the development of student racing vehicles, particularly in competitions such as Formula Student. This project focuses on the design and fabrication of a crash box and an anti-penetration plate to improve driver protection and structural safety in a Formula Student race car. The study addresses limitations in existing safety components, where current crash box structures and protective plates may not sufficiently absorb impact energy or prevent debris and foreign objects from entering the cockpit during collisions. Conducted as part of a Final Year Project, the work involved several stages including conceptual design, material selection, structural analysis considerations, and fabrication planning to develop a structure capable of enhancing energy absorption while remaining compatible with the vehicle chassis. The final crash box and anti-penetration plate were successfully designed and fabricated during the second phase of the project. Although experimental impact testing could not be conducted within the project duration, the proposed design is expected to improve impact resistance and cockpit protection based on established engineering design principles. In addition, the project also considers environmentally responsible material usage and disposal practices, aligning with the growing emphasis on sustainability in modern automotive engineering.

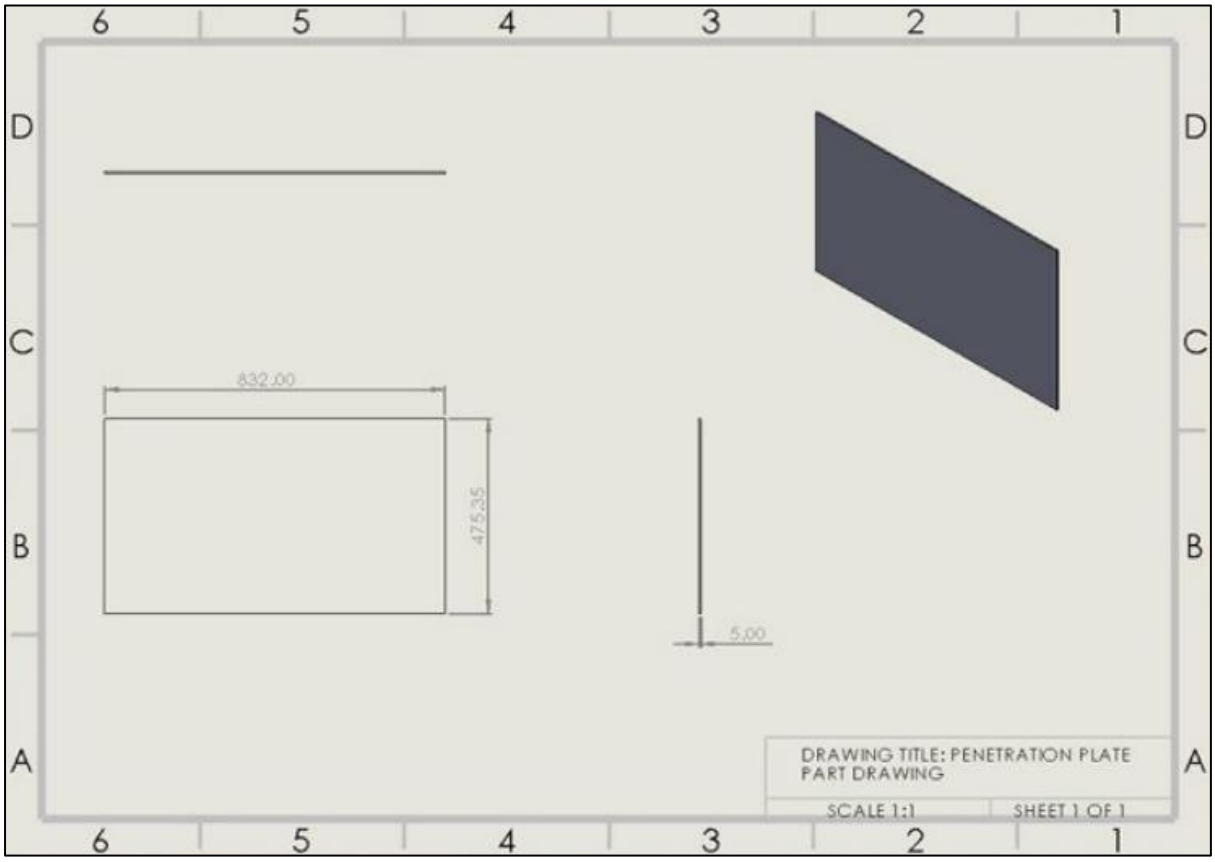
Keywords: *Crash box, Penetration plate*

PROTOTYPE



eISBN: 978-967-0033-74-7

DESIGN PARAMETER



eISBN: 978-967-0033-74-7

CHAPTER 47

Design and Fabrication of Gear Shifter System for Student Formula Racing Car

Mitchelle Hansley Anak Freddy Shiro [1] and Hazim Sharudin [2*]

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**Corresponding author (e-mail): hazim@uitm.edu.my*

PROJECT DESCRIPTION

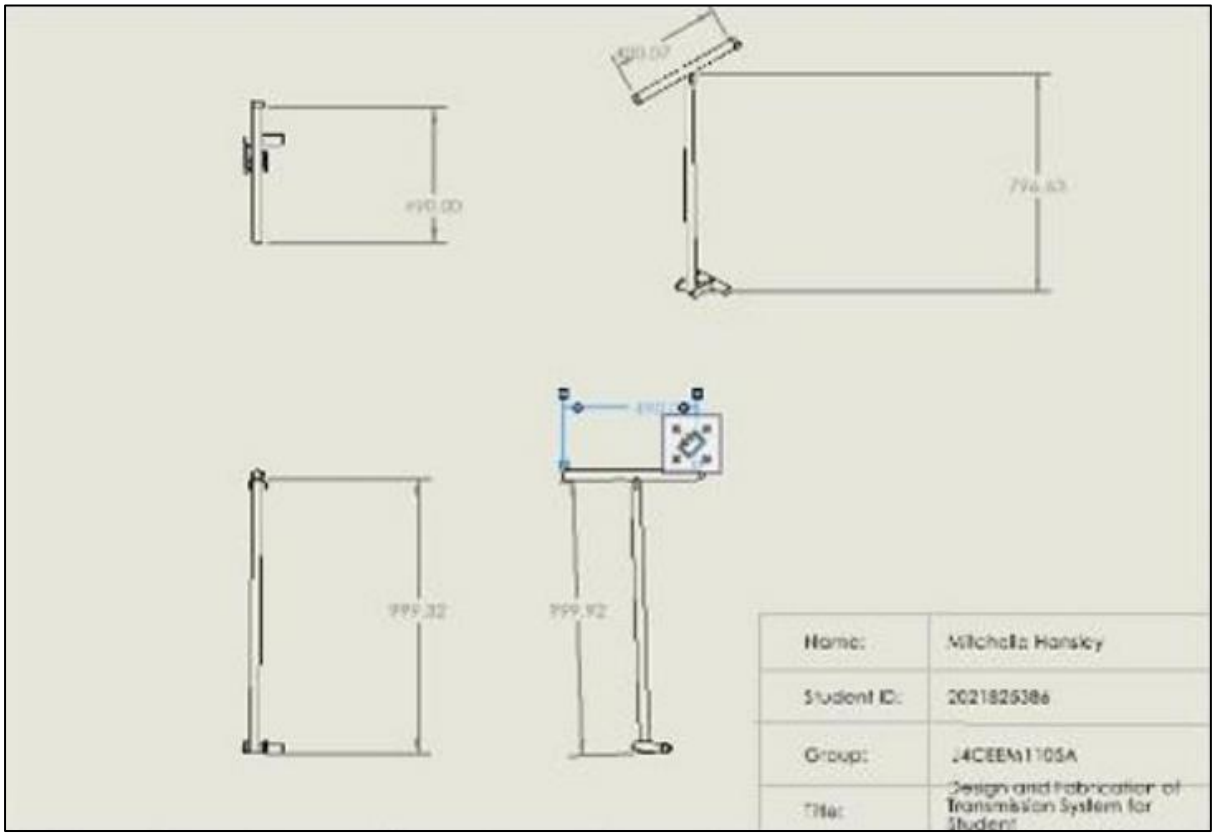
This project will be a focal point in the world of custom automotive industry. It helps drivers of the Formula Student Racing car to shift gears with ease. Most students are facing troubles regarding the mechanism of the gear shifter as it may deem as complicated. So this project will be able to help future automotive engineers figure out the basic concept of a gear shifter mechanism. This project will be using a few types of metals, depending on the usage. Various points are taken into consideration when choosing the type of metal such as the bending ability, how easy it is to handle and weld the metal. This project involves fabrication processes such as measuring and marking, cutting, and welding process. The results are to create a functioning gear shifter for the student formula racing car which are recorded and presented by the end of this semester. The hope for this project is that the mechanism can be used to generate ideas for the gear shifter system for many other upcoming races, helping all the students that are taking part in the Student Formula Racing Competition.

Keywords: *Transmission system, Formula student racing car*

PROTOTYPE



DESIGN PARAMETER



CHAPTER 48

Design and Fabrication of Impact Attenuator for Formula Student Racing Car

Adam Iman Bin Shahril Azwan [1] and Nurulsaidatulsyida Sulong [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
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PROJECT DESCRIPTION

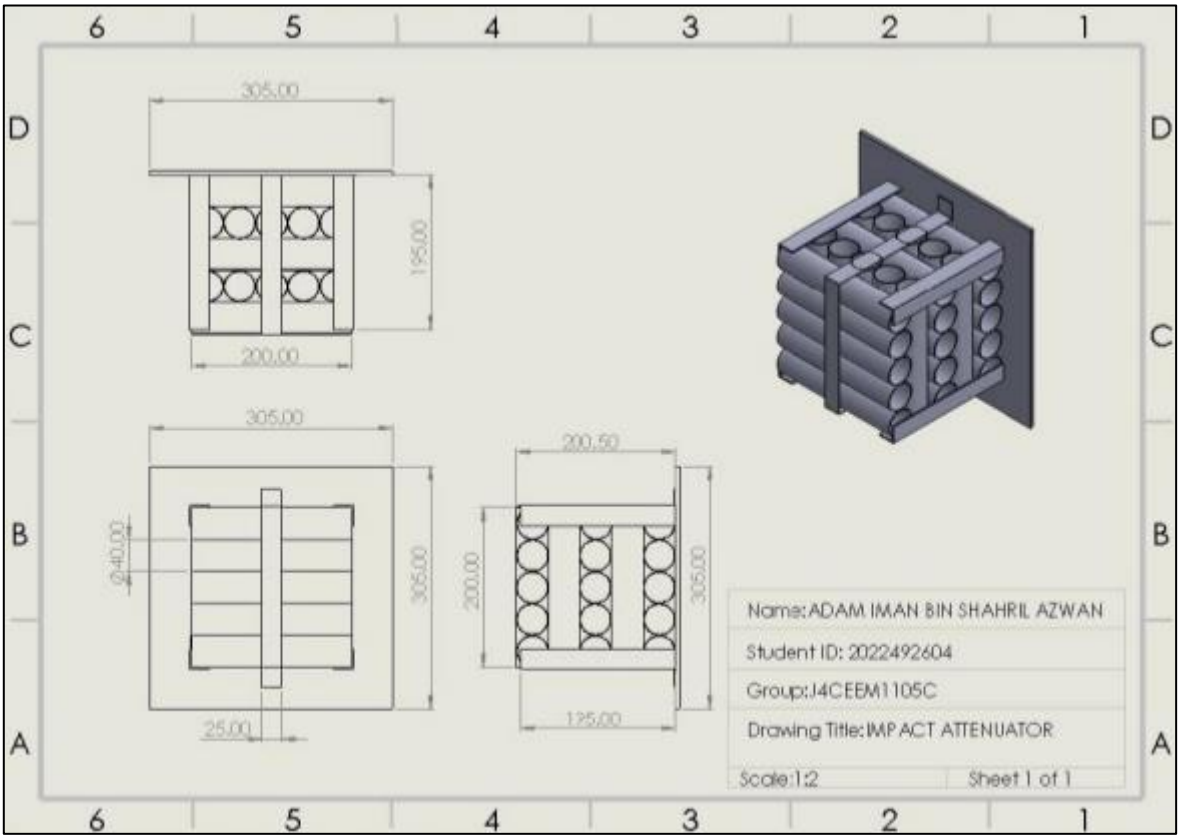
Improving driver safety during fast collisions depends on the creation of an impact attenuator for Formula Student racing vehicles. The design, material choice, and testing of a novel impact attenuator satisfying the strict guidelines and performance standards of the Formula Student competition is the main focus of this project. To absorb and distribute the energy during a frontal collision, the impact attenuator is placed strategically in the front of the car, exactly in front of the front bulkhead. Making the impact attenuator calls for numerous important stages. Design conceptualization is first done considering many configurations and materials to maximize energy absorption and weight efficiency based on dimensional restrictions and regulatory criteria. Selected for their great strength to weight ratios and exceptional energy dissipation qualities are advanced composite materials including carbon fibre and energy-absorbing foams. Made from the chosen materials, prototypes guarantee excellent construction by means of composite lay-up and precision moulding. Performance is evaluated using test data; design iterations are created as needed until the attenuator satisfies all safety and performance criteria. This study shows notable increases in safety performance, providing a strong answer that can be included into the construction of next Formula Student race cars, so improving the general safety criteria of the competition.

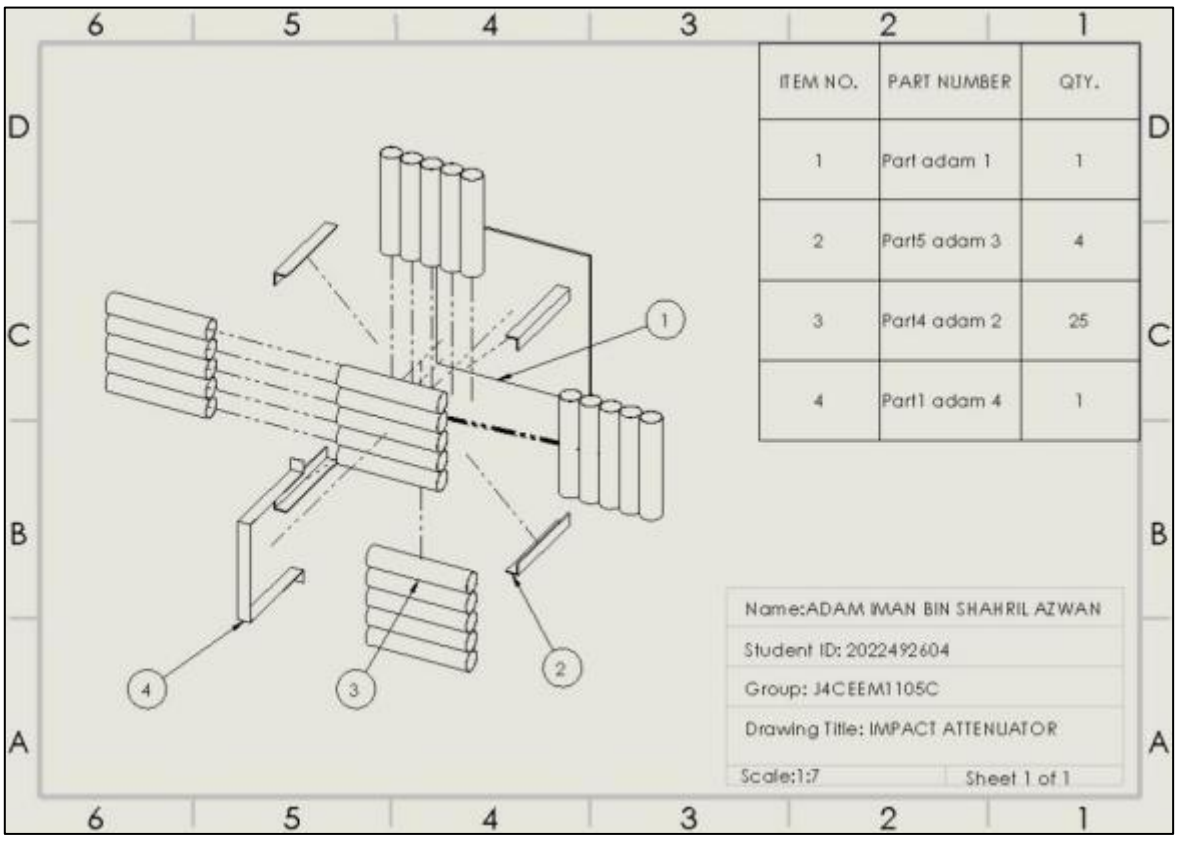
Keywords: *Attenuator , Student racing car*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 49

Design and Fabrication of Controller and Cooling System of Battery Casing of Formula Student EV Car

Naufal Fahim Bin Suffian [1] and Haszeme Bin Abu Kasim [2*]

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PROJECT DESCRIPTION

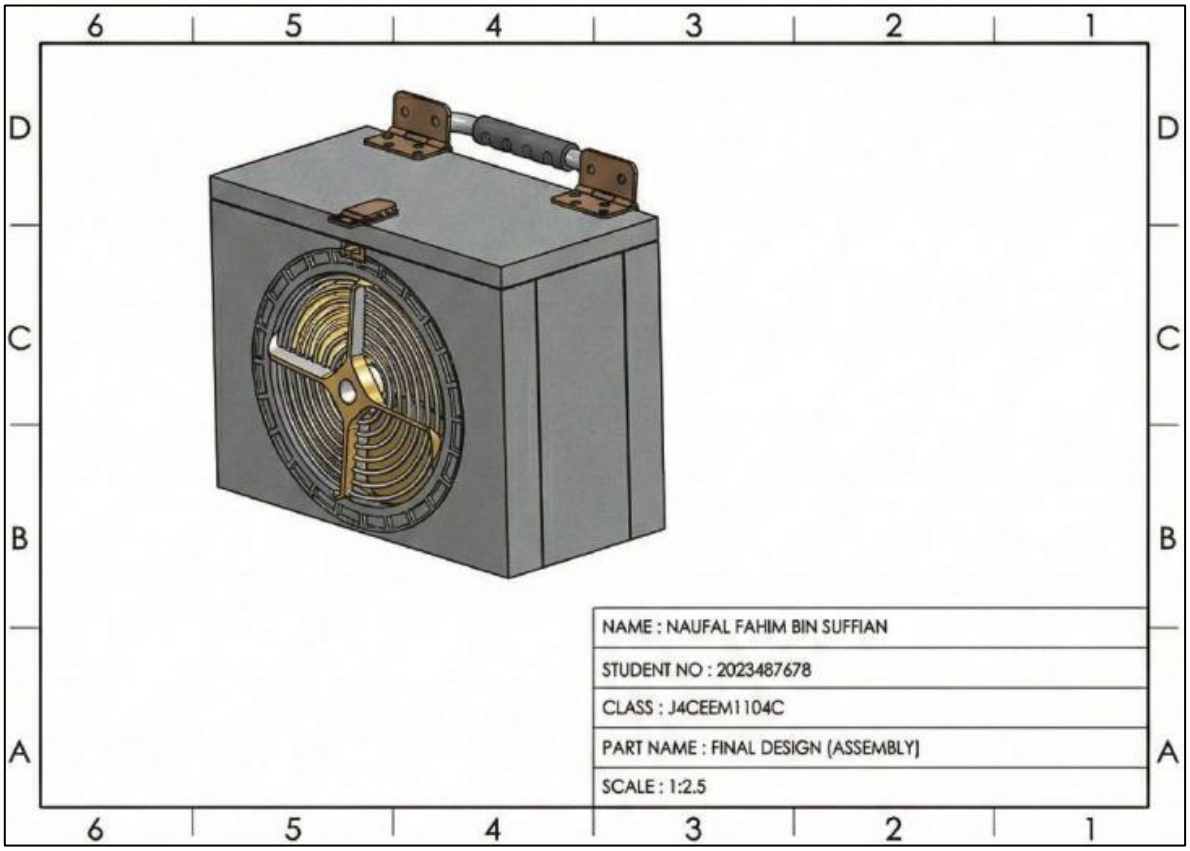
This project addresses the critical challenge of battery thermal management in Formula Student Electric Vehicles (EVs), where inadequate heat dissipation can lead to thermal runaway, reduced vehicle efficiency, and safety hazards. The primary objectives were to design and fabricate an optimized motor controller and cooling system holder that balances performance, weight, and cost-effectiveness.The methodology integrated both theoretical and practical engineering approaches. Utilizing SolidWorks CAD software, a custom casing was modeled and simulated to assess performance under racing conditions. A forced air-cooling (fan) system was selected as a lightweight and economical alternative to complex liquid cooling systems, effectively reducing the overall vehicle mass. Engineering analysis confirmed that the dual-fan configuration provides a calculated airflow of 28.29 CFM, sufficient to mitigate heat loss from the battery. Results demonstrate a successful proof-of-concept that enhances energy efficiency and reliability. The finalized prototype offers a low-cost, serviceable solution for student-built racing cars, ensuring the battery operates within optimal temperature ranges. This study contributes to the field of sustainable automotive innovation by bridging the gap between theoretical thermal management and practical industrial application..

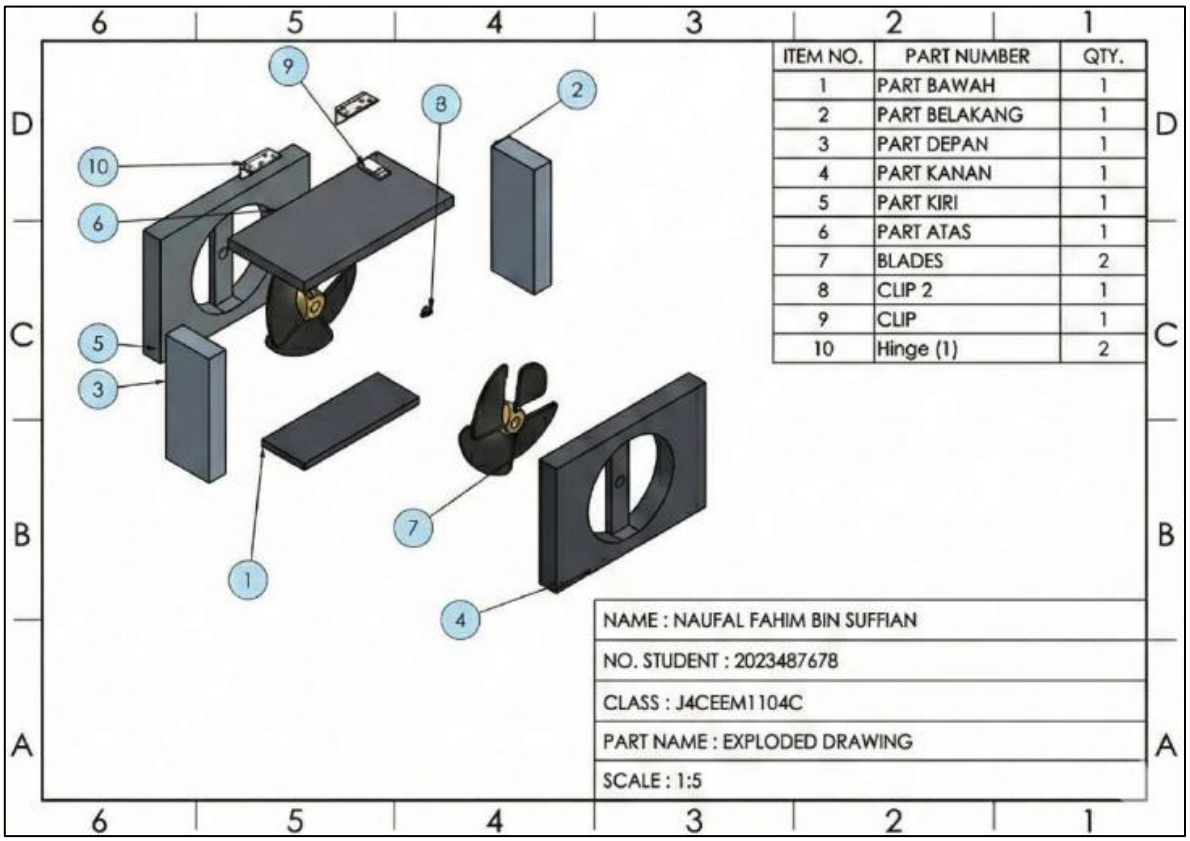
Keywords: *Thermal runaway, Computer-Aided Design (CAD)*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 50

Design and Fabrication of a Body Kit of a Student Formula Electric Vehicle

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**Corresponding author (e-mail): haszeme9720@uitm.edu.my*

PROJECT DESCRIPTION

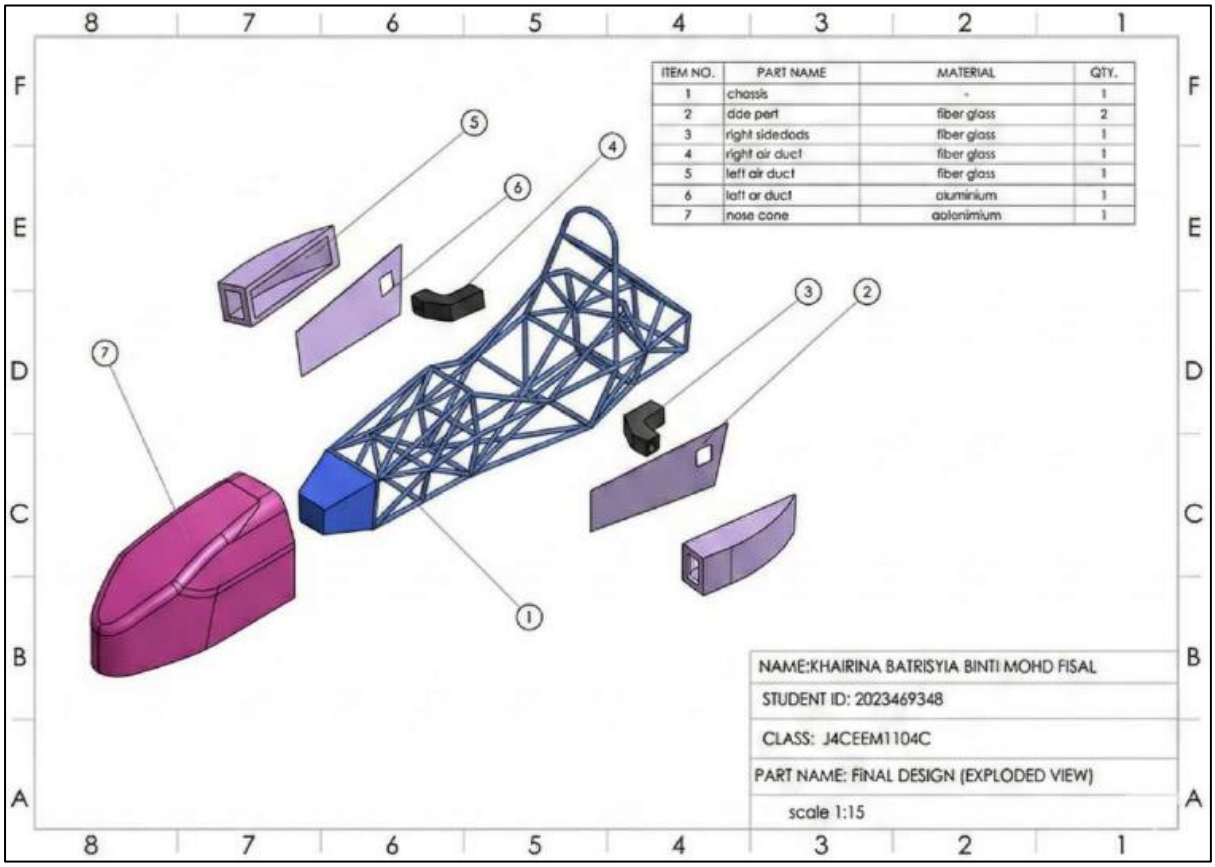
This project focuses on the design and fabrication of an aerodynamic body kit for a Student Formula Electric Vehicle (EV), a critical endeavor aimed at enhancing performance and energy efficiency within the constraints of the Formula Student Malaysia competition. The primary objective was to develop a lightweight, streamlined exterior that balances drag reduction, downforce generation, and effective thermal management for internal components like batteries and motors. Initial concept generation utilized morphological and Pugh chart evaluations to select an optimal configuration. Detailed design and iterative performance analysis were conducted using SolidWorks for 3D modeling and Computational Fluid Dynamics (CFD) to visualize airflow and quantify aerodynamic forces. Aluminum alloy was selected as the primary fabrication material due to its favorable strength-to-weight ratio and cost-effectiveness for student-level production. Fabrication techniques included precise cutting, bending, and TIG welding to secure the kit to the vehicle chassis.The project successfully resulted in a functional prototype featuring a streamlined nose cone and integrated sidepods. Results from CFD simulations and physical testing demonstrated a significant reduction in frontal drag and improved cooling airflow pathways.

Keywords: *Computational fluid dynamics , Aerodynamic drag*

PROTOTYPE



DESIGN PARAMETER



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CHAPTER 51

Safety and Drivability: Race Car Seat Design

Tuan Muhammad Amir Danish Bin Tuan Mohd Khairu Edzua [1] and Haszeme Bin Abu Kasim [2*]

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**Corresponding author (e-mail): haszeme9720@uitm.edu.my*

PROJECT DESCRIPTION

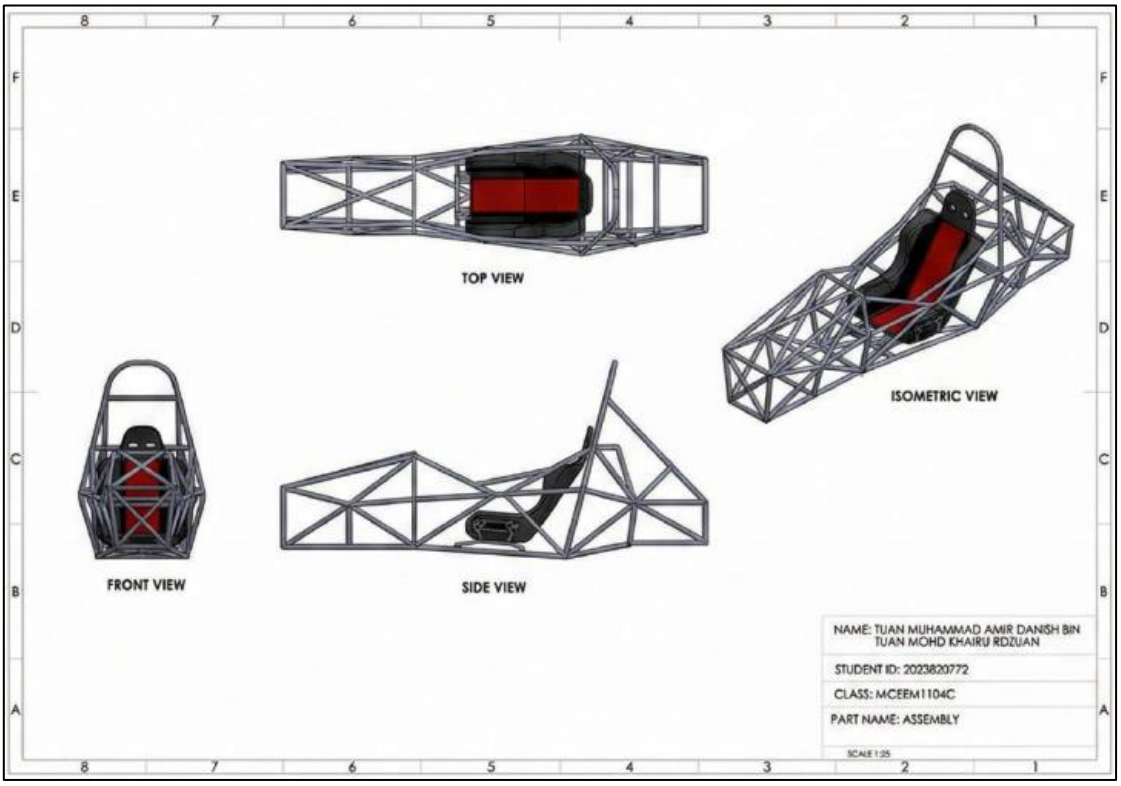
Ensuring both safety and drivability in Formula EV student cars is essential for protecting drivers while maintaining high performance. This project focuses on the design, optimization, and fabrication of a race car seat and integrated safety components—including a 4-point harness kit, crashbox, fire extinguisher, and firewall—to enhance driver protection and control.The methodology followed a structured engineering process, beginning with an ergonomic analysis to address common issues like poor posture and physical exhaustion during endurance races. SolidWorks was utilized for Computer-Aided Design (CAD) and simulation to test the seat's structural integrity, ensuring it could withstand a force of 800N while remaining below the material yield strength. Material selection prioritized efficiency and durability, specifically choosing PVC Leather for its waterproof and maintenance-friendly properties, alongside high-density foam for impact absorption.The outcome is a successfully fabricated safety system that meets Formula Student 2026 regulations. Results demonstrate that properly engineered components, such as a Styrofoam-filled crashbox to absorb initial impacts and an ergonomic seat tilted at 20° to the ground, significantly reduce accident risks.

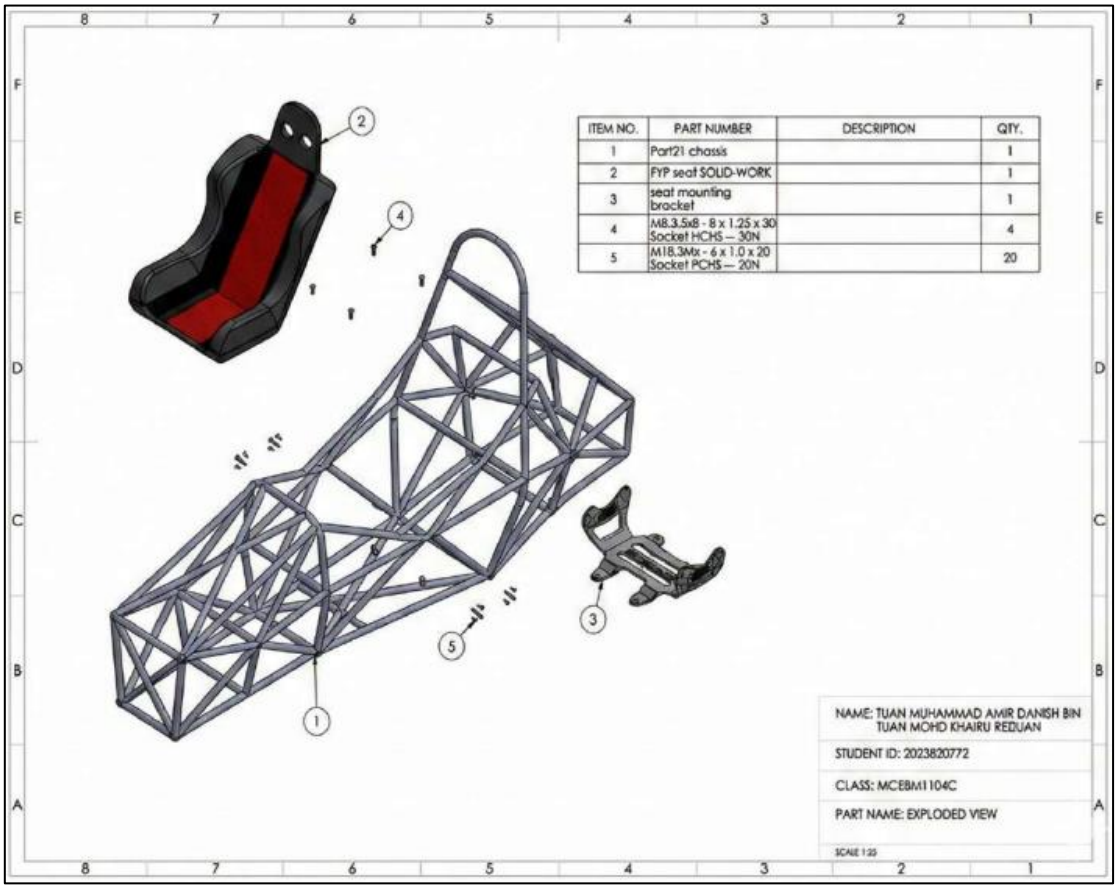
Keywords: *Ergonomics, Crashbox*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 52

Design and Development of a Prototype for Cutting and Separating Dry Chili Seeds

Muhammad Hadif Irsyad Bin Mohd Hasbi [1], Ainaa Maya Munira Binti Ismail [2*] and Najibah Ab Latif [3]

[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): ainaa7609@uitm.edu.my*

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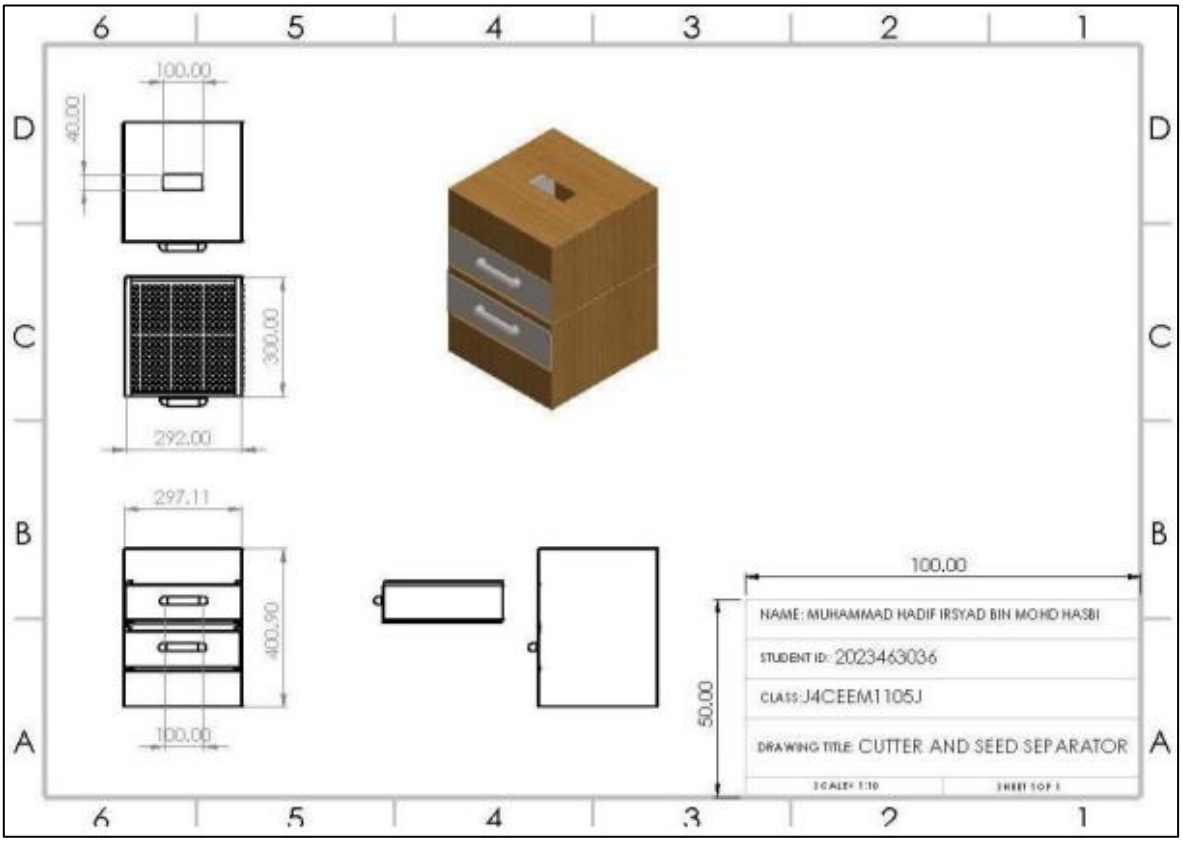
Chilli is a widely used spice in both household kitchens and small-scale food industries. However, manual processing of dried chilli, including chopping and seed separation, is labor-intensive, time-consuming, and poses safety risks due to the use of sharp tools. This project presents the design and fabrication of a prototype chilli cutter and seed separator machine aimed at improving efficiency, safety, and convenience. The device is constructed as a compact enclosure measuring 30 cm × 30 cm × 40 cm, fabricated from plywood to reduce costs while ensuring a lightweight structure. The system comprises two primary components: an upper cutter chamber with a rotating blade driven by a DC motor for slicing dried chilli, and a lower mesh filter section, assisted by a DC vibration motor to separate seeds from the skin. The prototype enables continuous operation, significantly reducing manual labor and processing time compared to conventional hand-cutting methods. In addition to saving time, the design enhances occupational safety by minimizing direct contact with sharp blades. Performance evaluation demonstrates that the machine achieves effective cutting and seed separation, offering a reliable, cost-effective, and portable solution suitable for small-scale production and household use.

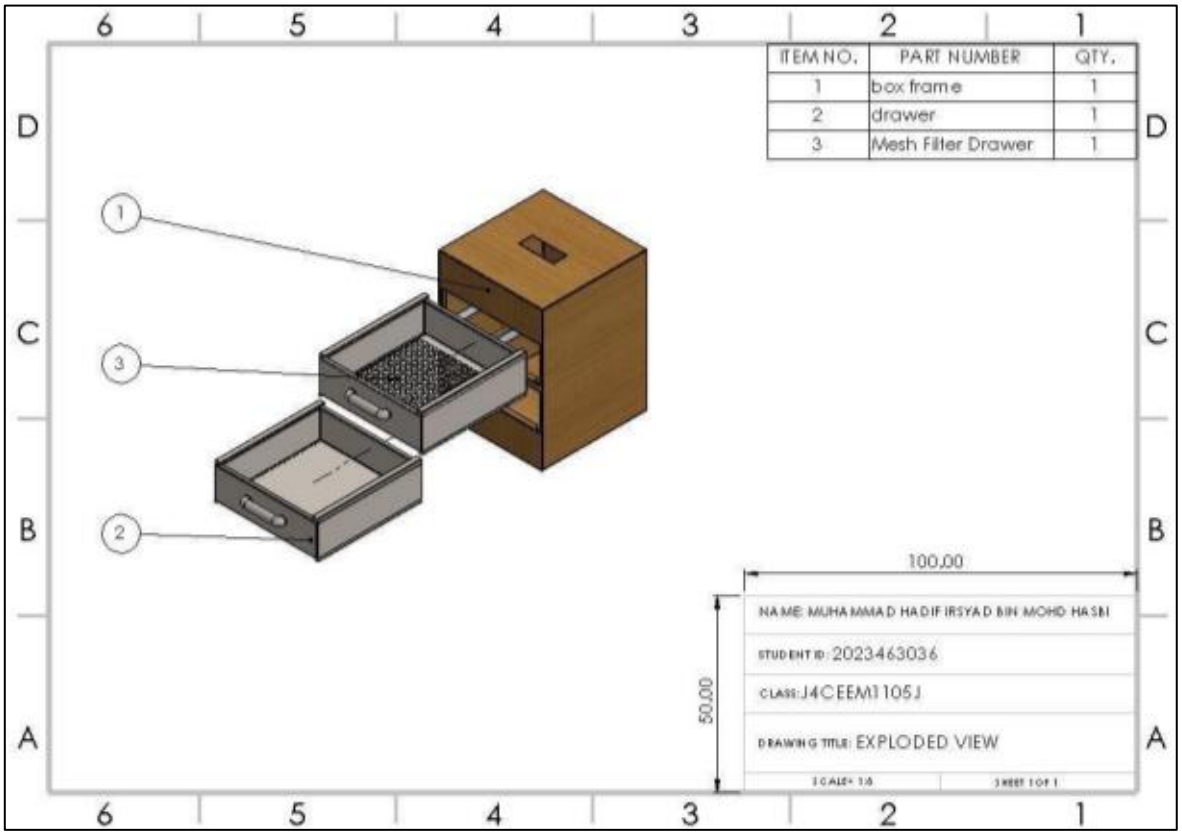
Keywords: *Chilli Cutter, Seed Separator,Food Processing*

PROTOTYPE



DESIGN PARAMETER





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eISBN: 978-967-0033-74-7

CHAPTER 53

Design and Development of an Automatic Clothesline

Zainul Ariffin Bin Saliman [1], Ainaa Maya Munira Binti Ismail [2*] and Najibah Ab Latif [3]

[1,2,3]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): ainaa7609@uitm.edu.my*

PROJECT DESCRIPTION

In areas with erratic weather patterns, the practice of air-drying laundry outdoors may be impracticable, resulting in damp or compromised garments as a result of unforeseen precipitation. This project discusses the design and construction of an automatic clothesline system that can respond to environmental changes by retracting garments indoors, reducing the need for constant supervision. The main objective is to develop an intelligent, personalised system that increases household convenience, efficiency, and clothing safety. The system is conceived as a wall-mounted, motorised clothesline that operates horizontally and is controlled by a mix of rain and low-light sensors. The prototype combines electronics, sensor technology, and mechanical design, with robust and lightweight materials to provide usefulness and dependability. The production methodology encompasses conceptual design, fabrication, assembly, and thorough testing under simulated weather conditions. The test results imply that the sensors respond accurately and quickly, triggering the motor with minimal delay, while the clothesline works dependably to protect against harsh weather conditions. The equipment delivers a sustainable, effective, and convenient alternative for modern households dealing with changing weather by reducing manual involvement and improving laundry protection.

Keywords: *Automatic cothlines, Smart home*

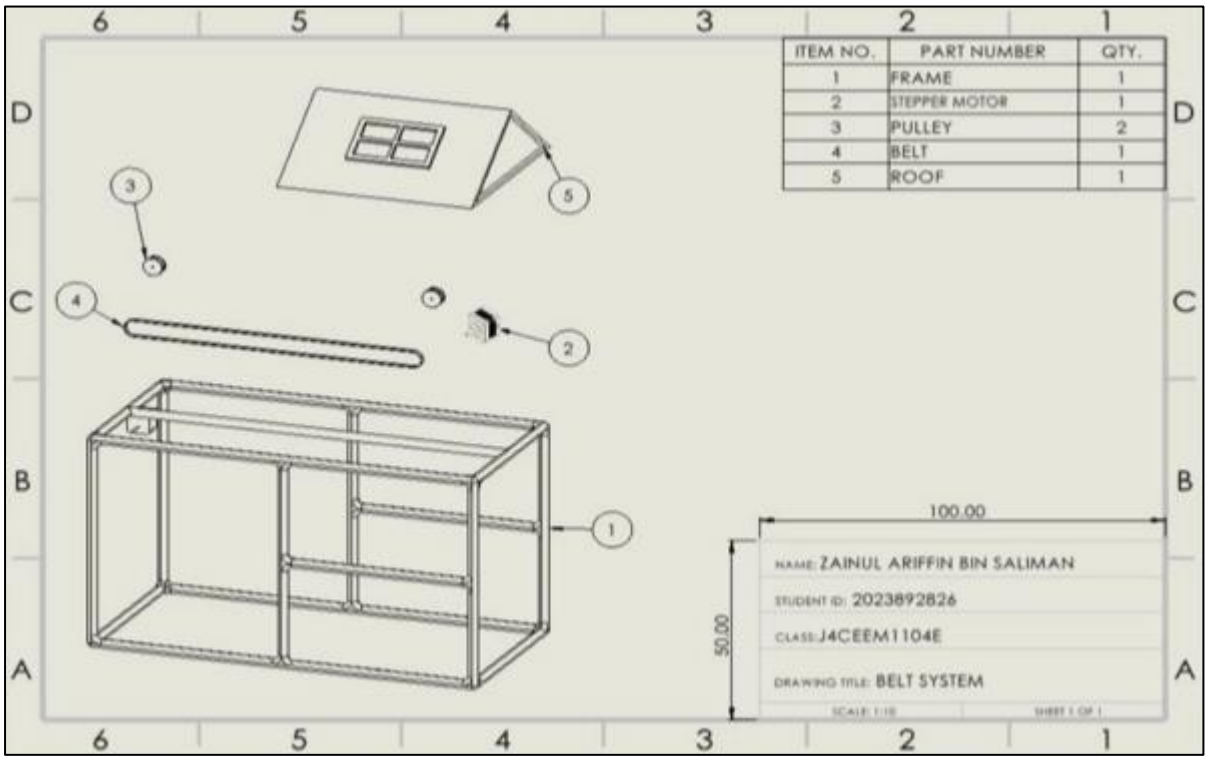
PROTOTYPE





DESIGN PARAMETER





CHAPTER 54

6-DOF Robotic Arm for Education Purpose

Harith Kamal Bin Saiful Azreen [1] and Wan Muhammad Syahmi Bin Wan Fauzi [2*]

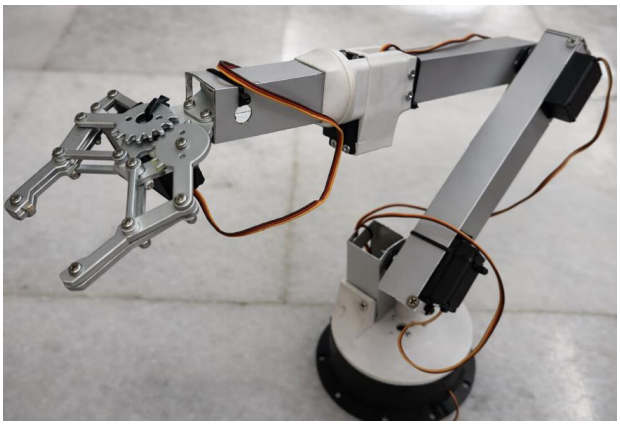
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): wmsyahmi@uitm.edu.my*

PROJECT DESCRIPTION

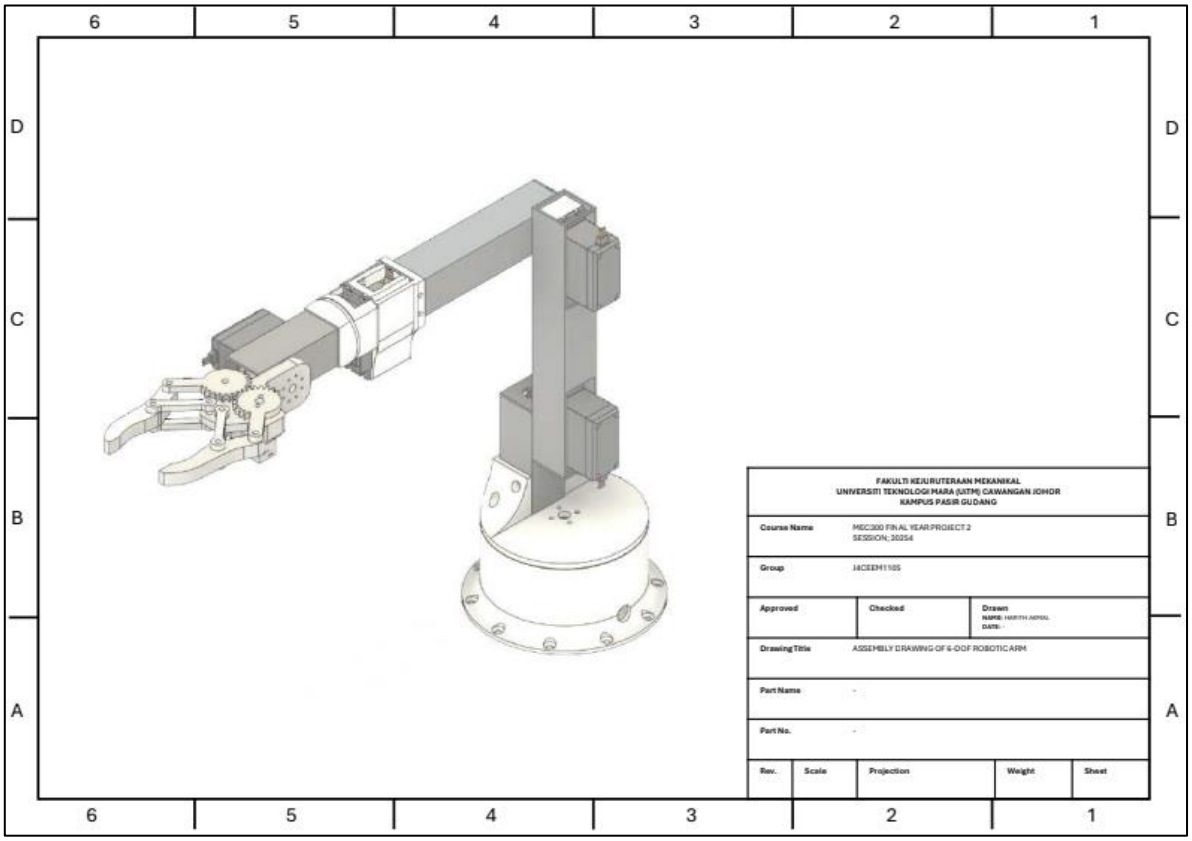
This project presents the design and development of an affordable six degrees-of-freedom (6-DOF) robotic arm intended to enhance STEM education through accessible, hands-on learning. The primary objective was to produce a cost-effective yet functional robotic system suitable for classroom use, enabling students to understand key concepts in robotics, kinematics, and automation. The project addressed the challenge of expensive educational robotics equipment, which often limits student exposure to practical applications. The development process involved designing detailed mechanical structures and technical schematics using SolidWorks, followed by the selection of reliable and low-cost components, including motors, sensors, and control hardware. The robotic arm was fabricated and assembled to ensure structural stability and precise movement. A simplified programming interface was also developed to allow students to easily control the robotic arm and interact with sensors, promoting experiential learning. Integration of actuators and sensors enabled accurate motion control and improved operational performance. The results demonstrated that the system could successfully perform basic industrial tasks such as pick-and-place operations with good repeatability and consistency. This confirms the suitability of the robotic arm as an educational platform for demonstrating real-world engineering applications. In conclusion, the project achieved its objective of developing a low-cost, functional 6-DOF robotic arm for STEM education.

Keywords: *Robotic, Arm*

PROTOTYPE

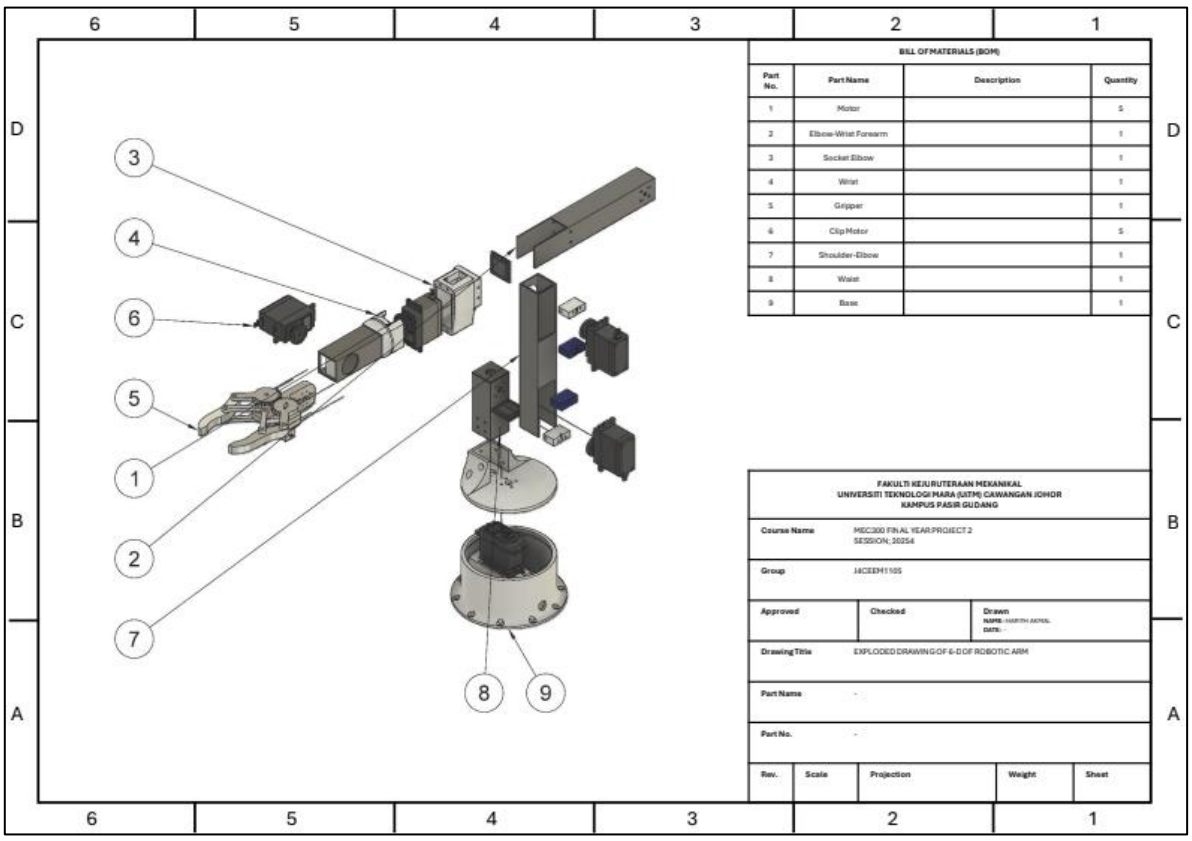


DESIGN PARAMETER



FAKULTI KEJURUTERAAN MEKANIKAL
UNIVERSITI TEKNOLOGI MARA (UiTM) CAWANGAN JOHOR
KAMPUS PASIR GUDANG

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Group	J4CEEM110S			
Approved	Checked	Drawn NAME: HAFITH AKMAL DATE: -		
Drawing Title	ASSEMBLY DRAWING OF 6-DOF ROBOTIC ARM			
Part Name	-			
Part No.	-			
Rev.	Scale	Projection	Weight	Sheet



BILL OF MATERIALS (BOM)

Part No.	Part Name	Description	Quantity
1	Motor		5
2	Elbow-Wrist Forearm		1
3	Socket Elbow		1
4	Wrist		1
5	Gripper		1
6	Clip Motor		5
7	Shoulder-Elbow		1
8	Waist		1
9	Base		1

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UNIVERSITI TEKNOLOGI MARA (UiTM) CAWANGAN JOHOR
KAMPUS PASIR GUDANG

Course Name	MEC300 FIN AL YEAR PROJECT 2 SESSION: 20254			
Group	J4CEEM110S			
Approved	Checked	Drawn NAME: HAFITH AKMAL DATE: -		
Drawing Title	EXPLODED DRAWING OF 6-DOF ROBOTIC ARM			
Part Name	-			
Part No.	-			
Rev.	Scale	Projection	Weight	Sheet

Prototype Design Collection Series 5
eISBN: 978-967-0033-74-7

CHAPTER 55

Automatic Rice Portion Dispenser

Nur Liyana Izzati Binti Izazuly [1] and Wan Muhammad Syahmi Bin Wan Fauzi [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): wmsyahmi@uitm.edu.my*

PROJECT DESCRIPTION

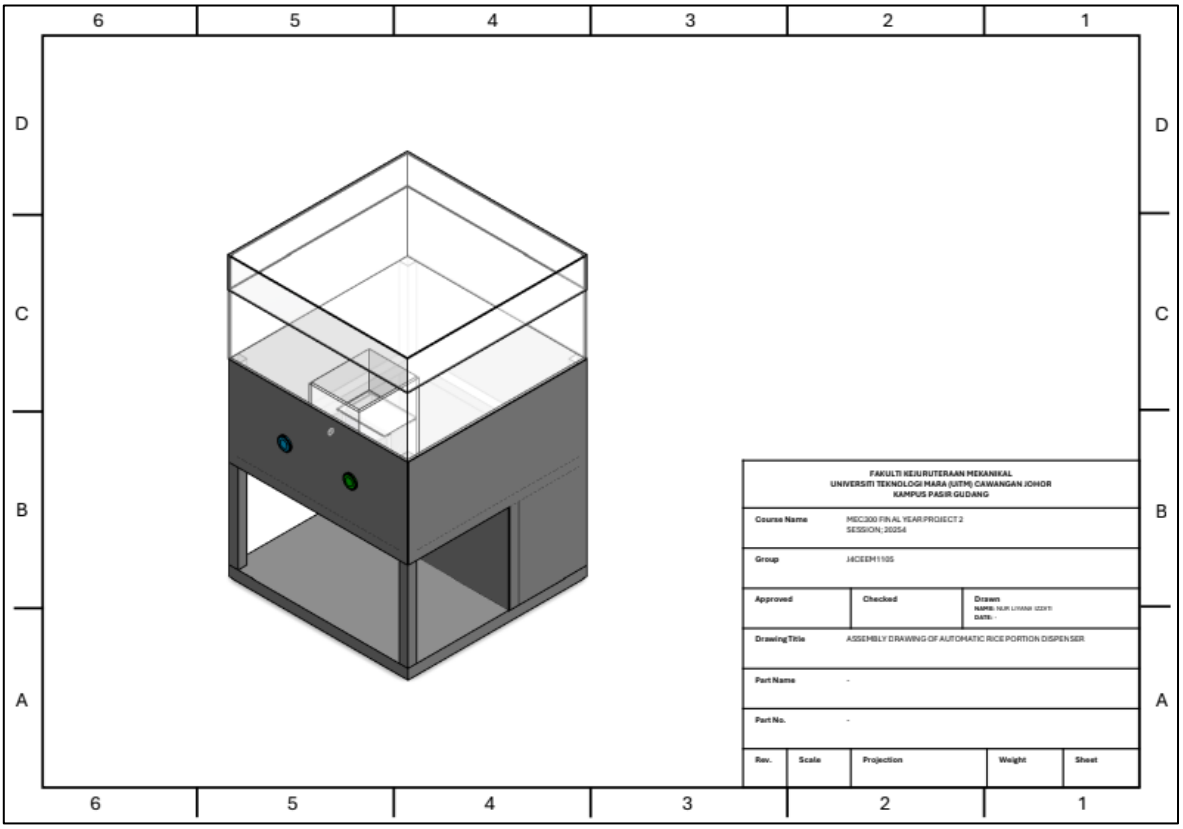
This project presents the design and development of an Automatic Rice Portion Dispenser aimed at improving efficiency, accuracy, and convenience in rice preparation. Conventional rice portioning methods rely on manual measurement, which is time-consuming, inconsistent, and contributes to food waste. Therefore, the main objective of this project is to design and fabricate a low-cost automated system capable of dispensing predefined rice portions using a simple user interface while reducing manual effort and improving portion consistency. The methodology involved concept generation, design selection, engineering analysis, fabrication, and performance testing. The selected design utilized a rotary dispensing mechanism driven by a NEMA17 stepper motor and controlled by an Arduino UNO microcontroller. Two push buttons were integrated to allow users to select different portion sizes based on rotation angles. Structural and mechanical analyses were conducted using SolidWorks to ensure safety and reliability. The prototype was fabricated using stainless steel, acrylic, and 3D-printed components, followed by assembly, programming, and functional testing. The results demonstrated that the developed prototype successfully dispensed rice automatically with acceptable accuracy and consistent operation. Engineering analysis confirmed that the structure and dispensing mechanism were mechanically safe, with low stress, minimal deformation, and high factors of safety.

Keywords: *Rice, Dispenser*

PROTOTYPE

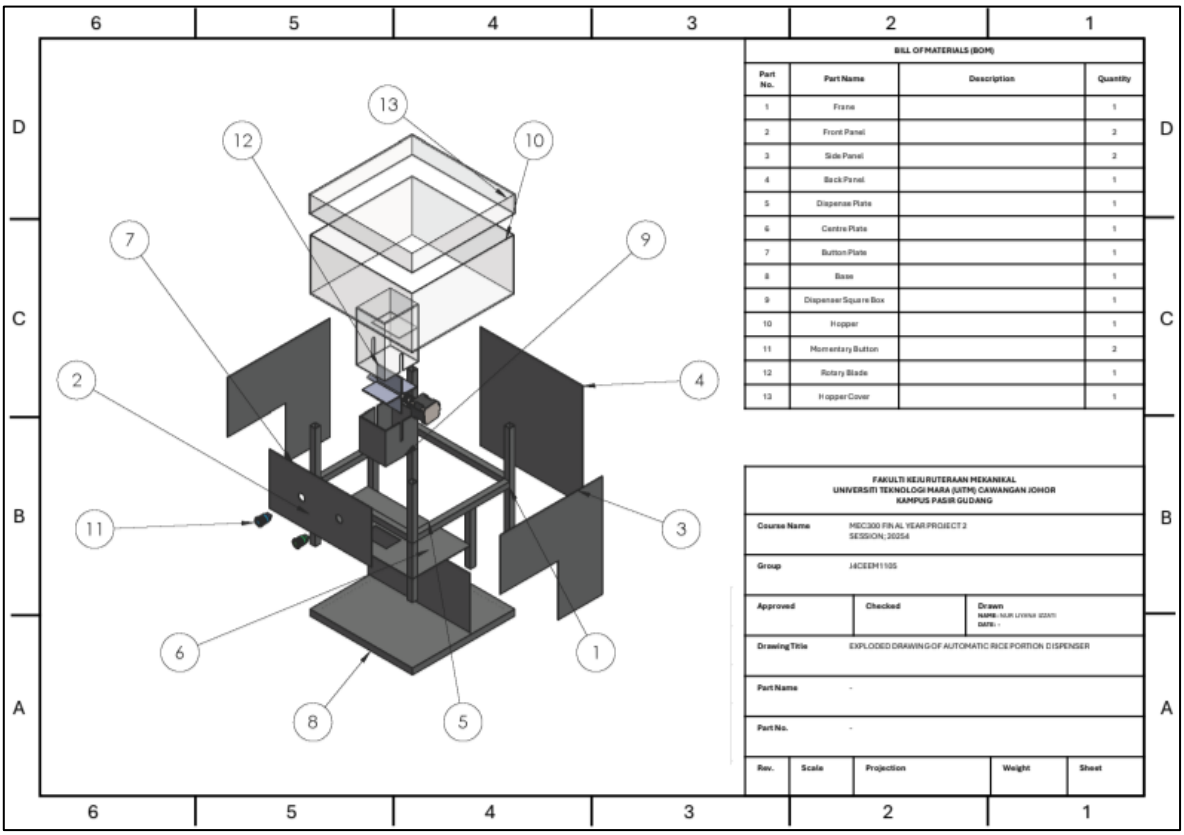


DESIGN PARAMETER



FAKULTI KEJURUTERAAN MEKANIKAL
UNIVERSITI TEKNOLOGI MARA (UiTM) CAWANGAN JOHOR
KAMPUS PASIR GUDANG

Course Name	MEC300 FIN AL YEAR PROJECT 2 SESSION: 20254
Group	J4CEEM110S
Approved / Checked / Drawn	NAME: NUR LIYANA IZZATI DATE: -
Drawing Title	ASSEMBLY DRAWING OF AUTOMATIC RICE PORTION DISPENSER
Part Name	-
Part No.	-
Rev. / Scale / Projection / Weight / Sheet	



BILL OF MATERIALS (BOM)

Part No.	Part Name	Description	Quantity
1	Frame		1
2	Front Panel		2
3	Side Panel		2
4	Back Panel		1
5	Dispense Plate		1
6	Centre Plate		1
7	Button Plate		1
8	Base		1
9	Dispenser Square Box		1
10	Hopper		1
11	Momentary Button		2
12	Rotary Blade		1
13	Hopper Cover		1

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KAMPUS PASIR GUDANG

Course Name	MEC300 FIN AL YEAR PROJECT 2 SESSION: 20254
Group	J4CEEM110S
Approved / Checked / Drawn	NAME: NUR LIYANA IZZATI DATE: -
Drawing Title	EXPLODED DRAWING OF AUTOMATIC RICE PORTION DISPENSER
Part Name	-
Part No.	-
Rev. / Scale / Projection / Weight / Sheet	

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CHAPTER 56

Smart Colour Sorting Conveyor System for Education Purposes

Muhammad Aiman Naim Bin Saifullizam [1] and Wan Muhammad Syahmi Bin Wan Fauzi [2*]

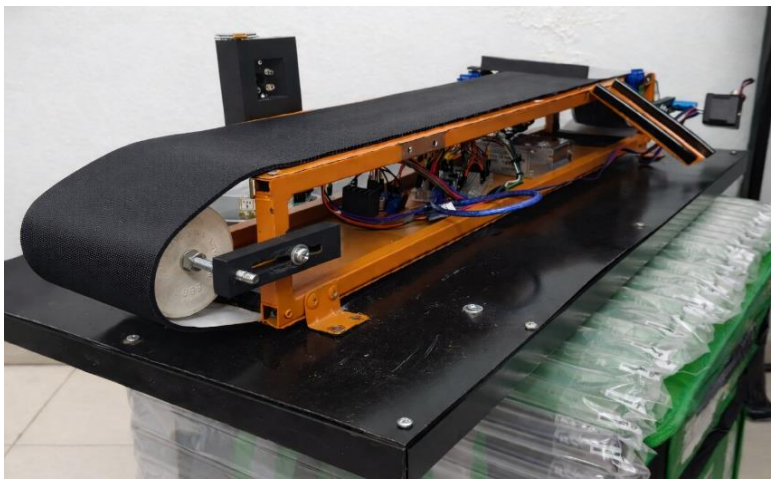
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): wmsyahmi@uitm.edu.my*

PROJECT DESCRIPTION

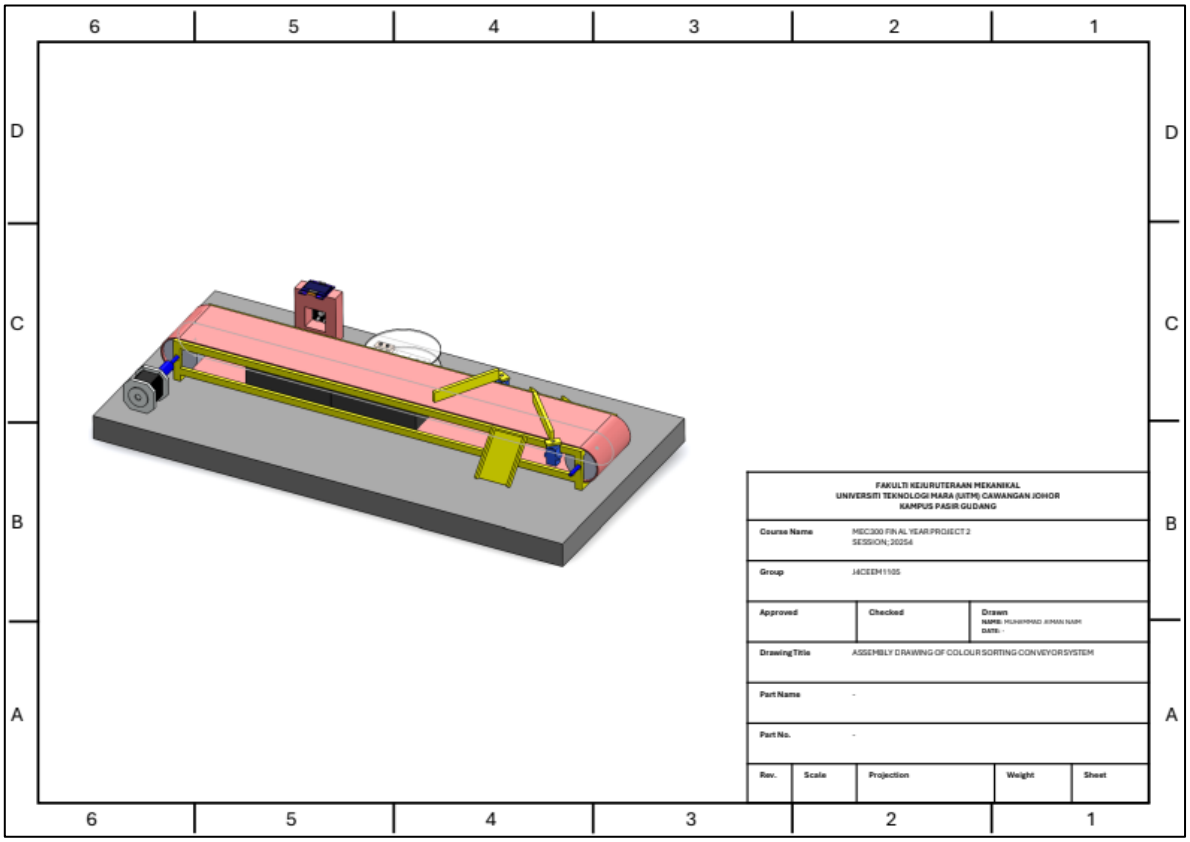
This project focuses on the STEM-based design and development of an automated, colour-sorting conveyor system specifically engineered as a practical learning tool for engineering students and Science, Technology, Engineering, and Mathematics (STEM) outreach. The primary objectives were to design and fabricate a portable, cost-effective prototype capable of automatically identifying and categorizing objects based on three specific colours: red, blue, and black. The methodology involved a systematic engineering approach, beginning with conceptual design in SolidWorks and followed by rigorous concept evaluation using a Pugh Chart. The final architecture integrates a durable steel-plate frame with an Arduino-based control system. Key mechanical and electrical components include a stepper motor to drive a PVC flat belt, a TCS3200 colour sensor for high-resolution detection, and a servo-actuated sorting arm to route objects into designated bins. Fabrication processes included steel cutting, welding, and grinding to ensure structural integrity and a professional finish. The project outcomes include a functional, low-cost prototype that successfully demonstrates fundamental automation principles such as sensor integration, mechanical control, and algorithmic decision-making. By replacing error-prone manual sorting with a reliable automated system.

Keywords: *Conveyor, Colour*

PROTOTYPE

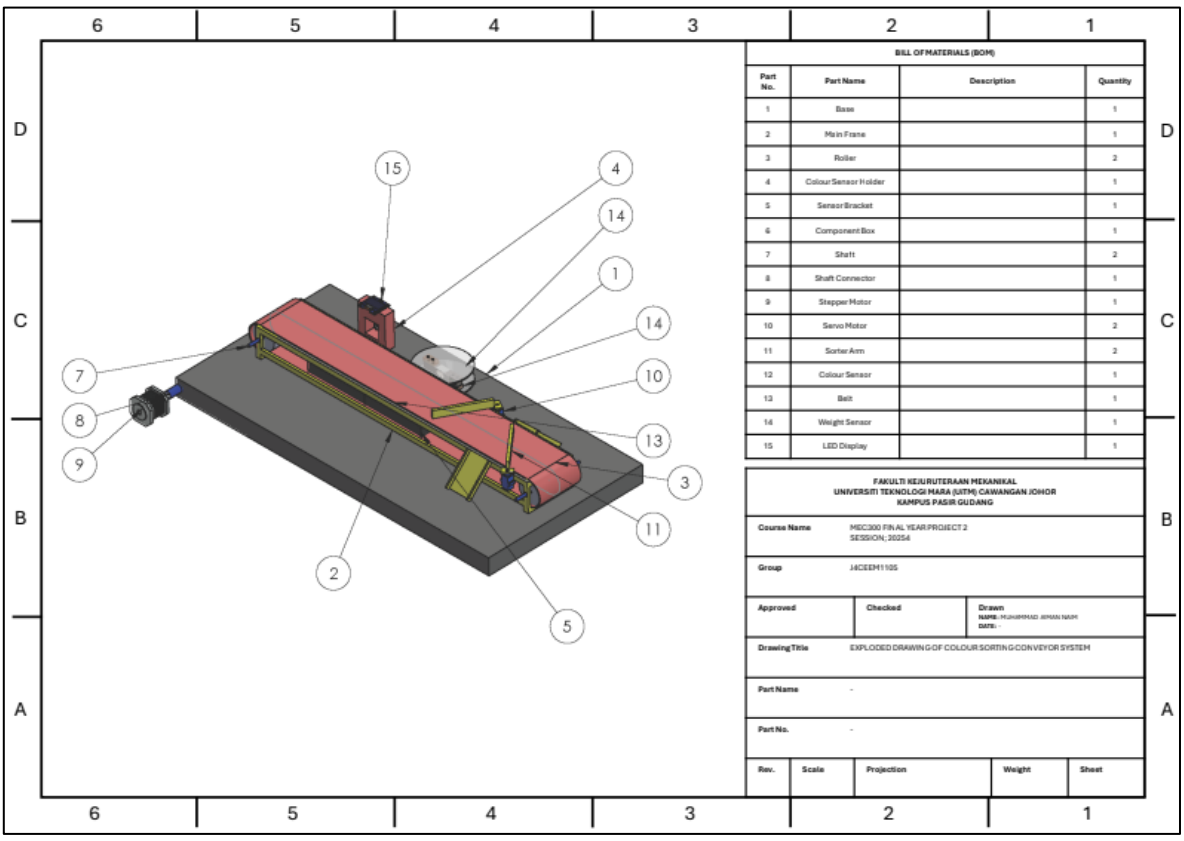


DESIGN PARAMETER



FAKULTI KEJURUTERAAN MEKANIKAL
UNIVERSITI TEKNOLOGI MARA (UiTM) CAWANGAN JOHOR
KAMPUS PASIR GUDANG

Course Name	MEC300 FIN AL YEAR PROJECT 2 SESSION: 20254			
Group	J4CEEM1105			
Approved	Checked	Drawn NAME: MUHAMMAD AIMAN NAIM DATE: -		
Drawing Title	ASSEMBLY DRAWING OF COLOUR SORTING CONVEYOR SYSTEM			
Part Name	-			
Part No.	-			
Rev.	Scale	Projection	Weight	Sheet



BILL OF MATERIALS (BOM)

Part No.	Part Name	Description	Quantity
1	Base		1
2	Main Frame		1
3	Roller		2
4	Colour Sensor Holder		1
5	Sensor Bracket		1
6	Component Box		1
7	Shaft		2
8	Shaft Connector		1
9	Stepper Motor		1
10	Servo Motor		2
11	Sorter Arm		2
12	Colour Sensor		1
13	Belt		1
14	Weight Sensor		1
15	LED Display		1

FAKULTI KEJURUTERAAN MEKANIKAL
UNIVERSITI TEKNOLOGI MARA (UiTM) CAWANGAN JOHOR
KAMPUS PASIR GUDANG

Course Name	MEC300 FIN AL YEAR PROJECT 2 SESSION: 20254			
Group	J4CEEM1105			
Approved	Checked	Drawn NAME: MUHAMMAD AIMAN NAIM DATE: -		
Drawing Title	EXPLODED DRAWING OF COLOUR SORTING CONVEYOR SYSTEM			
Part Name	-			
Part No.	-			
Rev.	Scale	Projection	Weight	Sheet

eISBN: 978-967-0033-74-7

CHAPTER 57

Single-Axis Solar Tracking

Muhammad Saiful Iman Bin Azreen Shah [1] and Wan Muhammad Syahmi Bin Wan Fauzi [2*]

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**Corresponding author (e-mail): wmsyahmi@uitm.edu.my*

PROJECT DESCRIPTION

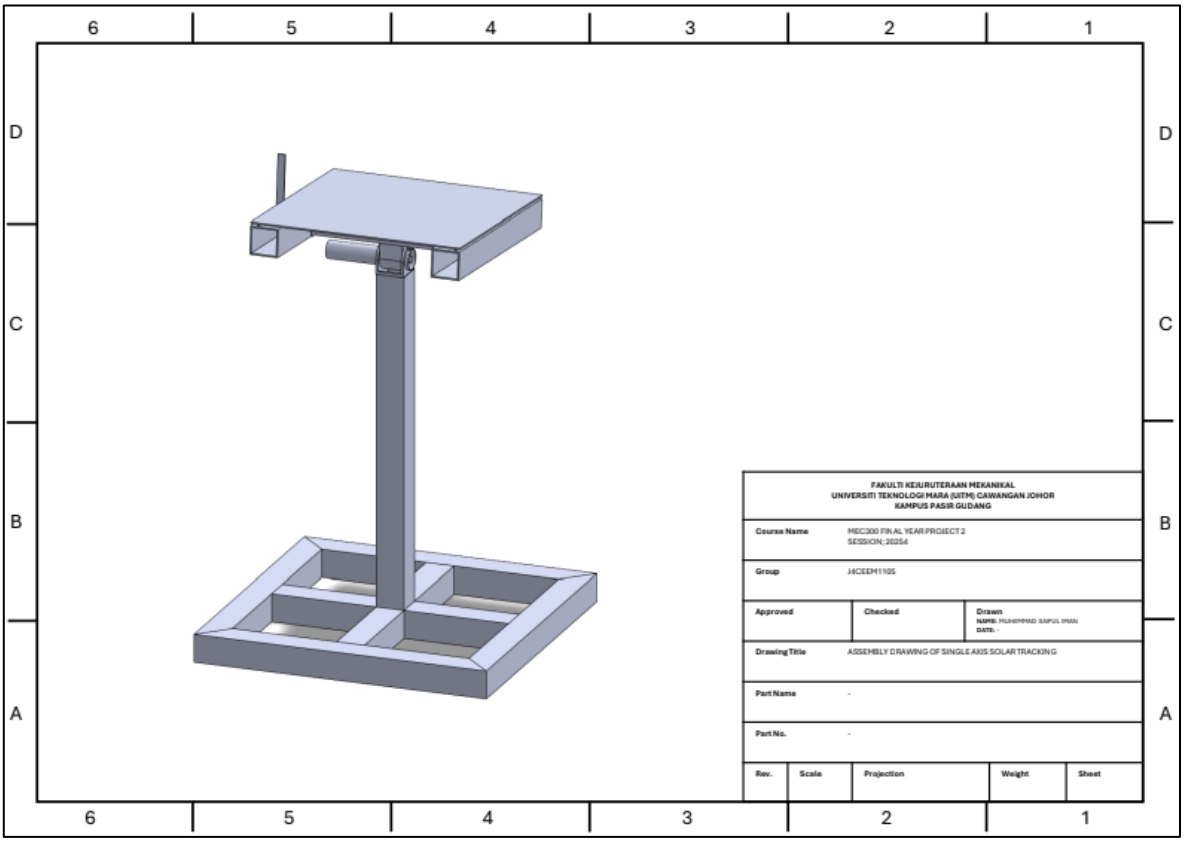
In order to boost the energy efficiency of solar panels, this project presents the design and fabrication of a cost-effective single-axis solar tracking system. Traditional fixed panels suffer from limited sunlight exposure due to their stationary nature, whereas this automated solution dynamically aligns with the sun to maximize energy harvest. The main objectives are to design and fabricate a functional physical prototype of a solar tracking system powered by a single motor. The project utilized SolidWorks 2021 for 3D modeling and stress analysis of the aluminum alloy frame. The control system was built using an Arduino Uno microcontroller, which processed signals from two light-dependent resistors (LDRs). These sensors detected sunlight intensity, allowing the Arduino to drive a DC gear motor via pulse width modulation (PWM) to adjust the panel's angle. The design focused on a horizontal tracking axis, ensuring the panel remained perpendicular to the brightest light source. The prototype successfully met all design goals, demonstrating a robust and reliable sun-tracking capability. Testing indicated that the system effectively increased solar panel efficiency by 20% to 30% by optimizing sunlight exposure throughout the day. Despite potential inaccuracies during cloud cover, the system maintained consistent operation, offering a sustainable and affordable renewable energy solution for residential use.

Keywords: *Solar, Tracking*

PROTOTYPE

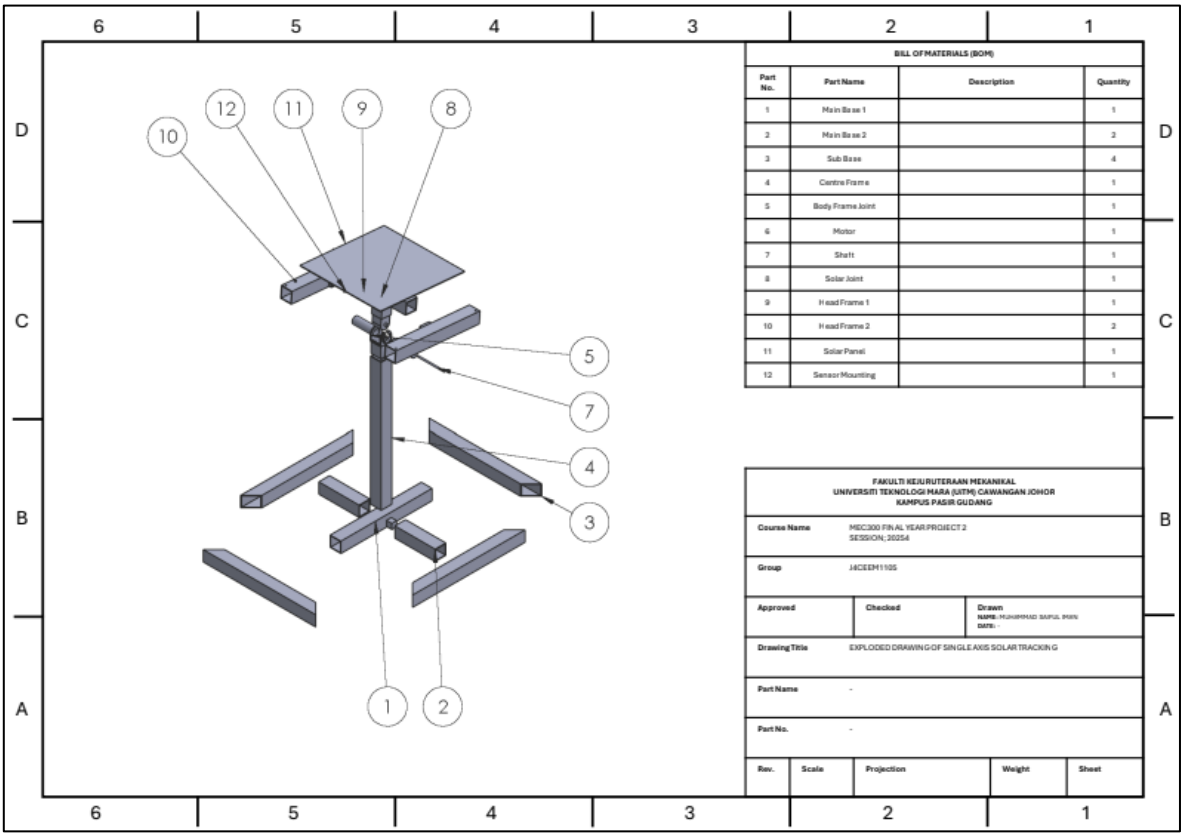


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UNIVERSITI TEKNOLOGI MARA (UiTM) CAWANGAN JOHOR
KAMPUS PASIR GUDANG

Course Name	MEC300 FIN AL YEAR PROJECT 2 SESSION: 20254			
Group	J4CEEM1110S			
Approved	Checked	Drawn NAME: MUHAMMAD SAIFUL IMAN DATE: -		
Drawing Title	ASSEMBLY DRAWING OF SINGLE AXIS SOLAR TRACKING			
Part Name	-			
Part No.	-			
Rev.	Scale	Projection	Weight	Sheet



BILL OF MATERIALS (BOM)

Part No.	Part Name	Description	Quantity
1	Main Base 1		1
2	Main Base 2		2
3	Sub Base		4
4	Centre Frame		1
5	Body Frame Joint		1
6	Motor		1
7	Shaft		1
8	Solar Joint		1
9	Head Frame 1		1
10	Head Frame 2		2
11	Solar Panel		1
12	Sensor Mounting		1

FAKULTI KEJURUTERAAN MEKANIKAL
UNIVERSITI TEKNOLOGI MARA (UiTM) CAWANGAN JOHOR
KAMPUS PASIR GUDANG

Course Name	MEC300 FIN AL YEAR PROJECT 2 SESSION: 20254			
Group	J4CEEM1110S			
Approved	Checked	Drawn NAME: MUHAMMAD SAIFUL IMAN DATE: -		
Drawing Title	EXPLODED DRAWING OF SINGLE AXIS SOLAR TRACKING			
Part Name	-			
Part No.	-			
Rev.	Scale	Projection	Weight	Sheet

CHAPTER 58

Automatic Pet Food Dispenser

Siti Nur Alea Farhana Mohd Isa [1], Norhisyam Jenal [2*] and Siti Aishah Taib [3]

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PROJECT DESCRIPTION

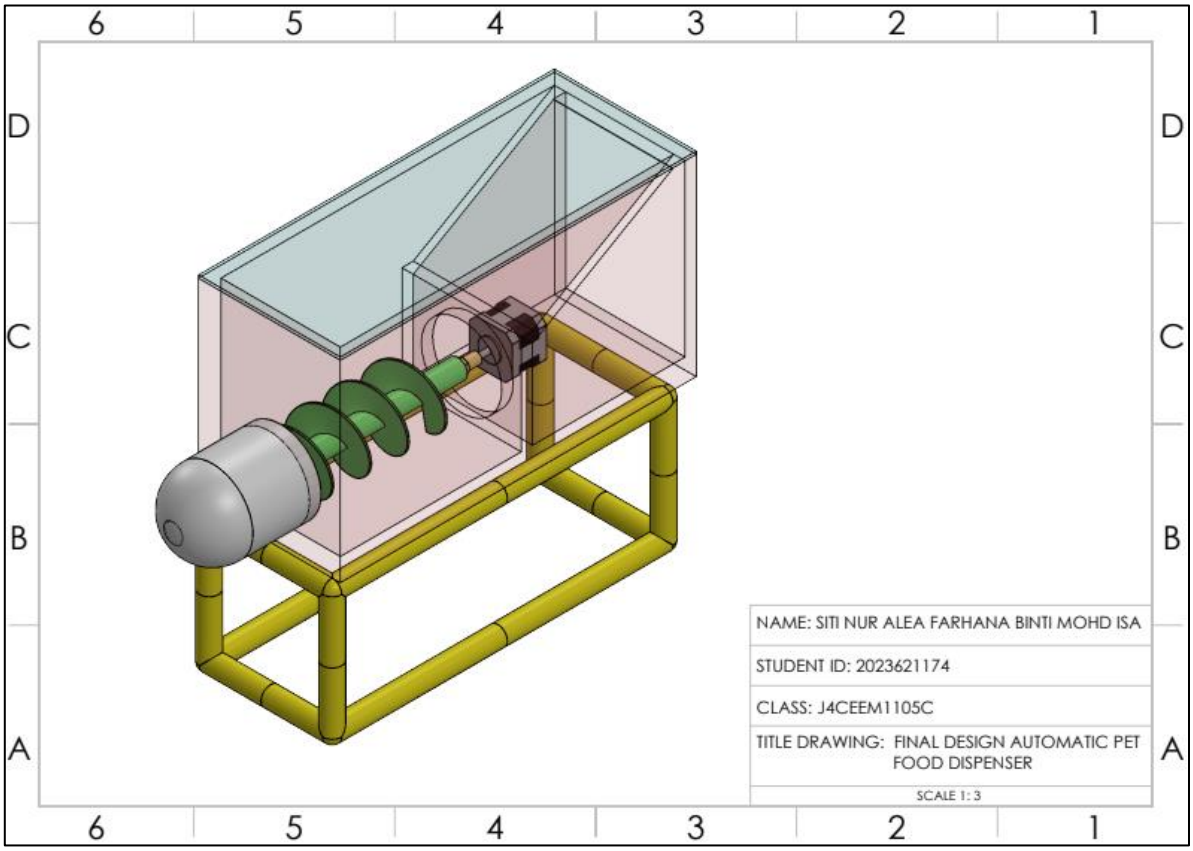
Pet owners are having difficulty feeding their pets manually at consistent times due to their busy lifestyles. As a result, the use of an automatic feeding machine is a viable solution to this problem. However, the high price of the product may become the deciding factor for the pet owners who are interested in having one. Therefore, the project focuses on the design and fabrication of an automatic pet feeder dispenser. In order to achieve the objective, the product functions with the use of an Arduino-based, user-programmed timer, and dry food dispenser. First, the overall design of the product was modeled using computer-aided design software. Next, an auger screw mechanism is used as the main mover of the food, and Arduino-based timer programming is developed to activate the mechanism based on the pre-planned schedule. Meanwhile, the structure of the product is made of hollow steel, sheet metal, and 3D-printed parts. The experiment results show that the product is capable of dispensing food according to the set timing. In conclusion, this product works as a simple and affordable cat food dispensing machine that can be an alternative pet feeding solution for the pet owners.

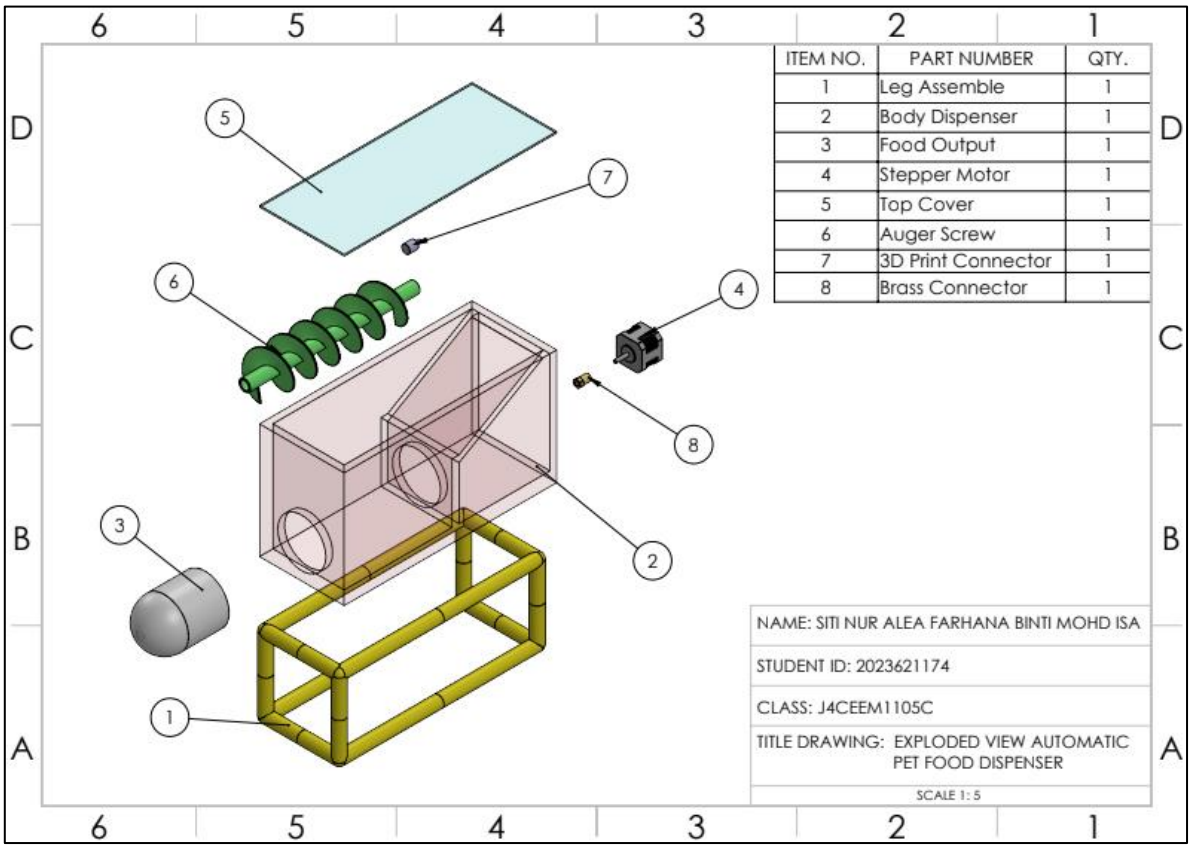
Keywords: *Automatic pet feeder, Auger screw mechanism*

PROTOTYPE



DESIGN PARAMETER





eISBN: 978-967-0033-74-7

CHAPTER 59

Design and Fabrication of a Reliability-Focused Electrical System for a Formula Student Race Car

Danial Haikal M. Rizal [1] and R. M. Aslam Raja Arif [2*]

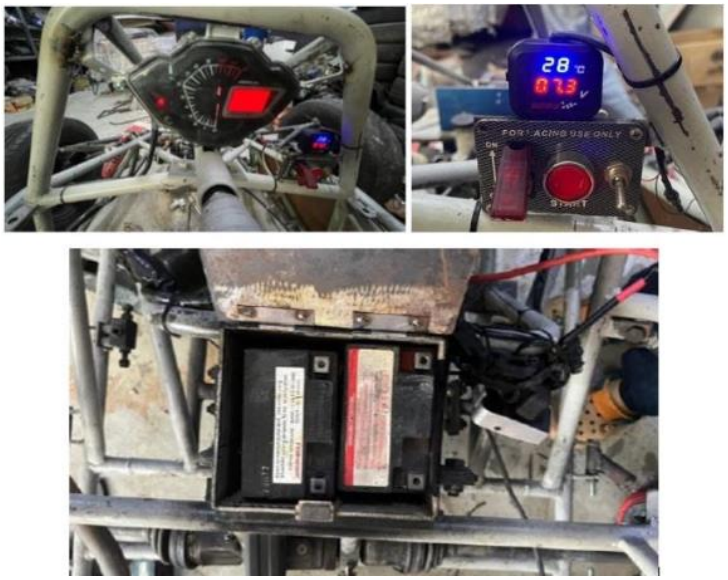
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): rajaaslam@uitm.edu.my*

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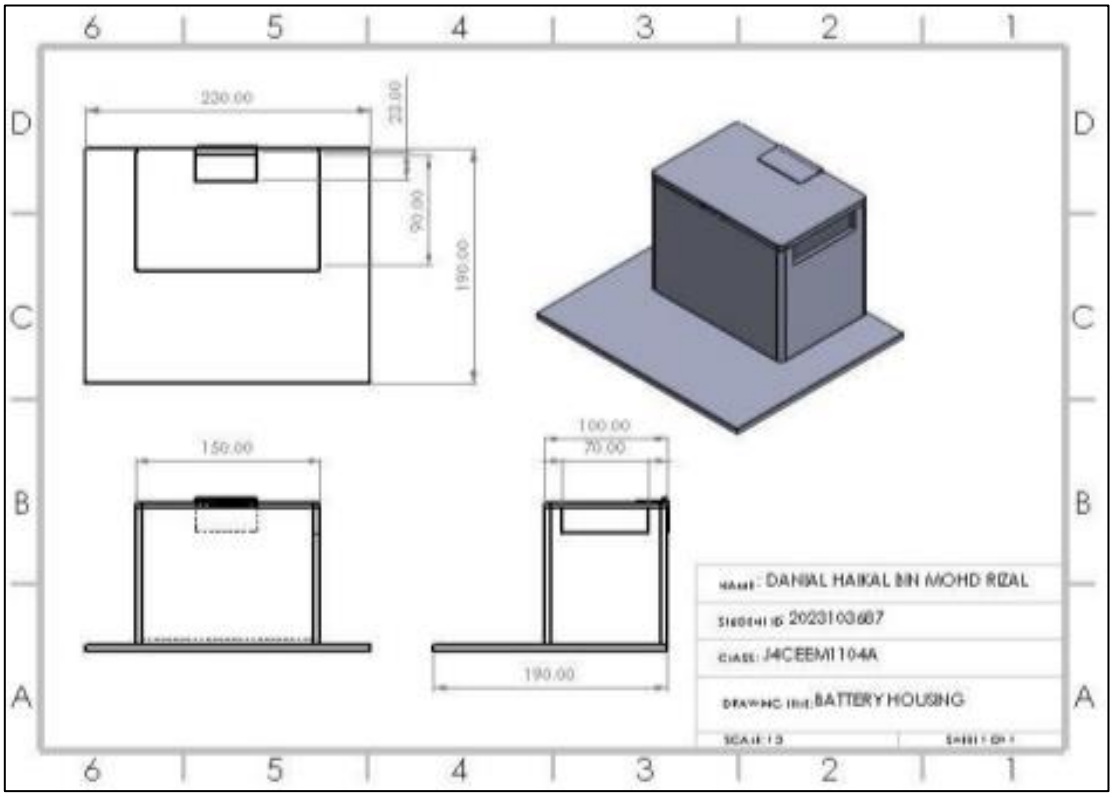
This project focuses on the design and fabrication of a reliable and efficient electrical system for a Formula Student-style race car powered by a Honda RS150cc combustion engine. The primary objectives were to integrate an engine temperature sensor for real-time thermal monitoring, improve the organization of the wiring harness, and develop a specialized battery casing capable of housing two batteries. Monitoring engine temperature is critical to preventing thermal stress, component warping, and potential engine failure. The methodology involved engineering analysis and CAD modeling using SolidWorks to design the battery housing and layout. Fabrication processes included precise cutting, GMAW welding for structural integrity, and the assembly of a custom wiring loom using heat-resistant hose and organized bundling techniques. A key innovation included a dual-battery configuration: a primary battery for the main wiring system and a secondary backup battery to ensure continuous power availability during racing operations. Outcomes demonstrated that the integrated system successfully provided real-time data to a centralized dashboard, enhancing driver awareness and vehicle safety.

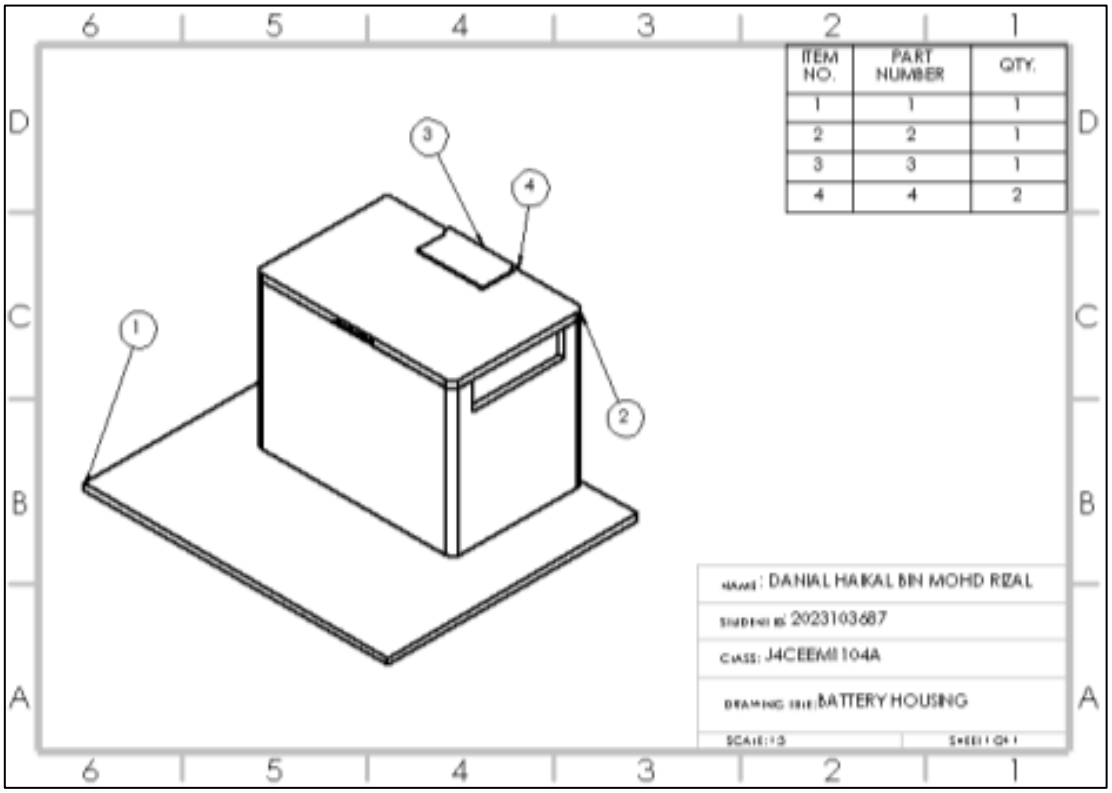
Keywords: *Formula student, Electrical system*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 60

Design and Fabrication of a Compliant Hydraulic Braking System for Formula Student Race Car

A. Aidid Fikry A. Fairuzy [1] and R. M. Aslam Raja Arif [2*]

[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): rajaaslam@uitm.edu.my*

PROJECT DESCRIPTION

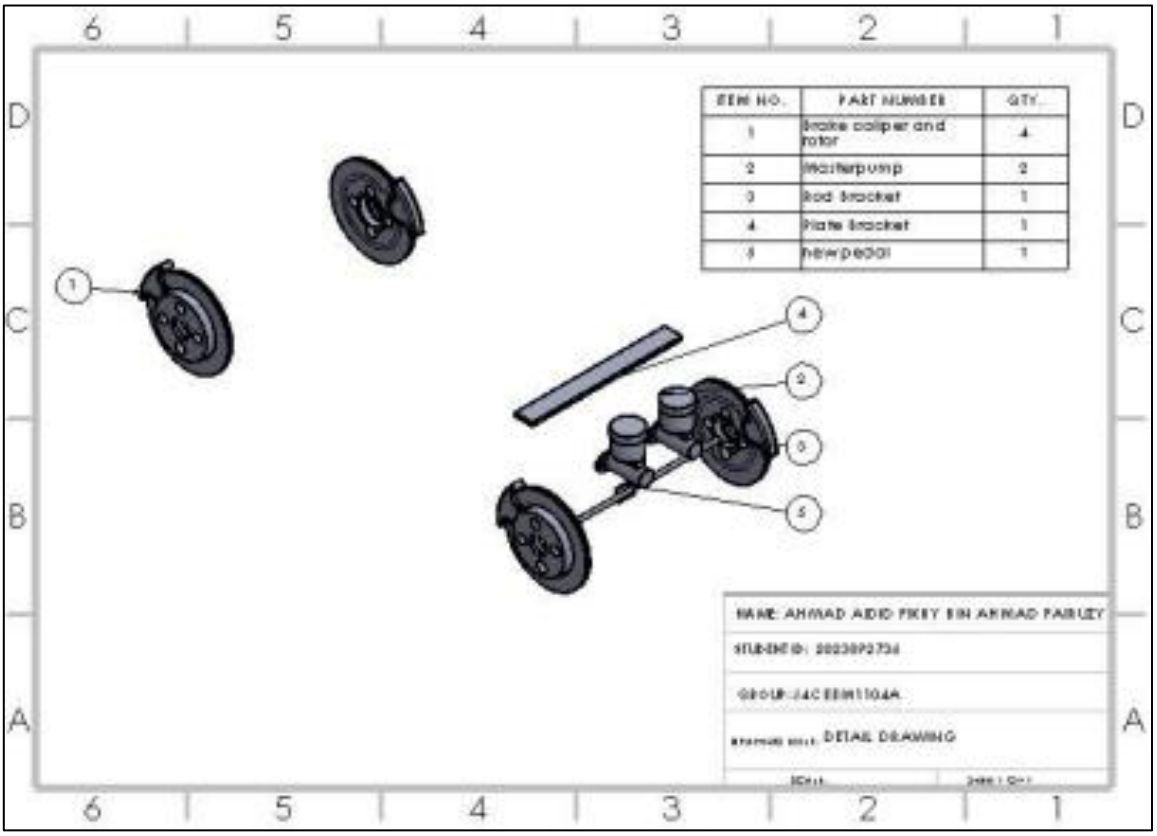
Braking performance is a critical factor in Formula Student race car design, where high deceleration capability, lightweight construction, and strict regulatory compliance are required. The existing Formula Student vehicle was equipped with a rear-only braking configuration, which did not meet the Formula SAE (FSAE) requirement of a hydraulic braking system acting on all four wheels with two independent hydraulic circuits and separate fluid reservoirs. This configuration compromised both safety and competition eligibility. This project aims to design and fabricate a compliant four-wheel hydraulic braking system for a Formula Student race car. The system was developed using SolidWorks for 3D modeling and structural layout validation. Thermal analysis of the brake rotor was conducted to evaluate heat distribution under braking loads. Fabrication processes included cutting, welding, machining, disc skimming, and assembly. The final prototype achieved improved braking balance, enhanced stopping power, and compliance with FSAE regulations within a budget of RM1000–RM1100. The developed braking system significantly enhances driver safety, vehicle control, and competitive readiness while providing practical manufacturing experience aligned with motorsport engineering standards.

Keywords: *Formula Student, Hydraulic Braking System,*

PROTOTYPE



DESIGN PARAMETER



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CHAPTER 61

Fruits and Vegetables Cleaning Machine

Muhammad Arif Syazwan Yusri [1], Norhisyam Jenal [2*] and Siti Aishah Taib [3]

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[3]*Academy of Language Studies, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim*
**Corresponding author (e-mail): hisyam0324@uitm.edu.my*

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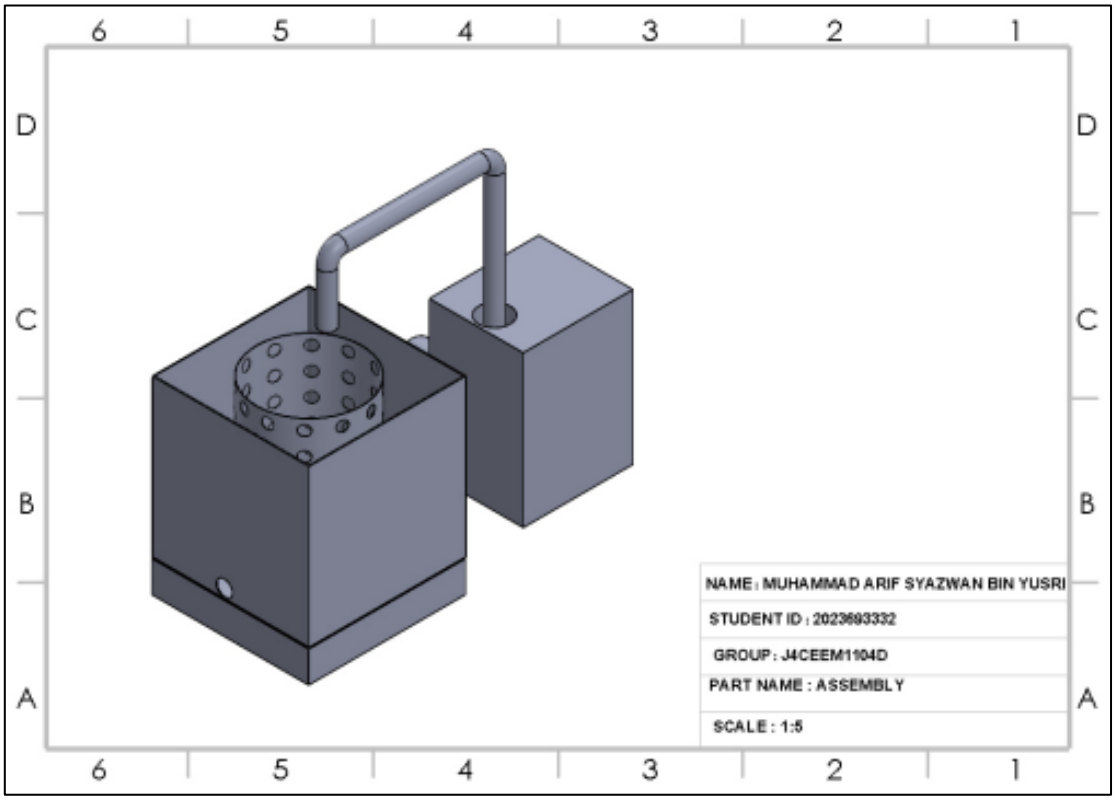
Fruits and vegetables play a big role in the food industry. However, traditional manual cleaning is a laborious process that uses a high amount of water, while fruits and vegetables need to be free from soil, pesticide residues, and harmful contamination. Thus, there is a need for a compact mechanism to provide an alternative solution to this issue, especially for small to medium enterprises and home cooks. With this in mind, this project focuses on the design and development of an automated machine for cleaning fruits and vegetables. First, the system's initial design is sketched using a computer-aided design (CAD) program. Then, the machine functions through a motorized mechanical rotation mechanism that consists of a rotating drum. Moreover, the cleaning process uses a water spraying system with a 12V DC pump and soft brushes included in it to further eliminate soil. At the same time, controlled by an adjustable digital timer, the machine automates rinsing and disinfection cycles within a preset duration. As a result, the testing demonstrated that the machine is user-friendly and capable of cleaning fruits and vegetables automatically using a plug-in power supply. With a fabrication cost of approximately RM 311, this automated system offers a cost-effective and sustainable alternative for enhancing food safety standards while optimizing resource conservation.

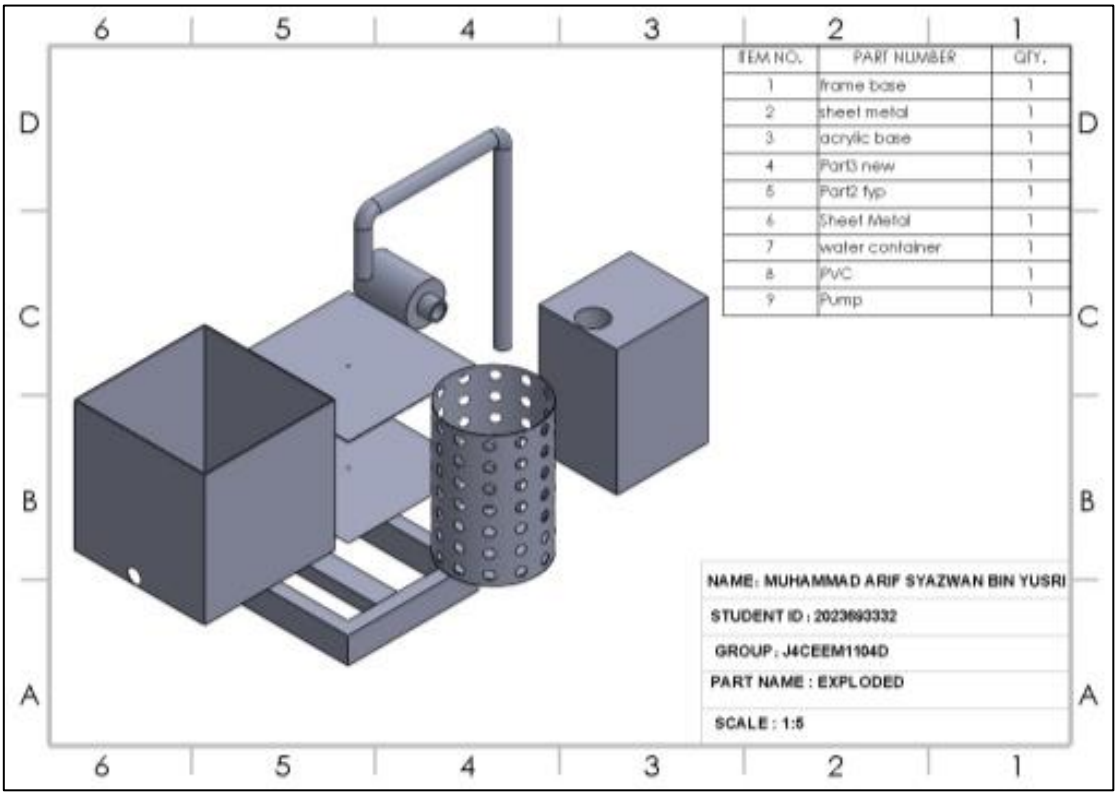
Keywords: *Automated produce cleaning, Food safety hygiene*

PROTOTYPE



DESIGN PARAMETER





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CHAPTER 61

Fruits and Vegetables Cleaning Machine

Muhammad Arif Syazwan Yusri [1], Norhisyam Jenal [2*] and Siti Aishah Taib [3]

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[3]*Academy of Language Studies, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim*
**Corresponding author (e-mail): hisyam0324@uitm.edu.my*

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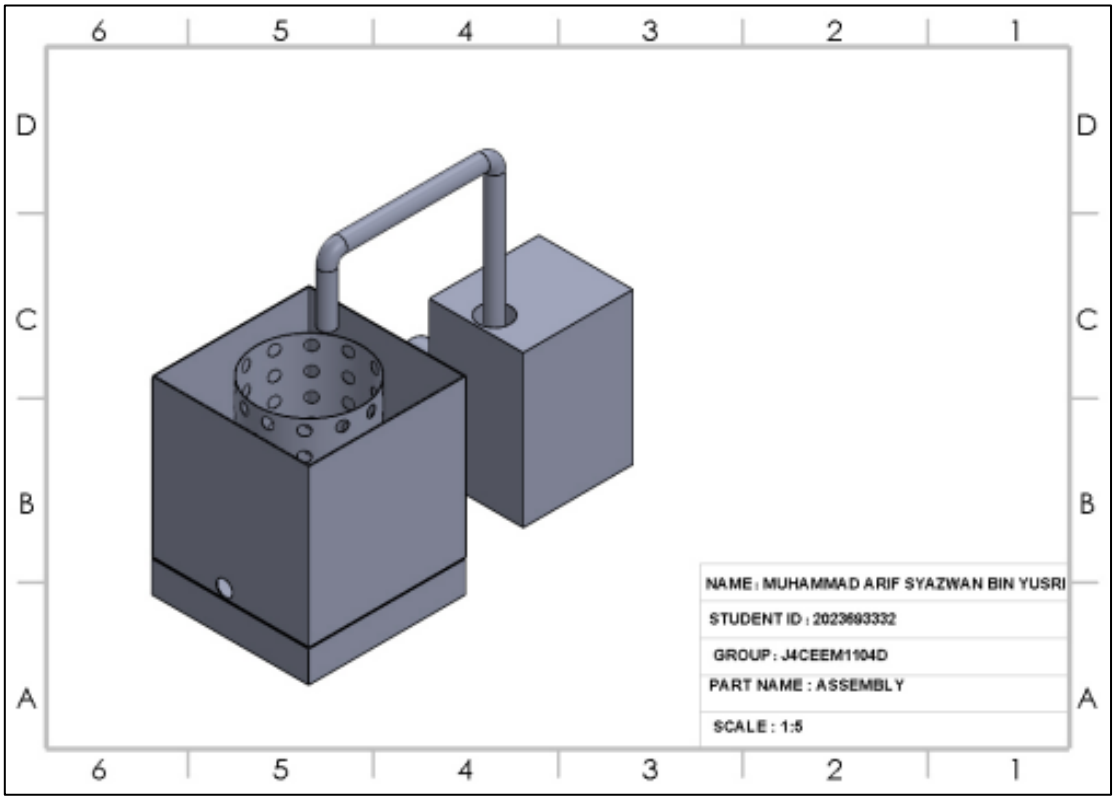
Fruits and vegetables play a big role in the food industry. However, traditional manual cleaning is a laborious process that uses a high amount of water, while fruits and vegetables need to be free from soil, pesticide residues, and harmful contamination. Thus, there is a need for a compact mechanism to provide an alternative solution to this issue, especially for small to medium enterprises and home cooks. With this in mind, this project focuses on the design and development of an automated machine for cleaning fruits and vegetables. First, the system's initial design is sketched using a computer-aided design (CAD) program. Then, the machine functions through a motorized mechanical rotation mechanism that consists of a rotating drum. Moreover, the cleaning process uses a water spraying system with a 12V DC pump and soft brushes included in it to further eliminate soil. At the same time, controlled by an adjustable digital timer, the machine automates rinsing and disinfection cycles within a preset duration. As a result, the testing demonstrated that the machine is user-friendly and capable of cleaning fruits and vegetables automatically using a plug-in power supply. With a fabrication cost of approximately RM 311, this automated system offers a cost-effective and sustainable alternative for enhancing food safety standards while optimizing resource conservation.

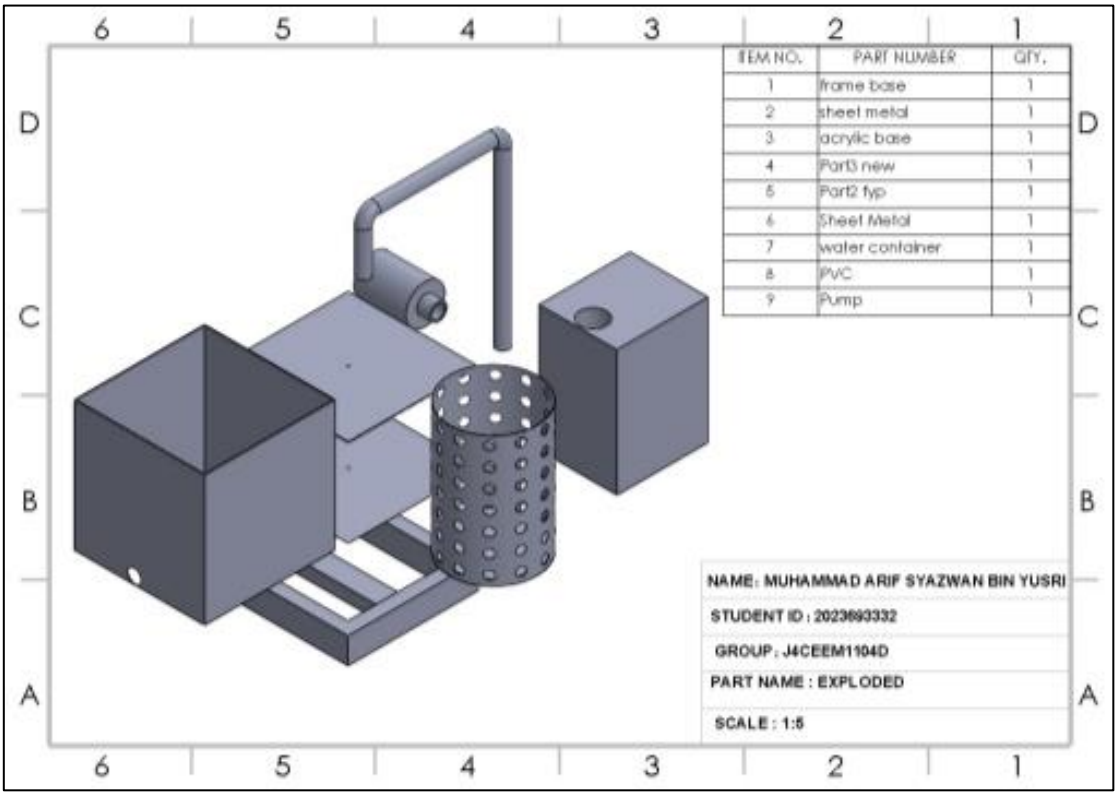
Keywords: *Automated produce cleaning, Food safety hygiene*

PROTOTYPE



DESIGN PARAMETER





CHAPTER 63

Automatic Colour Sorter Machine

Muhammad Irfan Aniq Abd.Rashid [1], Norhisyam Jenal [2*] and Siti Aishah Taib [3]

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[3]*Academy of Language Studies, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim*
**Corresponding author (e-mail): hisyam0324@uitm.edu.my*

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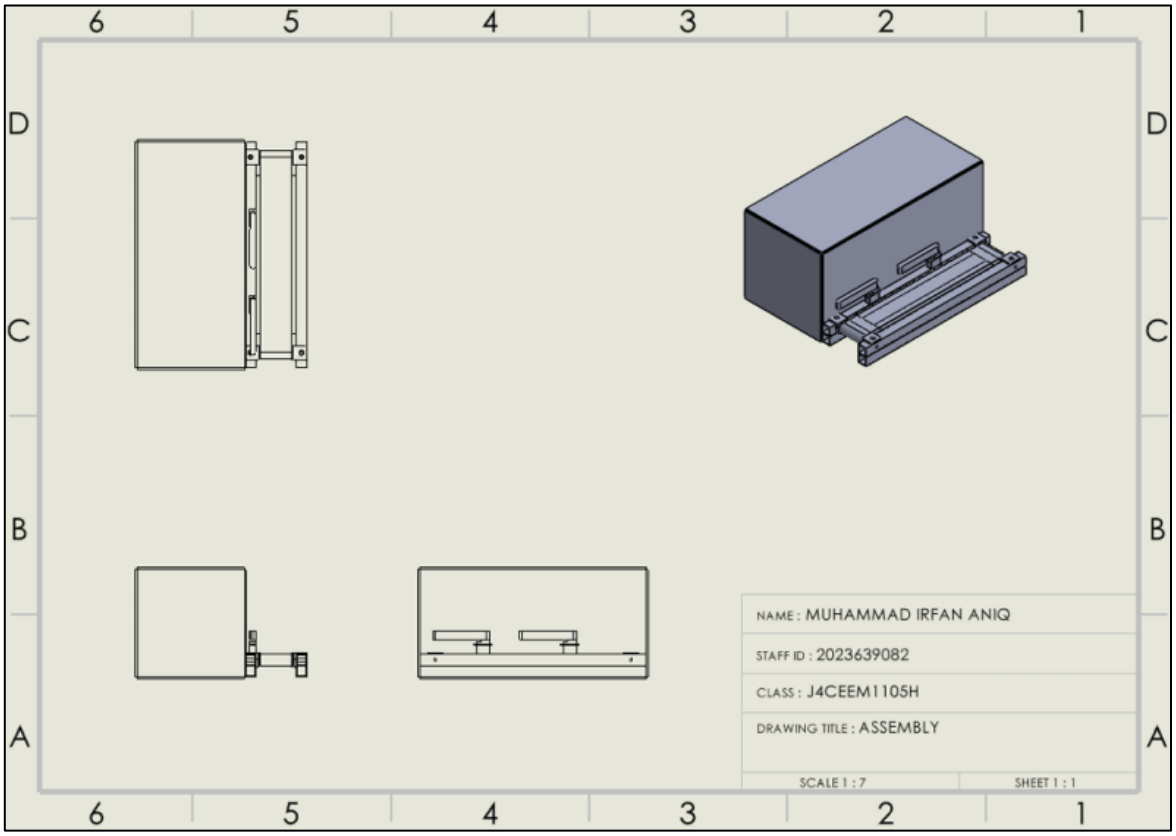
The process of colour sorting is significant in the manufacturing industries. Some examples where the process is used are the separation of different types of material in a mixture and the classification of the ripeness of fresh produce based on colour change. However, some small-scale industries are still using workers as colour sorters, which is costly due to high labour costs, long working hours, and slower production processes. Therefore, substituting the industrial colour sorting machine is the way to go; yet, the complexity of the machines, the high costs, and the high maintenance requirements outweigh the benefits. Thus, the objective of this project is to design and fabricate a prototype, automated, compact colour sorting conveyor. In order to achieve the objective, the preliminary design was drawn using computer-aided design (CAD) software, and the product is fully developed in-house. In terms of construction, the frame and body of the product are made of steel, Arduino-based colour-sensing sensors are used to detect different colours of objects on the conveyor belt, and a servo motor sorts the objects based on the colour. As a result, experimental testing with loads under 100 grams was successful, and the machine was able to identify and sort red, green, and yellow items in real-time.

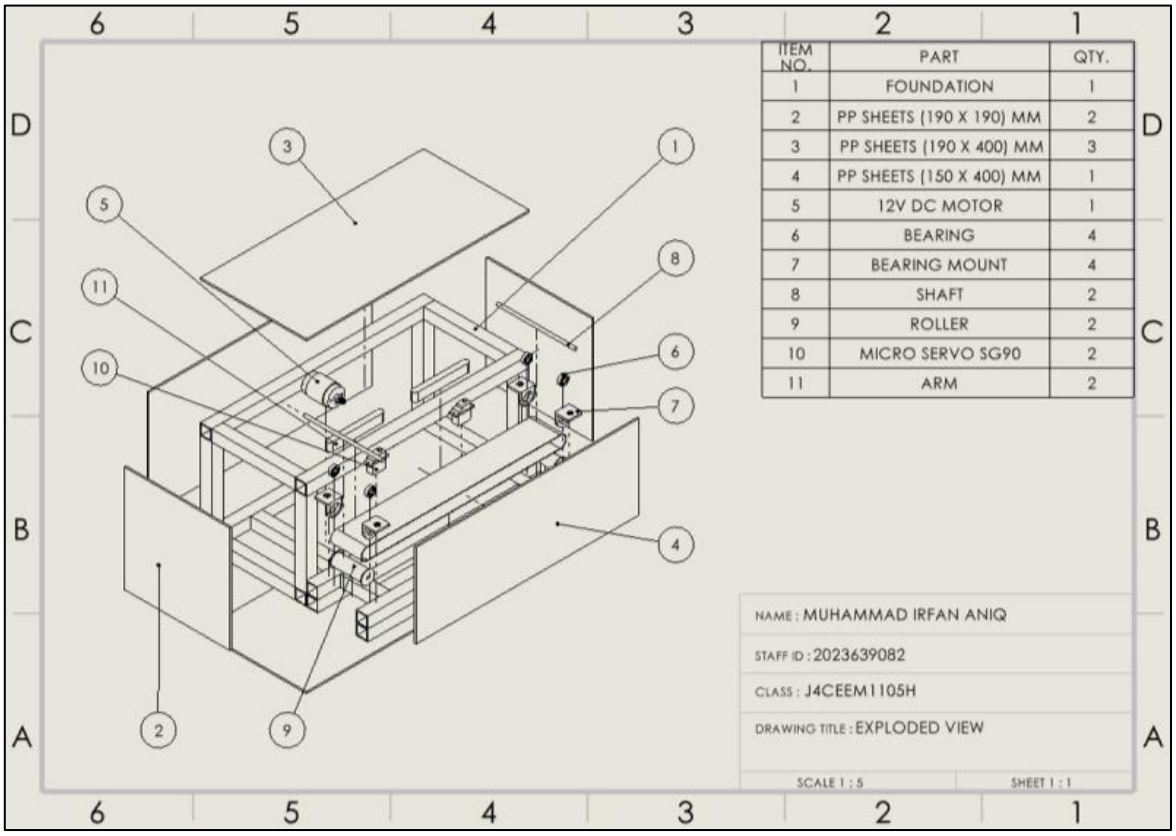
Keywords: *Colour sorting automation, Arduino-based conveyor system*

PROTOTYPE



DESIGN PARAMETER





Prototype Design Collection Series 5
eISBN: 978-967-0033-74-7

CHAPTER 64

Automatic Sheet Metal Curve Cutter

Muhammad Safwan Md Sabri [1], Mohd Noor Halmy Ab Latif [2*] and Norshadila Ahmad Badela [3]

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[3]*Kolej Komuniti Sungai Siput, Peti Surat 390, Kampung Sungai Sejuk 31100 Sungai Siput Utara, Perak Darul Ridzuan*
**Corresponding author (e-mail): halmy@uitm.edu.my*

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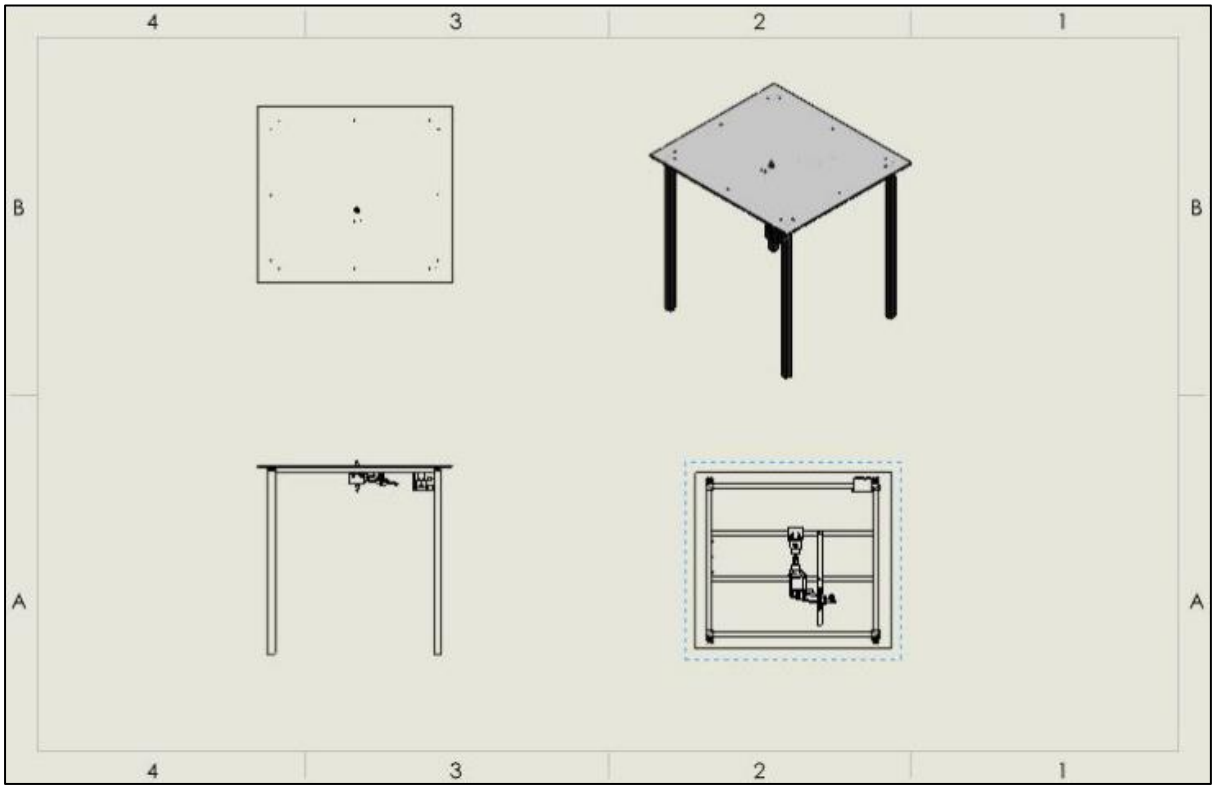
The Automatic Sheet Metal Curve Cutter is a machine designed to make metalworking easier, particularly for complex shapes like circles and curves. Traditionally, workers rely on manual tools like aviation snips, which are often slow, physically demanding, and leave behind rough, dangerous edges. This project focused on building a motorized alternative that is fast, accurate, and affordable for small workshops or schools. The machine's foundation is built from A36 mild steel tubing to ensure the frame remains strong and steady during operation. For the work surface, chipboard was selected because its smooth finish allows metal sheets to slide easily into the cutter without getting stuck. The power system uses an AC universal motor taken from an electric drill, which is connected to a nibbler head using a standard chuck. A vital part of this design is the AC voltage regulator, which gives the operator a control knob to adjust the cutting speed based on the type of metal being used. Testing proved that the machine can successfully handle both straight and curved cuts on thin materials. The prototype cleanly cut aluminum up to 0.7 mm thick with a smooth finish, and it handled stainless steel up to 0.5 mm, though the harder steel resulted in slightly rougher edges. Overall, this machine provides a practical way to speed up production, reduce physical strain on workers, and minimize wasted material.

Keywords: *Mild steel, Nibbler head*

PROTOTYPE



DESIGN PARAMETER



CHAPTER 65

Portable Parcel Wrapping Machine

Muhammad Helmi Masri [1], Mohd Noor Halmy Ab Latif [2*] and Norshadila Ahmad Badela [3]

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**Corresponding author (e-mail): halmy@uitm.edu.my*

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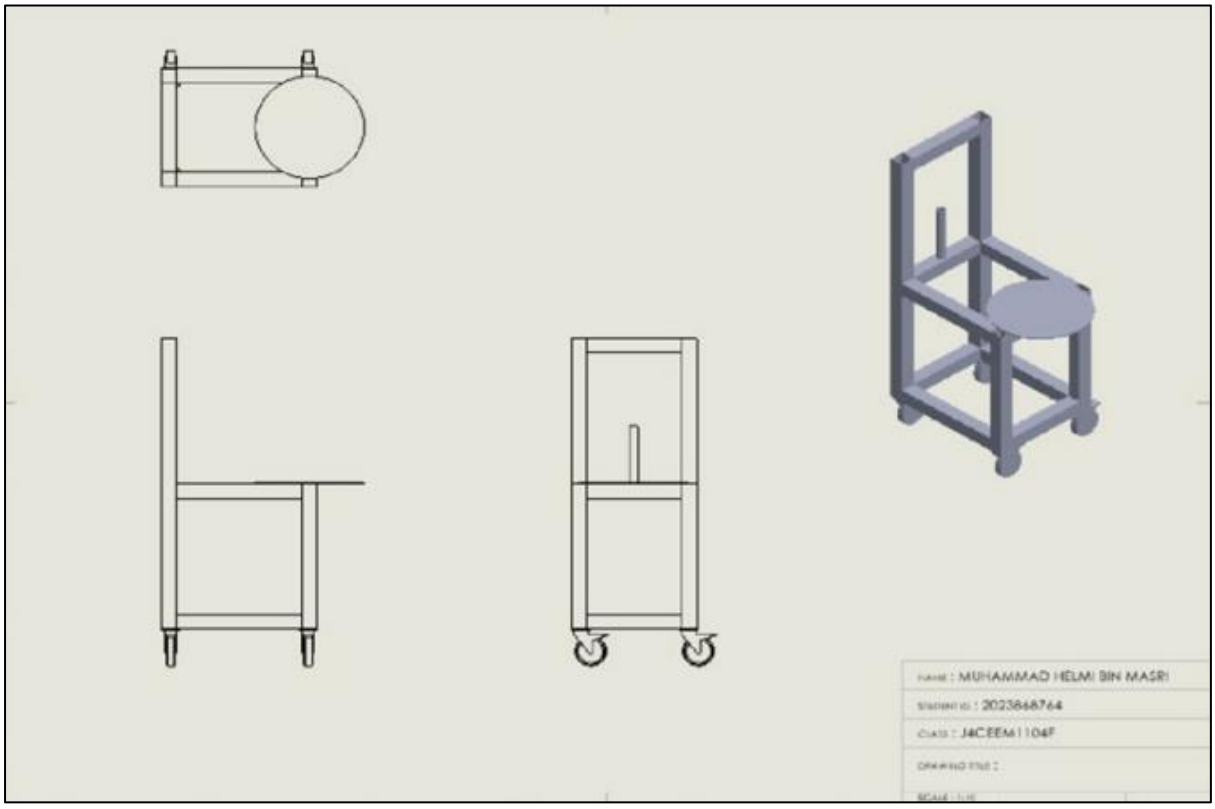
Small businesses today often face a difficult choice between time-consuming manual wrapping methods—which are inconsistent and wasteful—and expensive, large-scale industrial pallet wrappers. This project addresses these challenges by engineering a small, economical, semi-automatic parcel wrapping machine specifically designed for small-to-medium packages. The primary objective was to design a lightweight, compact, and affordable machine that improves packaging efficiency for home-based or small-scale industries without requiring high industrial investments.The machine's development followed a structured engineering methodology over two semesters. The final prototype features a strong structural frame constructed from A36 mild steel for stability and a smooth chipboard work surface to ensure effortless material feed. The motorized mechanism is powered by an AC universal motor from an electric drill, which is coupled to a vertical stainless steel film holder via a chuck. A critical design feature is the integration of an AC voltage regulator, allowing operators to adjust motor speed to suit various material properties. Experimental results confirmed the machine's capability to perform both straight and curved wrapping operations effectively on various parcels. The prototype successfully processed packages with functional edge quality and consistent film coverage while reducing material waste by nearly half through high-torque pre-stretching technology.

Keywords: *Mild steel, DC motor*

PROTOTYPE



DESIGN PARAMETER



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CHAPTER 66

Portable Clothes Dryer

Muhammad 'Aarif Irfan Mohd Zakaria [1], Mohd Noor Halmy Ab Latif [2*] and Norshadila Ahmad Badela [3]

[1,2]Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.
[3]Kolej Komuniti Sungai Siput, Peti Surat 390, Kampung Sungai Sejuk, 31100 Sungai Siput Utara, Perak Darul Ridzuan
**Corresponding author (e-mail): halmy@uitm.edu.my*

PROJECT DESCRIPTION

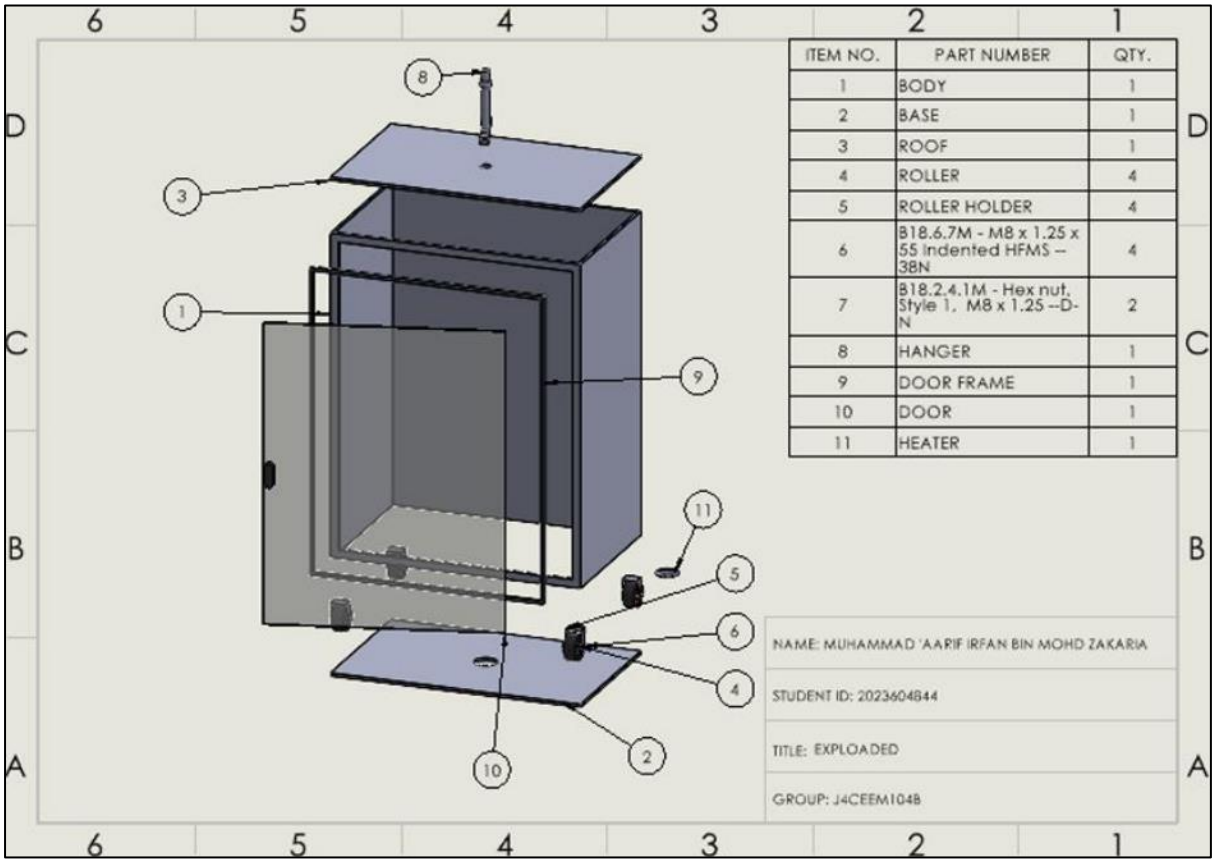
This project presents the design and development of a Portable Clothes Dryer intended to provide a convenient alternative to traditional outdoor drying methods. The dryer features a compact enclosed body, a hinged front door, an internal heating element, and a hanger for arranging clothes during operation. Four rollers are incorporated into the base to improve mobility and allow the unit to be repositioned when needed. The enclosed structure is designed to concentrate heat around the garments while reducing exposure to dust, rain, and other outdoor conditions. The project focuses on combining practicality, portability, and ease of use in a single appliance suitable for homes, hostels, and other spaces with limited drying areas. Its main components include the body, roof, base, door frame, door, heater, hanger, and supporting fasteners. The design aims to reduce dependence on sunlight and provide users with a more flexible drying option during wet weather. Further testing is required to evaluate drying time, temperature distribution, energy consumption, and overall safety before the product can be considered ready for regular household use in different environments and operating conditions.

Keywords: *Portable, Dryer*

PROTOTYPE



DESIGN PARAMETER



ITEM NO.	PART NUMBER	QTY.
1	BODY	1
2	BASE	1
3	ROOF	1
4	ROLLER	4
5	ROLLER HOLDER	4
6	B18.6.7M - M8 x 1.25 x 55 Indented HFMS -- 38N	4
7	B18.2.4.1M - Hex nut, Style 1, M8 x 1.25 --D-N	2
8	HANGER	1
9	DOOR FRAME	1
10	DOOR	1
11	HEATER	1

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