Additional facilities:

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Social Connect & Responsibility (BSCK307)

"Social Connect & Responsibility" is an interactive course rooted in the ethos of Indian knowledge systems, aiming to cultivate a profound bond between students and their environment. Through various stimulating activities, students are encouraged to establish connections with fellow individuals, nature, society, and the global community.
In the third semester of their undergraduate studies, engineering students from all branches will take this course.

The course curriculum is structured around five key components:
Plantation and Adoption of a Tree: Students engage in the symbolic act of planting and adopting a tree, fostering a sense of responsibility towards the environment. They delve into the cultural significance of the chosen plant species, exploring its origin, usage in daily life, and appearance in folklore and literature.
Heritage Walks and Crafts Corner: Through heritage tours and interactions with local craftsmen, students delve into the history and culture of their city. They document the evolution and practice of various craft forms, fostering an appreciation for traditional craftsmanship and cultural diversity.
Organic Farming and Waste Management: Students learn about the importance of organic farming and sustainable waste management techniques through practical visits and implementation on campus. They explore the usefulness of organic farming and wet waste management in neigh boring villages, promoting ecological sustainability.
Water Conservation: Investigating current water conservation practices in surrounding villages, students implement innovative solutions on campus. Through documentation, they raise awareness about water scarcity issues and advocate for sustainable water management practices.
Food Walks: Exploring the city's culinary practices and indigenous ingredients, students uncover the rich food lore of the region. They gain insight into traditional cooking methods and ingredients, fostering a deeper connection to local culture and sustainable food practices.

Throughout the course, students participate in variety of interactive sessions, open mic events, reading groups, and storytelling sessions facilitated by faculty mentors.
Through active engagement in these activities, students gain practical skills in environmental conservation, heritage preservation, and sustainable living. Moreover, they develop a comprehensive understanding of their interconnectedness with their surroundings and the global community.
Embracing the holistic approach of Indian knowledge systems, this course empowers students to become conscientious global citizens committed to fostering positive social and environmental change.

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ACTIVITY REPORT
OF
SOCIAL CONNECT & RESPONSIBILITY (21SCR36)

Submitted to

VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI-590018

By

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SMVITM

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SHRI MADHWA VADIRAJA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
BANTAKAL-574115, UDUPI DISTRICT
MARCH -2023

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ABSTRACT

The subject of Social Connect and Responsibilities aims to promote a sense of community responsibility towards enhancing local ecological, cultural, and social environments. The subject consists of five modules, each with a different focus area.

The first module centers on tree plantation and adoption. The objective of this module is to encourage participants to plant a tree and adopt it to ensure its growth and preservation. Tree plantation is essential for reducing carbon dioxide in the atmosphere and gifting an environmentally stable future to generations to come.

The second module focuses on heritage walks and craft corners. We are given an opportunity to visit a Habitat for Humanity community and understand the significance of cultural heritage, crafts, and craft forms as part of the local community's cultural heritage. We visited Hastashilpa Heritage Village and Clay kart, where we were introduced to local history, culture, and crafts, providing a broader perspective on the region and its people.

The third module focuses on waste management and organic farming. The we attended a guest talk on the importance of waste management and organic farming. The guest speaker gave insights into better waste management and how organic farming practices can contribute towards reducing the harmful impact of chemicals on the environment while enhancing soil fertility.

The fourth module focuses on water conservation. The module aims to increase awareness about the importance of water conservation, highlighting the significance of water as a resource and the need for sustainable water usage. We had an opportunity to attend a guest talk on water conservation, focusing on the issue of water scarcity and its implications.

The final module focuses on promoting local foods and culture. We had a Food Fest, we participated in the food fest, and tasted local delicacies, and also had an opportunity to prepare some dishes as a way of promoting the local cuisine and contributing towards the local economy.

In conclusion, social connect and responsibilities subject aim to promote environmental and cultural conservation through sustainable practices like tree plantation, organic farming, heritage walks, water conservation, and local food promotion. The goal is to encourage individuals to take up community practices that contribute positively to their immediate environment while instilling a sense of responsibility towards the larger society as well. Therefore, it is essential to continue promoting social attachment and responsibilities to instill a sense of communal responsibility in individuals that understand the importance of adopting sustainable practices to safeguard the environment, culture and society. Overall, this would enable people to live more harmoniously with the environment, contribute towards creating a better future for generations to come.

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Chapter 1

Plantation and Adoption of a Tree

• Importance Of Planting Trees

Trees help combat global warming by absorbing carbon dioxide, removing and storing carbon, and releasing Oxygen into the air. They reduce wind speeds and cool the air. Trees help prevent flooding and soil Erosion. Trees provide a canopy and a habitat for wildlife – from bats to squirrels, from birds to insects, and many other Species. It also provides them with Food. Trees help to improve air quality by trapping dust and other pollutants in the air. It also protects us from the harmful UV rays of the sun. Trees not only benefit our physical health but also improves our mental health. When we are surrounded by trees or take part in nature-based activities, our stress and depression levels are reduced relatively. Trees provide a serene and tranquil environment, therefore human settlements are incomplete without them. The number of trees surrounding you can impact the quality of your life. Along with countless fruits and nuts provided by trees, the bark of some trees can be made into cork And is a source of chemicals and medicines.

• Environmental Benefits

Many people decide to enrich their gardens by planting trees. Most of them do it for the beauty or to provide extra shade in summer months. However, there are more benefits from trees than you might think. Except for relaxing, connecting us with nature and their calming effect, trees do a lot when it comes to the environment.

- Reducing Climate Change
  Harmful CO2 contributes to climate change, the biggest current problem the world has to deal with. Trees help fight the excess carbon dioxide in the atmosphere. They absorb CO2 removing it from the air and storing it while releasing oxygen.

- Purifying Air
  Trees absorb pollutant gases such as nitrogen oxides, ozone, ammonia, and sulphur dioxide. Trees also absorb odours and act as a filter as little particulates get trapped in leaves.

- Cooling Down the Streets
  Removing trees and replacing them with heat-absorbing asphalt roads and buildings makes cities much warmer. Trees are cooling cities by up to 10 F by providing shade and releasing water.

- Saving water
  Besides cooling, trees also help to save water. Because of the shade they provide, water will evaporate slowly from low vegetation. Trees need about 15 water gallons a week to survive, and they release about 200-450 gallons of water per day.

- Preventing Water Pollution
  Without trees, stormwater flows into oceans and waters without being filtered. Trees break the rainfall and allow water to enter the earth and seep into the soil. Therefore, They prevent storm water from polluting oceans.

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- Providing Shelter for Wildlife

  Trees also contribute to boosting biodiversity as they become a food source and natural habitat for wildlife. Trees that are most planted as homes for birds, squirrels, and bees

- Renewable Energy Sources

  If harvested and treated sustainably, trees can become a great renewable source of energy. They are simple to use, have been around since the beginning of time, and with smart forest management they can become an excellent eco-friendly fuel.

- Reinforcing Soil

  Trees are one of the best partners when it comes to agriculture. They act positively in several ways: they reduce soil erosion, increase fertility and help soil obtain moisture. Fallen tree leaves lower reduce soil temperature and prevent soil from losing too much moisture. Decaying leaves that fall onto the ground turn into nutrients for tree growth and promote microorganism development.

- **Aloe Vera**

Introduction

Aloe vera is a cactus-like plant that grows in hot, dry climates. It is cultivated in Subtropical regions around the world. The Aloe vera plant has been known and used for Centuries for its health, beauty, medicinal, and skin care properties.

The name Aloe vera Derives from the Arabic word "Alloeh" meaning "shining bitter substance," while "vera" in Latin means "true." 2000 years ago.

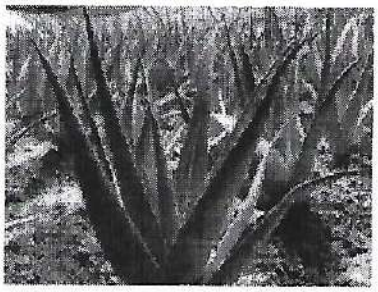

Fig 1.1 : Aloevera Plant

Anatomy

The plant has triangular, fleshy leaves with serrated edges, yellow tubular flowers, and fruits that contain numerous seeds.

Each leaf is composed of three layers :

An inner clear gel that contains 99% water and the rest is made of Clackmannan's, amino acids, lipids, sterols, and vitamins.

The middle layer of latex is the bitter yellow sap and contains anthraquinones

And glycosides.

The outer thick layer of 15–20 cells called as rind which has protective function and synthesizes carbohydrates and proteins.

Uses & Benefits of Aloe Vera

Aloe vera is a succulent plant that has been used for medicinal purposes for thousands of years. Some of the uses and benefits of aloe vera include:

1. Soothes sunburn and other skin irritations with its anti-inflammatory properties.
2. Helps to heal burns and wounds when applied externally.

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3. Has antibacterial and antiviral properties, making it useful in treating skin conditions such as acne and dermatitis.
4. Promotes hair growth and reduces dandruff when added to shampoos or applied directly to the scalp.
5. Alleviates constipation and digestive discomfort when taken orally in juice form.
6. Helps to lower blood sugar levels in people with type 2 diabetes.
7. Reduces dental plaque when used as a mouthwash.
8. Helps to alleviate symptoms of acid reflux and irritable bowel syndrome.
9. Boosts the immune system with its antiviral and antioxidant properties.
10. Reduces inflammation and pain associated with osteoarthritis and rheumatoid arthritis.

Overall, aloe vera has many uses and benefits for overall health and wellness. It can be consumed orally or applied topically for a variety of conditions, and is considered a versatile and effective natural remedy.

- **Mexican Mint**

Introduction

Mexican mint is a member of the mint family and has a similar leaf shape. It is semi-succulent with a pungent oregano-like flavor and odour. The plant appears almost entirely green, though some varieties have leaves with white edges. Its origin is uncertain, but it is thought to be native to Africa and probably India. Indian Borage or Mexican Mint is also known as Doddapatre / Sambarballi in Kannada
BOTANICAL NAME : Coleus Amboinicus

Fig 1.2 : Mexican Mint Plant

Anatomy

It is a large, fleshy, perennial plant which is highly aromatic and tends to branch Easily. This plant has short, soft, erect hairs, with distinctive smelling leaves. The stem is fleshy, about 30–90 cm long, with long rigid hairs. The taste of this leaf is pleasantly aromatic with an agreeable and refreshing odour. Flowers are on a short stem and are pale purplish.

Uses & Benefits

It has a strong flavor and aroma, with hints of mint, licorice, and citrus, and can be used fresh or dried in a variety of dishes. Here are some of its uses and benefits:

1. Promotes Digestion: Indian or Mexican Mint has digestive properties that help to alleviate stomach problems, such as bloating, gas, and indigestion.
2. Antimicrobial Properties: The herb has antimicrobial properties that help to prevent bacterial and fungal infections.
3. Anti-inflammatory Effects: Indian or Mexican Mint has anti-inflammatory properties that help to reduce inflammation in the body and relieve joint pain.

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4. Relieves Respiratory Problems: The herb's strong aroma can also help to relieve respiratory problems such as common cold, cough, and asthma.
5. Aids Oral Health: Indian or Mexican Mint helps to improve oral hygiene by fighting against oral bacteria and reducing bad breath.
6. Helps Control Blood Sugar: Indian or Mexican Mint has been found to have a hypoglycaemic effect, which means that it can help to lower blood sugar levels in people with diabetes.
7. Antioxidant Properties: The herb is high in antioxidants that help to protect cells from damage caused by free radicals and reduce the risk of chronic diseases.

Overall, Indian or Mexican Mint is a versatile herb that can be used in a variety of ways to add flavor to dishes and provide numerous health benefits.

- **Measure Taken by Govt. To Preserve Forest & Wildlife**

1. To conserve natural vegetation and wild animals, the Government has established national parks, wildlife sanctuaries, and biosphere reserves.
2. The Government has encouraged awareness programs like Vanamahotsava and Social Forestry.
3. The Govt has allocated funds in the Five Years Plans to enhance forest conservation and its sustainability
4. The Govt has enacted a Forest Conservation Act to check indiscriminate deforestation
5. The Govt has also adopted an integrated forest protection scheme to control forest fire, strengthening of infrastructure, protection, and conservation of sacred groves
6. The Wildlife Protection Act of 1972, protects areas that are meant for wildlife protection and also provides penalties and punishments for hunting and destroying forests.
7. National Biological Activity 2002 was established to ensure that the threatened species and habitats are protected.

- **Photo Gallery**

Fig 1.3 Plantation of Mexican Mint & Aloe Vera @SMVITM

Date : 26 Nov 2023 Time : 1.53 PM

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Chapter 2

Heritage Walk & Craft Corner

HASTASHILPA HERITAGE VILLAGE

- **Introduction & History**

Hasta Shilpa Heritage Village Museum is managed by Hasta Shilpa Trust which is a not-for-profit, Public charitable trust started by Vijayanath Shenoy. It is registered with the Government of Karnataka. It stands for restoration, conservation, preservation and promotion of India's fast-vanishing architectural heritage and material culture within the larger framework of the arts and culture. It also supports the development of knowledge and human resources in the arena of the arts, crafts and culture. Vijaynath Shenoy started with just 40 lakh donation from NORAD, a Norwegian Aid Agency in the six acres of land given to him by the state government. Today, the trust has relocated and restored more than 26 heritage structures. These structures are not just residential ones but also temples and hermitages. The restructured homes belong to different eras.

- **Inside Of Hastashilpa**

Hastashilpa heritage village consists of.

- 11 Heritage Structures

  Houses of Malnad, South Canara, North Canara, Historical Structures from North Karnataka and many more..
- 8 Traditional Shrines

  Shrines from various parts of Karnataka which includes 13th century Harihara Mandir.
- 3 Museums

  Tribal Art Museum from Bastar-Chattisgarh, Folk Deities of South Canara being the main attraction.
- 40 Odd shops

  Shops, Lanes and By-Lanes of the bygone era

- **Some Heritage Structures**

1. Harihara Mandira

Fig 2.1 : HariHara Mandir

The restored structure of Harihara Mandir is an architectural gem that stands out in the centre of a space, where several lanes and by lanes culminate as seen typically in Villages. Its origin dates back to a hoary past about 800 years back, when it was supposedly built as a shrine for Veerabhadra by an extreme Shaivites sect called Kapalikas. Subsequently during the medieval age Harihara statue was installed for reasons unknown. The passage of time further destroyed the structure, eventually collapsing into a heap covered by a mound of earth.

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2. Mangalorean Christian House

Fig 2.2 : Mangalorean Christian House

It Complete with symbols of Christianity and Portuguese-influenced details, this house is a traditional Christian house from Chikmagalur. The house displays items of typical interests of the Mangalorean Christians of that period, such as hunting, photography, and music.

3. Miyar House

Fig 2.3 : Miyar House

The structure is the principal entrance block (Hebbagilu Chavadi) of a typical agrarian Brahmin house of erstwhile South Canara district. Although started with all the traditional elements of this region, the influence of the british Colonial era, is very clearly seen in the character of the rear balcony. This stands as an example for an adaptive reuse, as it houses the administrative functions like an office, ticketing room, surveillance monitor, panel room and most importantly, an elegant gateway to the Heritage Villages

4. Mudhol Palace Durbar Hall

Fig 2.4 : Mudhol Palace Durbar Hall

A 19th century durbar hall , built by the Maratha ruling clan of ghorpades in Bagalkot district. Influenced by similar architecture of rajasthan and crafted locally with teak wood, this style represents an admirable blend. The Rajah of Mudhol held durbar in this hall quite occasionally.

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5. Kamal Mahal

Fig. 2.5 : Inside View of Kamal Mahal

This structure, part of a large royal residence, is the only wooden specimen of pre-Vijayanagara era that has survived. This unique ten layered wooden assembly was created to have a large column free central space and served as a private chamber of the army commander, who served the empire.

6. Deccani Nawab Mahal

Fig. 2.6 : Inside View of Deccani Nawab Mahal

This residential structure belonging to a family of Nawabs, showcases the Ostentatious lifestyle of noble men connected with royalty and reflects their wealth & social standing. The central space facilitated music and dance performances, viewed by the men from the space around and women folk from an exclusive balcony at the upper level.

7. Kunjur ChowkiMane

Fig. 2.7 : Inside View of Kunjur ChowkiMane

The Kunjur Chowki Mane was built in the architectural style of Kerala based on the Fifteenth century treatise 'Manushyalaya Chandrika". The plan of the structure follows a mandala or a grid aligned to the cardinal directions wherein the center of the mandala is left open or not built up, to coincide with the central courtyard. The basic house module is Nalukettu (nalu four. Kettu-wings) four blocks or wings of different widths in a descending order, the largest being the southern, and then the western followed by the northern and, the eastern wing being the least.

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POTTERY

- ## Introduction

Pottery, one of the oldest and most widespread of the decorative arts, consisting of objects made of clay and hardened with heat. The objects made are commonly useful ones, such as vessels for holding liquids or plates or bowls from which food can be served.

- ## Pottery Making Process

Fig. 2.8 : Different Steps of Pottery Making

Initially chunks of clay is collected from the river banks and stored. The chunks are beaten with the help of a wooden mallet to convert them into clay powder and further refined using a filter to obtain fine powder, by removing the impurities. Clay is mixed with required amount of sand and water and kneaded until a soft clay dough is acquired. Clay dough is stored in a moist free place for almost 2 months Potter's wheel is used to shape the clay into desired form.

Clay dough is placed at the center of the turning wheel and water is sprinkled to make the clay wet. As the wheel is turned, craftsmen starts to shape the clay. Water is added frequently to retain the moisture. The clay is shaped into desired form. The shaped articles are dried in direct sunlight. Finished articles are dried in the direct sunlight for a day. The products are then baked in a kiln to strengthen the quality and make them more durable. Backed products are painted with enamel colours to make them look more attractive and eye catching.

- ## Health Benefits of Clay Pot Cooking

Clay vessel cooking is one of the safest methods of cooking. It's unique in that, Cooking in clay pots adds beneficial minerals to your food because these pots are loaded with Iron, Calcium, Magnesium, and copper.

These elements release healthy benefits to your food. These clay pots are breathable which reduces food burning and allows for a slow and even cooking process that cooks very well. They also have the unique ability to lock steam. Since food is cooked slowly in clay vessels food retains oils and moisture. Clay is alkaline therefore cooking and eating in a clay vessel reduces the acidity in the food.

Drinking water from the clay pot improves metabolism, gentle on the throat, and also helps in preventing sunstrokes. When water is stored in clay pots, healing benefits are provided along with cooling the water.

Clay pots are easy to clean and they prove to be cheaper than plastic bottles in the long run. Clay vessels can be used year after year.

From these pot's beauty to the delicious, healthy food allows home cooks to create, these handmade clay pots are worth the investment in your kitchen, cooking, and meal.

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- **Photo Gallery**

Fig. 2.9 : Visit To The HastaShilpa Heritage Village, Manipal

Fig. 2.10 : Visit To The Clay Karts, Udupi

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Chapter 3

Wet Waste Management & Organic Farming

WASTE MANAGEMENT

- **Introduction**

Waste management refers to the process of handling, transporting, processing, and disposing of waste materials in a way that is safe, efficient, and environmentally responsible. This includes the collection, transport, treatment, and disposal of waste, together with monitoring and regulation of the waste management process and waste-related laws, technologies, and economic mechanisms.

Waste can be solid, liquid, or gases and each type has different methods of disposal and management. Waste management deals with all types of waste, including industrial, biological, household, municipal, organic, biomedical, radioactive wastes.The goal of waste management is to minimize the negative impact of waste on human health and the environment while maximizing the use of available resources.

- **Importance of Waste Management**

Waste management is important for several reasons, including:

- Protecting human health:

Poorly managed waste can have negative impacts on human health, such as the spread of disease and the release of harmful chemicals into the environment. Proper waste management helps prevent these risks and protects public health.

- Preserving the environment:

Waste can pollute the environment and harm wildlife. Proper waste management can reduce pollution and minimize the impact of waste on the environment.

- Conserving resources:

Proper waste management can help conserve natural resources by promoting the recovery of materials from waste for reuse or recycling.

- Reducing greenhouse gas emissions:

Landfills and incineration facilities can produce greenhouse gas emissions that contribute to climate change. Effective waste management can reduce these emissions by promoting the use of alternative waste treatment methods, such as composting and recycling.

In summary, effective waste management is important for protecting human health, preserving the environment, conserving resources, reducing greenhouse gas emissions, and creating economic benefits

- **General Waste Management Procedure**

General waste management procedures typically involve the following steps:

- Waste minimization: The first step in waste management is to minimize the amount of waste generated. This can be achieved by reducing the amount of materials used, recycling or reusing materials, and avoiding the use of hazardous substances.

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- Waste segregation: Once waste is generated, it should be segregated into different categories such as recyclable, organic, and hazardous waste. This ensures that each type of waste is treated appropriately and reduces the risk of contamination

- Collection and transportation: Waste is collected and transported to a treatment facility using appropriate methods such as waste collection trucks or containers.

- Treatment: Waste treatment methods can include recycling, composting, incineration, or landfilling, depending on the type of waste and its characteristics.

- Disposal: Once waste has been treated, it is disposed of in an appropriate manner that meets environmental regulations and standards.

- Monitoring and reporting: Waste management activities should be monitored and reported regularly to ensure that waste is being managed effectively and to identify areas for improvement.

It is important to note that waste management procedures can vary depending on the type and quantity of waste, local regulations and infrastructure, and other factors. Therefore, it is important to consult with waste management professionals and follow local regulations when developing waste management procedures.

- **Preparation of Bio-Compost**

Fig. 3.1 : Bio Compost Preparation, Before & After

Bio composting is a process of decomposing organic materials into a nutrient-rich soil Amendment. The steps for preparation of bio compost are as follows:

- Select a site: Choose a site for composting that is well-drained, has good air circulation, and is away from buildings, water sources, and sensitive areas.

- Gather materials: Gather organic materials such as vegetable and fruit scraps. Yard waste, and animal manure. Avoid adding meat, dairy products, and oils to the compost pile as they can attract pests and slow down the composting process.

- Prepare the compost pile: Create a compost pile by layering the organic materials with soil or finished compost. A good ratio to aim for is three parts "browns" (dried leaves, straw, or shredded paper) to one part "greens" (fresh grass clippings, vegetable scraps, or coffee grounds).

- Add water: Water the compost pile to keep it moist, but not too wet. A good rule of thumb is to keep the compost pile as damp as a wrung-out sponge.

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- Turn the compost: To speed up the composting process, turn the compost pile regularly (about once a week). This helps to aerate the pile and mix the materials, which promotes decomposition,

- Monitor the compost: Monitor the compost pile to ensure that it is decomposing properly. The temperature inside the pile should reach 130-160°F (55-70°C) within the first few days of composting. If the temperature does not rise, the compost may need more nitrogen-rich materials or more frequent turning

- Harvest the compost: After a few months, the compost should be ready for use. Harvest the compost by sifting it through a screen to remove any large pieces of material. The finished compost can be used as a soil amendment in gardens, lawns, and other planting areas.

In summary, the steps for preparation of bio compost involve selecting a site, gathering materials, preparing the compost pile, adding water, turning the compost, monitoring the compost, and harvesting the finished compost.

- **Preparation of Bio-Gas**

Fig. 3.2 : Bio – Gas Plant

Biogas is a renewable energy source produced through the anaerobic digestion of organic materials. The steps for preparation of biogas are as follows:

- Feedstock selection: Choose organic materials for the biogas production process. These can include animal manure, food waste, crop residues, and energy crops such as corn or sugarcane.

- Feedstock preparation: The organic materials are then prepared for digestion by shredding or chopping them into small pieces.

- Anaerobic digestion: The prepared feedstock is placed in an anaerobic digester, which is a sealed container that allows anaerobic bacteria to break down the organic material and produce biogas. The digester can be a small-scale system for household use or a large-scale system for industrial use.

- Biogas collection: The biogas produced during anaerobic digestion is collected in the digester and piped to a storage tank.

- Biogas treatment : The biogas collected from the digester contains impurities such as water vapour, carbon dioxide, and hydrogen sulfide. These impurities must be removed to make the biogas suitable for use as a fuel. The biogas is treated by passing it through a scrubber or filter to remove the impurities.

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- Biogas use: The purified biogas can be used for a variety of applications such as cooking, heating, and electricity generation. Biogas can be used in gas stoves or burners, boilers, or combined heat and power (CHP) systems.

- Digestate disposal: The leftover material from the anaerobic digestion process, known as digestate, can be used as a fertilizer or soil amendment.

In summary, the steps for preparation of biogas involve feedstock selection and preparation, anaerobic digestion, biogas collection, biogas treatment, biogas use, and digestate disposal. Biogas is a renewable energy source that offers several benefits, including reducing greenhouse gas emissions and providing a sustainable source of energy.

ORGANIC FARMING

- ## Introduction

Organic farming is a method of agriculture that relies on natural processes to cultivate crops and raise livestock without the use of synthetic fertilizers, pesticides, or genetically modified organisms. Organic farming is a sustainable and environmentally friendly approach to agriculture that promotes soil health, biodiversity, and the use of renewable resources.

- ## Importance and Benefits of Organic Farming

Organic farming is a method of agriculture that relies on natural processes and inputs to produce crops, without the use of synthetic fertilizers, pesticides, or genetically modified organisms. The importance and benefits of organic farming include:

- Environmental Sustainability: Organic farming practices promote soil health, biodiversity, and water conservation. They help reduce the amount of chemicals and other pollutants released into the environment, and can help mitigate the effects of climate change by reducing greenhouse gas emissions.

- Healthier Food: Organic farming produces crops that are free of synthetic pesticides and fertilizers, and are often higher in nutrient content. Additionally, organic livestock are not given antibiotics or growth hormones, resulting in meat and dairy products that are healthier for human consumption.

- Economic Benefits: Organic farming supports local economies by creating jobs and keeping money within the community. Organic farming also encourages diversity in crops, which can provide a more stable income for farmers.

- Animal Welfare: Organic farming practices often prioritize the humane treatment of animals, with organic livestock having access to outdoor space and natural feed, leading to happier and healthier animals.

- Food Security: Organic farming practices often rely on traditional, locally adapted farming techniques, which can help preserve traditional knowledge and increase food security for local communities.

Overall, organic farming is an important and beneficial approach to agriculture that promotes environmental sustainability, healthier food, economic benefits, animal welfare, and food security.

- **Limitations of Organic Farming**

While organic farming has many benefits, there are also some limitations and challenges that must be considered. Here are some of the limitations of organic farming:

- Lower yields: Organic farming methods often result in lower crop yields than conventional methods due to the absence of synthetic fertilizers and pesticides.
- Limited availability: Organic farming requires more time, effort, and resources, which can make it less accessible and affordable for small-scale and low-income farmers.
- Increased labour costs: Organic farming often requires more manual labour for tasks such as weeding and pest control, which can increase labour costs and make it less economically viable.
- Difficulty in controlling pests and diseases: Without the use of synthetic pesticides, organic farmers must rely on natural pest control methods, which can be less effective and more difficult to manage.
- Dependence on weather conditions: Organic farming practices are more dependent on weather conditions, which can make it more vulnerable to weather- related risks such as droughts and floods.
- Limited availability of organic inputs: Organic fertilizers and other inputs can be more difficult to obtain and may be more expensive than synthetic alternatives.

- **Initiatives taken by Government**

- Rashtriya Krishi Vikas Yojana (RKVY): This is a flagship scheme of the Indian government, which encourages farmers to adopt organic farming practices by providing financial assistance for the same.
- National Programme for Organic Production (NPOP): This Program was introduced to provide national standards for organic products. It ensures that organically grown products meet the required standards for national and international markets.
- Jaivik Kheti Portal: The Indian government has launched the Jaivik Kheti Portal, an online platform to provide information about organic farming practices, techniques, and standards.
- Soil Health Card Scheme: The Soil Health Card Scheme provides farmers with detailed information about the nutrient content of their soil to help them use organic fertilizers and manage soil health.

- **Photo Gallery**

Fig. 3.3 : Guest Talk On Waste Management & Organic Farming @ Seminar Hall, SMVITM

Chapter 4

Water Conservation

• Introduction

Water conservation refers to the preservation of water and its resources through careful planning, control, development, and management of the resource. It includes the activities and strategies undertaken to protect the water from pollution and manage freshwater so that it is evenly distributed for everyone to access. It also includes the efficient use of water by avoiding unnecessary water wastage and usage. It focuses on using water in a sustainable manner so that the needs of the present are met while also keeping the needs of the future in consideration

• Water Availability

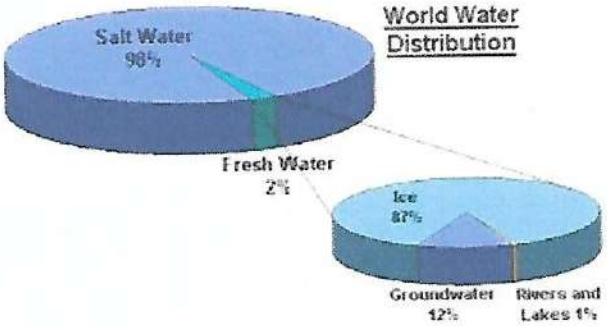

Fig. 4.1 : World Water Distribution Chart

Water availability is the quantity of water that can be useful to human beings without causing any harm to the ecosystem or other living creatures. According to the statistics, almost 97% of the earth's water is saline, and among the available 3%, aquifers are considered economically useful water resources for human beings. Water availability, both surface water and groundwater, is crucial for various fields like agriculture, industry, energy generation and most importantly, human consumption. Climate, local geological conditions, use of land, quality of water everything will affect the water availability.

Approximately 71% of the earth's surface is covered by water. Water on earth can be divided into underground water and surface water. Surface water includes water from the ocean, lakes, rivers, icetops, and glaciers. Among these freshwater resources are water falling from the sky, lake, rivers, streams and underground water.

Underground water is the water below our feet that is more important to live. Surface water is mainly used for agricultural needs and as drinking water, whereas groundwater helps to keep rivers and lakes full. Most of the freshwater available on earth is stored in ice caps and glaciers in the polar regions.

• Causes of Water Scarcity

Water scarcity is when potable, unpolluted water is lower than the demand in a Region. Typically, water scarcity is driven by two important factors - the increasing use of freshwater and the depletion of usable freshwater resources. Furthermore, scarcity can be of two types - physical water scarcity and economic water scarcity. *Economic water scarcity* is caused by the mismanagement of sufficiently available water resources.

Following are some of the major causes of water shortage:

- Natural calamities such as droughts and floods .
- Increased human consumption
- Overuse and wastage of water

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- Global rise in freshwater demand
- Overuse of aquifers and its consequent slow recharge

- **Effects of Water Scarcity**

Water scarcity refers to the situation where there is not enough water available to meet the needs of people and ecosystems in a particular area. The effects of water scarcity can be devastating and far-reaching, impacting everything from human health and agriculture to economic growth and political stability. Here are some of the key effects of water scarcity:

- Health: Water scarcity can lead to poor sanitation and hygiene, which in turn can cause the spread of water-borne diseases such as cholera, typhoid, and dysentery. Lack of access to clean drinking water can also lead to dehydration, which can be particularly dangerous for children, the elderly, and people with existing health conditions.

- Agriculture: Water scarcity can have a major impact on agriculture, which is one of the biggest consumers of water worldwide. When water is scarce, crops may fail, leading to food shortages and higher food prices. This can in turn lead to social unrest and political instability.

- Industry: Many industries rely heavily on water, including mining, manufacturing, and energy production. Water scarcity can make it difficult or impossible for these industries to operate, leading to economic losses and job cuts.

- Environment: Water scarcity can have a major impact on ecosystems, particularly freshwater ecosystems such as rivers, lakes, and wetlands. When water is scarce, these ecosystems can become degraded or even disappear, leading to a loss of biodiversity and ecosystem services.

- Political stability: Water scarcity can lead to political instability and conflict, particularly in regions where water is a scarce and valuable resource. This can lead to tensions between different groups, including countries, and may even lead to armed conflict.

In summary, water scarcity can have a wide range of negative effects, impacting everything from human health and agriculture to economic growth and political stability. It is therefore essential that we take steps to conserve and manage our water resources effectively in order to avoid the worst impacts of water scarcity.

- **Strategies for Water Conservation**

Here are some strategies for water conservation

1. Water-saving technologies: Use of technologies can help prevent water wastage. Technologies like low-flow showerheads and faucets, dual-flush toilets, efficient dishwashers, and washing machines can save significant amounts of water.

2. Water reuse: Greywater reuse is the practice of reusing water from sinks, showers, and washing machines for non-drinking purposes like irrigation, toilet flushing, etc. This technique can help conserve water and save energy.

3. Fixing leaks: Sometimes, water leaks, like dripping faucets or toilet leaks, can waste large amounts of water. Fixing these leaks can save significant amounts of water and money.

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4. Good water practices: There are various water-saving practices people can do daily to conserve water, such as turning off the tap while brushing teeth, taking shorter showers, and not letting the tap run while washing hands.

5. Efficient irrigation: Use of drip irrigation systems for agriculture that reduce water loss by placing water directly at the roots of plants.

6. Improving infrastructure: Investments in improving water infrastructure can help conserve water. Technologies like leak detection systems, automated irrigation controllers, and smart water meters can help conserve water.

By implementing these strategies for water conservation, people can significantly reduce water usage, save money, and preserve essential water resources.

- **Initiatives taken by the Government**

1. Jal Shakti Abhiyan: It is a flagship initiative of the government that aims to revive and conserve water resources across India through the development of water-harvesting structures, groundwater recharge structures, water conservation activities, and promotion of efficient water-use practices.

2. Pradhan Mantri Krishi Sinchai Yojana (PMKSY): The scheme was launched in 2015 with an aim to extend the coverage of irrigation and improve water-use efficiency through the promotion of water-saving technologies and modern irrigation practices.

3. Namami Gange Programme: Launched in 2014, this program aims to rejuvenate the Ganga river and its tributaries and promote water conservation through the creation of infrastructure for wastewater treatment and riverfront development.

4. Atal Bhujal Yojana: This scheme was launched in 2020, and aims at promoting better water management and groundwater recharge in India's water-stressed areas through participatory groundwater management and improving infrastructure for recharge

- **Photo Gallery**

Fig 4.2 : Guest Talk On Water Conservation @ Seminar Hall SMVITM

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Chapter 5

FOOD WALK

- ## Introduction to South Canara Food Tradition

South Canara is a coastal region located in the south-western state of Karnataka, India. The region has a rich history of cultural influences from coastal communities, such as the Konkanis, Mangaloreans, and the Bearys. The food tradition of South Canara is a unique blend of various cuisines and flavors, influenced by the customs and traditions of the communities that inhabit it.

Coconut, a common ingredient in coastal regions, is used liberally in the region's cuisine. The cuisine's distinct feature is the use of spices and masalas, which lend a unique flavor to the dishes. The region has a tradition of preparing rich and spicy curries with a lot of tangy and spiced flavors.

Some of the popular dishes of South Canara include neer dosa, idli sambar, medu vada, goli baje, bisi bele bath, patrode etc. The cuisine is also famous for its fried snacks and sweets such as banana fritters (bajji), bondas, halwa, and payasam.

Overall, the food tradition of South Canara is a delicious blend of flavors and spices, enriched by the region's cultural and geographical influences.

- ## Traditional Food Grains

South Canara has a variety of traditional food grains, including rice, ragi, wheat, corn etc. These grains are used to make a variety of dishes, such as idli, dosa, and roti.

- Boiled Rice :

Fig 5.1 : Boiled Rice

Boiled rice is a staple food in South Canara. It is prepared by boiling short-grain rice in water until fully cooked and is typically served as an accompaniment to curries, chutneys, and pickles. Boiled Rice is preferred for its softness, texture and taste. Compared to white rice, it has more nutrients like iron, magnesium and has very high fiber. This ensures it is digested slowly, keeping the stomach full, reduces the urge to eat frequently.

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- Ragi :

Fig. 5.2 : Ragi

Ragi is also known as finger millet. It is a staple food in many cultures due to its high nutritional value, including being a rich source of calcium, iron, and fiber. Ragi is known for its ability to grow in harsh climates and with minimal water It can be used to make a variety of dishes including porridge, bread, and snacks.

- **Traditional Food Pulses**

South Canara, also known as Dakshina Kannada, has a rich tradition of using pulses in its traditional cuisine. Pulses are used as a source of protein and are used in a variety of dishes. Some of the traditional food pulses of South Canara include Toor dal, Chana dal, urad dal, green gram etc.

- Black Gram :

Fig. 5.3 : Black Gram

Black gram split (urad dal) and whole urad dal have tremendous nutritional value. Urad dal is a good source of proteins, carbohydrates, lipids, iron, and calcium. These minerals strengthen your bone mineral density and reduce your chances of getting osteoporosis.

- Green Gram :

Fig. 5.4 : Green Gram

Green gram are high in nutrients and antioxidants, which may provide health benefits.
In fact, they may protect against heat stroke, aid digestive health, promote weight loss and lower "bad" LDL cholesterol, blood pressure and blood sugar levels.

- Chickpea :

Fig. 5.5 : Chickpea

Chickpea is popular in South Canara's cuisine. Chickpeas are rich in protein, fiber, and several vitamins and minerals. In South Canara, chickpeas are used to make a variety of dishes, including chana dal. Chickpeas are also used to make roasted chickpeas, which is a popular snack in the region.

- **Traditional Fruits And Vegetables**

South Canara is known for its rich agricultural produce of traditional fruits and vegetables such as jackfruit, mango, coconut, bananas, sapota, chilies, tamarind.
These ingredients are extensively used in the region's cuisine, providing essential nutrition and flavour to the local people. They represent the rich cultural heritage of South Canara's cuisine and make it unique and special.

- Sapota or Chikoo :

Fig. 5.6 : Sapota

Sapota or Chikoo is a sweet and juicy fruit that is widely cultivated in South Canara.
It has a rough, sandy brown skin and a soft fleshy interior with a unique taste that is a blend of caramel, pear, and brown sugar. It is used in making milkshakes, ice-creams, smoothies, and desserts like halwa. Sapota is a rich source of vitamins, minerals, and dietary fiber.

- Jackfruit :

Fig 5.7 : Jackfruit

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Jackfruit is a large tropical fruit grown in South Canara with a sweet, fruity flavor and chewy texture. Young, unripe jackfruit is used as a vegetable in curries and stews, while ripe jackfruit is used in desserts. Jackfruit seeds are also eaten as a snack or roasted. Jackfruit is a rich source of vitamins, minerals, fiber, carbohydrates.

- Snake Gourd :

Fig. 5.8 : Snake Gourd

Snake gourd is a traditional vegetable widely cultivated in South Canara. It is a long, cylindrical-shaped vegetable with slightly curved ends, rough greenish-brown skin, and white pulp inside with undeveloped seeds. Snake is often used in curries, stews, and soups in South Canara's cuisine. It is a low-calorie vegetable and is an excellent source of vitamins, minerals, and dietary fiber.

- Mattu Gulla / Brinjal :

Fig. 5.9 : Mattu Gulla

Mattu Gulla / Brinjal is a variety of brinjal grown in the village of Mattu in Udupi district of South Canara. It is a small to medium-sized, round or oval-shaped brinjal with a smooth, glossy, purple or greenish purple skin, and firm, creamy-white flesh with small seeds. It is often used in traditional South Canara dishes like Mattu Gulla Sambar, Mattu Gulla Palya. Mattu Gulla is an excellent source of dietary fiber, vitamins, and minerals.

- **Traditional Dishes**

South Canara's traditional dishes include Idli, Vada, and Dosa, Bisi Bele Bath, Sheera, Kori Rotti, Patrode, Goli Baje, Neer Dosa, Sambar, Rasam, Kadubu, and Payasam.

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- Buns and Goli Baje :

Fig. 5.10 : Buns

Fig. 5.11 : Goli Baje

Buns are sweet bread made with mashed bananas, yeast, and flour, and are enjoyed with spicy chutneys. Goli Baje is a savory snack made with all-purpose flour, yogurt, and spices, which is deep-fried into small dumplings with a crispy exterior and a soft, fluffy interior. Both snacks are popular street food items and an essential part of South Canara's culinary tradition.

- Patrode :

Fig. 5.12 : Patrode

Patrode is a traditional dish from South Canara region of Karnataka. It is a savoury snack made of colocasia leaves, rice flour, and spices, which is steamed and sliced. The dish is known for its unique taste and health benefits, as it is rich in dietary fiber, vitamins, and minerals. Patrode is a staple dish in the Tulu Nadu region, and it is typically served during special occasions or festivals.

- **Food Fest Dishes**
- Sprouted Green Gram Salad :

Fig. 5.13 : Sprouted Green Gram Salad

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Sprouted green gram salad is a simple yet healthy and delicious dish that packs a punch of nutrition and flavor. The dish is made from the sprouted moong beans, which are a good source of plant-based protein, fiber, and essential vitamins and minerals. The sprouted beans are mixed with a variety of fresh vegetables such as cucumber, tomato, onion, and carrot, and seasoned with herbs, lemon juice, and spices to create a refreshing and flavorful salad.

Ragi Cake :

Fig 5.14 : Ragi Cake

Ragi cake is a traditional sweet dish from Karnataka, a state in South India, made from ragi flour, jaggery, and coconut milk. Ragi flour is a gluten-free flour made from finger millet, and the dish is popular for being healthy and nutritious, as finger millet is a good source of protein, fiber, and essential nutrients. The sweet dish is prepared by mixing ragi flour and jaggery syrup in a pan, then adding coconut milk and cooking until it thickens. The mixture is then poured into a greased plate, cooled, and cut into pieces. Ragi cake is typically served as a dessert, and its unique flavor and texture make it a popular choice among health-conscious individuals who are looking for healthy dessert options.

Sweet Poha With Raw Mango :

Fig. 5.15 : Sweet Poha

Sweet poha is a popular sweet dish from India made from flattened rice (poha) and jaggery. It is typically flavored with cardamom powder, grated coconut, and sometimes nuts, raisins, or other fruits. The poha is soaked in water for a few minutes, then mixed with jaggery syrup and other flavors to create a soft and sweet dish. Sweet poha is typically served as a breakfast or snack item and is popular due to its ease of preparation and nutritious qualities. It is high in fiber, protein, and essential vitamins and minerals.

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Kokum Juice :

Fig 5.16 : Kokum Juice

Kokum juice is a popular drink from the coastal regions of India. It is made from the fruit of the same name, kokum, which is sour and red in color. The fruit is first sun-dried and then soaked in water for a few hours to extract the juice. The juice is then strained, and sugar, salt, and other spices like cumin, coriander, and ginger, are added to enhance the flavor. Kokum juice is believed to have several health benefits, including aiding digestion, reducing acidity, and preventing dehydration. It is also known to be rich in antioxidants and is a good source of vitamin C.

- **Photo Gallery**

Fig. 5.17 : Food Fest @ SMVITM

Fig 5.18 : Prepared Dishes

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CONCLUSION

In conclusion, social connect and responsibility is an important subject that aims to promote the well-being of society and the environment. Through initiatives like planting and adopting trees, heritage walks and craft corners, water conservation, waste management, and organic farming and traditional foods, individuals can play a significant role in creating a sustainable future. These initiatives not only help to address environmental challenges but also strengthen community connections and cultural identity. It is crucial that we continue to prioritize these initiatives, implement best practices, and incorporate them into our daily lives so that we can create a better and more connected world for generations to come.

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Research Methodology & Intellectual Property Rights (21RMI56)

During the fifth semester of the graduation, all engineering students from various branches will study this course. The course offers a comprehensive overview of engineering research methodology and explores into the details of Intellectual Property Rights (IPR) within the engineering domain.

Here's a summary of each module:

Module 1:

Introduction to Research: Covers the meaning of research, objectives, and types of engineering research.

Ethics in Engineering Research: Discusses ethical considerations, types of research misconduct, and ethical issues related to authorship.

Module 2:

Literature Review and Technical Reading: Explores techniques for conducting literature reviews, effective technical reading, and note-taking strategies.

Attributions and Citations: Focuses on giving credit, understanding citations, and acknowledging sources properly.

Module 3:

Introduction to Intellectual Property: Discusses the role of IP in societal and economic development, IP governance, and the history of IP in India.

Patents: Covers conditions for obtaining patents, patent rights, enforcement, patenting processes, and related legal aspects.

Utility Models: Explores the process, terminology, and legal framework associated with utility models.

Module 4:

Copyrights and Related Rights: Discusses copyright criteria, ownership, infringements, fair use, registration, and international agreements.

Trademarks: Covers eligibility, registration process, types, enforcement, and famous trademark cases.

Module 5:

Industrial Designs: Explores eligibility, registration procedures, enforcement, and notable case studies.

Geographical Indications: Discusses laws, rights, registration procedures, enforcement, and case studies.

Case Studies: Analyzes significant patent cases such as Curcuma (Turmeric) Patent, Neem Patent, and Basmati Patent.

IP Organizations in India: Introduces various IP-related organizations, schemes, and programs in India.

The course assessment includes quizzes, literature reviews, and case studies covering patents, copyrights, and geographical indications. It encourages students to write research papers and file patents.

Overall, the course provides students with vital research skills, ethical awareness, and a thorough understanding of Intellectual Property Rights in engineering. This prepares them to engage responsibly and ethically in the realms of research and innovation.

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25-30,35

DESIGN AND FABRICATION OF FOOT OPERATED WASH BASIN

PROJECT REPORT

Submitted in partial fulfilment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

By

RAKSHITH N	**4MW16ME068**
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CERTIFICATE

Certified that the work entitled **"DESIGN AND FABRICATION OF FOOT OPERATED WASH BASIN"** has been carried out by

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2. **SHREYAS POOJARY**	**4MW16ME089**
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who are bonafide students of SMVITM, Bantakal, in partial fulfillment for the award of Bachelor of Engineering in Mechanical Engineering discipline of the Visvesvaraya Technological University, Belagavi, during the year 2019-2020. It is certified that all the corrections/suggestions indicated during the internal assessment have been incorporated in the report. The project report presented has been approved, as it satisfies the academic requirement in respect of project work prescribed by the University for the award of the degree.

Mr. Kiran N Bhat Assistant Professor, Department of ME, SMVITM, Bantakal	**Dr. Sudarshan Rao K** Professor & Head, Department of ME, SMVITM, Bantakal	**Dr. Thirumaleshwara Bhat** Principal, SMVITM, Bantakal

External Viva

Name of the Examiner	**Signature with date**
1.....	.....
2.....	.....

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VIGNESH NAYAK

ABSTRACT

Hand washing also known as hand hygiene, is the act of cleaning one's hands with soap or equivalent materials and water to remove viruses/bacteria/germs/micro-organisms,dirt, grease or other harmful and unwanted substances stuck to the hands. Drying of the washed hands is a part of the process as wet and moist hands are more easily gets contaminated. In the present project, a foot operated wash basin is designed and fabricated in order to avoid touching of taps while washing hands. By using this wash basin, the user can avoid usage of hands to turn on or turn off the water supply. The wash basin consist of pedal/ram at the bottom which is connected to stop cock/valve which is weight loaded at one end. The user have to apply pressure on the pedal using foot to operate the wash basin. The flow of water can be easily controlled by the amount of pressure applied on the pedal by foot; thereby avoiding wastage of water. Thus by avoiding the direct contact of hand while washing the spread of corona virus can be controlled.

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CHAPTER 1

INTRODUCTION

Hand washing with soap, when done correctly, is critical in the fight against COVID-19, but 3 billion people have no ready access to a place to wash their hands with soap at home. WHO released interim guidance on 1 April 2020, recommending to all Member States to make hand hygiene facilities in front of public and private commercial buildings as well as at all transport hubs obligatory. In particular people in densely populated settings will benefit from improved hand hygiene infrastructure at home and in public places.

Low-cost, rapidly scaled up solutions for hand hygiene made from local materials such as the tippy tap can foster community engagement and ownership, but evidence suggests that these Hand washing facilities might break easily and it's unclear whether they lead to sustainable behaviour change. Higher-end, more durable, attractive and disability accessible commercial products are more expensive and not as easy to manufacture and repair locally but might be more likely to encourage sustained behaviour change.

In the context of COVID-19, Hand washing is critical wherever a people meet and touch surface, but Hand washing remains also a key hygiene practices to prevent many other water-borne diseases. This includes homes, but also public places such as schools, health care facilities, workplaces, markets, places of worship and public transportation hubs. The Hand washing station needs to be intuitive and easy to use foe all, including people living with disability and children. The provision, operation and maintenance of Handwashing stations needs to go in hand with behaviour change programming to promote uptake and strengthening of the enabling environment to ensure sustainability of the facilities and their use.

Especially in emergency response, the adaption, repair, rehabilitation and maintenance of existing infrastructure should be prioritized. The refilling with water and supplies and maintenance of the Hand washing facility should follow an established protocol with clearly defined roles, responsibilities and accountabilities for critical tasks as well as budget assigned for critical supplies and spare parts. Regular monitoring and adequate regulation need to be in place to ensure the long-term operationality of the infrastructure.

The global indicator for hygiene in household settings is access to hand washing stations with soap and water on premises. The WHO/UNICEF joint Monitoring Programme defines a hand washing station as a device that "May be fixed or mobile and include a sink with tap water, buckets with taps, tippy-taps, and jugs or basins designated for hand washing".

In the context of COVID-19, the hand washing facilities will likely be provided externally by governments or third parties, so demand and use need to be carefully considered.

For health care settings the indicator is functional hand hygiene facility (with water and soap and/or alcohol-based hand rub) are available at points of care, and within 5 metres of toilets.

Direct hand-to-hand transmission of virus appears to play an important role in the spread of virus infections. The purpose of the studies described was to compare the immediate and residual effectiveness of different hand treatments for removal of Coronavirus from the hands. The study evaluated the effectiveness of ethanol hand sanitizers with or without organic acids to remove detectable Coronavirus from the hands and prevent infection. Ethanol hand sanitizers were significantly more effective than hand washing with soap and water. The addition of organic acids to the ethanol provided residual virucidal activity that persisted for at least 4 hours.

Washing hands prevents illness and spread of infection to others. hand washing with soap removes germs from hands. This helps prevent infections because:

- People frequently touch their eyes, nose, and mouth without even realizing it. Germs can get into the body through the eyes, nose and mouth and make us sick.
- Germs from unwashed hands can get into foods and drinks while people prepare or consume them. Germs can multiply in some types of foods or drinks, under certain conditions, and make people sick.
- Germs from unwashed hands can be transferred to other objects like handrails, table tops or toys, and then transferred to another person's hands.
- Removing germs through hand washing therefore helps prevent diarrhea and respiratory infections and may even help prevent skin and eye infections.

Teaching people about hand washing helps them and their communities stay health.

Hand washing education in the community:

- Reduces the number of people who get sick with diarrhea by 23-40%.
- Reduces respiratory illness, like colds, in the general population by 16-21%.
- Reduces absenteeism due to gastrointestinal illness in school children by 40%.

Hand washing with soap is one of the cheapest, most effective things one can do to protect yourself and others against Coronavirus, as well as many other infectious diseases. Yet for billions, even this most basic steps is simply out of reach, said UNICEF director of programmes. "It is far from magic bullet. But it is important to make sure people know what steps they should take to keep themselves and their families safe, even as we continue our longstanding efforts to make basic hygiene and sanitation available to everyone.

The World Health Organization recommends washing hands for at least 20 seconds before/after the following:

- Before and after caring for any sick person.
- Before, during and after preparing food.
- Before and after eating.
- After using the toilet.
- After helping someone who just used the toilet.
- After blowing one's nose, or coughing or sneezing.
- After touching an animal, animal feed or animal waste.
- After touching garbage.

However, if soap and water are not available, hand sanitizer that is at least 60% alcohol in water (specifically, ethanol or isopropyl alcohol/isopropanol (rubbing alcohol)) can be used instead, unless hands are visibly excessively dirty or greasy. When both hand washing and using hand sanitizer are not available, hands can be cleaned with ash and clean water, although the benefits and harms are uncertain for reducing the spread of viral or bacterial infections.

World Health Organization has declared the Coronavirus disease 2019 (COVID-19) a pandemic. A global coordinated effort is needed to stop the further spread of the virus. A pandemic is defined as "occurring over a wide geographic area and affecting an exceptionally high proportion of the population". The last pandemic reported in the world was the H1N1 flu pandemic in 2009. On 31 December2019, a cluster of cases of pneumonia of unknown cause, in the city of Wuhan, Hubei province in China, was reported to the WHO. In January 2020, a previously unknown new virus was identified, subsequently named the 2019 novel Coronavirus and samples obtained from the cases and analysis of the virus genetics indicated this was the cause of the outbreak. This novel Coronavirus was named Coronavirus Disease 2019 (COVID-19) by WHO in February 2020. The virus is referred to as SARS-CoV-2 and

the associated disease is COVID-19. Corona viruses are family of viruses that cause illness such as respiratory diseases or gastrointestinal diseases. Respiratory diseases can range from the common cold to more severe diseases like Middle East Respiratory Syndrome (MERS-CoV), Severe Acute Respiratory Syndrome (SARS-CoV).

A novel Coronavirus (nCoV) is a new strain that has not been identified in humans previously. Typically Coronavirus present with respiratory symptoms. Among those who will become infected, some will show no symptoms. Those who do develop symptoms may have a mild to moderate, but self-limiting disease with symptoms similar to the seasonal flue. Symptoms may include:

- Respiratory symptoms
- Fever
- Cough
- Shortness of breath
- Breathing difficulties
- Fatigue
- Sore throat

A minority group of people will present with more severe symptoms and will need to be hospitalised, most often with pneumonia.

The WHO suggests the following basic preventative measures to protect against the new Coronavirus.

1. Stay up to date with the latest information on the COVID-19 outbreak through WHO updates on your local and national public health authority.
2. Perform Hand Hygiene frequently with an alcohol-based hand rub if your hands are not visibly dirty or with soap and water if hands are dirty.
3. Avoid touching your eyes, nose and mouth.
4. Practice respiratory hygiene by coughing or sneezing into a bent elbow or tissue and then immediately disposing of the tissue.
5. Wear a medical mask if you have respiratory symptoms and performing hand hygiene after disposing of the mask.
6. Maintain social distancing (approximately 2 meters) from individuals with respiratory symptoms.
7. If you have a fever, cough and difficulty breathing seek medical care.

Principal
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The most important thing to stay fit and healthy is frequent hand washing. Frequent hand washing in right manner helps to wash away germs such as bacteria and viruses that have picked from other surfaces. Global hand washing Day is observed every year on October 15. Washing hands frequently is one of the most effective interventions. Most of the infectious diseases can be prevented by simple hand wash.

Medical hand hygiene refers to hygiene practices related to medical procedures. hand washing before administering medicine or medical care can prevent or minimize the spread of the disease. The main medical purpose of washing hands is to cleanse the hands of pathogens (bacteria, viruses or other microorganisms) and chemicals which can cause harm. This is especially important for people who handle food or work in the medical field, but also an important practice for the general public. However, frequent hand washing can lead to skin damage due to drying of the skin. Some healthcare professionals began hand washing in the patient care setting in the early 19th century. The practice evolved over the years with evidential proof of its vast importance and coupled with other hand-hygienic practices, decreased pathogens responsible for nosocomial or Hospital-Acquired Infections (HAI).

Rationalization of water consumption is critical issue because of limited water resources in many countries and high cost of water purification or desalination. Tracking revealed that most of the users leave taps opened and water continues running despite there are time periods they don't use water such as while washing teeth or switching ablutions organs. Other additional important observations could be summarized as follows:

i. When washing dirty hands, user opens the tap and he needs to wash the tap handle after washing his hands and then re-wash his hands. In addition, with some handle types, there may be difficulty in opening and closing as fingers glide on tap knobs.
ii. When washing several pots or utensils sequentially in kitchen, user cannot take advantage of water flowing during moments he switches between them and the majority of users does not or cannot shut off water and it remains to flow to sink without use.

Automatic or electronic taps are expensive and need electrical power and means of protection to isolate the wiring. Further, they have another problem, namely the existence of a time lag between the moment of cutting the beam and the onset of water flow. Also other time lag makes it continue to stream before it shuts down automatically. Eventually, it is clear the need to intensify methods of awareness development through various media to get

people to rationalization. The process of water use rationalization relies on two main parts, namely:

I. Users awareness, readiness and seriousness for realization and,

II. Providing means with suitable costs and easy to use.

As part of Coronavirus response, UNICEF is also reminding the public of the best way to wash their hands properly:

1. Wet hands with running water.
2. Apply enough soap to cover wet hands.
3. Scrub all surfaces of the hands including back of hands, between fingers and under nails for at least 20 seconds.
4. Rinse thoroughly with running water.
5. Dry hands with a clean cloth or single-use towel.

Hence it is evident that use of "Pedal Operated Gravity Tap" can avoid/limit the direct hand contact with water tap and reduce the spread of novel Coronavirus.

CHAPTER 2

OBJECTIVES

The objectives of the project are as follows:

- To design a foot operated hand wash basin
- To fabricate a foot operated hand wash basin
- To incorporate simple mechanism, avoid spring usage in foot operated wash basin
- To produce the foot operated wash basin with minimum cost and utilize mechanical parts/components to increase the durability

CHAPTER 3
LITERATURE SURVEY

Prabhu G. Suresha, Chameettachal Akhil, Aithal Anjali, Dsouza R. Giselle, Bhaskar Revti, and Govindakarnavar Arunkumar, in the paper entitled **"Human Coronaviruses In Severe Acute Respiratory Infection (SARI) Cases in Southwest India",** A laboratory based retrospective cross sectional study was conducted in which respiratory samples (throat swabs) of patients (n=864), with Influenza negative SARI, of all age groups between Jan 2011–Dec 2012 were tested for HCoVs including MERS-CoV using Conventional and real time PCR assays. The prevalence of HCoV among SARI cases was 1.04% (9/864) [95% CI: 0.36–1.72]. Of these four (44.44%) were identified as HCoV OC43, three (33.33%) as HCoV NL63 and two (22.22%) as HCoV 229E. No HCoV HKU1 was detected. The samples were also negative for SARS-CoV and MERS-CoV. The results of this study documents low prevalence of human coronaviruses in SARI cases in south western India and the absence of highly pathogenic human coronaviruses. As the study included only SARI cases the prevalence reported could be an under estimate when it is extrapolated to community.

Mingbin Liu, Jianming Ou, Lijie Zhang, Xiaona Shen, Rongtao Hong, Huilai Ma, Bao-Ping Zhu and Robert E. Fontaine, researched on **"Protective Effect of Hand-Washing and Good Hygienic Habits against Seasonal Influenza: A Case-Control Study"** observational studies have reported protective effects of Handwashing in reducing upper respiratory infections, little is known about the associations between hand-washing and good hygienic habits and seasonal influenza infection. Case control study was conducted to test whether the risk of influenza transmission associated with self-reported hand-washing and unhealthy hygienic habits among residents in Fujian Province, south-eastern China. Laboratory confirmed seasonal influenza cases were consecutively included in the study as case-patients (n=100). For each case, selected 1 control person matched for age and city of residence. Telephone interview was used to collect information on hand-washing and hygienic habits. The associations were analyzed using conditional logistic regression. Compared with the poorest hand-washing score of 0 to 3, odds ratios of influenza infection decreased progressively from 0.26 to 0.029 as hand-washing score increased from 4 to the maximum of 9 ($P<0.001$). Compared with the poorest hygienic habit score of 0 to 2, odds ratios of influenza infection decreased from 0.10 to 0.015 with improving score of hygienic

habits ($P<0.001$). Independent protective factors against influenza infection included good hygienic habits, higher hand-washing score, providing soap or hand cleaner beside the hand-washing basin, and receiving influenza vaccine. Regular hand-washing and good hygienic habits were associated with a reduced risk of influenza infection

The paper entitled **"Portable hands-free wash stand"** from **Chen-Hsiung Chang** carried out a portable hands-free wash stand characterized by upper and lower foot pedals on its ladder-shaped bottom block for controlling water pump to pump up clean water to feed pipe for wash, and comprising a control switch for the selection of warm water and cool water, wherein waste water is collected in waste water storage tank; a low water level indicating lamp turns on when clean water of clean water storage tank been used up so as to advise people to move the present wash stand to a specific location for filling clean water and draining off Waste Water.

T. Sathish, D. Bala Subramanian, K. Muthukumar, S. Karthick in **"Study an implementation of rack and pinion in the wash basin for hygiene hand washing",** carried out experiment in which water tank is fixed on the top which is used to store the water. Pedal is connected to the shaft which is connected to the rack bar. When pedal moves down the moving shaft presses the rack bar to upside. When the rack bar goes upside also pinion moves 90degree and it opens the tap and allows flowing the water in the wash basin. When the pedal is left, spring attachment mechanism compresses and again rackbar comes to original position (i.e. downward). The tap is automatically closed. No waste of water is occurred due to forget to close the tap. The project is used to operate the water pipe by leg through the easy operation of the pedal for washing purpose. It is very useful for physically challenged people and hand injured person also. Primary achievement is to avoid the contamination of the diseases. This project protect the people from the contamination and restricts huge water wastage. This project is cheap in cost and very useful to use in hotels, restaurants, public areas and home uses.

Robert V. Gilbert invented **"Latching foot pedal actuated tap water flow controller"** product. An assembly with valves and that permits fluid flow through the invention when the foot pedal is depressed. A mechanism engaged by depressing toe kick will latch pedal in a position where fluid flow continues after the foot is removed. Depressing pedal while the

latch is engaged, causes the latch to automatically disengage. When pedal is released at this time, fluid flow will stop. The assembly is designed to be installed in the cabinet under a kitchen or lavatory sink with all elements concealed except part of pedal and part of the latch mechanism. For example, a dish has just been rinsed and is being placed in a drying rack or in the dishwasher. When the dish is not under the water stream flowing out of the faucet, the water is just flowing down the drain. During this time, water that is usually purchased, and many times heated, flows down the drain without performing a function. People cannot help but do this because their hands are occupied with the dish or whatever. Some inventors have recognized this waste by inventing foot pedal actuated valves. These devices free up the hands to perform the tasks because the foot is used to turn the water off and on. Inventors have also recognized the convenience of using the foot instead of the hands to turn the water off and on.

The paper entitled **"Foot operated water control"** from **Ronald D. Weber** invented a remote control wash basin having a foot pedal operation. The foot pedal operates a crank to pull a wire cable that operates a lever to open a normally closed push button valve. Depressing the foot pedal latches the valve into the open position where it remains until a release pedal is depressed. The release pedal occupies the portion of the face of the foot pedal and releases the latch to allow the foot pedal to return to its normally non-operational position. The foot pedal operated fluid controlling mechanism can be added to a wash basin cabinet with minimal changes. This invention relates in general to water controlling devices and in particular to a faucet operating device having a foot operated valve for controlling the flow of water from faucets. An object of the present invention is to provide a device for use in controlling the flow of fluids, particularly water, the device being particularly adapted for use in controlling the flow of water to a faucet by the use of a foot pedal. Further, the wash basins of the prior art required that the foot pedal be continuously depressed in order to have a water flow from the faucet. The person operat ing the water flow must continually stand on the foot pedal to control the flow from the faucet This may be fine for workers and non-handicapped people but is non-functional for persons who are handicapped and cannot stand immediately adjacent to the wash basin or who cannot coordinate the depression of the foot pedal while washing themselves at the wash basin. This invention contemplates, among other features, the provision of a faucet operating mechanism for wash basins which is operated by

the foot so that the operator can wash himself without necessitating the use of his hands in operating the device. According to the present invention, a foot pedal can be depressed to control the operation of a push button valve through a wire cable that operates a lever to actuate the push button valve. The push button valve in turn controls the flow of the fluid into the faucet and the basin. The foot pedal includes a latching mechanism that keeps the foot pedal depressed to keep the valve actuated and the fluid flowing. A separate release pedal releases the latch to permit the return of the foot pedal and the closing of the valve to stop the fluid flow. Yet another object of the present invention is to provide a foot operated fluid controlling device that can be easily adapted to presently installed wash basins to permit the continued flow of water from a faucet when the foot pedal is depressed and stops the flow of water when a release pedal is depressed.

Frank Foster in paper entitled **"Hand washing unit"** invented a hand wash Station comprises a wall mounted cabinet which contains Soap and water dispensing means, a proximity Sensor and processing circuitry. The processing circuitry controls the dispensing of Soap and water in response to Signals from the proximity Sensor. A count of valid hand washes is incremented only if a user's hand is detected by the proximity sensor at certain key points. The key points comprise at least the start of a last soap dispensing step and the start of a last rinsing water dispensing step. Differential valid hand wash count Values are stored periodically by processing circuitry and can be downloaded to a central Station for analysis. It is an object of the present invention to provide a handwash Station which provides reliable data regarding handwashing activity. According to one aspect of the present invention, there is provided a hand washing and rinsing unit for a wash basin comprising: a water dispenser; a liquid Soap dispenser, a proximity Sensor for detecting a user's hand or hands in a position to receive water and/or Soap from the water and Soap dispensers and outputting a hands present Signal indicative thereof, and a controller for controlling the dispensing of water and Soap in dependence on the hands present Signal and recording valid hand wash events, wherein the controller responds to a hands present Signal to control the water dispenser to dispense a quantity of water onto a users hand or hands for wetting, and thereafter, on condition that the hands present Signal is present during a predetermined test window, controls the Soap dispenser to dispense Soap onto a user's hand or hands and records a valid hand wash event. Preferably, the control means is responsive to a hands present Signal after the dispensing of

Soap to control the water dispenser to dispense a quantity of water onto a user's hand or hands for rinsing and wherein a valid handwash event is only recorded if rinsing water has been dispensed. The controller is arranged Such that Soap and rinsing water for a preliminary wash are dispensed immediately after said wetting water is dispensed.

3.1 Summary

These days handwashing is very critical across the world in all the places person meet, touch the surface either it be home, public areas, hotels, workplaces health care centres etc.

Based on literature survey it can be concluded that contact less tap or foot operated tap is very effective to avoid spread of virus infection and also other waterborne diseases. Water wastage can also be reduced using these taps.

CHAPTER 4
FABRICATION PROCESS

4.1 Components

Components used for the project is shown in the Table 4.1

Table 4.1 Components used

Particulars	Quantity
Metal Rod	1
Metal Sheet	2
Stopcock	1
Tap	1
Extension Pipe	2
S nipple	2
Bolts	6
Nuts	14
Self screw	20
M seal	6

Figure 4.1 shows the flow chart used for fabrication process.

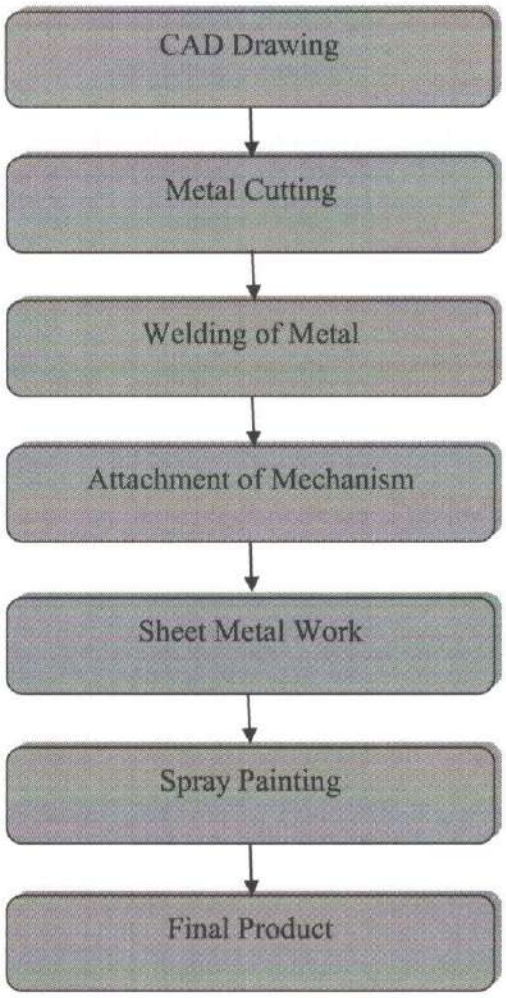

Figure 4.1 Fabrication Process

4.2 CAD Drawing

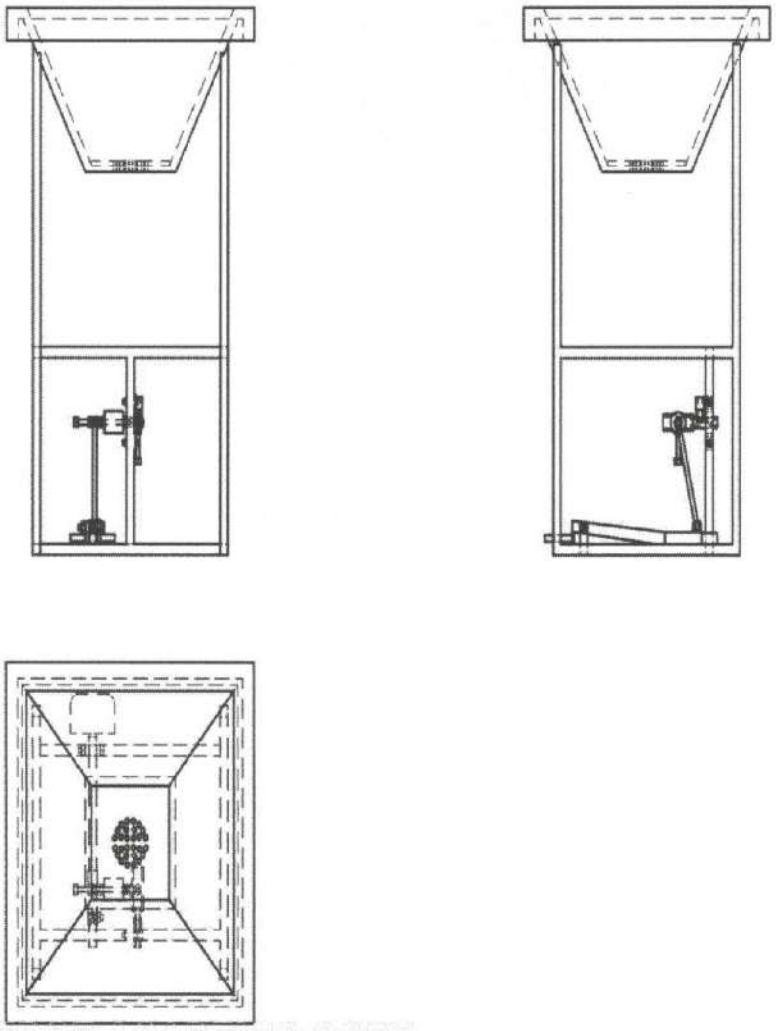

Figure 4.2 Cadd Drawings of Different views

2 dimensional CADD drawing was created in solid edge software, firstly the metallic stand of height 22inches and base14*14inches was drawn. Basin was drawn for dimension at the top side was14*14inches and the bottom side was 6*6inches. Figure 4.2 shows the back view, side view and top view of the model.

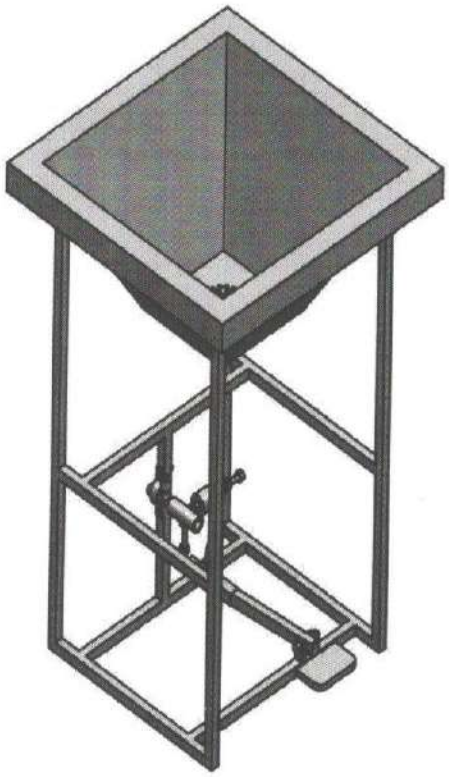

Figure 4.3 3dimensional Model

Different parts of the product such as Metal stand, Basin, Stopcock, Nuts and Bolts are created first in solid edge software as per the required dimensions and then these parts were assembled, which is shown in the Figure 4.3. Figure 4.3 shows the 3 dimensional view of the model.

4.3 Metal Cutting

Figure 4.4 Metal Cutting

Figure 4.4 shows the cut metal rod. Metal cutting is the process of producing a job by removing a layer of unwanted material from a given workpiece. One full length metal rod was taken and was cut for the height of 22 inches which is suitable height for everybody to use and as per the dimension of 14*14inches for basin to be fitted.

4.4 Welding of Metal

Figure 4.5 Welded Metal Stand

Welding is a fabrication process that joins materials, usually metals or thermoplastic, by using high heat to melt the parts together and allowing them to cool, causing fusion. Metal road which has been cut as per the required dimension has been welded using arc welding process and the suitable stand has been created. Metal stand weighs around 4kg.

4.5 Attachment of Mechanism

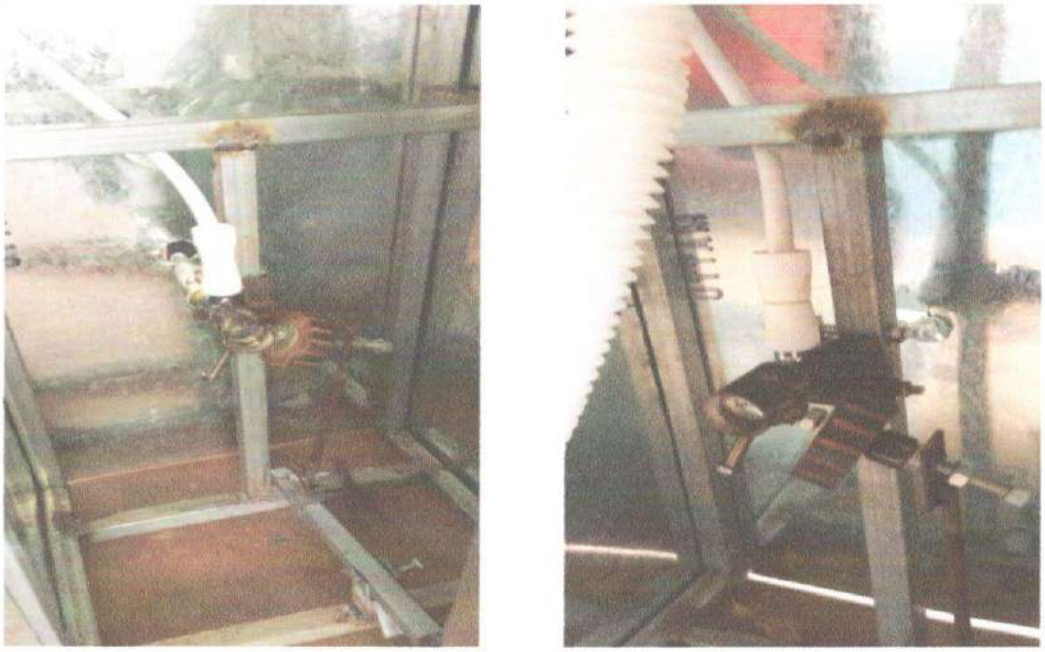

Figure 4.6 Mechanism

Figure 4.6 shows the simple Gravity Mechanism which contains minimum angle stopcock at the centre to which large bolt is welded on right side to hold 1kg weight. Weight can be placed at required distance from stopcock and it is tightened by double nuts and washer on both the sides. Other end is connected to the pedal at the bottom using metal rod and also double nuts are and washer are used to tighten it. One opening of stopcock is connect to main water supply and upper end is connected to tap at the top of the basin through control valve to control the flow of water. When weight is exerted on stopcock pedal is at upward or normal position which makes stopcock to be closed. When the pressure is applied on the pedal weight moves upward making stopcock open allowing water flow through the tap to basin. Mechanism works under 1kg pressure. When the applied pressure is removed from pedal making stopcock to close by exertion of weight and flow of water is stopped.

4.6 Sheet Metal Work

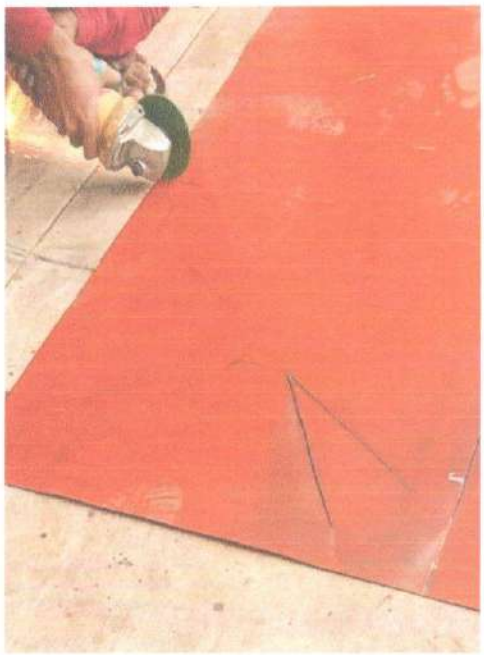

Figure 4.7 Cutting of Sheet metal

Sheet metal work is the process of metalworking that forms new products from various types of sheet metal. Sheet metal work was carried out to make a basin of dimension 14*14inches. At the start 16*16inches square was drawn on a plain sheet. 2inches extension was given for hamming to make basin correct fit to the stand. At the centre of the square 6*6inches small square was drawn and edges was joined by giving 5mm extension from diagonal to provide desired depth to the basin. Unwanted materials were removed then the hamming was done to bring it do desired shape. Edges were hammed to 90° to fit the basin to the stand.

4.7 Spray Paint

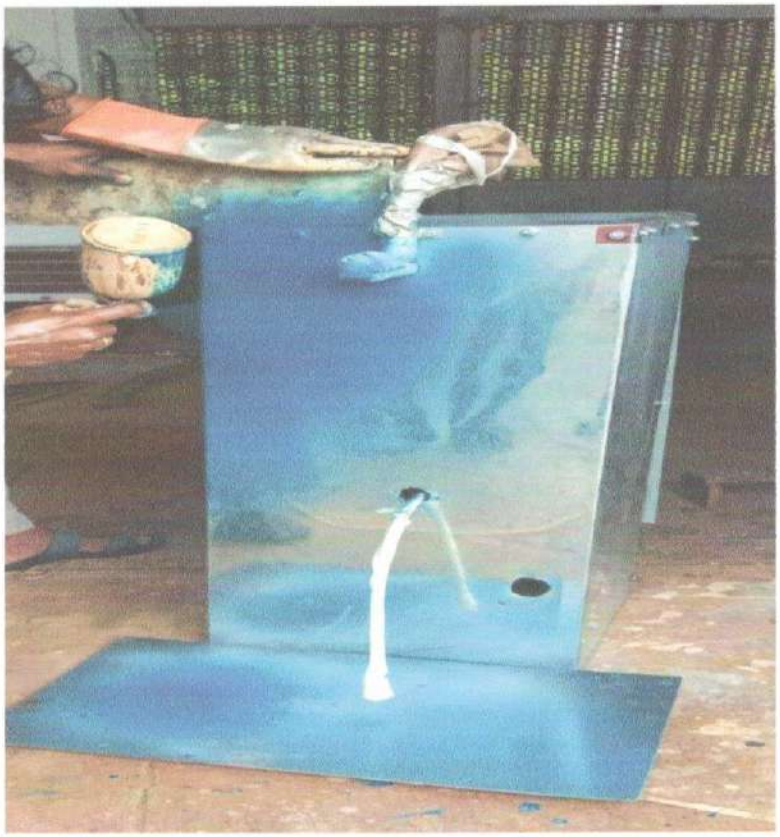

Figure 4.8 Spray Painting

Figure 4.8 shows the spray painting done to the product. Outer covering was made from thin metal sheet on three sides except the front side. Hammerite Blue Spray paint was mixed with thinner and applied to all the surrounding to appear it in suitable look. Blue colour is given to the basin. Inner mechanism was also painted to avoid it from rusting.

4.8 Final Product

Figure 4.9 Final Product

Figure 4.9 shows the final model of the foot operated wash basin.

CHAPTER 5

CONCLUSIONS

5.1 Conclusion

The fabrication of foot operated wash basin is successfully completed. Usage of springs is avoided and the washbasin operates with a gravity mechanism. The amount of water coming out of tap can be comfortable controlled by applying the adequate amount of pressure on foot pedal. Usage of this wash basin meets the objective by avoiding the operation of water tap by hand. Thus, spread of harmful contagious viruses by the touch of hand can be controlled. The wash basin can be manufactured with affordable cost.

5.2 Future Scope

- Different mechanisms can be adapted and different basin size can be manufactured.
- The same gravity mechanism can be sealed and attached to normal water basin
- Overall cost can be reduced by using waste metal sheets and other metallic parts.

CHAPTER 6

COST ANALYSIS

Cost of the project is shown in the Table 6.1

Table 6.1 Cost Analysis

Sl. No.	Particulars	Quantity (no's)	Cost/unit (Rs)	Total Cost (Rs)
1	Metal Rod	1	450	450
2	Metal Sheet	2	400	800
3	Stopcock	1	260	260
4	Tap	1	600	600
5	Paint	1	300	300
6	Miscellaneous	-	-	800
Total				**3210/-**

CHAPTER 7

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Bantakal students develop foot-operated washbasin

DHNS, Udupi,

JUL 26 2020, 22:31 ISTUPDATED: JUL 26 2020, 22:35 IST

The foot-operated washbasin developed by the Mechanical Engineering students at Shri Madhwa Vadiraja Institute of Technology and Management (SMVITM), Bantakal.

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SOLAR POWERED GRASS TRIMMER WITHOUT BATTERY

PROJECT REPORT

Submitted in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI- 590018

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2022 – 2023

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CERTIFICATE

Certified that the work entitled **"SOLAR POWERED GRASS TRIMMER WITHOUT BATTERY"** has been carried out by

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KIRAN

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ABSTRACT

The need for sustainable and eco-friendly lawn maintenance equipment has led to the development of solar-powered grass trimmers without battery. This abstract presents a design concept for a solar-powered grass trimmer without battery that eliminates the reliance on batteries, ensuring a cleaner and more efficient operation. The proposed grass trimmer without battery utilizes a solar panel to capture sunlight and convert it into electrical energy. The harvested energy powers a small electric motor, carefully selected to meet the trimmer's power requirements. A linear motion mechanism, such as gears, is employed to convert the motor's rotary motion into linear motion. To transfer the linear motion to the cutting mechanism, a barrel cam mechanism is incorporated, by integrating the cutting blade's head with the barrel cam, the rotational motion is transferred to the cutting mechanism, effectively trimming the grass. This innovative design eliminates the need for a battery, reducing the environmental impact and maintenance costs associated with traditional grass trimmers. The solar powered grass trimmer without a battery provides an efficient and sustainable solution for lawn maintenance. It harnesses solar energy, enabling continuous operation as long as sunlight is available. Future work involves detailed engineering and optimization to enhance the efficiency and performance of the solar-powered grass trimmer without battery.

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Chapter 1

INTRODUCTION

The use of solar power as an alternative source of energy has been in existence long before now but has not had diverse application methods due to other frequently used sources of energy. Solar energy involves the process of Harnessing solar energy by the sun's rays to generate electricity. This is done using solar panels which convert sunlight into electrical energy. The panels are made up of photovoltaic cells that absorb sunlight and convert it into direct current (DC) electricity.

The DC electricity is then converted into alternating current (AC) electricity which can be used to power homes, businesses, and industries. One of the biggest advantages of solar energy is that it is a clean energy source. It does not produce any greenhouse gas emissions like fossil fuels do. By using solar energy, we can reduce our carbon footprint and help fight climate change. Another advantage of solar energy is that it is abundant and renewable. Unlike fossil fuels, the sun's energy will never run out, making it a sustainable and long-term solution for energy production. In fact, the amount of solar energy that hits the Earth in just one hour is enough to power the entire world for a year. These technologies are broadly characterized as either passive solar or active solar depending on how the energy is converted to solar power. The effectiveness of these technologies has made solar energy a very important source of renewable energy and thereby giving room for new developments in its wide range of applications.

In today's world, power consumption is taking a shift from the use of common sources of energy such as fossil fuel and wood fuels to solar energy. The change in energy consumption trend was due to the awareness of fossil fuel pollution and its contribution to global warming, and also the fact that fuel energy is non-renewable and unsustainable.

Solar energy is also becoming increasingly affordable and accessible. With the help of government incentives and technological advancements, the cost of solar energy systems has decreased significantly. This means that more and more households and businesses are able to install solar panels and generate their own clean, renewable energy. Solar energy is not without its limitations, however. One disadvantage is that it is dependent on weather conditions and daylight hours. This means that solar panels may not produce electricity at night or on cloudy days. However, advancements in battery storage technology are allowing for the storing of excess electricity generated during daylight hours for use during non-daylight hours.

In Nigeria today, like most other developing countries, fossil fuel has been a basic source of non-renewable energy. Pending the fact that we import fuel there is always a tendency of a hike in the cost of fuel as a result of the country economic instability. Lawn maintenance is the art and vocation of keeping a lawn

healthy, clean, safe and attractive, typically in a garden, park, institutional setting or estate. Man is constantly trying to adapt to his environment by creating a habitat suitable for his survival.

1.1 History of grass cutter

The first lawn mower was invented by Edwin Budding in 1830 in Thrupp, Gloucestershire, England. His mower was designed primarily to cut the grass on sports grounds and extensive gardens as superior to scythe. The scythe was the first device ever used to cut grass to a desirable height. It has a simple design, containing a long wooden handle with a curved blade attached perpendicularly to the end. Until the 19th century, the scythe was the only option for cutting grass, which proved to be a long tedious process. Budding's idea of a lawn mower came after watching a machine in a local cloth mill that used a cutting cylinder mounted on a bench to trim clothes for a smooth finish after weaving. Budding assumed that a similar concept could be used to cut grass if the mechanism is mounted on a wheel frame to enable the blades to rotate close to the lawn's surface. These early machines were made of cast iron and featured a large rear roller with a cutting cylinder in front. The cutting cylinder contained several blades connected in series around the cylinder. The cast iron gear wheel transmitted power from the rear roller to the cutting cylinder blade.

Fig 1.1 Scythe

Fig 1.2 First lawn mower by Edwin budding

In 1900, Ransomes, Sims, and Jefferies produced one of the best ever English machines, the first internal combustion gasoline engines available in chain or gear driven models.

In 1919, Colonel Edwin George helped the United States in manufacturing gasoline powered mowers. Although these engine powered mowers were available, they were rarely used in households due to the economic problems of the time. In the 1920s and 1930s, the electric powered mower and rotary cutting were created but did not become popular until considerably later. Throughout the 1940s the only innovations were developing smaller, lighter-weight designs along with more powerful engines. In the 1960s, the designs were now being produced in plastic materials to further reduce the weight and cost.

Fig 1.3 Lawn mower in the 1980s

Fig 1.4 Modern lawn mowers

Modern-day grass cutters, also known as lawnmowers, have evolved significantly over the years to provide efficient and convenient grass cutting solutions. These machines are designed to maintain lawns and gardens by trimming the grass to a desired height and often come with adjustable cutting heights, grass collection bags, easy-start mechanisms, safety features, and various accessories to enhance their functionality. When selecting a grass cutter/lawnmower, factors to consider include lawn size, terrain, desired cutting height, power source (gas, electric, battery), maintenance requirements, budget, and personal preferences.

1.2 Statement of the problem

Nowadays, pollution is a major issue in the universe. In case of gas-powered lawnmowers due to the emission of gases, it is responsible for pollution. Due to the continuous increase in the cost of fuel and the effect of emission of gases from the burnt fuel into the atmosphere, this necessitated the use of the abundant solar energy from the sun as a source of power to drive a grass trimmer.

The sun provides the sustainable amount of the energy used for various purposes on earth for atmospheric system. A solar powered grass trimmer was designed and developed, based on the general principle of mowing. It is a gardening tool that uses solar energy as an alternative source of power to trim and cut grass. Unlike battery-operated, gasoline-powered, and plug-in trimmers, solar-powered trimmers are eco-friendly and don't rely on electricity from the grid. The solar-powered trimmer works by collecting energy from the sun through a solar panel and converting it into electrical power to operate the trimmer. This means that it doesn't require a battery and can operate for an unlimited time as long as there's sufficient sunlight.

1.3 Working principle

The designed solar powered grass trimmer comprises of direct current (D.C) motor, a solar panel, a spring steel blade, and a control switch. Mowing is achieved by the D.C. motor which provides the required torque needed to drive the spring steel blade.

The solar powered grass trimmer is operated by the switch which closes the circuit and allows the flow of current to the motor which in turn drives the blade used for mowing. A barrel cam mechanism can be used in a solar-powered grass trimmer without a battery to convert the linear motion generated by the trimmer's motor into a rotational motion. The rotational motion can then be used to power the cutting mechanism of the trimmer

1.4 Background of the study

A grass cutter is a ground keeping device that makes use of two cutting blades to cut a grass surface to an even height. There are various ways used to power a grass cutter, but the use of solar energy as a source of energy to operate a grass cutter without using any battery is the main focus of this project. It is a device that has been developed as an eco-friendly solution to maintain lawns by harnessing solar energy. The device offers the benefit of reducing carbon emissions, and is cost-effective in the long run.

The concept of solar-powered devices is not new. It has been used for a long time in calculators, lighting systems, and other portable electronics. However, with concerns about the environment and the emphasis on renewable energy, the use of solar power devices is gaining more popularity.

The solar-powered grass trimmer without a battery has been developed to provide an efficient and effective means of maintaining lawns without the need for traditional power sources. The device makes use of photovoltaic cells to convert sunlight into electrical energy, which in turn powers the grass trimmer. The device does not require any external power source, thereby reducing the cost of operation and making it more practical.

The development of solar-powered grass trimmer without battery marks a remarkable step towards a sustainable future with an emphasis on renewable energy sources. As global concerns over environmental pollution and climate change continue to mount, the use of such eco-friendly devices is becoming increasingly relevant.

1.5 Technical details

A solar-powered grass trimmer without a battery typically operates by utilizing solar energy directly from the sun to power the device. Here's a general overview of how it works:

1.5.1 Solar panel

The basic working principle of solar panel is when the sun shines onto a solar panel, energy from the sunlight is absorbed by the PV cells in the panel. This energy creates electrical charges that move in response to an internal electric field in the cell, causing electricity to flow.

- Photovoltaic Effect: Solar panels comprise multiple solar cells, typically composed of semiconductor materials, such as silicon. When sunlight, which is composed of photons, strikes the surface of the solar panel, the photons transfer their energy to the electrons in the semiconductor material.
- Electron Excitation: The energy from the photons causes the electrons in the semiconductor material to become excited and break free from their atoms, creating electron-hole pairs.
- Electric Field: The solar panel is constructed with different layers of semiconductor material, doped with impurities to create a built-in electric field. This electric field separates the excited electrons and the positively charged holes, preventing them from recombining immediately.
- Electron Flow: The separated electrons are forced to move in a specific direction due to the built-in electric field within the solar panel. This creates an electric current that flows through the material and can be harnessed for use.
- Electrical Output: Metal contacts located on the top and bottom of the solar panel collect the current generated by the flow of electrons. These contacts are connected to external wires, allowing the current to be utilized as electrical energy. The solar panel usually consists of photovoltaic cells that generate an electric current when exposed to light.

Fig 1.5 Solar panel

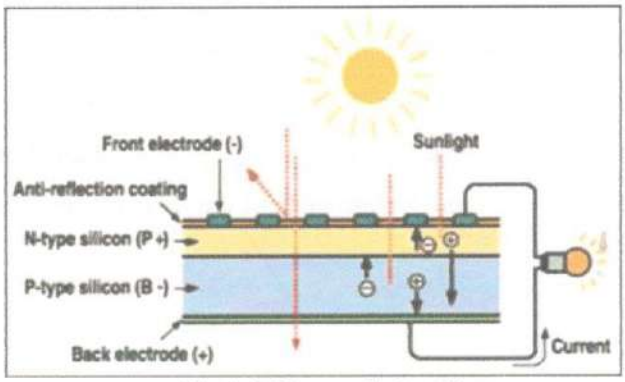

Fig 1.6 Photovoltaic effect

1.5.2 Motor Operation

An electric DC motor works on the principle that when an electric current is passed through a conductor placed normally in a magnetic field, a force acts on the conductor as a result of which the conductor begins to move and mechanical energy is obtained. As the DC power from the solar panel is supplied to the electric motor of the grass trimmer, the motor is responsible for driving the cutting mechanism, typically a blade, which trims the grass.

Fig 1.7 RO motor

1.5.3 Wheels

Wheels play a crucial role in facilitating the cutting and overall operation of the machine such as Mobility, Manoeuvrability, Cutting Height Adjustment, Stability, and Balance.

Fig 1.8 Wheels

1.5.4 Control switch

The control switch allows you to turn the solar-powered grass trimmer on or off. When you want to start using the trimmer, you would typically switch it on. This allows the trimmer to draw power from the solar panels and activate the cutting mechanism.

Fig 1.9 Control switch

1.5.5 Chassis

A chassis consists of an internal vehicle frame that supports an artificial object in its construction and use, and can also provide protection for some internal parts. The chassis is made up of mild steel material. The function of the chassis is to carry the components and to receive the load applied to it.

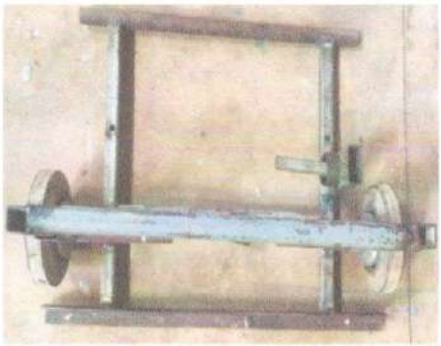

Fig 1.10 Chassis

1.5.6 Bearing

A bearing is a machine that constrains relative motion to only the desired motion and reduces friction between moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified according to the type of operation, the motions allowed, or to the directions of the loads applied to the parts.

Fig 1.11 Bearings

1.5.7 Helical gear

A helical gear is a type of gear with teeth that are cut at an angle, creating a helix shape. Helical gears have angled teeth that form a helix around the gear's axis this helix angle allows for smoother and quieter operation compared to spur gears. The teeth on a helical gear are inclined to the gear's axis of rotation. This angle is known as the helix angle or the spiral angle, common helix angles are typically around 15 to 30 degrees. In our project we have used two pairs of Helical gears, it converts the horizontal circular motion of the metal wheel into the vertical circular motion of the cutter. The gear teeth ratio and gear ratio are 1:3.4 and 1:3.

Fig 1.12 Helical gear

1.5.8 Cutting blade

The cutting blade used in solar-powered grass trimmer is of spring steel material. Spring steel is a type of high-strength steel known for its excellent elasticity and flexibility. It is widely used in the manufacturing of various tools and machinery components that require resilience and resistance to deformation.

Fig 1.13 Spring steel

Chapter 2

LITERATURE REVIEW

In the study of jean-Paul Lalonde's cutting and mulching lawn mower blades, the blade assembly for lawn mower which produced efficient mulching of the grass was reviewed. The assembly was adapted to produce self-cleaning inside the shroud housing of the mower and the internal surface of the same housing. The grass was finely mulched and blown downward outwardly of the shroud housing of the lawn mower and kept the latter clean. The grass cuttings were blown downward and it avoided the raking and reduced the need for a lateral outlet in the shroud hosing. It also reduced the risks of injuries caused by obstacles which were flung outward, such as rocks, sticks, or by engagement of foot in the path of the rotating blade.

In the study of Anthony R. Paytas solar powered mower, the machine was designed to be operated by the electric motor. The lawnmower made use of batteries which were either charged by electric power source or by solar energy by exposing it to the sunlight insolation. In the design, the pairs of solar panels connected by the ridge of the panels was raised above the electric motor. The solar panels consisted of multiple solar cells that produced the required voltage and current. The voltage regulator at the charging outlet was connected to control current flow with respective battery. Voltage regulator was required to maintain the safe charging as additional voltage or current could be drawn from the solar cell. The electric clutch was used as electric brake which provided the opposite polarity when the safety bar was released.

In the study of Delbert R. Lucas and Ryan J. Lucas, they developed a hybrid electric lawnmower which could be operated by either direct current (DC) or alternating current (AC) power supply. A 60 volts DC supply was provided from the battery pack to the motor with a hybrid AC/DC controller which acted as step down controller or power inverter. The full bridge rectifier was used to rectify the current from AC to DC. The mower could be run in two modes such as conserve and boost mode. An additional 6volts battery was provided to a hybrid AC/DC controller that increased the speed of blade motor when switched to boost mode. Furthermore, when the mower was switched to the conserve mode, the battery life was prolonged.

In the study of Ronald Thomas and Donald H. Smiths combined A.C./DC electric lawn mower, a lawn mower was designed which had both AC and DC motors. Both motors were connected by gear and clutch arrangement which could be operated together or separately. When the AC motor was powered, DC was permitted to the freewheel by the clutch assembly mechanism. When the grass was dense, both the AC and DC motors were powered. Both AC and DC motors drove the gear through their association with the clutch assembly. In the design, three gears were used which were arranged in the way that they were always in contact with one another and the driven clutch plates were in motion all the time. AC and DC motors were mounted adjacent to each other.

In the study of D. Satwik et al design and fabrication of a lever operated solar lawn mower, the main objective was to cut grass at different heights. The proposed lawn mower had a spur gear displacement mechanism in which the rotor blade height can be adjusted by using the lever attached to it and that can proportionally change the height of the grass cut of the lawn and required grass cut can be achieved and this process of adjustment will be completed in less than 20 seconds. The components used in machine fabrication include; DC motor, battery, solar panel, spur gears, wheels, ultrasonic sensor, Arduino board and a rotor blade.

In the study of Stephen R. Wassell, a solar powered lawn mower was designed which contained an electric motor, a rechargeable battery and photovoltaic cells panel that was attached on the handle of the lawn mower. A solar powered lawnmower was compared and studied with the gasoline powered lawnmowers from the effectiveness point of view. Both the mowers were compared and concluded that the solar powered mowers were more efficient, noiseless and had minimum energy cost. As it was solar powered, no air pollution was caused as gasoline mowers produced a lot of noise and affected the environment.

In the study of Willsie, a lawnmower blade was designed that had improved blade bar which was flat and also slight twist was provided. A pivotal cutter discs was fitted on each end of the blade. Each end of the blade was fitted with blower elements which blew the grass. The design provided maximum throwing of cut grass from the housing of the mower during the blade rotation. To direct the cut grass into outward direction of the cutter discs, the blower elements were extended above the ends of the cutter discs. It facilitated the expulsion of the grass clipping beneath the lawnmower housing.

2.1 Summary

The solar-powered lawn mower is set to eliminate both noise and environmental pollution to the barest minimum. The design can be seen as an alternate option to popular and environmentally hazardous gas-powered lawnmowers. Solar lawn mower is advantageous over gasoline powered mowers because it eliminates environmental pollution which is responsible for the emission of gases that results in global warming on the earth's surface. Also, with the rate at which petroleum products are increasing day by day, the use of solar energy can be seen as a reasonable practice to the use of renewable energy sources to operate lawnmowers by eliminating the use of gasoline fuels which gasoline engines solely depend on.

Chapter 3

OBJECTIVES AND METHODOLOGY

3.1 Objectives

The objectives of this project are to:

- Design and fabrication of the solar powered grass trimmer without battery.
- Testing of the grass trimmer and comparing its performance with a gasoline operated grass cutter.

3.2 Methodology

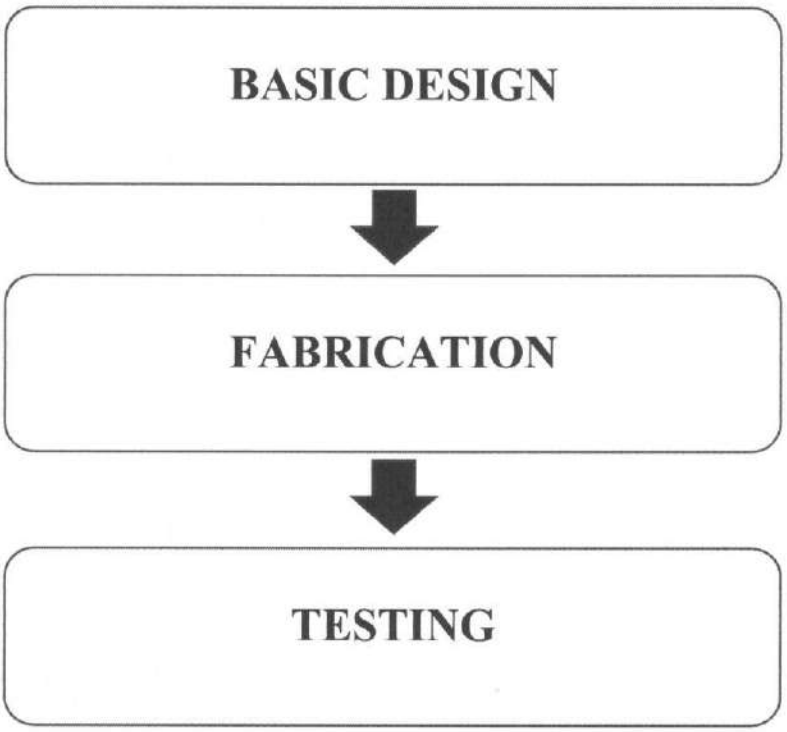

Fig 3.1 Methodology of the work

3.2.1 BASIC DESIGN OF PROTOTYPE:

The first step in the design process would be to determine how much power is required to operate the grass trimmer. This will take into account the cutting mechanism, motor efficiency, and other factors such as the design of the prototype, through the textual description, sketches, and CAD models.

Once the power requirements have been determined, the next step is to select the appropriate solar panel. This will depend on the power requirements as well as the amount of sunlight available in the area where the grass trimmer will be used.

The cutting mechanism can be designed using a variety of techniques, such as a spinning blade, wire cutter, or a linear blade cutting motion which is being used in this project. The design should take into account the amount of power available and the type of grass that will be trimmed.

The motor should be selected based on the power requirements and the type of cutting mechanism being used. A high-efficiency motor can help to ensure that the grass trimmer operates efficiently.

3.2.2 FABRICATION:

The components, including the solar panel, cutting mechanism, motor, wheels, and control switch should be assembled together. This will involve connecting the different parts together and ensuring that they are securely fastened.

3.2.3 TESTING:

The prototype can be tested in real-world conditions to determine its effectiveness. As the design may need to be tweaked for optimal performance, testing and redesign may be an ongoing process. Once the device has been assembled, it should be tested to ensure that it operates efficiently. Make sure everything is connected properly and test the trimmer in a safe area. Testing should be conducted under different weather and light conditions to see how the device performs. Also testing and comparing the fabricated solar powered grass trimmer with the gasoline powered grass cutter.

Table:3.1 Material selection

S/N	COMPONENTS	MATERIAL SUITABLE	REASON FOR SELECTION
1	Solar panel	100W (monocrystalline)	Functionality
2	Motor	70W/24V DC	Easily accessible and economical
3	Blade	Spring steel	Resilience, Hardness, and Durability
4	Frame	Mild steel	Strength
5	Wheels	Rubber	Mobility
6	Gears	Steel	To transfer motion and power
7	Bearings	Stainless steel	To reduce friction between rotating parts

Chapter 4

DESIGN OF COMPONENTS/ ASSEMBLY

4.1 3D CAD model

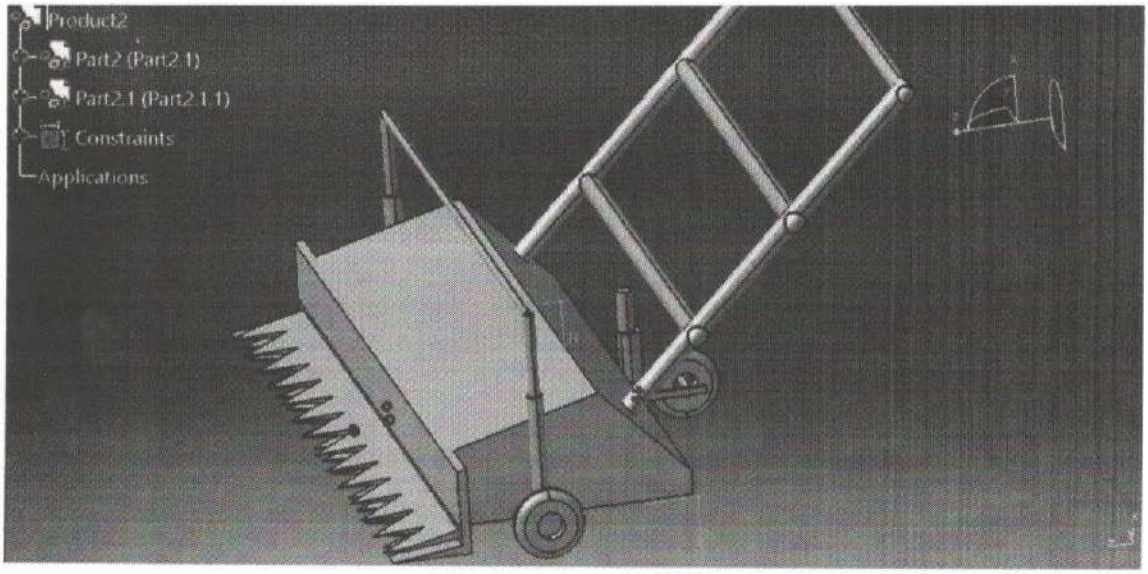

Fig 4.1 Isometric view

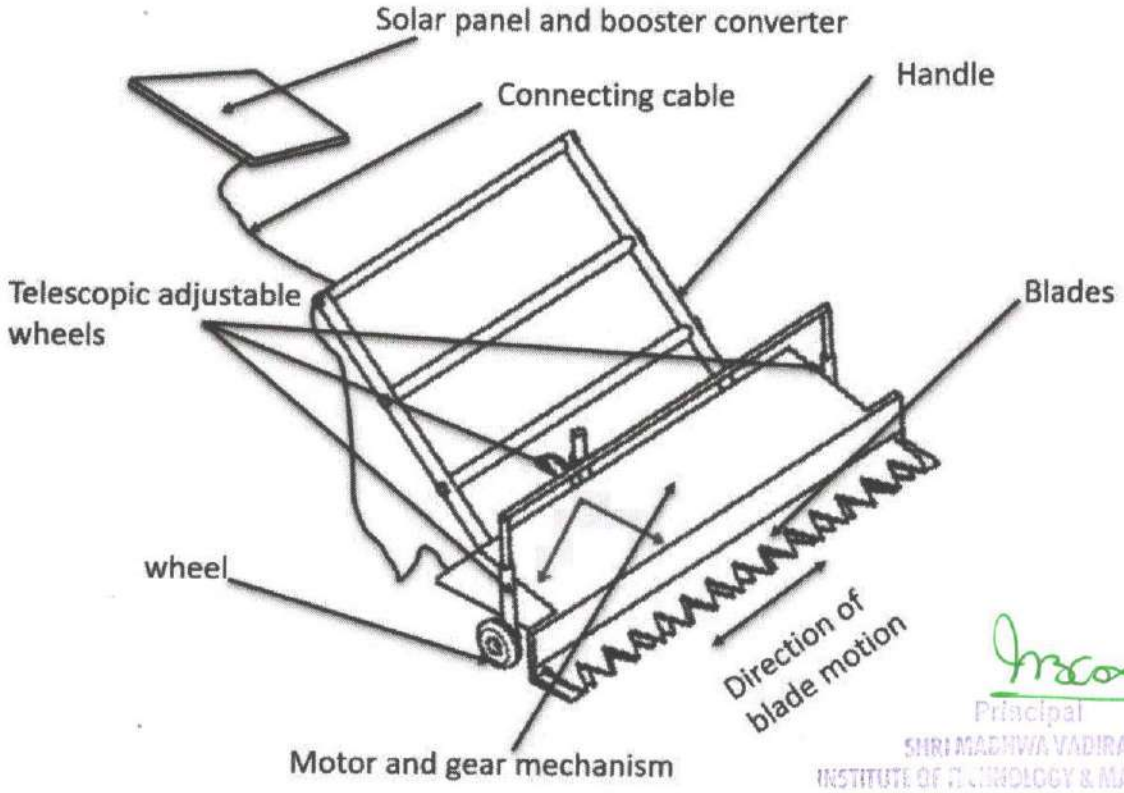

Fig 4.2 Isometric view with part naming

Solar Powered Grass Trimmer without Battery

Chapter 5
Chapter 4

RESULT ANALYSIS
DESIGN OF COMPONENTS/ASSEMBLY

5.1 Result analysis
4.1 3D CAD model

A solar-powered grass trimmer without a battery offers several advantages for lawn maintenance. Firstly, it [illegible] operationa[illegible] energy. Ho[illegible] source, and [illegible] could gene[illegible] and the ava[illegible] [illegible] power generation [illegible] [illegible] panel [illegible] itions

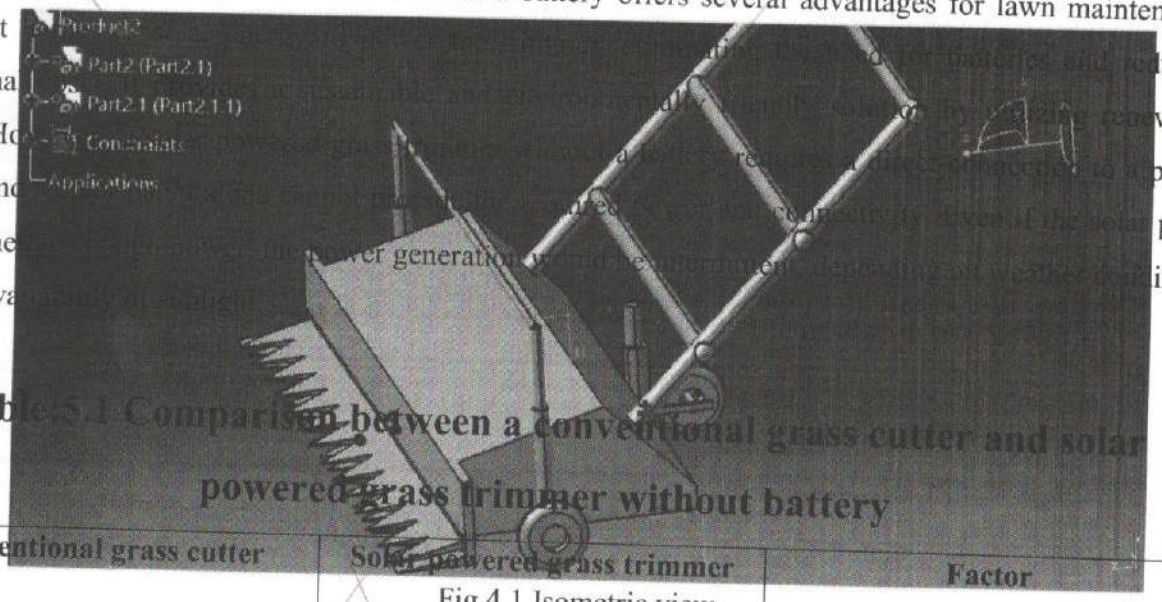

Fig 4.1 Isometric view

Table 5.1 Comparison between a conventional grass cutter and solar powered grass trimmer without battery

Conventional grass cutter	Solar powered grass trimmer without battery	Factor
Causes more pollution	Clean and pollution free	Air Pollution
More	Less	Effort
More	Less	Maintenance required
More	Less	Noise pollution
More	Comparatively less	Efficiency
Complex	Simple	Construction

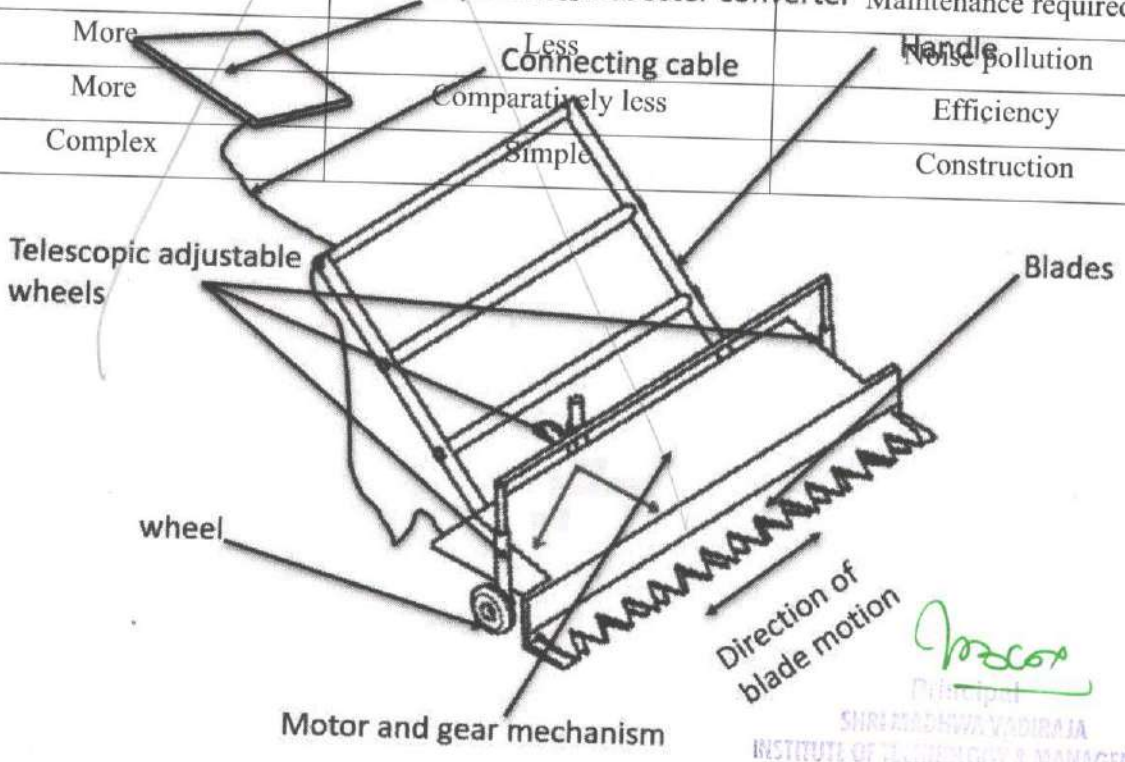

Fig 4.2 Isometric view with part naming

4.2 Assembly drawing

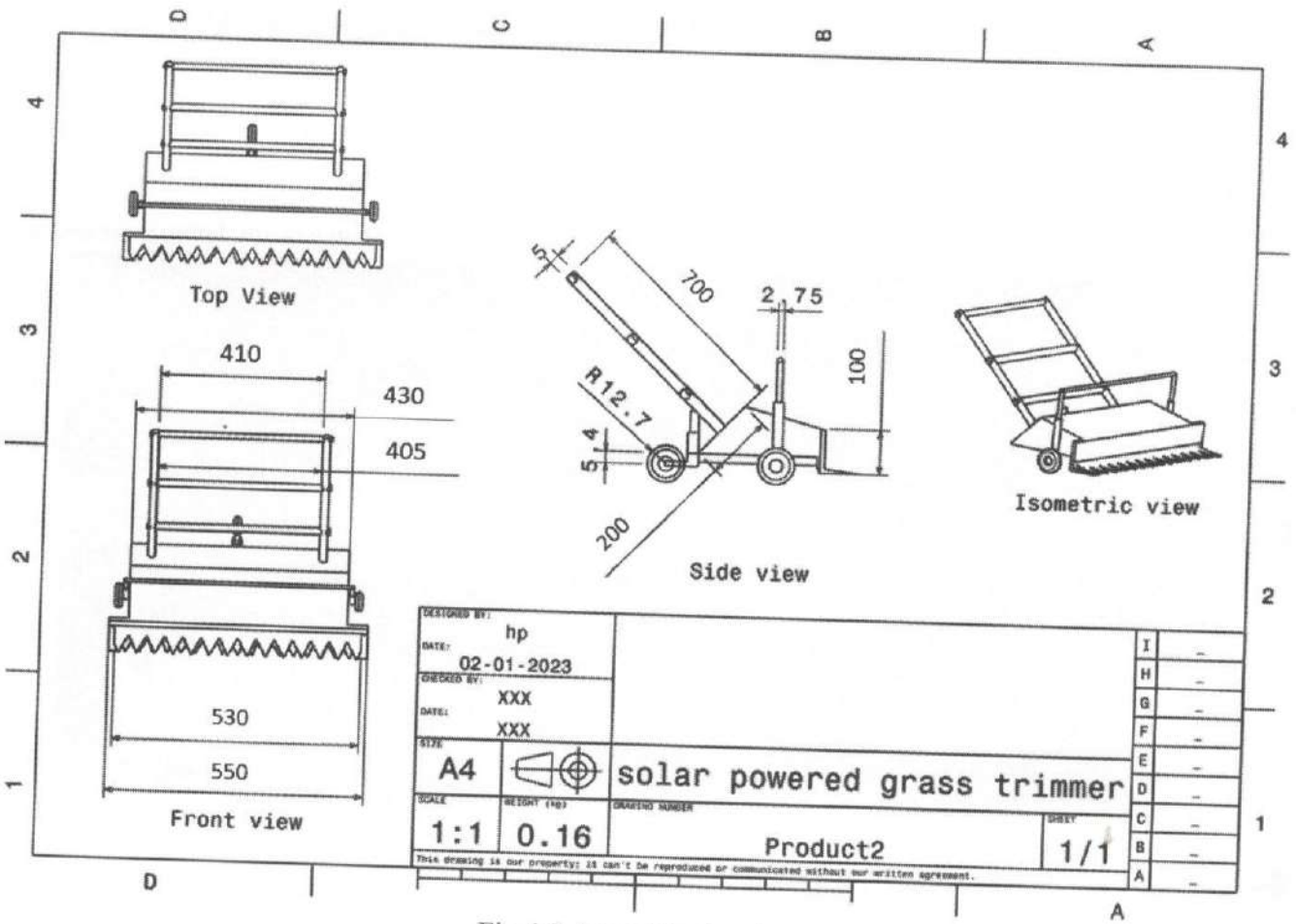

Fig 4.3 Assembly drawing

4.3 Blade dimension

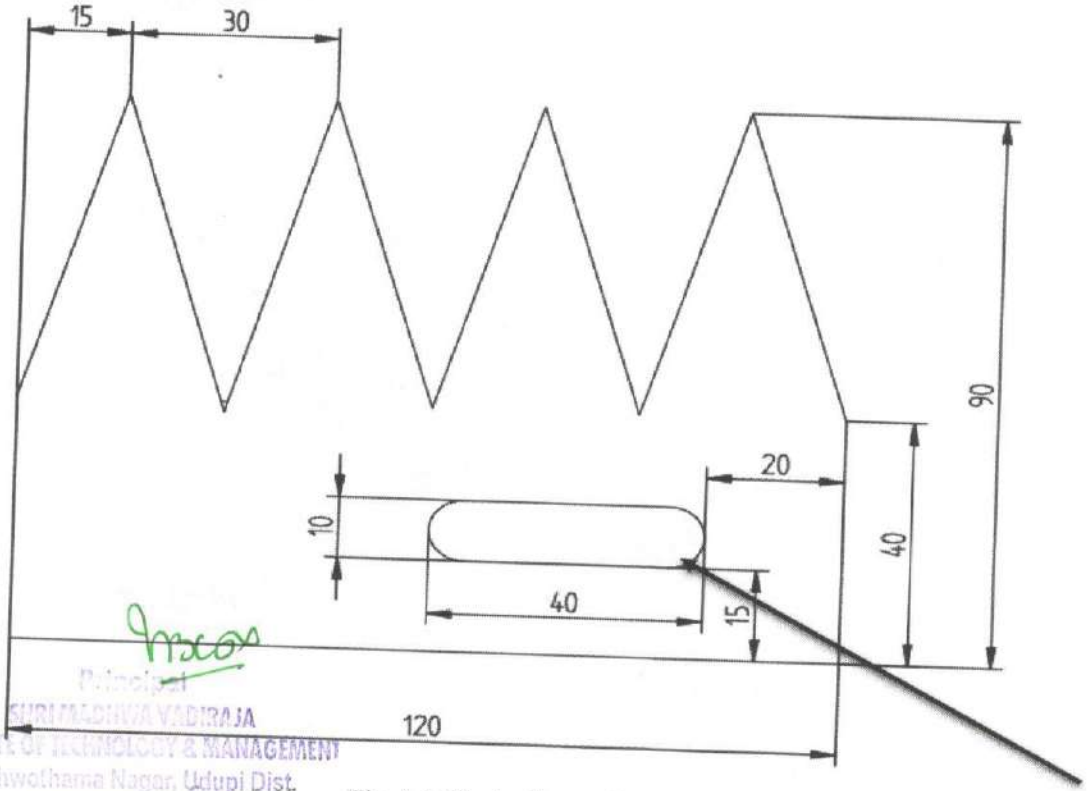

Fig 4.4 Blade dimension

Chapter 5

RESULT ANALYSIS

5.1 Result analysis

A solar-powered grass trimmer without a battery offers several advantages for lawn maintenance. Firstly, it harnesses solar energy to power the trimmer, eliminating the need for batteries and reducing operational costs. It provides a sustainable and environmentally friendly solution by utilizing renewable energy. However, a solar powered grass trimmer without a battery requires a direct connection to a power source, and a solar panel alone cannot provide the required power and connectivity. Even if the solar panel could generate enough power, the power generation would be intermittent, depending on weather conditions and the availability of sunlight.

Table:5.1 Comparison between a conventional grass cutter and solar powered grass trimmer without battery

Conventional grass cutter	Solar powered grass trimmer without battery	Factor
Causes more pollution	Clean and pollution free	Air Pollution
More	Less	Effort
More	Less	Maintenance required
More	Less	Noise pollution
More	Comparatively less	Efficiency
Complex	Simple	Construction

Chapter 6

COST ANALYSIS

Table:6.1 Cost analysis of the work

S/N	Components	Quantity	Price in Rs.
1	Solar panel	2	5000/-
2	Motor	1	1000/-
3	Gears	2	500/-
4	Wheels	3	100/-
6	Spring steel	1	1000/-
7	Bearings	3	200/-
8	Other expenses	-	500/- approx.
Total cost	-	-	8000/- approx.

Chapter 7

ADVANTAGES and LIMITATIONS

7.1 Advantages

1. Environmentally friendly: A solar-powered grass trimmer without a battery reduces reliance on fossil fuels, minimizing carbon emissions and promoting cleaner energy.
1. Cost-effective: It eliminates the need for purchasing and replacing batteries, resulting in long-term cost savings for users.
2. Noise reduction: Compared to traditional gas-powered trimmers, a solar-powered trimmer operates silently, reducing noise pollution.
3. Low maintenance: Without a battery, there is no need for regular battery maintenance or replacements, simplifying upkeep for the user.
4. Portable and lightweight: The absence of a heavy battery makes the trimmer lighter and easier to carry, enhancing manoeuvrability and reducing user fatigue.
5. Continuous operation: As long as there is sunlight, the trimmer can operate continuously without the need for recharging or refuelling.
6. Zero emissions: By utilizing solar power, the trimmer produces no harmful emissions during operation, contributing to cleaner air quality.
7. Versatility: It can be used in remote locations or areas without access to electrical outlets, providing greater flexibility for lawn maintenance.
8. Durability: Without a battery, the trimmer is less prone to damage from battery leaks or power fluctuations, increasing its overall durability.
9. Renewable energy source: Solar power is a renewable energy source, making the trimmer a sustainable and future-proof solution for lawn care needs.

7.2 Limitations

1. Limited operation time due to reliance on direct sunlight for power.
2. Inability to operate during cloudy or low-light conditions.
3. Reduced cutting power compared to battery-powered trimmers.
4. Lack of portability as the trimmer must remain connected to a solar panel for power.
5. Potential limitations in trimming larger or denser areas of grass due to lower power output.
6. Dependence on specific angles and positions of the solar panel to maximize energy absorption.
7. Vulnerability to damage or malfunction in extreme weather conditions such as heavy rain or snow.
8. Higher upfront cost for the solar panel and associated equipment.
9. Limited availability and variety of solar-powered grass trimmers without batteries.

Chapter 7

ADVANTAGES and LIMITATIONS

7.1 Advantages

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Chapter 8

CONCLUSION AND FUTURE SCOPE

8.1 CONCLUSION

Solar-powered grass trimmers without a battery provide several advantages that make them an attractive choice for environmentally conscious individuals.

1. First and foremost, they rely on clean and renewable solar energy, reducing reliance on fossil fuels and minimizing greenhouse gas emissions. This sustainable energy source allows users to trim their lawns without contributing to air pollution or noise pollution associated with traditional gas-powered trimmers.
2. The absence of a battery simplifies the design and operation of these trimmers. Without the need for a rechargeable battery, they are generally lighter in weight and more maneuverable, making it easier to navigate around obstacles and trim hard-to-reach areas.
3. There is no concern about battery maintenance, degradation, or replacement, reducing long-term costs and the environmental impact of battery disposal.
4. Solar-powered grass trimmers without a battery also offer the advantage of being independent of electrical outlets. Users can freely move around their outdoor spaces without the constraint of cords or the need for extension cables. This enhances flexibility and convenience during trimming tasks.
5. The use of solar power eliminates the ongoing expense of purchasing fuel or electricity to operate the trimmer. Once the initial investment is made, solar energy is essentially free, resulting in long-term cost savings. This makes solar-powered grass trimmers without a battery a cost-effective option for homeowners and gardeners.
6. The solar-powered grass trimmer without battery is a promising and environmentally-friendly solution for maintaining lawns and grassy areas.
7. Its solar panels harnessing energy from the sun offer numerous benefits, including reduced carbon emissions, lower operational costs, and quieter operation compared to traditional gas-powered or electric grass cutters.
8. The solar-powered grass cutter is easy to use and requires minimal maintenance, making it a convenient and sustainable option for lawn care.

While these trimmers have numerous advantages, it is important to consider their limitations. They rely on sufficient sunlight for operation, meaning trimming may be limited during periods of low light or cloudy weather. However, advancements in solar technology continue to improve the efficiency of these trimmers, ensuring reliable performance even under less-than-ideal conditions.

8.2 Future scope

A solar-powered grass trimmer without a battery has the potential to be an innovative and sustainable solution for lawn care. While the technology for such a device is not widely available at the moment, here are some future possibilities and scope for development:

1. Solar panel efficiency: Advancements in solar panel technology can significantly improve the efficiency of solar-powered devices. Future solar panels could be more compact, lightweight, and capable of generating higher amounts of electricity from sunlight, making them ideal for powering grass trimmers.
2. Efficient motor design: Future grass trimmers can benefit from more energy-efficient and lightweight electric motors. Technological advancements could lead to the development of compact and powerful motors that require less energy to operate, thus reducing the overall energy consumption of the device.
3. Lightweight and durable materials: Advances in materials science may result in the development of stronger, lighter, and more durable materials for the construction of grass trimmers. This would allow for the creation of lightweight and efficient devices that are easy to manoeuvre and have a longer lifespan.
4. Smart technology integration: Integration of smart technologies, such as artificial intelligence and machine learning algorithms, can optimize the performance of solar-powered grass trimmers. These algorithms can analyse and adapt to different grass types, weather conditions, and user preferences, ensuring efficient grass cutting and minimal energy waste.
5. Robotic automation: Solar-powered grass trimmers could be combined with robotic automation to create autonomous lawn maintenance systems. These systems would operate independently, powered by solar energy, and use sensors, cameras, and algorithms to navigate lawns, detect grass height, and efficiently trim the grass without human intervention.

Overall, the future scope for a solar-powered grass trimmer without a battery is promising, with potential advancements in solar panel efficiency, motor design, materials, smart technology integration, and robotic automation. These developments can lead to more sustainable and efficient lawn care solutions that reduce reliance on fossil fuels and minimize environmental impact.

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Photo gallery

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SOLAR POWERED GRASS TRIMMER WITHOUT BATTERY

PROJECT REPORT

Submitted in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI- 590018

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KIRAN

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ABSTRACT

The need for sustainable and eco-friendly lawn maintenance equipment has led to the development of solar-powered grass trimmers without battery. This abstract presents a design concept for a solar-powered grass trimmer without battery that eliminates the reliance on batteries, ensuring a cleaner and more efficient operation. The proposed grass trimmer without battery utilizes a solar panel to capture sunlight and convert it into electrical energy. The harvested energy powers a small electric motor, carefully selected to meet the trimmer's power requirements. A linear motion mechanism, such as gears, is employed to convert the motor's rotary motion into linear motion. To transfer the linear motion to the cutting mechanism, a barrel cam mechanism is incorporated, by integrating the cutting blade's head with the barrel cam, the rotational motion is transferred to the cutting mechanism, effectively trimming the grass. This innovative design eliminates the need for a battery, reducing the environmental impact and maintenance costs associated with traditional grass trimmers. The solar powered grass trimmer without a battery provides an efficient and sustainable solution for lawn maintenance. It harnesses solar energy, enabling continuous operation as long as sunlight is available. Future work involves detailed engineering and optimization to enhance the efficiency and performance of the solar-powered grass trimmer without battery.

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Chapter 1

INTRODUCTION

The use of solar power as an alternative source of energy has been in existence long before now but has not had diverse application methods due to other frequently used sources of energy. Solar energy involves the process of Harnessing solar energy by the sun's rays to generate electricity. This is done using solar panels which convert sunlight into electrical energy. The panels are made up of photovoltaic cells that absorb sunlight and convert it into direct current (DC) electricity.

The DC electricity is then converted into alternating current (AC) electricity which can be used to power homes, businesses, and industries. One of the biggest advantages of solar energy is that it is a clean energy source. It does not produce any greenhouse gas emissions like fossil fuels do. By using solar energy, we can reduce our carbon footprint and help fight climate change. Another advantage of solar energy is that it is abundant and renewable. Unlike fossil fuels, the sun's energy will never run out, making it a sustainable and long-term solution for energy production. In fact, the amount of solar energy that hits the Earth in just one hour is enough to power the entire world for a year. These technologies are broadly characterized as either passive solar or active solar depending on how the energy is converted to solar power. The effectiveness of these technologies has made solar energy a very important source of renewable energy and thereby giving room for new developments in its wide range of applications.

In today's world, power consumption is taking a shift from the use of common sources of energy such as fossil fuel and wood fuels to solar energy. The change in energy consumption trend was due to the awareness of fossil fuel pollution and its contribution to global warming, and also the fact that fuel energy is non-renewable and unsustainable.

Solar energy is also becoming increasingly affordable and accessible. With the help of government incentives and technological advancements, the cost of solar energy systems has decreased significantly. This means that more and more households and businesses are able to install solar panels and generate their own clean, renewable energy. Solar energy is not without its limitations, however. One disadvantage is that it is dependent on weather conditions and daylight hours. This means that solar panels may not produce electricity at night or on cloudy days. However, advancements in battery storage technology are allowing for the storing of excess electricity generated during daylight hours for use during non-daylight hours.

In Nigeria today, like most other developing countries, fossil fuel has been a basic source of non-renewable energy. Pending the fact that we import fuel there is always a tendency of a hike in the cost of fuel as a result of the country economic instability. Lawn maintenance is the art and vocation of keeping a lawn

healthy, clean, safe and attractive, typically in a garden, park, institutional setting or estate. Man is constantly trying to adapt to his environment by creating a habitat suitable for his survival.

1.1 History of grass cutter

The first lawn mower was invented by Edwin Budding in 1830 in Thrupp, Gloucestershire, England. His mower was designed primarily to cut the grass on sports grounds and extensive gardens as superior to scythe. The scythe was the first device ever used to cut grass to a desirable height. It has a simple design, containing a long wooden handle with a curved blade attached perpendicularly to the end. Until the 19th century, the scythe was the only option for cutting grass, which proved to be a long tedious process. Budding's idea of a lawn mower came after watching a machine in a local cloth mill that used a cutting cylinder mounted on a bench to trim clothes for a smooth finish after weaving. Budding assumed that a similar concept could be used to cut grass if the mechanism is mounted on a wheel frame to enable the blades to rotate close to the lawn's surface. These early machines were made of cast iron and featured a large rear roller with a cutting cylinder in front. The cutting cylinder contained several blades connected in series around the cylinder. The cast iron gear wheel transmitted power from the rear roller to the cutting cylinder blade.

Fig 1.1 Scythe

Fig 1.2 First lawn mower by Edwin budding

In 1900, Ransomes, Sims, and Jefferies produced one of the best ever English machines, the first internal combustion gasoline engines available in chain or gear driven models.

In 1919, Colonel Edwin George helped the United States in manufacturing gasoline powered mowers. Although these engine powered mowers were available, they were rarely used in households due to the economic problems of the time. In the 1920s and 1930s, the electric powered mower and rotary cutting were created but did not become popular until considerably later. Throughout the 1940s the only innovations were developing smaller, lighter-weight designs along with more powerful engines. In the 1960s, the designs were now being produced in plastic materials to further reduce the weight and cost.

Fig 1.3 Lawn mower in the 1980s

Fig 1.4 Modern lawn mowers

Modern-day grass cutters, also known as lawnmowers, have evolved significantly over the years to provide efficient and convenient grass cutting solutions. These machines are designed to maintain lawns and gardens by trimming the grass to a desired height and often come with adjustable cutting heights, grass collection bags, easy-start mechanisms, safety features, and various accessories to enhance their functionality. When selecting a grass cutter/lawnmower, factors to consider include lawn size, terrain, desired cutting height, power source (gas, electric, battery), maintenance requirements, budget, and personal preferences.

1.2 Statement of the problem

Nowadays, pollution is a major issue in the universe. In case of gas-powered lawnmowers due to the emission of gases, it is responsible for pollution. Due to the continuous increase in the cost of fuel and the effect of emission of gases from the burnt fuel into the atmosphere, this necessitated the use of the abundant solar energy from the sun as a source of power to drive a grass trimmer.

The sun provides the sustainable amount of the energy used for various purposes on earth for atmospheric system. A solar powered grass trimmer was designed and developed, based on the general principle of mowing. It is a gardening tool that uses solar energy as an alternative source of power to trim and cut grass. Unlike battery-operated, gasoline-powered, and plug-in trimmers, solar-powered trimmers are eco-friendly and don't rely on electricity from the grid. The solar-powered trimmer works by collecting energy from the sun through a solar panel and converting it into electrical power to operate the trimmer. This means that it doesn't require a battery and can operate for an unlimited time as long as there's sufficient sunlight.

1.3 Working principle

The designed solar powered grass trimmer comprises of direct current (D.C) motor, a solar panel, a spring steel blade, and a control switch. Mowing is achieved by the D.C. motor which provides the required torque needed to drive the spring steel blade.

The solar powered grass trimmer is operated by the switch which closes the circuit and allows the flow of current to the motor which in turn drives the blade used for mowing. A barrel cam mechanism can be used in a solar-powered grass trimmer without a battery to convert the linear motion generated by the trimmer's motor into a rotational motion. The rotational motion can then be used to power the cutting mechanism of the trimmer

1.4 Background of the study

A grass cutter is a ground keeping device that makes use of two cutting blades to cut a grass surface to an even height. There are various ways used to power a grass cutter, but the use of solar energy as a source of energy to operate a grass cutter without using any battery is the main focus of this project. It is a device that has been developed as an eco-friendly solution to maintain lawns by harnessing solar energy. The device offers the benefit of reducing carbon emissions, and is cost-effective in the long run.

The concept of solar-powered devices is not new. It has been used for a long time in calculators, lighting systems, and other portable electronics. However, with concerns about the environment and the emphasis on renewable energy, the use of solar power devices is gaining more popularity.

The solar-powered grass trimmer without a battery has been developed to provide an efficient and effective means of maintaining lawns without the need for traditional power sources. The device makes use of photovoltaic cells to convert sunlight into electrical energy, which in turn powers the grass trimmer. The device does not require any external power source, thereby reducing the cost of operation and making it more practical.

The development of solar-powered grass trimmer without battery marks a remarkable step towards a sustainable future with an emphasis on renewable energy sources. As global concerns over environmental pollution and climate change continue to mount, the use of such eco-friendly devices is becoming increasingly relevant.

1.5 Technical details

A solar-powered grass trimmer without a battery typically operates by utilizing solar energy directly from the sun to power the device. Here's a general overview of how it works:

1.5.1 Solar panel

The basic working principle of solar panel is when the sun shines onto a solar panel, energy from the sunlight is absorbed by the PV cells in the panel. This energy creates electrical charges that move in response to an internal electric field in the cell, causing electricity to flow.

- Photovoltaic Effect: Solar panels comprise multiple solar cells, typically composed of semiconductor materials, such as silicon. When sunlight, which is composed of photons, strikes the surface of the solar panel, the photons transfer their energy to the electrons in the semiconductor material.
- Electron Excitation: The energy from the photons causes the electrons in the semiconductor material to become excited and break free from their atoms, creating electron-hole pairs.
- Electric Field: The solar panel is constructed with different layers of semiconductor material, doped with impurities to create a built-in electric field. This electric field separates the excited electrons and the positively charged holes, preventing them from recombining immediately.
- Electron Flow: The separated electrons are forced to move in a specific direction due to the built-in electric field within the solar panel. This creates an electric current that flows through the material and can be harnessed for use.
- Electrical Output: Metal contacts located on the top and bottom of the solar panel collect the current generated by the flow of electrons. These contacts are connected to external wires, allowing the current to be utilized as electrical energy. The solar panel usually consists of photovoltaic cells that generate an electric current when exposed to light.

Fig 1.5 Solar panel

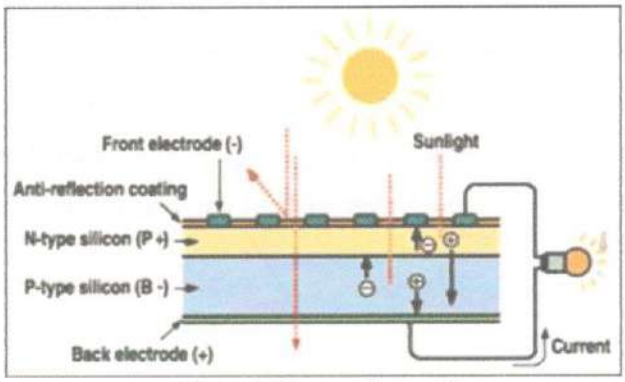

Fig 1.6 Photovoltaic effect

1.5.2 Motor Operation

An electric DC motor works on the principle that when an electric current is passed through a conductor placed normally in a magnetic field, a force acts on the conductor as a result of which the conductor begins to move and mechanical energy is obtained. As the DC power from the solar panel is supplied to the electric motor of the grass trimmer, the motor is responsible for driving the cutting mechanism, typically a blade, which trims the grass.

Fig 1.7 RO motor

1.5.3 Wheels

Wheels play a crucial role in facilitating the cutting and overall operation of the machine such as Mobility, Manoeuvrability, Cutting Height Adjustment, Stability, and Balance.

Fig 1.8 Wheels

1.5.4 Control switch

The control switch allows you to turn the solar-powered grass trimmer on or off. When you want to start using the trimmer, you would typically switch it on. This allows the trimmer to draw power from the solar panels and activate the cutting mechanism.

Fig 1.9 Control switch

1.5.5 Chassis

A chassis consists of an internal vehicle frame that supports an artificial object in its construction and use, and can also provide protection for some internal parts. The chassis is made up of mild steel material. The function of the chassis is to carry the components and to receive the load applied to it.

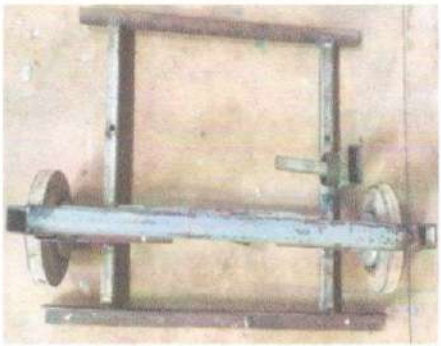

Fig 1.10 Chassis

1.5.6 Bearing

A bearing is a machine that constrains relative motion to only the desired motion and reduces friction between moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified according to the type of operation, the motions allowed, or to the directions of the loads applied to the parts.

Fig 1.11 Bearings

1.5.7 Helical gear

A helical gear is a type of gear with teeth that are cut at an angle, creating a helix shape. Helical gears have angled teeth that form a helix around the gear's axis this helix angle allows for smoother and quieter operation compared to spur gears. The teeth on a helical gear are inclined to the gear's axis of rotation. This angle is known as the helix angle or the spiral angle, common helix angles are typically around 15 to 30 degrees. In our project we have used two pairs of Helical gears, it converts the horizontal circular motion of the metal wheel into the vertical circular motion of the cutter. The gear teeth ratio and gear ratio are 1:3.4 and 1:3.

Fig 1.12 Helical gear

1.5.8 Cutting blade

The cutting blade used in solar-powered grass trimmer is of spring steel material. Spring steel is a type of high-strength steel known for its excellent elasticity and flexibility. It is widely used in the manufacturing of various tools and machinery components that require resilience and resistance to deformation.

Fig 1.13 Spring steel

Chapter 2

LITERATURE REVIEW

In the study of jean-Paul Lalonde's cutting and mulching lawn mower blades, the blade assembly for lawn mower which produced efficient mulching of the grass was reviewed. The assembly was adapted to produce self-cleaning inside the shroud housing of the mower and the internal surface of the same housing. The grass was finely mulched and blown downward outwardly of the shroud housing of the lawn mower and kept the latter clean. The grass cuttings were blown downward and it avoided the raking and reduced the need for a lateral outlet in the shroud hosing. It also reduced the risks of injuries caused by obstacles which were flung outward, such as rocks, sticks, or by engagement of foot in the path of the rotating blade.

In the study of Anthony R. Paytas solar powered mower, the machine was designed to be operated by the electric motor. The lawnmower made use of batteries which were either charged by electric power source or by solar energy by exposing it to the sunlight insolation. In the design, the pairs of solar panels connected by the ridge of the panels was raised above the electric motor. The solar panels consisted of multiple solar cells that produced the required voltage and current. The voltage regulator at the charging outlet was connected to control current flow with respective battery. Voltage regulator was required to maintain the safe charging as additional voltage or current could be drawn from the solar cell. The electric clutch was used as electric brake which provided the opposite polarity when the safety bar was released.

In the study of Delbert R. Lucas and Ryan J. Lucas, they developed a hybrid electric lawnmower which could be operated by either direct current (DC) or alternating current (AC) power supply. A 60 volts DC supply was provided from the battery pack to the motor with a hybrid AC/DC controller which acted as step down controller or power inverter. The full bridge rectifier was used to rectify the current from AC to DC. The mower could be run in two modes such as conserve and boost mode. An additional 6volts battery was provided to a hybrid AC/DC controller that increased the speed of blade motor when switched to boost mode. Furthermore, when the mower was switched to the conserve mode, the battery life was prolonged.

In the study of Ronald Thomas and Donald H. Smiths combined A.C./DC electric lawn mower, a lawn mower was designed which had both AC and DC motors. Both motors were connected by gear and clutch arrangement which could be operated together or separately. When the AC motor was powered, DC was permitted to the freewheel by the clutch assembly mechanism. When the grass was dense, both the AC and DC motors were powered. Both AC and DC motors drove the gear through their association with the clutch assembly. In the design, three gears were used which were arranged in the way that they were always in contact with one another and the driven clutch plates were in motion all the time. AC and DC motors were mounted adjacent to each other.

In the study of D. Satwik et al design and fabrication of a lever operated solar lawn mower, the main objective was to cut grass at different heights. The proposed lawn mower had a spur gear displacement mechanism in which the rotor blade height can be adjusted by using the lever attached to it and that can proportionally change the height of the grass cut of the lawn and required grass cut can be achieved and this process of adjustment will be completed in less than 20 seconds. The components used in machine fabrication include; DC motor, battery, solar panel, spur gears, wheels, ultrasonic sensor, Arduino board and a rotor blade.

In the study of Stephen R. Wassell, a solar powered lawn mower was designed which contained an electric motor, a rechargeable battery and photovoltaic cells panel that was attached on the handle of the lawn mower. A solar powered lawnmower was compared and studied with the gasoline powered lawnmowers from the effectiveness point of view. Both the mowers were compared and concluded that the solar powered mowers were more efficient, noiseless and had minimum energy cost. As it was solar powered, no air pollution was caused as gasoline mowers produced a lot of noise and affected the environment.

In the study of Willsie, a lawnmower blade was designed that had improved blade bar which was flat and also slight twist was provided. A pivotal cutter discs was fitted on each end of the blade. Each end of the blade was fitted with blower elements which blew the grass. The design provided maximum throwing of cut grass from the housing of the mower during the blade rotation. To direct the cut grass into outward direction of the cutter discs, the blower elements were extended above the ends of the cutter discs. It facilitated the expulsion of the grass clipping beneath the lawnmower housing.

2.1 Summary

The solar-powered lawn mower is set to eliminate both noise and environmental pollution to the barest minimum. The design can be seen as an alternate option to popular and environmentally hazardous gas-powered lawnmowers. Solar lawn mower is advantageous over gasoline powered mowers because it eliminates environmental pollution which is responsible for the emission of gases that results in global warming on the earth's surface. Also, with the rate at which petroleum products are increasing day by day, the use of solar energy can be seen as a reasonable practice to the use of renewable energy sources to operate lawnmowers by eliminating the use of gasoline fuels which gasoline engines solely depend on.

Chapter 3

OBJECTIVES AND METHODOLOGY

3.1 Objectives

The objectives of this project are to:

- Design and fabrication of the solar powered grass trimmer without battery.
- Testing of the grass trimmer and comparing its performance with a gasoline operated grass cutter.

3.2 Methodology

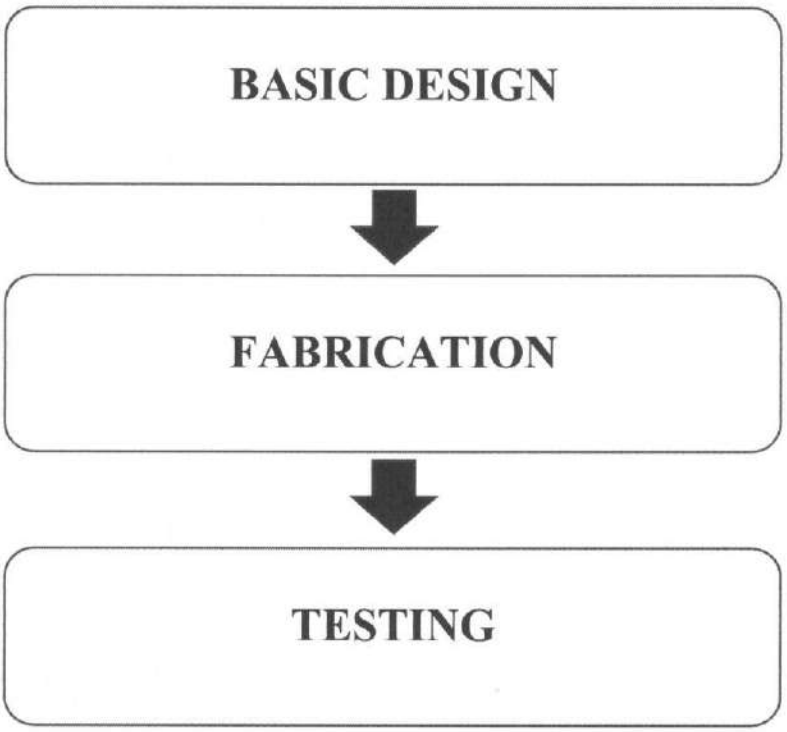

Fig 3.1 Methodology of the work

3.2.1 BASIC DESIGN OF PROTOTYPE:

The first step in the design process would be to determine how much power is required to operate the grass trimmer. This will take into account the cutting mechanism, motor efficiency, and other factors such as the design of the prototype, through the textual description, sketches, and CAD models.

Once the power requirements have been determined, the next step is to select the appropriate solar panel. This will depend on the power requirements as well as the amount of sunlight available in the area where the grass trimmer will be used.

The cutting mechanism can be designed using a variety of techniques, such as a spinning blade, wire cutter, or a linear blade cutting motion which is being used in this project. The design should take into account the amount of power available and the type of grass that will be trimmed.

The motor should be selected based on the power requirements and the type of cutting mechanism being used. A high-efficiency motor can help to ensure that the grass trimmer operates efficiently.

3.2.2 FABRICATION:

The components, including the solar panel, cutting mechanism, motor, wheels, and control switch should be assembled together. This will involve connecting the different parts together and ensuring that they are securely fastened.

3.2.3 TESTING:

The prototype can be tested in real-world conditions to determine its effectiveness. As the design may need to be tweaked for optimal performance, testing and redesign may be an ongoing process. Once the device has been assembled, it should be tested to ensure that it operates efficiently. Make sure everything is connected properly and test the trimmer in a safe area. Testing should be conducted under different weather and light conditions to see how the device performs. Also testing and comparing the fabricated solar powered grass trimmer with the gasoline powered grass cutter.

Table:3.1 Material selection

S/N	COMPONENTS	MATERIAL SUITABLE	REASON FOR SELECTION
1	Solar panel	100W (monocrystalline)	Functionality
2	Motor	70W/24V DC	Easily accessible and economical
3	Blade	Spring steel	Resilience, Hardness, and Durability
4	Frame	Mild steel	Strength
5	Wheels	Rubber	Mobility
6	Gears	Steel	To transfer motion and power
7	Bearings	Stainless steel	To reduce friction between rotating parts

Chapter 4

DESIGN OF COMPONENTS/ ASSEMBLY

4.1 3D CAD model

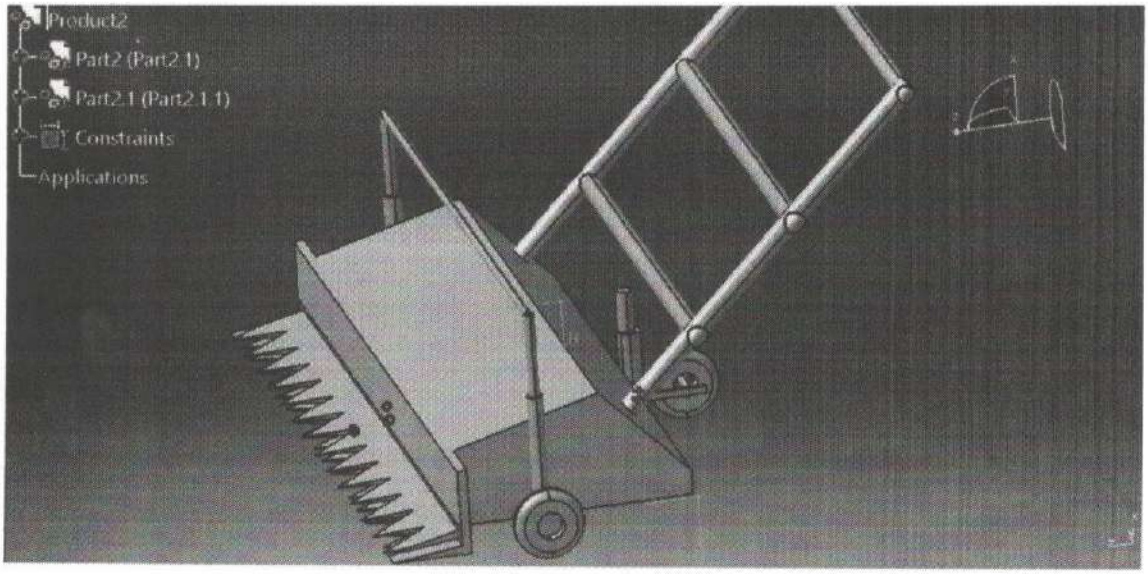

Fig 4.1 Isometric view

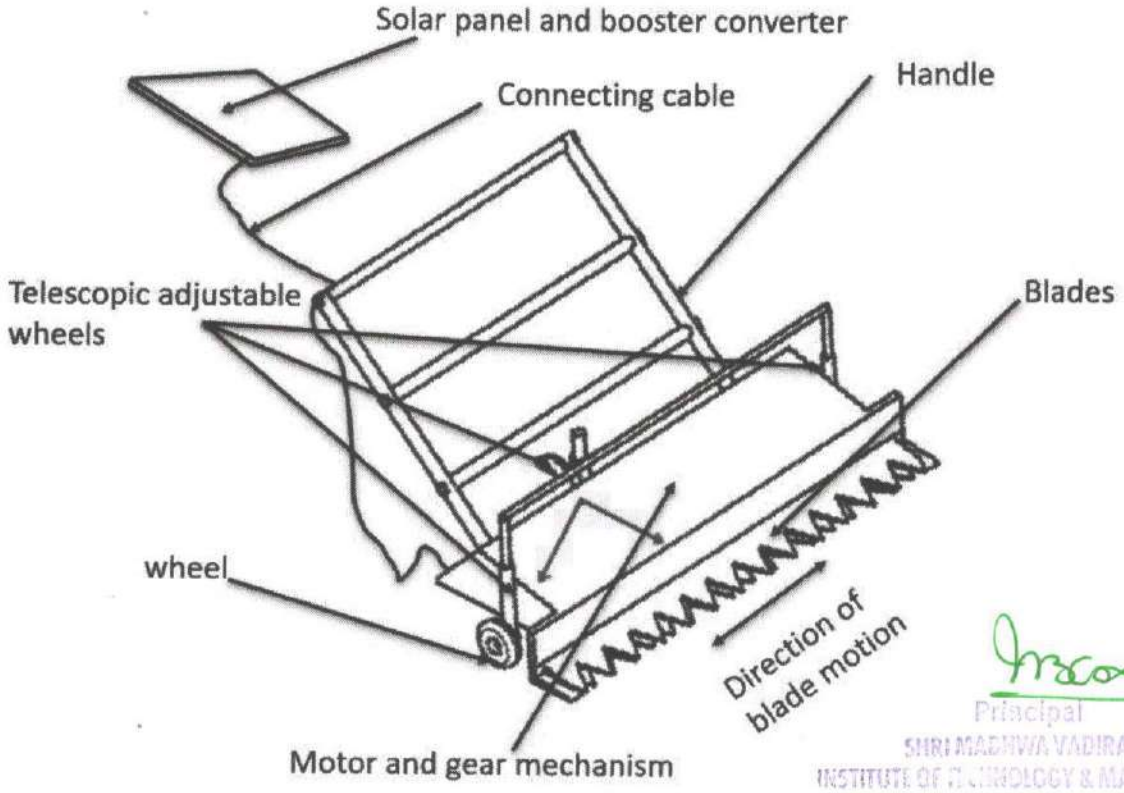

Fig 4.2 Isometric view with part naming

Solar Powered Grass Trimmer without Battery

Chapter 5
Chapter 4

RESULT ANALYSIS
DESIGN OF COMPONENTS/ASSEMBLY

5.1 Result analysis
4.1 3D CAD model

A solar-powered grass trimmer without a battery offers several advantages for lawn maintenance. Firstly, it [illegible] operationa[illegible] energy. Ho[illegible] source, and [illegible] could gene[illegible] and the ava[illegible] [illegible] power generation [illegible] [illegible] panel [illegible] itions

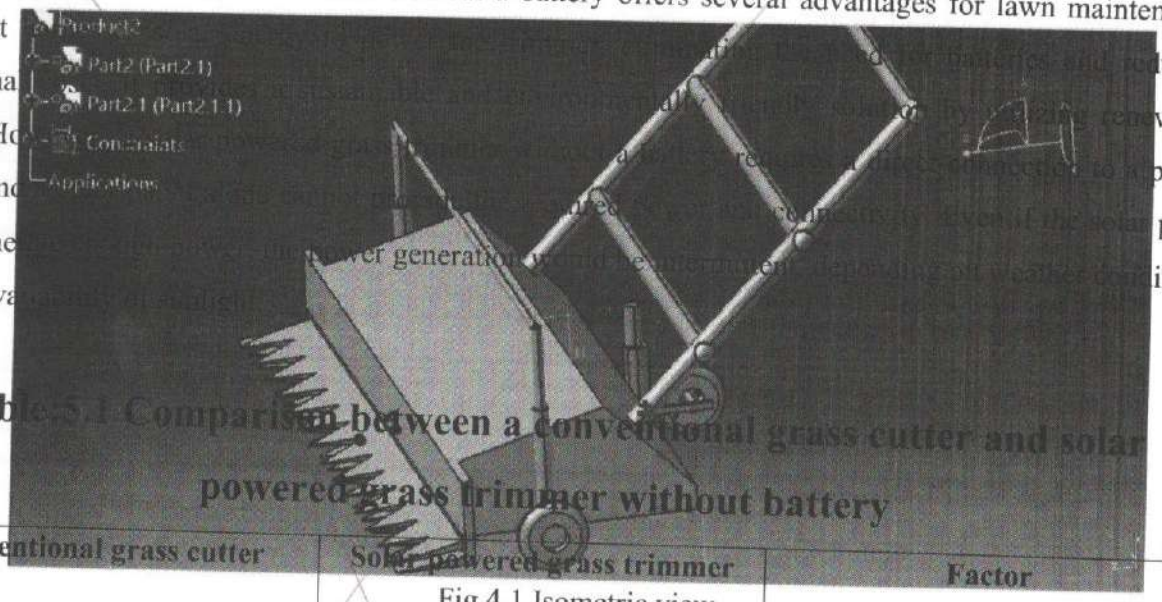

Fig 4.1 Isometric view

Table 5.1 Comparison between a conventional grass cutter and solar powered grass trimmer without battery

Conventional grass cutter	Solar powered grass trimmer without battery	Factor
Causes more pollution	Clean and pollution free	Air Pollution
More	Less	Effort
More	Less	Maintenance required
More	Less	Noise pollution
More	Comparatively less	Efficiency
Complex	Simple	Construction

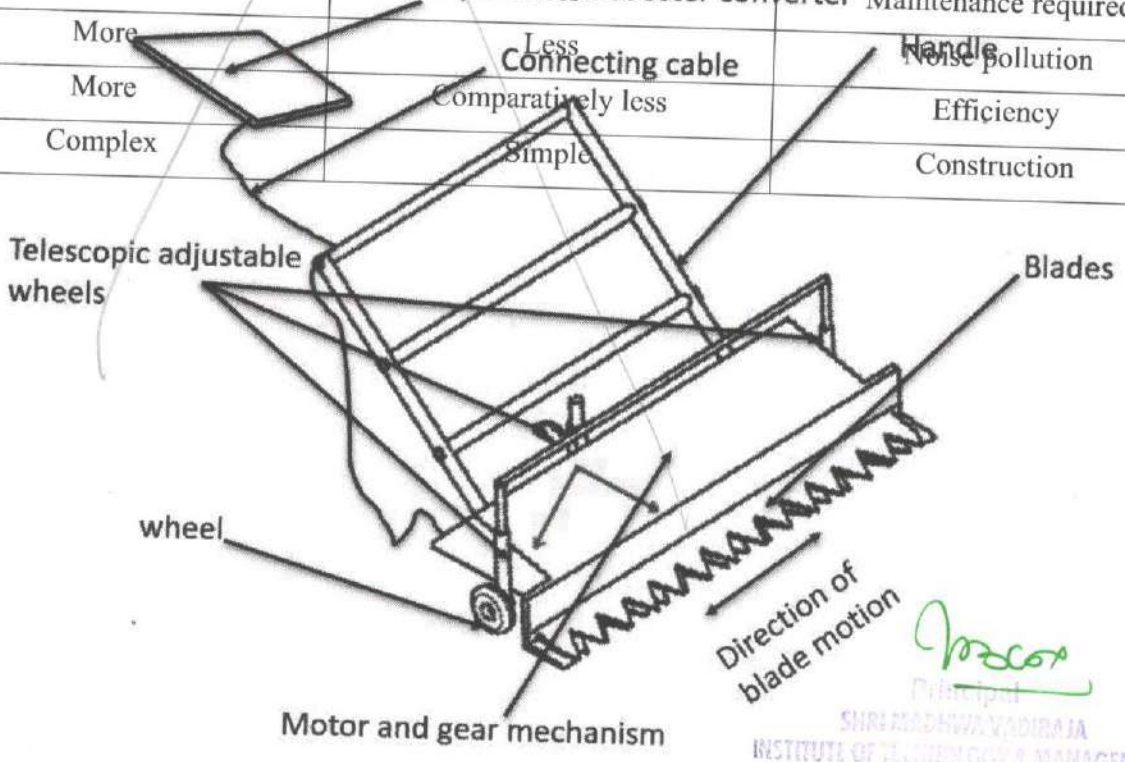

Fig 4.2 Isometric view with part naming

4.2 Assembly drawing

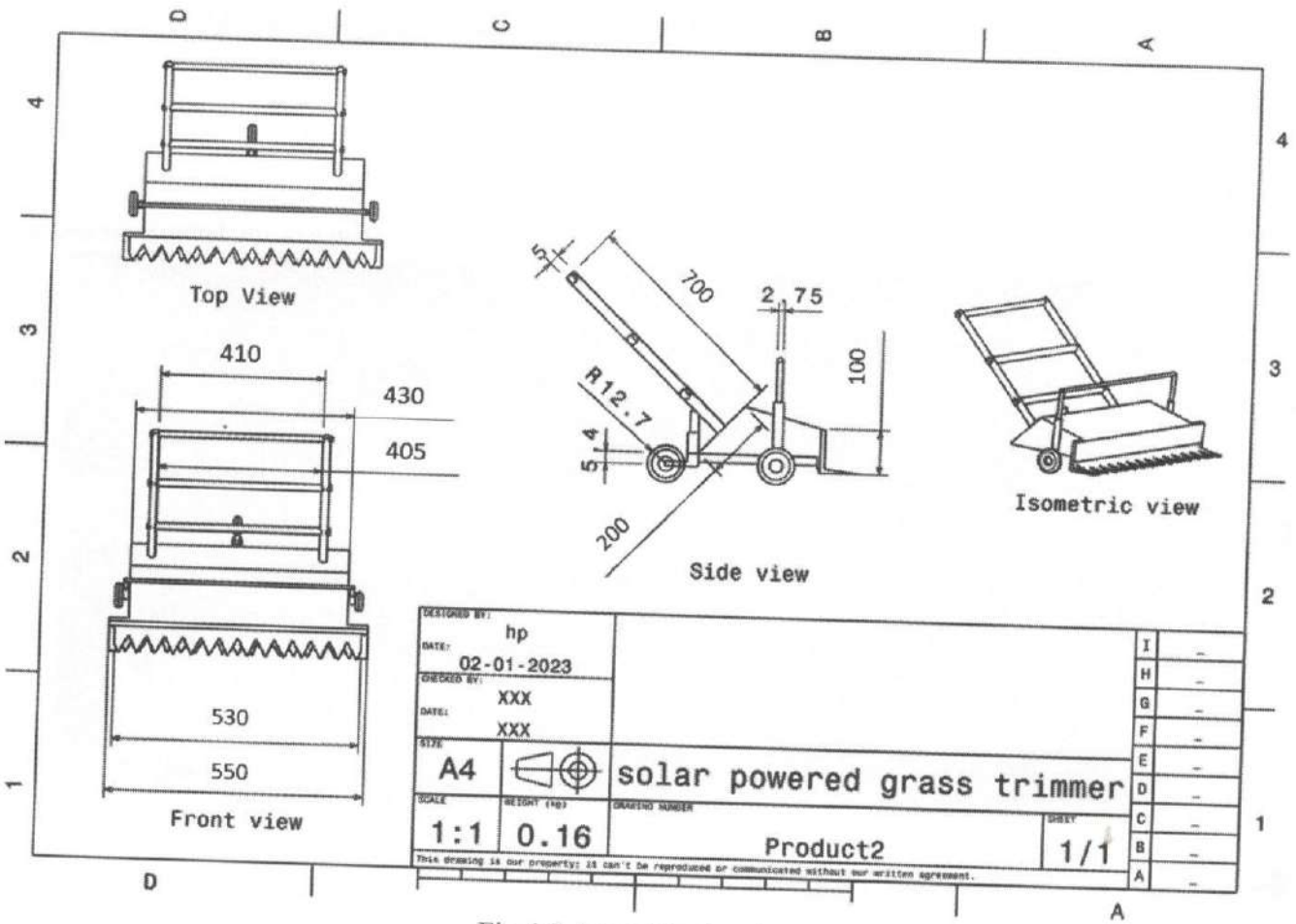

Fig 4.3 Assembly drawing

4.3 Blade dimension

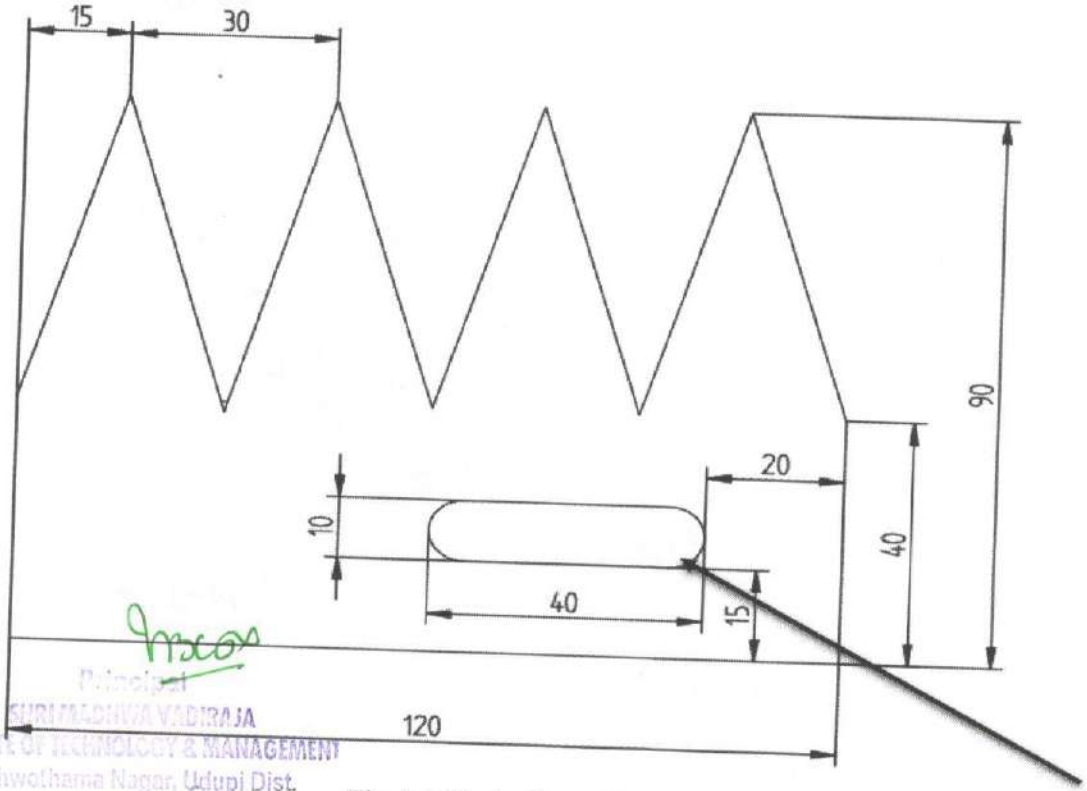

Fig 4.4 Blade dimension

Chapter 5

RESULT ANALYSIS

5.1 Result analysis

A solar-powered grass trimmer without a battery offers several advantages for lawn maintenance. Firstly, it harnesses solar energy to power the trimmer, eliminating the need for batteries and reducing operational costs. It provides a sustainable and environmentally friendly solution by utilizing renewable energy. However, a solar powered grass trimmer without a battery requires a direct connection to a power source, and a solar panel alone cannot provide the required power and connectivity. Even if the solar panel could generate enough power, the power generation would be intermittent, depending on weather conditions and the availability of sunlight.

Table:5.1 Comparison between a conventional grass cutter and solar powered grass trimmer without battery

Conventional grass cutter	Solar powered grass trimmer without battery	Factor
Causes more pollution	Clean and pollution free	Air Pollution
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More	Less	Noise pollution
More	Comparatively less	Efficiency
Complex	Simple	Construction

Chapter 6

COST ANALYSIS

Table:6.1 Cost analysis of the work

S/N	Components	Quantity	Price in Rs.
1	Solar panel	2	5000/-
2	Motor	1	1000/-
3	Gears	2	500/-
4	Wheels	3	100/-
6	Spring steel	1	1000/-
7	Bearings	3	200/-
8	Other expenses	-	500/- approx.
Total cost	-	-	8000/- approx.

Chapter 7

ADVANTAGES and LIMITATIONS

7.1 Advantages

1. Environmentally friendly: A solar-powered grass trimmer without a battery reduces reliance on fossil fuels, minimizing carbon emissions and promoting cleaner energy.
1. Cost-effective: It eliminates the need for purchasing and replacing batteries, resulting in long-term cost savings for users.
2. Noise reduction: Compared to traditional gas-powered trimmers, a solar-powered trimmer operates silently, reducing noise pollution.
3. Low maintenance: Without a battery, there is no need for regular battery maintenance or replacements, simplifying upkeep for the user.
4. Portable and lightweight: The absence of a heavy battery makes the trimmer lighter and easier to carry, enhancing manoeuvrability and reducing user fatigue.
5. Continuous operation: As long as there is sunlight, the trimmer can operate continuously without the need for recharging or refuelling.
6. Zero emissions: By utilizing solar power, the trimmer produces no harmful emissions during operation, contributing to cleaner air quality.
7. Versatility: It can be used in remote locations or areas without access to electrical outlets, providing greater flexibility for lawn maintenance.
8. Durability: Without a battery, the trimmer is less prone to damage from battery leaks or power fluctuations, increasing its overall durability.
9. Renewable energy source: Solar power is a renewable energy source, making the trimmer a sustainable and future-proof solution for lawn care needs.

7.2 Limitations

1. Limited operation time due to reliance on direct sunlight for power.
2. Inability to operate during cloudy or low-light conditions.
3. Reduced cutting power compared to battery-powered trimmers.
4. Lack of portability as the trimmer must remain connected to a solar panel for power.
5. Potential limitations in trimming larger or denser areas of grass due to lower power output.
6. Dependence on specific angles and positions of the solar panel to maximize energy absorption.
7. Vulnerability to damage or malfunction in extreme weather conditions such as heavy rain or snow.
8. Higher upfront cost for the solar panel and associated equipment.
9. Limited availability and variety of solar-powered grass trimmers without batteries.

Chapter 7

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Chapter 8

CONCLUSION AND FUTURE SCOPE

8.1 CONCLUSION

Solar-powered grass trimmers without a battery provide several advantages that make them an attractive choice for environmentally conscious individuals.

1. First and foremost, they rely on clean and renewable solar energy, reducing reliance on fossil fuels and minimizing greenhouse gas emissions. This sustainable energy source allows users to trim their lawns without contributing to air pollution or noise pollution associated with traditional gas-powered trimmers.
2. The absence of a battery simplifies the design and operation of these trimmers. Without the need for a rechargeable battery, they are generally lighter in weight and more maneuverable, making it easier to navigate around obstacles and trim hard-to-reach areas.
3. There is no concern about battery maintenance, degradation, or replacement, reducing long-term costs and the environmental impact of battery disposal.
4. Solar-powered grass trimmers without a battery also offer the advantage of being independent of electrical outlets. Users can freely move around their outdoor spaces without the constraint of cords or the need for extension cables. This enhances flexibility and convenience during trimming tasks.
5. The use of solar power eliminates the ongoing expense of purchasing fuel or electricity to operate the trimmer. Once the initial investment is made, solar energy is essentially free, resulting in long-term cost savings. This makes solar-powered grass trimmers without a battery a cost-effective option for homeowners and gardeners.
6. The solar-powered grass trimmer without battery is a promising and environmentally-friendly solution for maintaining lawns and grassy areas.
7. Its solar panels harnessing energy from the sun offer numerous benefits, including reduced carbon emissions, lower operational costs, and quieter operation compared to traditional gas-powered or electric grass cutters.
8. The solar-powered grass cutter is easy to use and requires minimal maintenance, making it a convenient and sustainable option for lawn care.

While these trimmers have numerous advantages, it is important to consider their limitations. They rely on sufficient sunlight for operation, meaning trimming may be limited during periods of low light or cloudy weather. However, advancements in solar technology continue to improve the efficiency of these trimmers, ensuring reliable performance even under less-than-ideal conditions.

8.2 Future scope

A solar-powered grass trimmer without a battery has the potential to be an innovative and sustainable solution for lawn care. While the technology for such a device is not widely available at the moment, here are some future possibilities and scope for development:

1. Solar panel efficiency: Advancements in solar panel technology can significantly improve the efficiency of solar-powered devices. Future solar panels could be more compact, lightweight, and capable of generating higher amounts of electricity from sunlight, making them ideal for powering grass trimmers.
2. Efficient motor design: Future grass trimmers can benefit from more energy-efficient and lightweight electric motors. Technological advancements could lead to the development of compact and powerful motors that require less energy to operate, thus reducing the overall energy consumption of the device.
3. Lightweight and durable materials: Advances in materials science may result in the development of stronger, lighter, and more durable materials for the construction of grass trimmers. This would allow for the creation of lightweight and efficient devices that are easy to manoeuvre and have a longer lifespan.
4. Smart technology integration: Integration of smart technologies, such as artificial intelligence and machine learning algorithms, can optimize the performance of solar-powered grass trimmers. These algorithms can analyse and adapt to different grass types, weather conditions, and user preferences, ensuring efficient grass cutting and minimal energy waste.
5. Robotic automation: Solar-powered grass trimmers could be combined with robotic automation to create autonomous lawn maintenance systems. These systems would operate independently, powered by solar energy, and use sensors, cameras, and algorithms to navigate lawns, detect grass height, and efficiently trim the grass without human intervention.

Overall, the future scope for a solar-powered grass trimmer without a battery is promising, with potential advancements in solar panel efficiency, motor design, materials, smart technology integration, and robotic automation. These developments can lead to more sustainable and efficient lawn care solutions that reduce reliance on fossil fuels and minimize environmental impact.

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