

SHELL ECO MARATHON EUROPE 2016

Texas A&M University at Qatar
Mechanical Engineering – Class of 2016

Background and Overview

Shell Eco Marathon (SEM) is a world-wide competition that challenges students to design, build and test ultra-energy-efficient vehicles. Texas A&M at Qatar will be participating under Urban Concept Group in SEM Europe 2016 which will be taking place in London, UK from June 30 to July 3rd, 2016. The race track will be around the iconic of the Queen Elizabeth Olympic Park. The vehicle will be designed adapting this track relative to steering, braking, stability and safety. The team aims to complete 8 laps in less than 43 minutes to qualify for nominating TAMUQ's name to the lead at the competition.

Where?



About the Competition

URBAN CONCEPT

TAMUQ is participating under the category of UC i.e. designing an energy efficient vehicle that is closer in appearance to today's production type passenger cars

What is operating the vehicle?

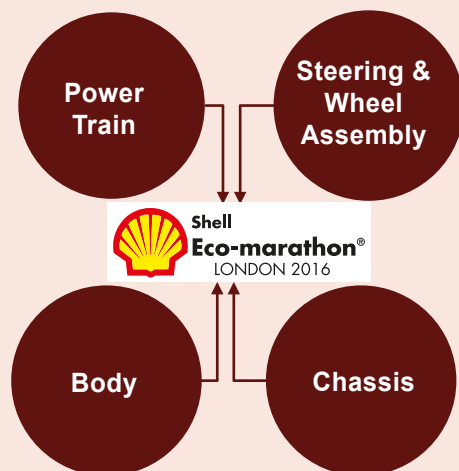
The team will be designing a battery electric vehicle



Requirement for Valid Attempt

Each team must complete 8 laps in a maximum time of 43 minutes with an average speed of approximately 25 km/h covering a total distance of 17.92 km between start and finish lines.

Sub-Systems



Highlights on Rules and Regulations

Vehicle Regulations

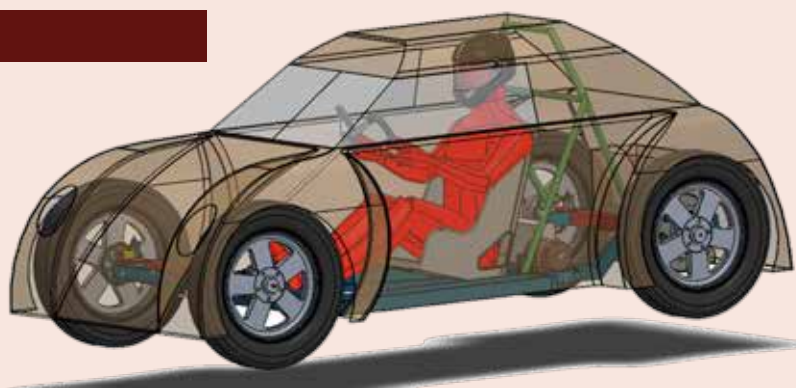
- Vehicle height must be between 100 cm and 130 cm
- Body width must be between 120 cm and 130 cm
- Vehicle length must be between 220 cm and 350 cm
- Wheelbase at least 120 cm
- UC vehicle must have exactly 4 wheels
- Chassis must be equipped with roll bar that extends 5 cm around the driver's helmet for full visibility

Driver Regulations

- Full compliance with safe driving and sporting rules
- Minimum driver weight = 70 KG wearing helmet and fire retardant clothing



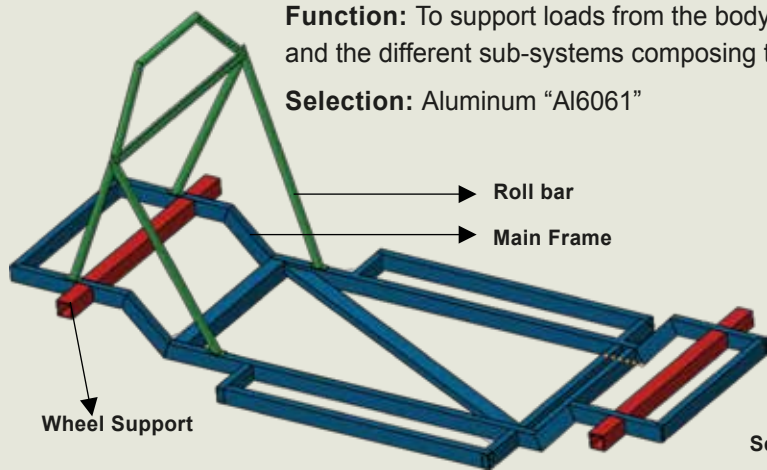
Car Assembly



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Chassis



Function: To support loads from the body, driver and the different sub-systems composing the car.

Selection: Aluminum "Al6061"



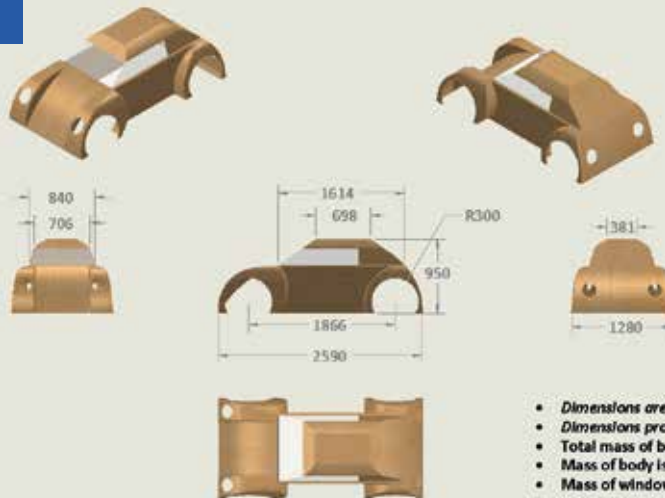
Body

Function:

To cover all parts of the driver such that he is completely isolated from contacting the ground

Selection:

- For the windows and windshield: Acrylic or Plexi-glass
- For the body: Wood or rigid polyethylene foam



- Dimensions are in mm
- Dimensions provided are rounded values
- Total mass of body was approximated to be around 5.6kg
- Mass of body is approximately 4kg
- Mass of window/windshield is approximately 1.6kg

Power

Motor

Function: To generate mechanical power

Requirements

- $P=1.4$ kW, $T=35$ Nm, $\omega=571$ rpm

Selection

- 48 VDC Brushless, 1.5 kW, 5600 rpm, 31.25 A



Battery

Function: To store energy

Requirements

$E=354$ Watt-hours

Selection

1000 W-h, 4.1 KG, 40 A



Chain and Sprocket

Function: To transmit mechanical energy from the motor to the wheel

Requirements

Gear reduction ratio of 9 to achieve optimum speed

T8F chain and sprocket to mesh with the motor sprocket

Minimal energy loss

Selection

112 teethed front and rear chain



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Steering, Wheel Assembly and Brakes

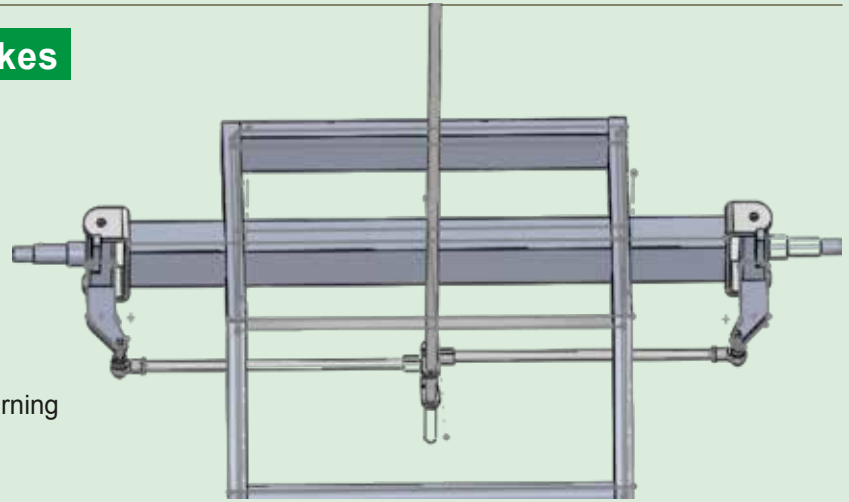
Steering and Wheel Assembly

Functions

- To transmit power to the ground
- To control the direction of vehicle motion
- To interface with the chassis, brakes and power train sub-systems

Highlights

- Simple and low weight Go-Kart steering system
- Ackerman geometry to reduce frictional losses while turning
- Michelin tires to fit 16x3.5 wheels



Front View of the Steering System

Braking System

Functions

- To slow down or stopping the vehicle when it is in motion
- To keep the vehicle stationary when it is parked

Highlights

- Tektro HD T525 mountain bike braking system
- Mineral oil hydraulic braking system
- High performance metal-ceramic brake pads
- Lock device mechanism

Requirements

- Single braking pedal of surface area 25 cm²
- Two independent braking systems operating in X form
- Brake disk and caliper for each wheel

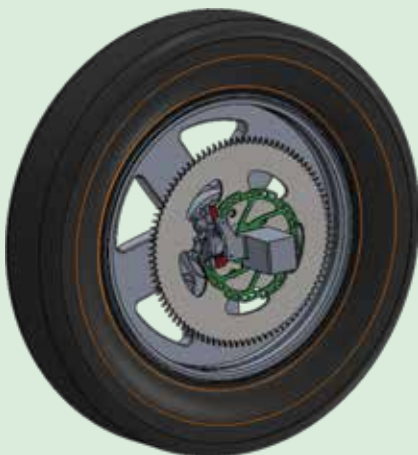


Brake caliper and rotors (disk) interface with the wheel assembly

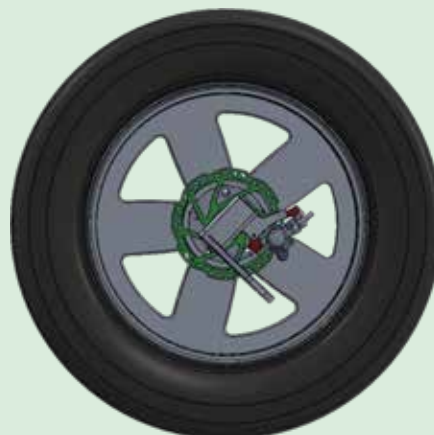


Handle interfaces with the chassis and changed into a foot brake-pedal

Wheel Assembly



Back Wheel



Front Wheel



Wheel Used