

Design and development of research Electric Vehicle for the institute

Introduction

The IVDC club of IIT Indore was added to a project of the institute with CIVETS of electrical department as our partner and Prof. Devendra Deshmukh as our project mentor. The project was about the design and manufacturing of a four-seater electric vehicle for research and development in the domain of vehicles automation. The project was divided between CIVETS and IVDC club where IVDC club was to design and manufacture the body of the vehicle whereas CIVETS would design the powertrain of the vehicle.

Design and development of the body

We (IVDC club) were to design the body of the vehicle which included everything from suspensions to the entire chassis of the vehicle. Therefore, the entire team of volunteers and club members were divided into many parts according to the designing of the different components of the vehicle. Some of the teams were:

1. Chassis team
2. Steering and front axle team
3. Suspensions team, etc.

I was the part of the chassis team.

Chassis design

We were a team of two people where we both designed the basic structure of the chassis. My job was to design the basic 3d model and to calculate the static and dynamic loads on the chassis. My partner's job was to design the basic 3d model and to simulate the load handling on the chassis using 3d simulation software based on the loads calculated by me.

We were told to design a roll cage type chassis for the vehicle which could seat four people. Because chassis is the part of the vehicle which contains everything from axles to suspensions therefore, we had to work closely with other teams to ensure that the dimension are appropriate for all the components and everything is compatible with each other.

Approach

The approach we took was to first calculate the load the vehicle and chassis would experience which included both static and dynamic loading. We knew the estimated mass and velocity of the vehicle. For static loads, it was easy to calculate as we had to calculate using simple formulas. For dynamic loading, we calculated the energy conversion from kinetic energy the vehicle would handle while in motion. The time interval for different load were taken as same as they are taken for the BAJA vehicles. After all the loads we then worked with the suspension team to know more about the suspensions and its dimensions they were planning to use because different types of suspensions use different mechanisms to attach from the chassis. Then we designed the 3d model for the chassis and tested it for load handling using software simulations. After some iterations we came up with a design. In each step and for every calculation we took some safety factor which was usually between 2 to 2.5.

Final design

Below is our final design which we came up with. It was our final design but might not be for the vehicles as our term as club members were over after this. If requirements will change in future so will the design.

