

# **GUJARAT TECHNOLOGICAL UNIVERSITY**



Chandkheda, Ahmedabad

Affiliated



## **DR. S. & S.S. GHANDHY GOVERNMENT ENGINEERING COLLEGE**

A  
Project Report  
On  
**WIRELESS CHARGING OF**

### **EV-VEHICLE**

Under subject of  
DESIGN ENGINEERING-2-B  
Team ID: - 412636

B.E– 3, Semester- 6  
(ELECTRICAL ENGINEERING)

Submitted by:

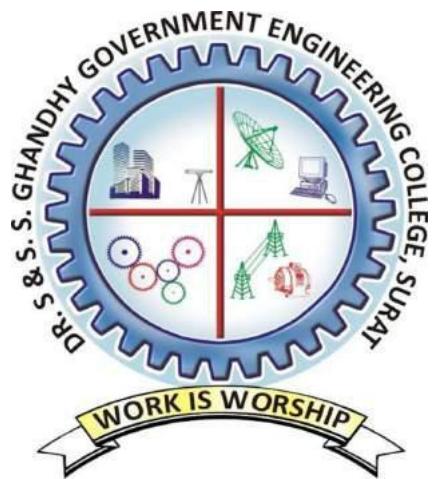
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(2022-2023)

# **DR. S. & S.S. GHANDHY GOVERNMENT ENGINEERING COLLEGE , SURAT**



## **CERTIFICATE**

This is to certify that **Mr. Katariya Darshan K.** of Bachelors of Engineering of semester **6<sup>th</sup>** having Enrolment No.- 200230109053 Student of **ELECTRICAL ENGINEERING** has satisfactorily completed detail project report of " **WIRELESS CHARGING OF EV-VEHICLE** " during the academic year 2022-23

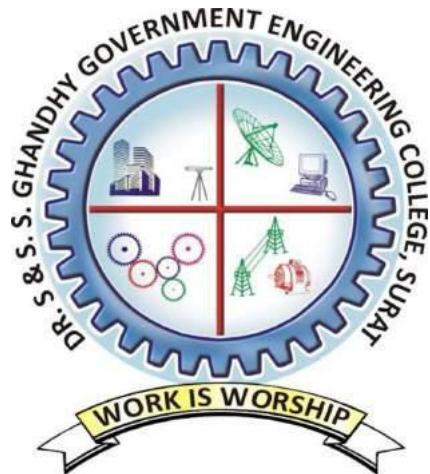
This project work has been carried out by them in group (05 Person) under guidance of Miss. U. N. PATEL

Date of Submission:-/-/-

Faculty guide  
Miss. U. N. Patel

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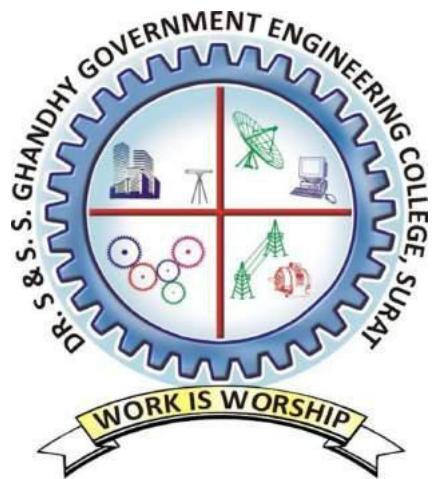
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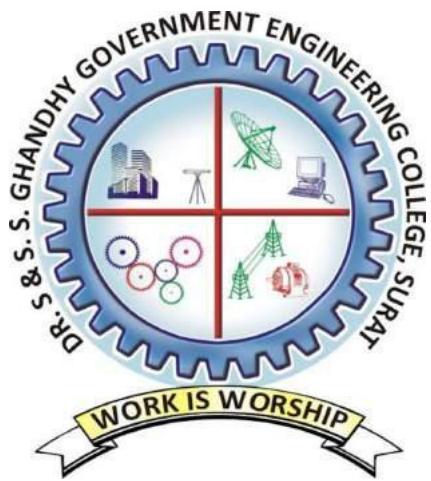
This project work has been carried out by them in group (05 Person) under guidance of Miss. U. N. PATEL

Date of Submission:-/-/-/-

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# **DR. S. & S.S. GHANDHY GOVERNMENT ENGINEERING COLLEGE , SURAT**



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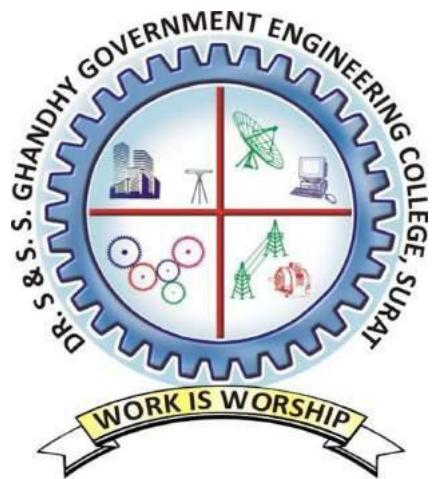
This project work has been carried out by them in group (05 Person) under guidance of Miss. U. N. PATEL

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# **DR. S. & S.S. GHANDHY GOVERNMENT ENGINEERING COLLEGE , SURAT**



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# 1. INTRODUCTION

- The project “ WIRELESS CHARGING OF EV-VEHICLE ” is a humble attempt to eliminate the waste of time in charging of ev-vehicle . In recent years, charging electric cars has been the primary concern in boosting the energy transition, although other solutions are raised alongside electric charging stations.

With the invention of the wireless charging system, owners of the electric vehicles do not need to wait longer for hours at a charging station. Now people who own an electric car can put their vehicle on charge even when parking in a garage or anywhere. Generally, people are aware of the wireless transmission of data, audio and video signals, so what keeps us transmitting energy through data.

Research has shown that a special charging board is built while moving the batteries of the electric cars. However, the biggest problem with electric vehicles is the strenuous process of searching for a charging station while the battery is on the verge of exhaustion. Because of this, the vehicles take a long time to get recharged.

# **IMPORTANCE**

- So far, almost all EVs have relied on wired charging solutions in which drivers plug in a cable to recharge the car's battery. But wireless or automated charging holds vast potential to make EV ownership more convenient, cost-effective, and appealing for drivers and fleet operators

With countries across the globe aiming to reach their respective decarbonisation targets, electric vehicles (EVs) will play an increasingly important role. In 2021, EV sales were up by 109% more than the previous year, with 2.3 million EVs sold in Europe. To ensure that this growth rate continues, and decarbonisation targets are subsequently reached, there is now a greater demand for a more efficient EV charging infrastructure.

Wireless EV charging would be a game-changer for the automotive industry and would increase charging efficiency. Although the current process of plugging in your EV is easy, wireless EV charging is smoother, enabling the user to charge their EV without having to leave the vehicle.

# WORK DONE BY THE SYSTEM

- Magnetic flux is generated vertically from the ground when electricity passes through the Ground Transmission Unit's primary coil, which is installed on the surface of the parking place. Electrical pressure is generated by overlapping with the secondary coil in the Vehicle Receiver Unit in the vehicle, and electricity is supplied from the first coil to the second one (electromagnetic induction). The unique technology achieves a charging efficiency of 80-90%, equivalent to that of cable charging.

System mainly has two sections, wireless power transmitter & a wireless power receiver sections. The transmitter section of the proposed system consists of a power source and a transmitter coil whereas the receiver section consists of a receiver coil, rectifier and filtering circuit, and a rechargeable battery. The AC power from the transformer is given to the primary coil which is implanted on the charging station. The flux is radiated out from the primary coil and this flux is linked with the secondary coil which induces current in the secondary coil in the EV. The alternating current induced in the secondary coil is converted to direct current which is then used to charge the battery of the EV.

## **2. AEIOU SHEET**

### **➤ Environment**

All season  
High capacity  
Easy to use

### **➤ Interaction**

Engineer with engineer  
Shopkeeper with customer  
Supplier with customer  
Engineer with company  
Company with customer

### **➤ Object**

Connecting wire  
Electric vehicle  
Coil  
Battery  
Solar panel

## ➤ Activities

- Export/Import
- Smart charging
- Selection of area
- Safety

## ➤ Users

- Customer
- Engineers
- Government
- Worker
- company
- Staff

## AEIOU Summary:

Group ID: H12636

Date:

Version:

Domain Name: wireless charging of EV

### Environment:

All Season

Easy to use

less Effort

### Interactions:

Engineer with Company

Engineer with Engineer

government  
with people

### Objects:

Electrical Vehical

Solar Panel

Car

battery

### Activities:

Safety

Import

selection of area

Energy convert

Export

### Users:

Engineers

Worker

Company

Government

people

Staff

Customer

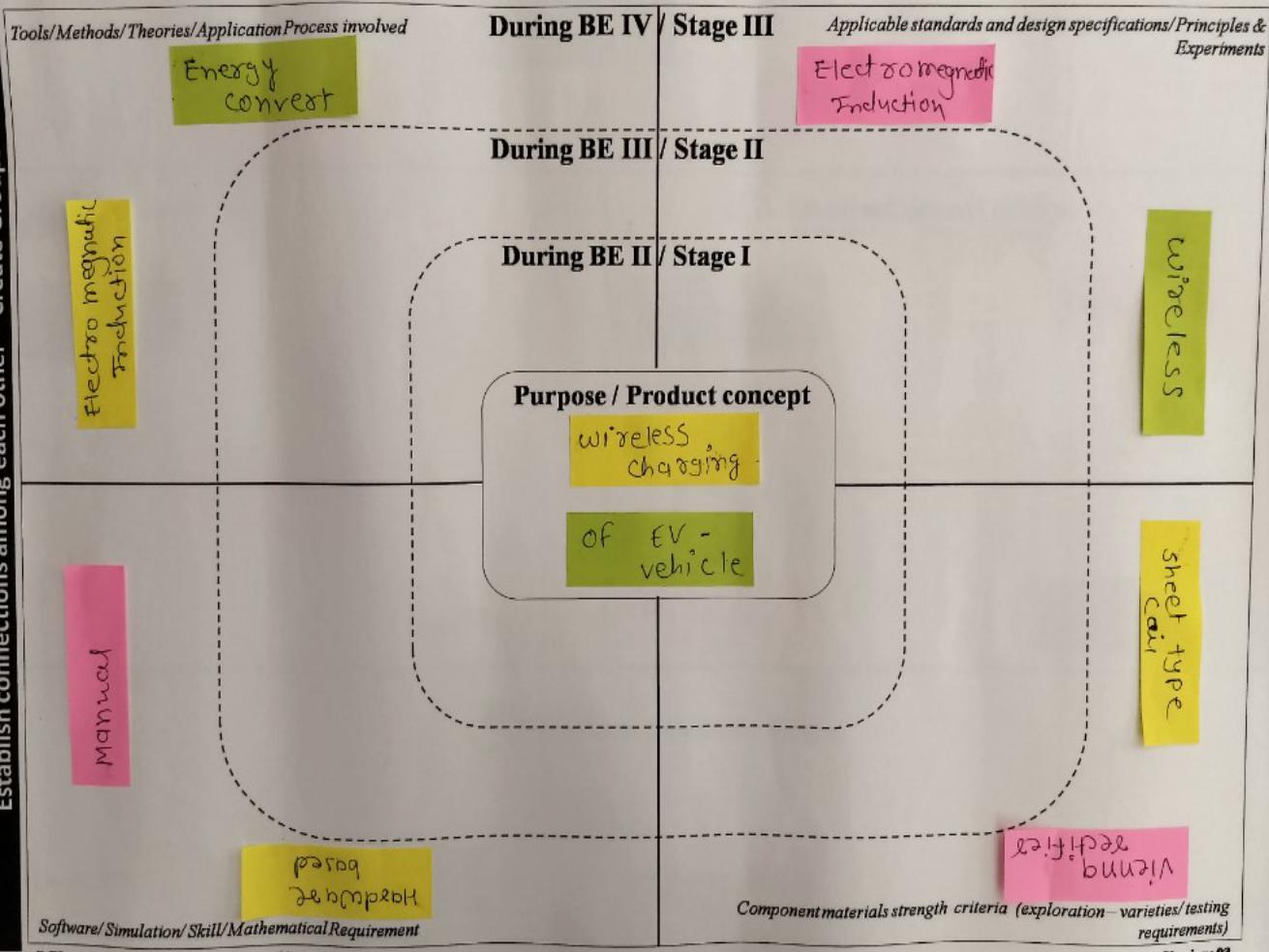
### 3. LNM CANVAS

Learnings Need Matrix

Group ID: H12636

Date: \_\_\_\_\_

Establish connections among each other - Create Groups



## 4.MIND MAPPING

### ➤ Function

- Automatic
- Pollution free
- Wireless
- Charging efficiency

### ➤ Benefits

- Easy to use
- Interface durability is better
- Time saving
- Money saving

### ➤ Objects

- Battery
- Coil
- Solar panel
- Connecting wire

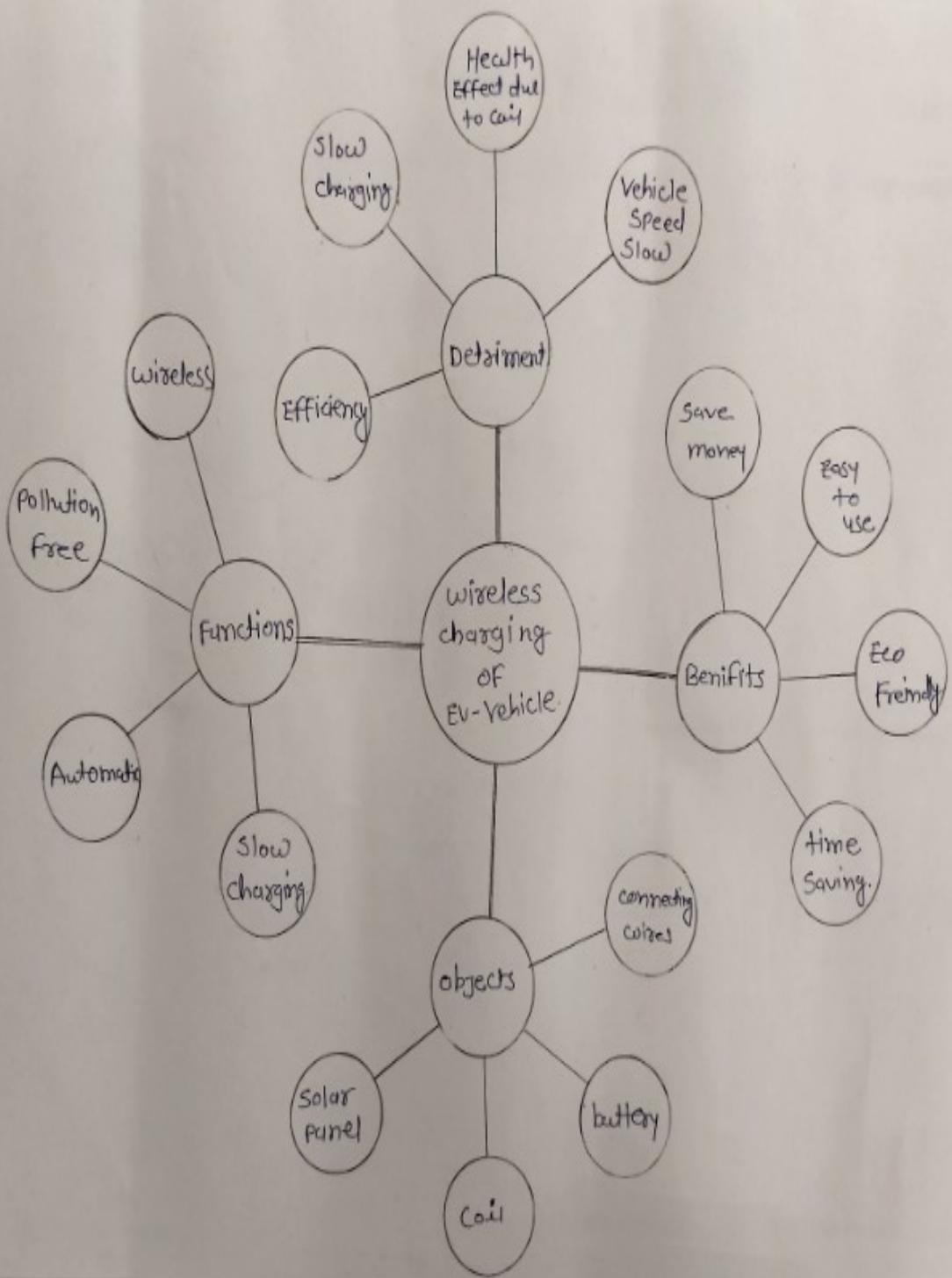
## ➤ **Detriment**s

Health effect

Slow charging speed

Charging efficiency

Vehicle speed is slow



# **5. EMPATHY MAPPING**

## **➤ User**

Government  
Workers  
Engineers  
Faculties

## **➤ Stakeholders**

Electrical – Mechanical companies  
Government  
Customers  
Shop owners

## **➤ Activities**

Time saving  
Wireless charging  
Automatic

## Empathizing Canvas

Design For	Design By
Date	Version
<b>USER</b> Government Workers	<b>STAKEHOLDERS</b> Engineers Dealers.
<b>ACTIVITIES</b>	
Automatic	time Saving.
wireless charging	
<b>STORY BOARDING</b>	
<b>HAPPY</b> → wireless EV-charging would be a game changer for the Automotive industry and would increase charging efficiency.	
<b>HAPPY</b> → wireless EV-charging is smoother, enabling the user to charge their EV without having to leave the vehicle.	
<b>SAD</b> → Short working distance. → low conversion efficiency and slow speed.	
<b>SAD</b> → High power consumption, more power consumption. → High cost.	

# 6. IDEATION CANVAS SHEET

## ➤ People

Workers  
Engineers  
Government  
Industries Staff  
Company

## ➤ Activities

driving  
Export/import  
Selection of area

## ➤ **Situation / context / location**

All season  
Save money  
save time  
Easy use  
In all cities

## **Props / Tools / Object / Equipment**

Electric vehicle  
Coil  
Connecting wire  
Solar panel

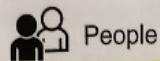
The Ideanaut: Ideation Canvas

Project: wireless charging of EV

Team:

H12636

Workers

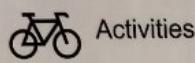


People  
Industries  
Staff

Engineers

Government

Company



Activities

driving

Import / Export

selection of area



Situation/Context/Location

(What / When)

(Why)

(Where)

All season

SAVE MONEY

Easy use

All cities.

Save time



Props/Tools/Objects/Equipment

battery

Coil

solar Panel

LED bulbs

## **7. PRODUCT DEVELOPMENT CANVAS**

### **➤ Purpose**

Save fuel

Eco friendly

### **➤ People**

Government

Engineers

### **➤ Product Experience**

Charging of ev -vehicle is easy

Save time

Less costly

### **➤ Product Functions**

automatic

wireless

### **➤ Product features**

Wireless

Pollution free

## ➤ Components

Electric vehicle

Coil

Connecting

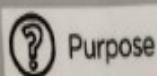
wire

battery

## ➤ Customer Revolution Reject, Redesign, Retain

## Product Development Canvas

Team/Date/Version: H12636 / /



Purpose

SAVE TIME

SAVE FUEL

ECO FRIENDLY



drivers

Engineers

Governments



Product Experience

Easy charging

SAVE TIME

Less Costly



Product Functions

pollution free

wireless

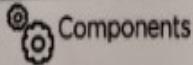


Product Features

wireless

Automatic

Show charging  
state



Components

Solar panel

battery

Electric Vehicle

Car

Connecting wires

Specific range

Initial cost



Customer Revalidation

Customer  
Satisfaction

Customer  
time Saving

less working  
by customer



Reject, Redesign, Retain

Slow charging

## 8. PROTOTYPE



## About Project

- Basic principle of wireless charging is same as transformer working principle. In wireless charging there are transmitter and receiver, 220V 50Hz AC supply is converted into High frequency alternating current and this high frequency AC is supplied to transmitter coil, then it creates alternating magnetic field that cuts the receiver coil and causes the production of AC power output in receiver coil. But the important thing for efficient wireless charging is to maintain the resonance frequency between transmitter and receiver. To maintain the resonant frequencies, compensation networks are added at both sides. Then finally, this AC power at receiver side rectified to DC and fed to the battery through Battery Management System (BMS).

## **FUTURE SCOPE**

- The world is rapidly going wireless. Within a span of a few decades, phones and internet became wireless, and now charging has become wireless. Even though wireless charging is still pretty much in its early stages, the technology is anticipated to evolve dramatically over the next few years.

The global wireless charging market for electric vehicles is projected to grow from USD 15 million in 2022 to USD 377 million by 2027, at a CAGR of 88.4%. Factors such as rising sales of electric vehicles around the world, along with the increasing inclination towards autonomous driving technology by automotive OEMs will boost the demand for the wireless charging market for electric vehicles. Increasing investments for smart roads in several countries such as the US, Germany, and Italy, among others, in conjunction with increasing governmental support for wireless charging will create new opportunities for this market. For instance, in February 2022, the government of the US state of Michigan announced its plan to build an electrified road to charge moving electric vehicles, ElectReon, an Israel-based company, will develop an electric road system pilot project across a one-mile stretch of Detroit's roadway to charge electric vehicles.

## **Estimated cost**

## **8. CONCLUSIONS**

- Wireless charging is convenient and fairly efficient, but there has not been enough research done to increase efficiency and distance necessary between the device and charger.

The main agenda of this paper is to give an overview of various wireless charging techniques out of which inductive wireless transfer has proven to be the best method of wireless charging. This paper also attempts to review about the application of static and dynamic wireless charging and how battery plays an important role in the electric vehicle. Here, the battery size is effected by wireless charging techniques which lowers the overall cost of the electric vehicle. The electric vehicle batteries which were to take quite a lot time to charge up to the rated value will be charged within less time comparatively as their battery capacity is reduced.

**THANK YOU**