

OFF CENTRE

Development Category



United Arab
Emirates

 Zain Print & Promotion
Trading LLC

OUR TEAM

ABOUT OUR TEAM



Sultan Afhaam

Afhaam with his entrepreneurial skills with the help of his marketing magic, he was the perfect candidate for our 'Resource Manager'



Abinav Pallathoor

An accomplished coder with leadership qualities, using analytical judgment to contribute to programming. Hardworking and persistent, he strives for perfection in his ideas.



Aadil Abdul Jaleel

Experienced builder with essential qualities including confidence in his ideas, challenging others with new and innovative concepts. He organizes brainstorming meetings for project ideas.



Sai Vaibhav Arepaka

The most equipped with knowledge in 3D printing, as well as designing, and was given the task of being the manufacturing engineer.



Meet Bhambani

Meet had a knack for graphic designing and always found a way to incorporate creativity in his works and was given the role of 'Design Manager'

What is Off Centre?

We are a team of five students from GEMS OUR OWN HIGH SCHOOL in Al Warqa, Dubai, united by a shared passion for innovation and creativity. As participants in this prestigious competition, we are eager to present our unique ideas and solutions to be incorporated into our 4x4 car, inspired by our common drive for success.

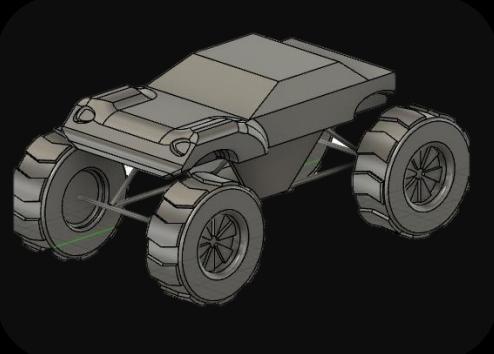


Udaya Prakash

Whether it's competing in robotics competitions, developing innovative solutions, or simply nurturing a lifelong passion for robotics, Mr. Udaya Balakrishnan is dedicated to unlocking the potential within each student. With their guidance, the realm of robotics becomes a gateway to endless creativity, imagination, and boundless achievements.

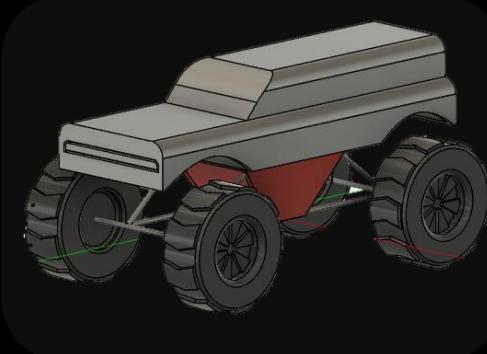
CAR DESIGNS

OUR CAR PROTOTYPES



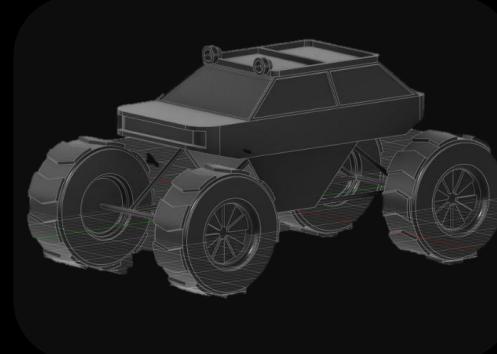
Proto-01

Inspired by the Porsche 911 turbo(1975-89)



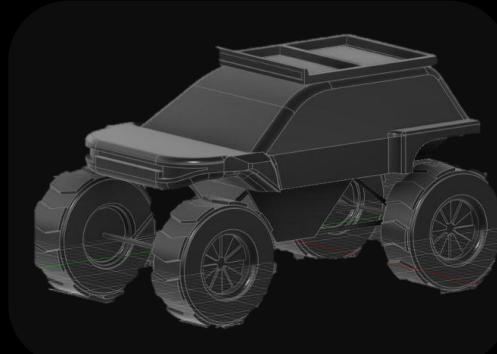
Proto-02

Design features taken from the Chevy 1987 Blazer



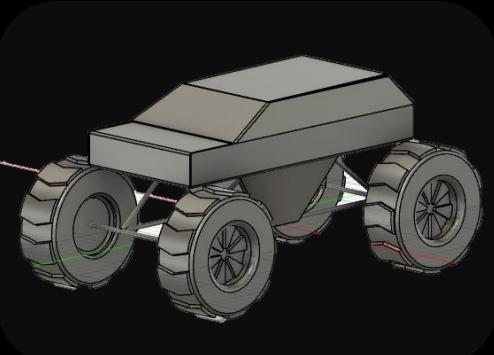
Proto-03

Paying homage to the Lotus Esprit present in the Bond franchise



Proto-04

A modern take on the Jeep



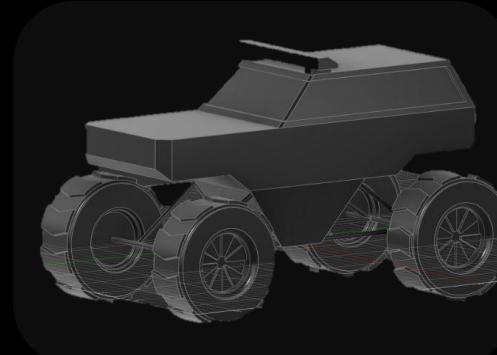
Proto-05

A minimalistic approach to modern 4x4



Proto-06

Approaching it with a bit of the Australian Yute style



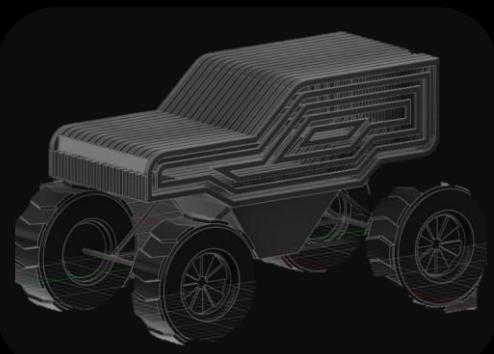
Proto-07

Giving minimalism more 4x4



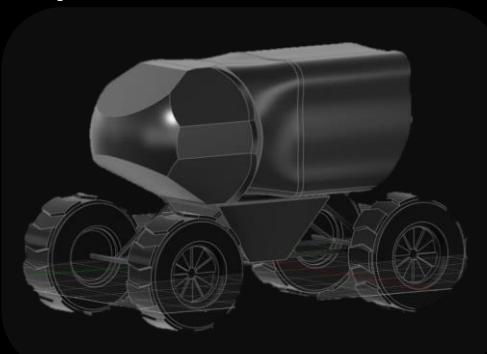
Proto-08

Equipping it with practicality with the help of a truck bed



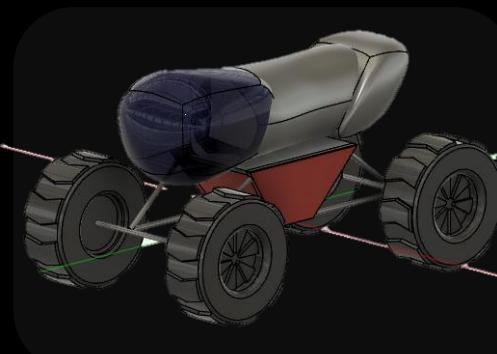
Proto-09

Our most innovative and eye-catching design, equipped with slatted frill design



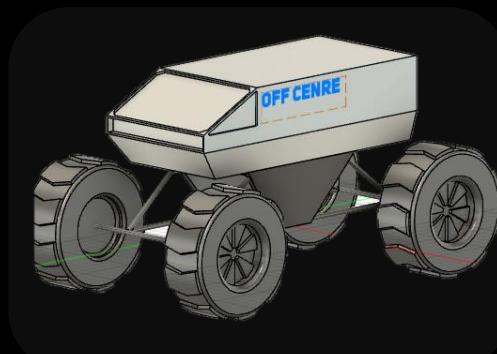
Proto-10

Our first take into space like rover design



Proto-11

Giving the previous prototype more smooth curves



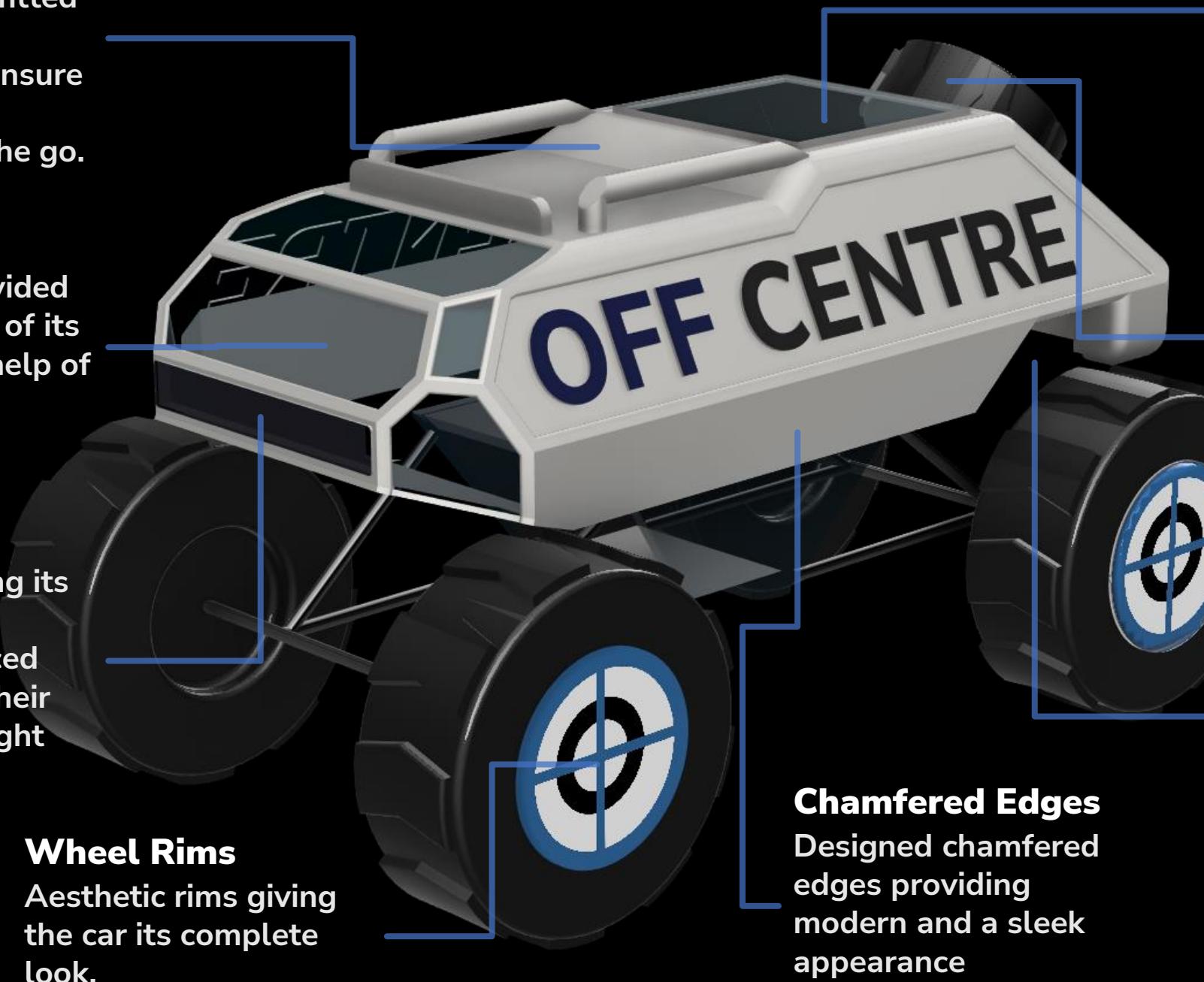
Proto-12

Design inspiration taken from the series, 'Lost in Space'

CAR DESIGNS

MEET AXIS 01

Mobile Home
Geared up with a mobile home outfitted with essential commodities to ensure comfort and convenience on the go.



Axis 01

After 12 prototypes and through which we go through multiple design philosophies. Finally, we produced a design philosophy that agrees with the mantra of Off-Centre. Inspired by the famous TV series, 'Lost in Space'. We present you Axis 01.

The car design showcases a harmonious blend of modernity and rugged design. Chamfered edges throughout the body provides for a space thematic ride. Having both elements of sustainability with added practicality. It truly is the definition of Pioneering Innovation.

Solar Panel
Solar panel installation on the roof provides a stress-free relief for the provision of electricity.

Backup Wheel
Equipped with a backup wheel

Automatic Towbar
A smart towbar capable of locking into tow position precisely with little to no human interaction

CAR MANUFACTURING

THE BUILDING OF AXIS 01



CANS

We collected and surveyed our cans to make the car body. The recycled cans were both sustainable and gave the car a raw aesthetic, however considering its lack of structural integrity and the hours taken for the crafting with such a material, we had to let go of it.



PAPER MÂCHÉ

We researched on paper mâché and how we can utilize recycled newspaper for having more of a sustainable footprint. We also made a mold of the car to shape the paper. However, since it is more susceptible to moisture and could disintegrate over time, we decided not to go this path.



EPOXY MESH

Pouring epoxy over a mold of the car which has been covered with a mesh or a cloth can produce a shiny and beautiful car shell. This helps in the recycling of old cloth, repurposing it as a medium for epoxy. But epoxy takes large amount of time to cure and due to our limited resources and time constraints, we took another route

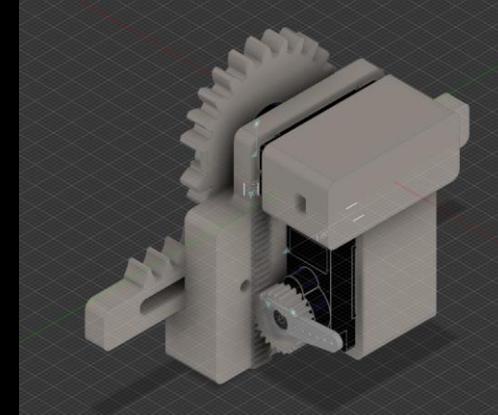
3D Printing

After researching and surveying multiple manufacturing methods, we concluded with 3D printing. 3D printing was originally a medium we first wanted to not go for since its mere ubiquity. However, seeing that we are designing cars for the future it only seemed right to go for 3D printing, since 3D printing is going more mainstream. Although one factor of 3D printing, we weren't fond of was its lack of sustainability, to which we found a solution. That was with the use of recycled filament that can be produced from old bottles. In the coming models of our car along the future, we will be sure to print it using recycled filament.

PROGRAMMING

My Axis 1

Status: Not Connected



Connect Bluetooth

Towbar

ON OFF

AUTO ALIGN

Headlight

ON AUTO

X Angle

X Angle Input..

SET ANGLE INPUT

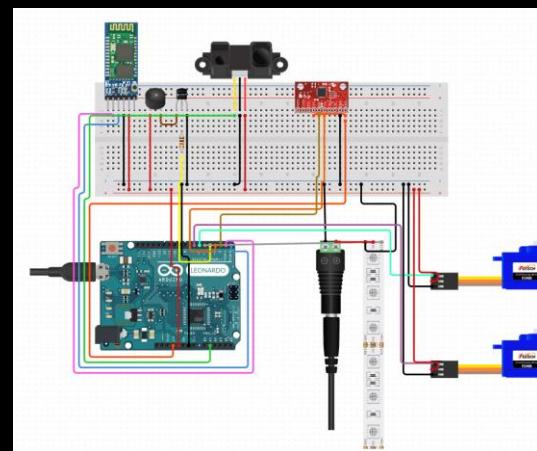
Y Angle

X Angle Input..

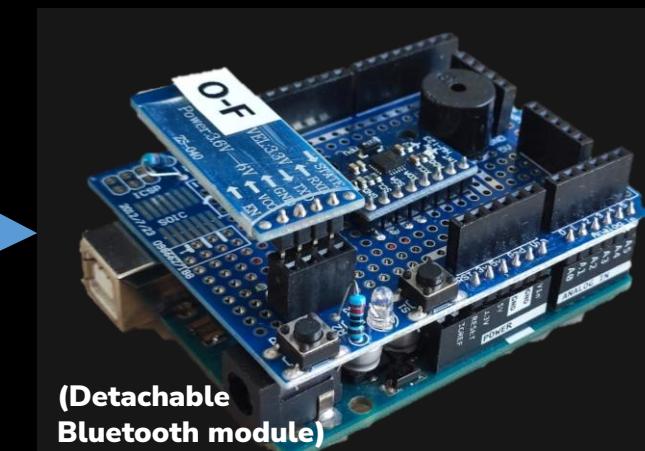
```

1 #include <FastI2C.h>
2 #include <Wire.h>
3 #include <servo.h>
4
5 // PINS
6 #define BUZZER_PIN 2
7 #define SERVO_PIN 9
8 #define SERVO_LATCH 10
9 #define SERVO_LINEAR 11
10
11 // I2C settings
12 #define NM_LEDS 6
13 #define DATA_PIN 12
14 CRGB led[NM_LEDS];
15
16 #define INPUT_MIN 0.0
17 #define INPUT_MAX 100.0
18 CRGB purple = CRGB(128, 0, 128);
19 CRGB blue = CRGB(0, 0, 255);
20
21 // Servo
22 Servo servo_latch;
23 Servo servo_linear;
24
25 // SERIAL COMMUNICATION
26 String commands = "";
27 String prev_commands = "";
28 String serial_data = "";
29
30 // VARIABLES
31 float max_x_angle = 10;
32 float min_x_angle = -10;
33 float max_y_angle = 10;
34 float min_y_angle = -10;
35
36 bool is_alarm = false;
37 int alarm_count = 0;
38 int alarm_threshold = 5;
39
40
41 // GYRO VARIABLES
42 float RateX011, RatePitch, RateYaw;
43 float RateCalibrationX011, RateCalibrationPitch, RateCalibrationYaw;
44 int RateCalibration;
45 float Accx, Accy, Accz;
46 float AccX, AccY, AccZ;
47 float Angleroll, Anglepitch;
48 uint32_t Longtime;
49 float yawdeg, KalmanUncertaintyAngleRoll/*=*/;
50 float yangledeg, KalmanUncertaintyAnglePitch/*=*/;
51 float KalmanOutput[2]{0.0};
52
53 void KalmanUpdate(KalmanState &KalmanInput, float KalmanInput, float KalmanMeasurement) {
54     KalmanState KalmanState;
55     float KalmanUncertainty = KalmanInput * 0.004 * 0.004 * 4 * 4;
56     float KalmanUncertaintyMeasurement = KalmanMeasurement * 0.004 * 0.004 * 4 * 4;
57     KalmanState.landaudeviation = (KalmanInput - KalmanMeasurement) / KalmanUncertainty;
58     KalmanUncertainty = (1 - KalmanGain) * KalmanUncertainty;
59     KalmanOutput[0] = KalmanState;
56     KalmanOutput[1] = KalmanUncertainty;
60 }
61
62 void gyro_signals(void) {
63     Wire.beginTransmission(0x68);
64     Wire.write(0x00);
65     Wire.endTransmission();
66     Wire.beginTransmission(0x68);
67     Wire.write(0x01);
68     Wire.endTransmission();
69     Wire.beginTransmission(0x68);
70     Wire.write(0x02);
71     Wire.endTransmission();
72     Wire.beginTransmission(0x68);
73     Wire.requestFrom(0x68, 5);
74     int16_t AccXLSB = Wire.read() << 8 | Wire.read();
75     int16_t AccYLSB = Wire.read() << 8 | Wire.read();
76     int16_t AccZLSB = Wire.read() << 8 | Wire.read();
77     Wire.beginTransmission(0x68);
78     Wire.write(0x03);
79     Wire.endTransmission();
80     Wire.beginTransmission(0x68);
81     Wire.endTransmission();
82     Wire.beginTransmission(0x68);
83     Wire.write(0x04);
84     Wire.endTransmission();
85     Wire.requestFrom(0x68, 5);
86     int16_t GyroXLSB = Wire.read() << 8 | Wire.read();

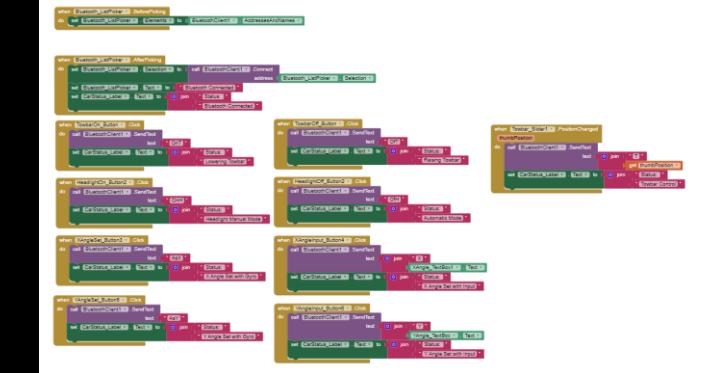
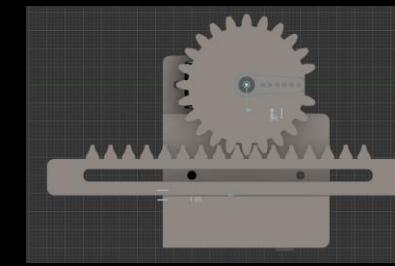
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Circuit Diagram



Final Product



Automated Towbar

Towbar Mechanism:

We made an automated towbar system, with a linear rack and pinion, that moves the hooking mechanism to the trailer, and with a press of a button, latches onto the trailer with absolute precision. This mechanism will save time during the tow challenge. It uses two servos one for the x gantry and the other for the latching mechanism.

Control App:

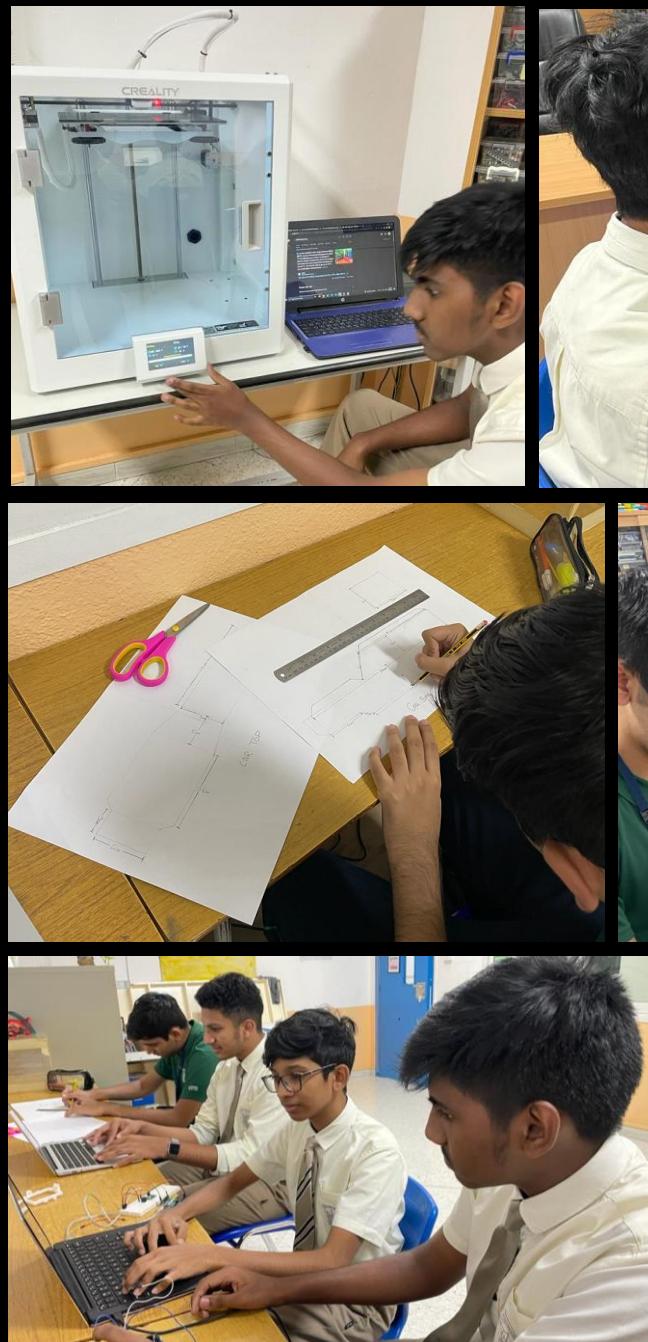
In order to control the towbar, there is an android app, made using MIT app inventor. There are options such as towbar control, headlight control, x and y tilt settings, and manual control of the towbar x gantry.

Arduino – Bluetooth Communication:

It communicates to the Arduino using a hc-05 Bluetooth module, which sends strings of data to the Arduinos serial

PROJECT MANAGEMENT

OUR WORKFLOW WITHIN THE TEAM



Team Roles

Within the first week, we solidified our roles and duties. We made sure our workflow was streamlined and gave ourselves deadlines to make sure our workflow runs smooth without any stops.

Workflow

We designed 13 prototypes of car designs within 3 weeks until we found our favorite candidate.

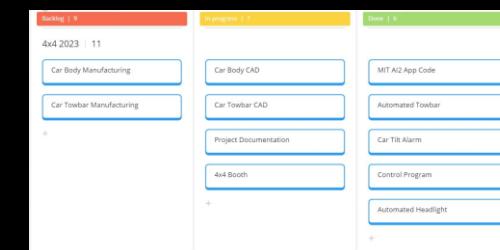
Alongside the designers, the manufacturing engineer was tasked to find the most innovative and efficient manufacturing methods.

Our Graphical Designer with the help of our Resource Manager, designed and curated content for our competition elements. Also was tasked to make the script for our Verbal Presentation

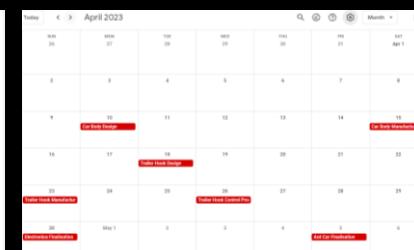
The coding was done by our proclaimed Coder and was given the occasional call for support for certain mechanisms needed to be programmed

Organization of team events

To make sure we were meeting deadlines, we used Google calendar with deadlines, we also used Miro to keep track of our progress.



Miro



Google Calendar

For our Computer aided software's which helped us prototype and design, we used:



Fusion 360



Blender



WhatsApp



Zoom

Constant meetings were organized to keep ourselves up to date for which we used:

OFF CENTRE

