Engineering Projects Portfolio

CAD Designs

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LinkedIn Profile

GradCAD Page

GradCAD Group

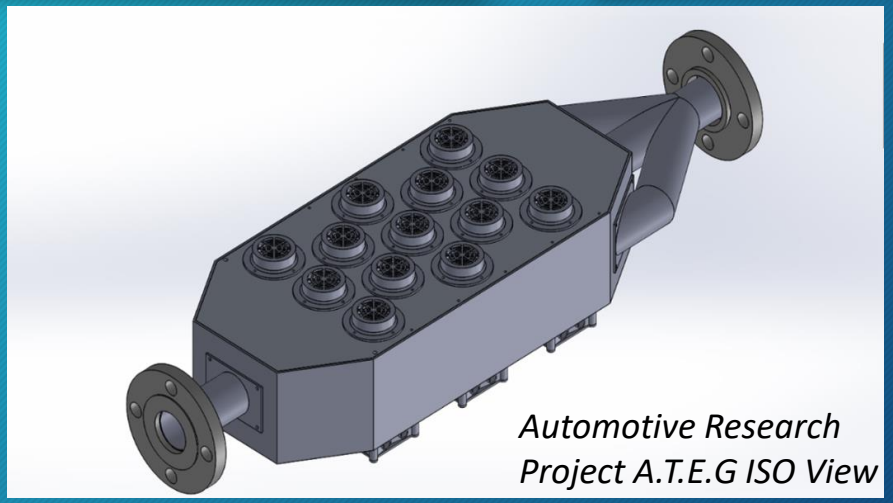
Contact Details

Introduction

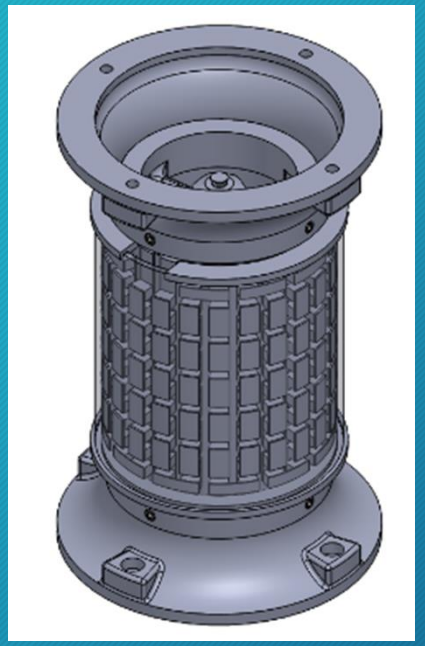
AIM: This portfolio aims to give the reader a greater understanding of the engineering design capabilities I have self-taught over the past five or more years. The timescale of each project varies from before starting my undergraduate degree to my master's. Each project has a goal and a synopsis of my challenges and how I overcame them. I'd be happy to go more in-depth about this portfolio if you're interested. So please don't be reluctant to get in touch with me. My contact details are on the front page.

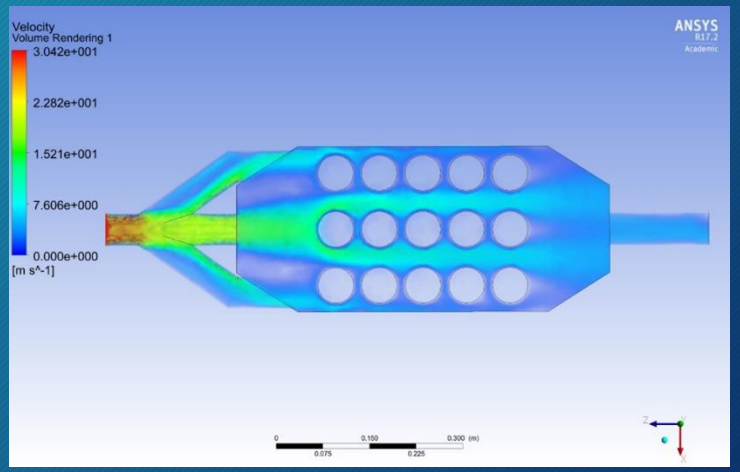
Automotive Research Project (EPQ)

In 2017, I first attempted to showcase my creative and project development skills at the age of 17, by independently authoring a 41 page automotive research report titled, “Is there a device that generates useful power from the waste energy of a car?” for an “Automotive Thermoelectric Generator” and then got it critiqued by the McLaren F1 design experts. This comprehensive project report includes detailed component designs, engineering calculations, results, a final prototype, links to all the preparatory research done for this project and a presentation outlining the challenges faced and my recommended solutions.



Automotive Research Project A.T.E.G ISO View

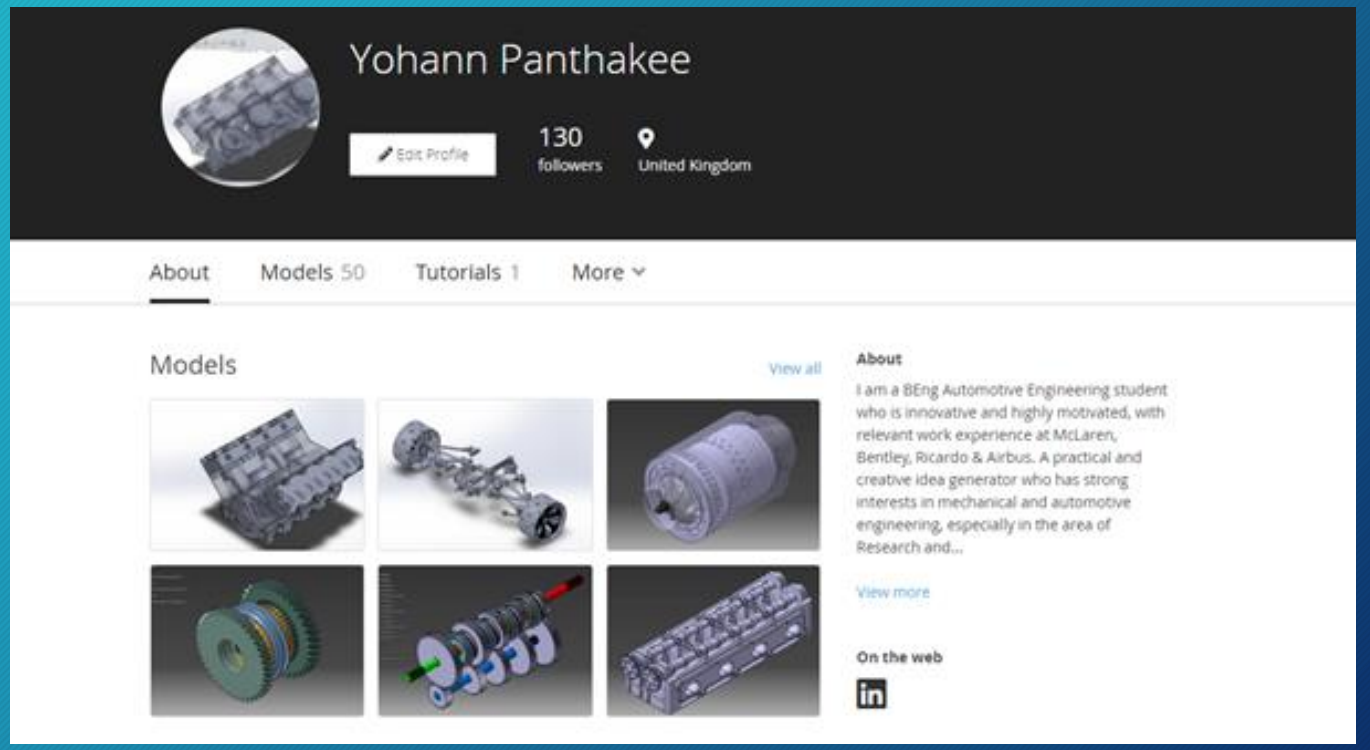




GrabCAD Portfolio

- **Online CAD Portfolio:-** This is a collection of most of my CAD models/assemblies. This also includes a specialist discussion group called “Cars and Automotive Design” which I have created. GrabCAD
- **Aim:-** To record the progress of my engineering skills using various CAD software though project-based learning. Through this group that I have set up, I am able to learn and gain more knowledge on specific /general engineering topics and the same is true for other like-minded engineering aspirants.

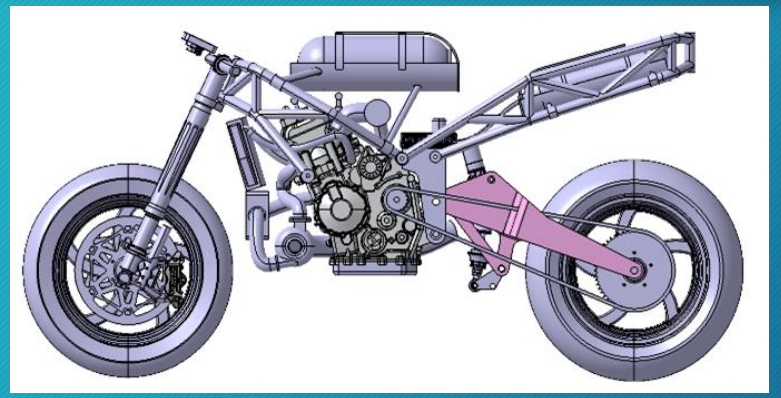
Main profile page Statistics	
GrabCAD score	4923
Total downloads	11976
Profile views:	3839
Followers:	221
Number of Models:	50
Member since:	January 01, 2016
Group Statistics	
Members	8006
Discussions	169
Created	April 12, 2018

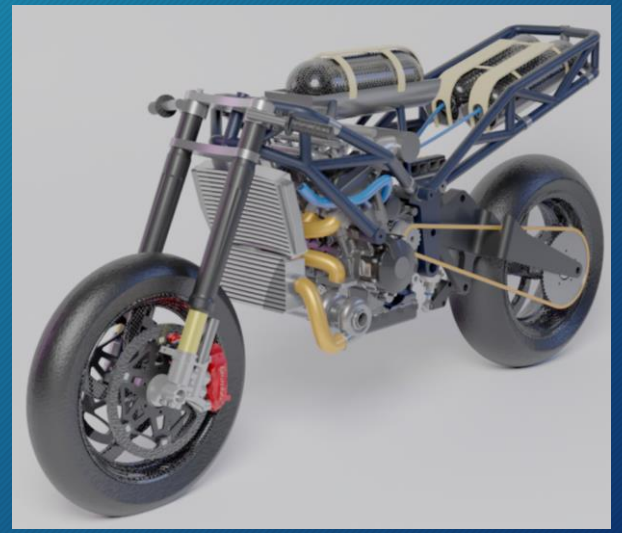


Project: Masters Group Design Project

Alternate Fuel Endurance Bike

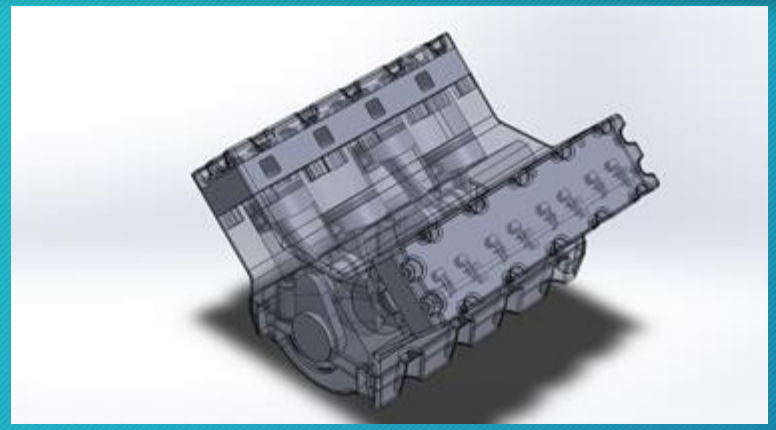
- **Software:** CATIA V5
- **Aim:** In teams of 11 design and present an endurance bike that runs on alternate fuel source. Project timeline 3-months including a final presentation to industry.
- **My Role:** I was the Lead design engineer and was my role to collect all the different design requirements from the whole team and develop the CAD model for the Team. I had chosen CATIA V5 as my software of choice and its tools were perfect for this application.
- **Design Considerations:** When working with so many people and designing something as complicated as a whole bike, organisation was key to the success of the team. Being the leader, It was my responsibility to design the bike with the intention of being updatable as over the project there were many updates needing to be implemented to improve the bike. As a result I would often work with my team and we developed a plan of action when designing each part/assembly.
- **Awards:** Through the hard work of the whole team we won the best presentation award which included the development of the bike as a whole



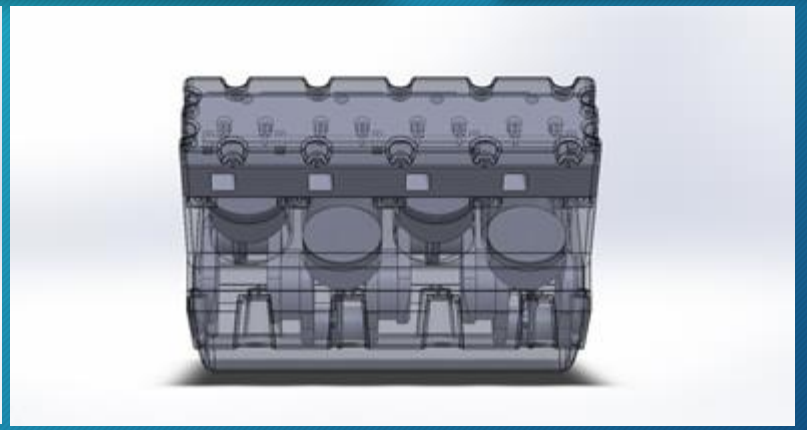


Project: V8 Engine

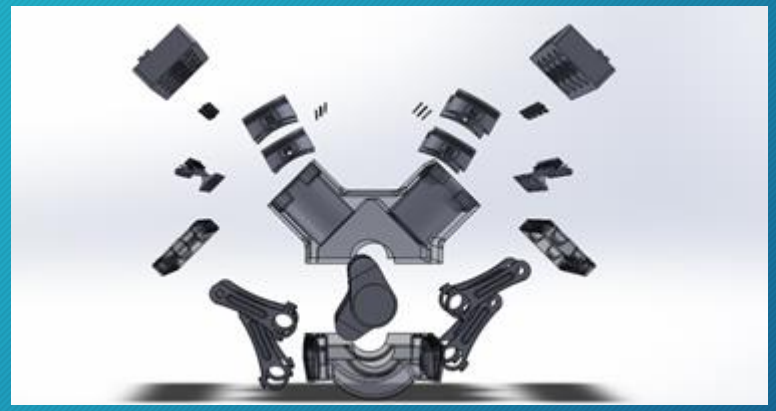
- **Software:** SolidWorks
- **Aim:** To model a V8 Engine with all its components and an assembled final product. The V8 Engine was modelled based of my own research off the internet.
- **Challenges:** The issues I had faced included finding initial rough dimensions of the V8 engine as there were very few completed technical drawings accessible on the internet. This also posed an issue as finding out how each component is assembled was difficult.
- **Solution:** To solve these issues, I took a 180-degree approach and studied how each component works in the engine. By using spatial visualization, I was able to piece together each of the components in my mind to see how they could fit together.



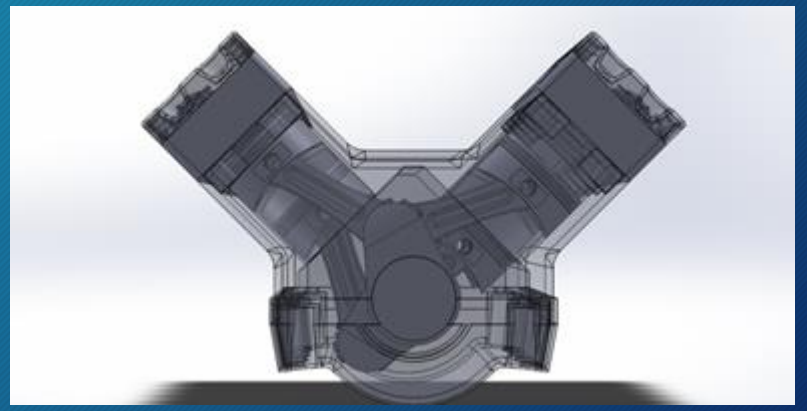
V8 Engine ISO View



V8 Engine Side View



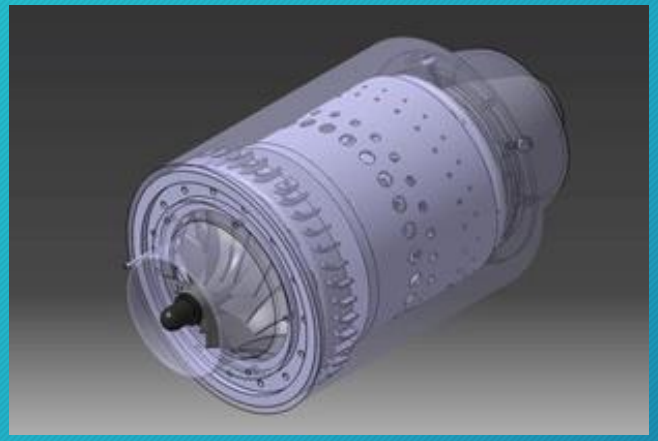
V8 Engine Exploded View



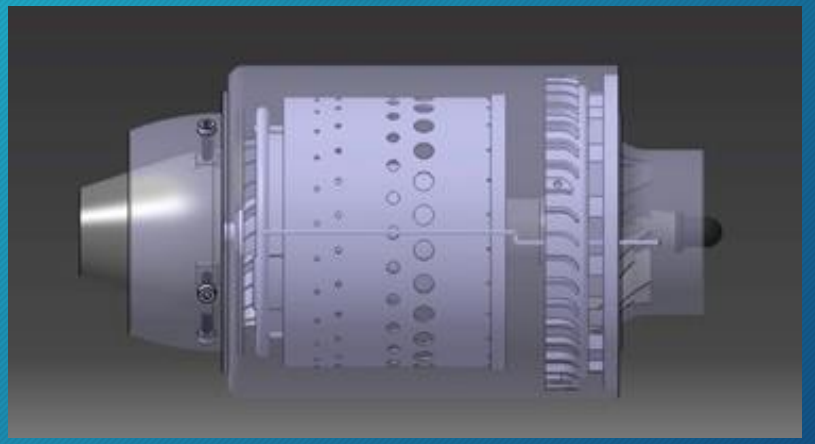
V8 Engine Front View

Project: KJ-66 Micro Turbine Jet Engine

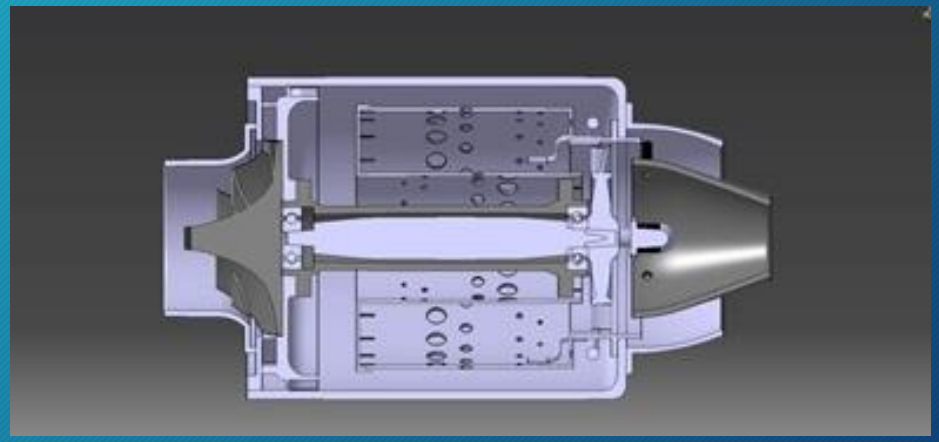
- **Software:** CATIA
- **Aim:** To model a micro Turbine Jet Engine with all its components and an assembled final product. The micro Turbine Jet Engine was modelled based of my own research off the internet.
- **Challenges:** The issues I had faced was modelling the diffuser, NGV and fuel lines. This was difficult because of the complex nature of the components.
- **Solution:** To solve these issues, I did some more research online into "Generative Shape Design (GSD)" and by using this, I could model the complicated tubular shape for the fuel lines. For the NGV and the diffuser plate, I pre-planned my steps before attempting the design and this helped me a lot.



KJ-66 Micro Turbine Jet Engine ISO View



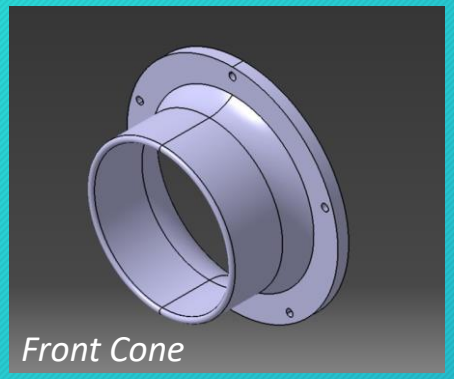
KJ-66 Micro Turbine Jet Engine Exploded View

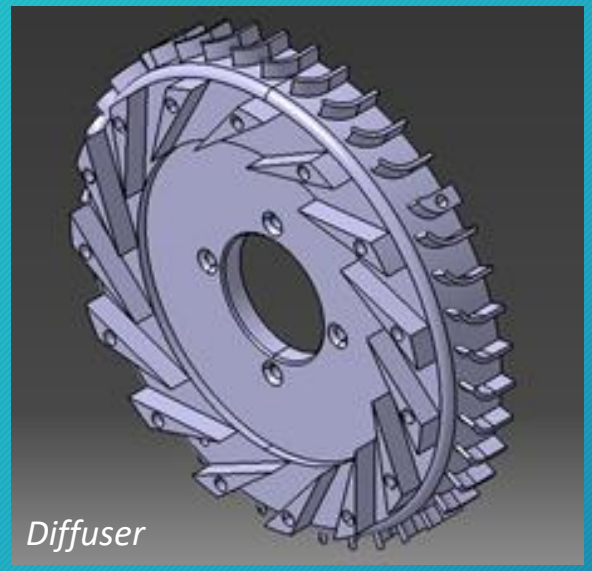


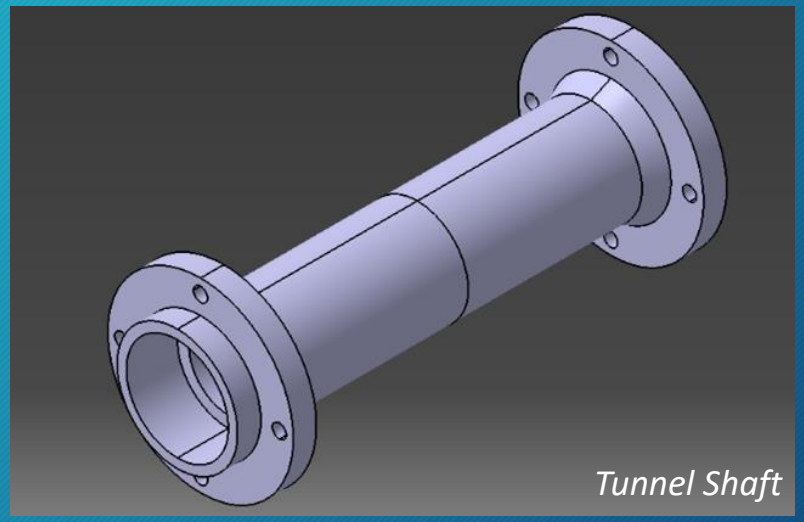
KJ-66 Micro Turbine Jet Engine Side View

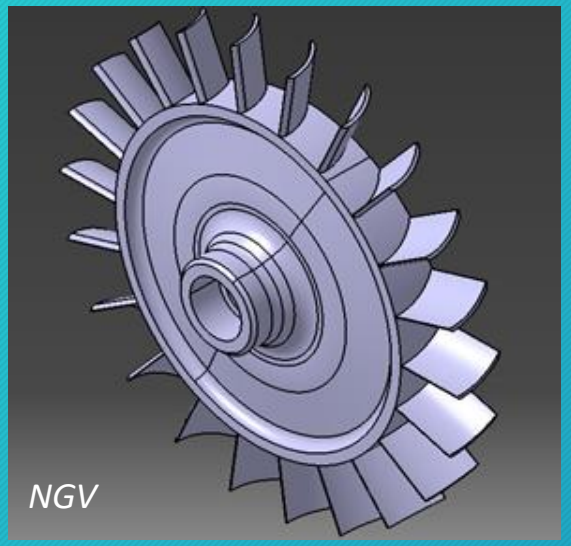
Project: KJ-66 Micro Turbine Jet Engine

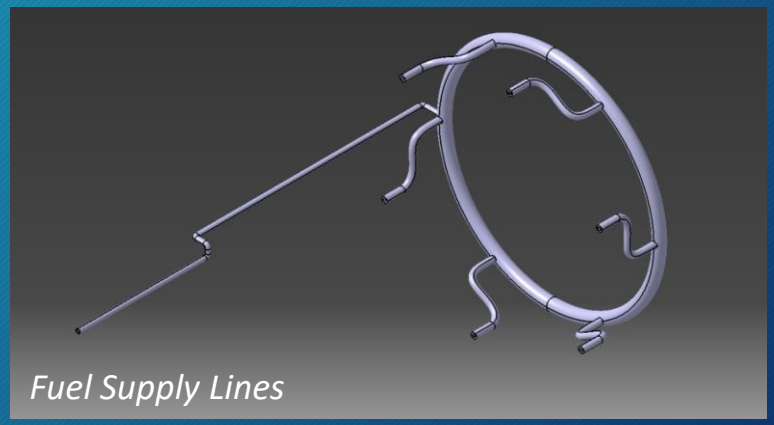
A Few Engine Components


Front Cone


Diffuser


Tunnel Shaft


NGV


Fuel Supply Lines

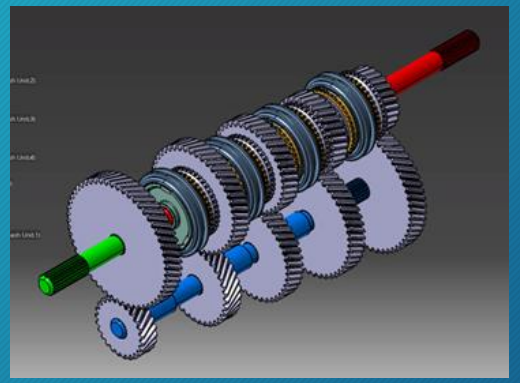
Project: 5 Speed Transmission

- **Software:** CATIA, Matlab, Excel

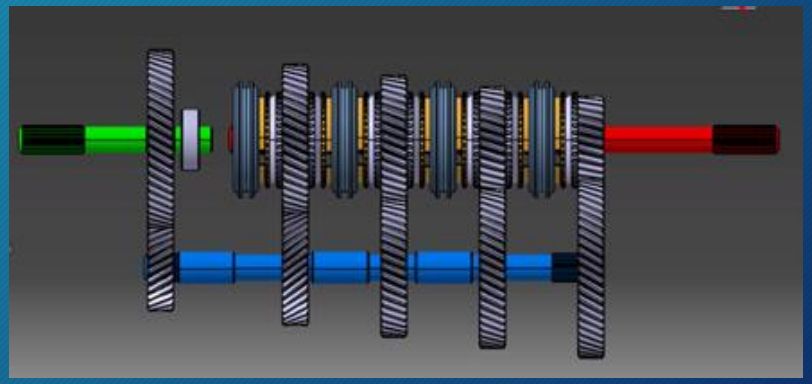
- **Aim:** To calculate transmission ratios using “MATLAB” and create graphs of optimum shifting times, distance travelled in each gear and the respective vehicle speeds. Used the advanced parametric functionality of CATIA in conjunction with the above-generated data to automate the generation of the Helical and Spur Gear 3D models.

- **Challenges:** There were quite a few challenges that I had faced when doing this project; though, the main one was the MATALB programming. This was the first major project I had done in MATLAB as before starting this project, I had only been exposed to some MATLAB at university. Therefore, I taught myself all the various codes of the program such as functions, non-linear equations, plots, loops etc. Another challenge I faced was learning all the theory behind the calculations.

- **Solution:** The method I undertook to learning all the codes for the program was to use a project-based approach where I looked up tutorial videos on the general area of what I was trying to achieve, then created a small dummy program to get the layout of the steps for the codes and finally applied it to the main program. Using this method for all the different parts of the code i.e. functions, nonlinear equations, plots, loops etc., I significantly improved my coding skills which I can now apply to future projects. The other issue was about understanding the background theory which I got from a combination of research papers and other books on the subject. However, the main source of my information was from my GrabCAD discussion group that I had set up, as I was able to confer with knowledgeable people on the topic, ask the relevant questions and understand a lot more about this subject.



5 Speed Transmission ISO View



5 Speed Transmission Side View

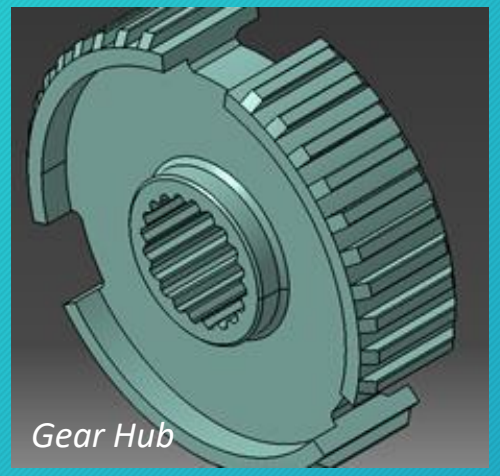
Project: 5 Speed Transmission

A Few Assembly Components

Sliding Sleeve

Synchroniser Ring

Blocker Ring Synchromesh Unit

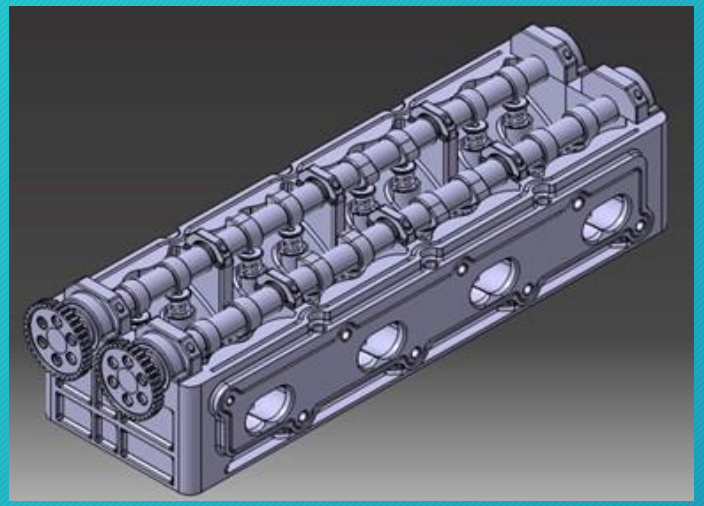


Gear Hub

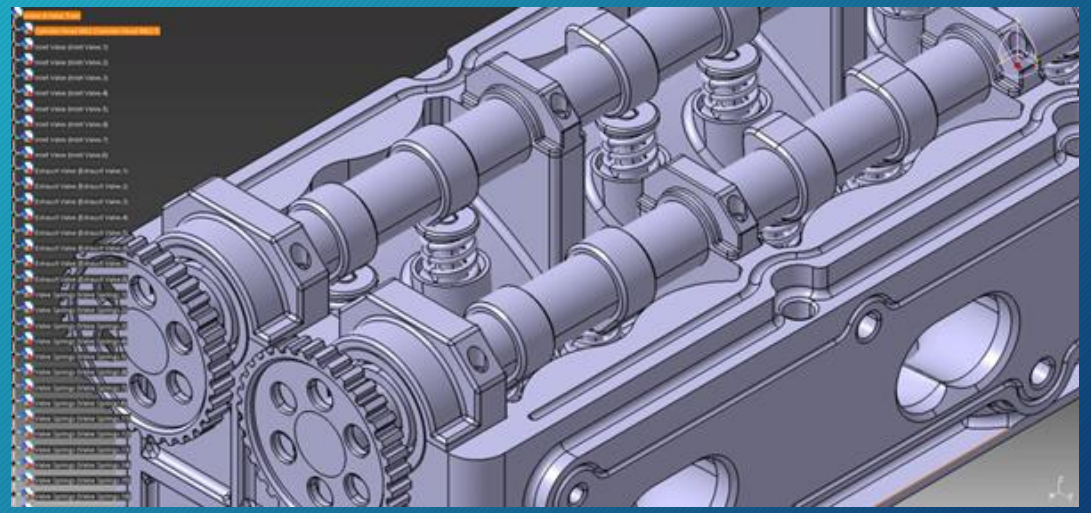
Parametric Helical Gear

Project: Inline 4 Valve Train

- **Software:** CATIA
- **Aim:** To model an Inline 4 Valve Train with all its components and with an assembled final product. The Inline 4 Valve Train was modelled based of my own research off the internet.
- **Challenges:** The main challenge I had faced was regarding how to approach designing such a complicated component.
- **Solution:** Pre-planning was the key to modelling the Inline 4 Valve Train efficiently. Also, the skills I learnt from the KJ-66 Micro Turbine Jet Engine project where I used GSD was very helpful when designing the internal inlet and exhaust ports.



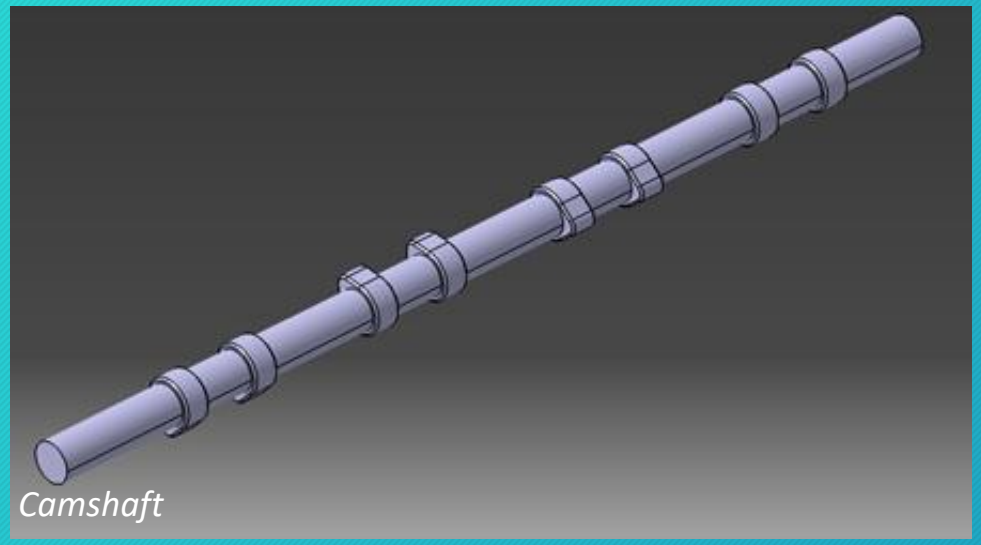
Valve Train Assembly ISO View



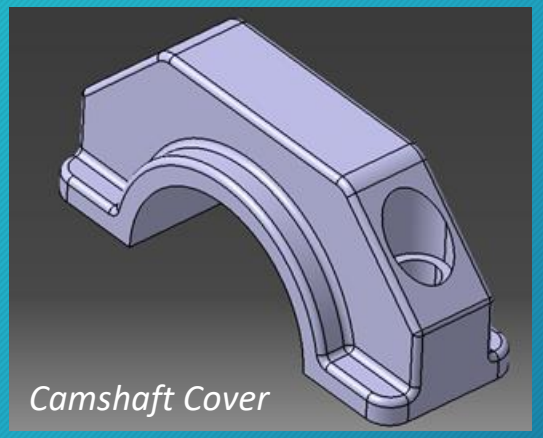
Valve Train Assembly Side View

Project: Inline 4 Valve Train

A Few Assembly Components

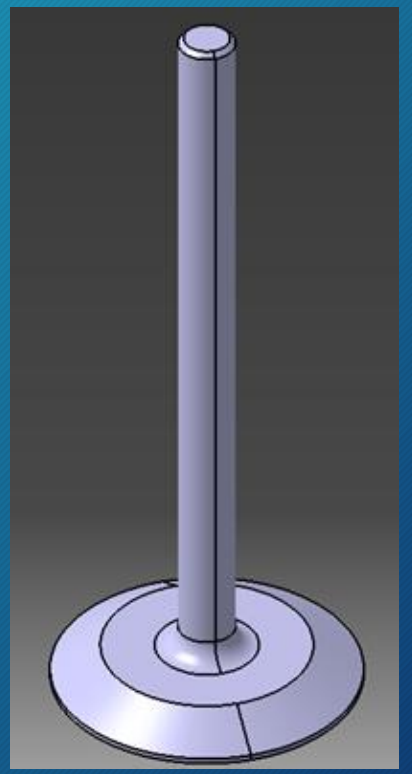


Camshaft



Camshaft Cover

Valve Spring



Tunnel Shaft

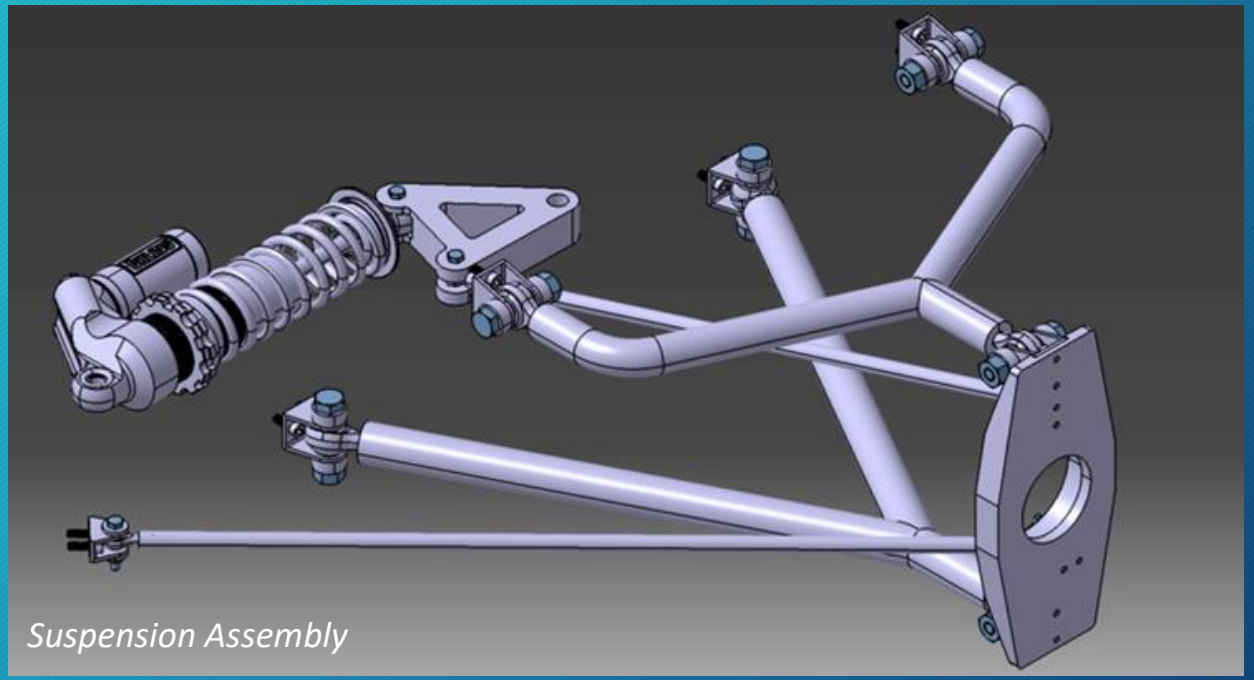
Project: Suspension Assembly

- **Software:** CATIA

- **Aim:** To model a Suspension Assembly with all its components and with an assembled final product. The Suspension Assembly was modelled as part of our university course work project. The aim of the project was to design and model an autonomous vehicle for a disabled person.

- **Challenges:** The main challenge that I faced was the concentric alignment of all the components in the assembly. Since one of the main criteria in the design brief was to have an assembly which can move in the CAD assembly, it was vital that every component was lined up perfectly.

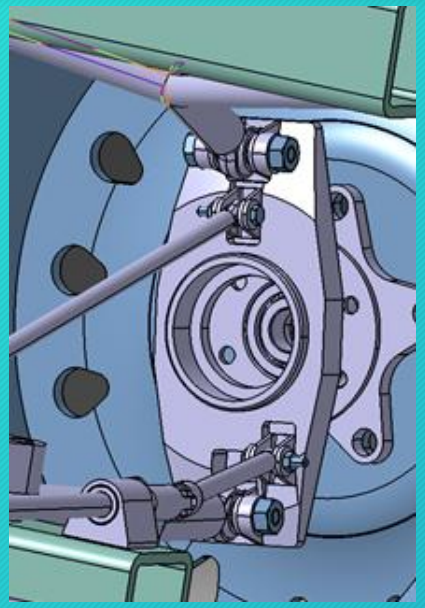
- **Solution:** Pre-planning was the key to modelling the Suspension Assembly efficiently. Also, the use of a 2D CATIA sketch allowed me to play with the dimensions and accurately produce the length of the control arms.



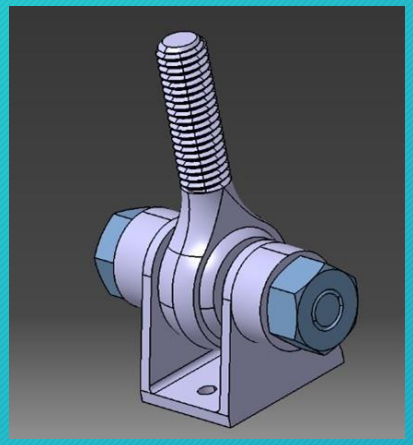
Suspension Assembly

Project: Suspension Assembly

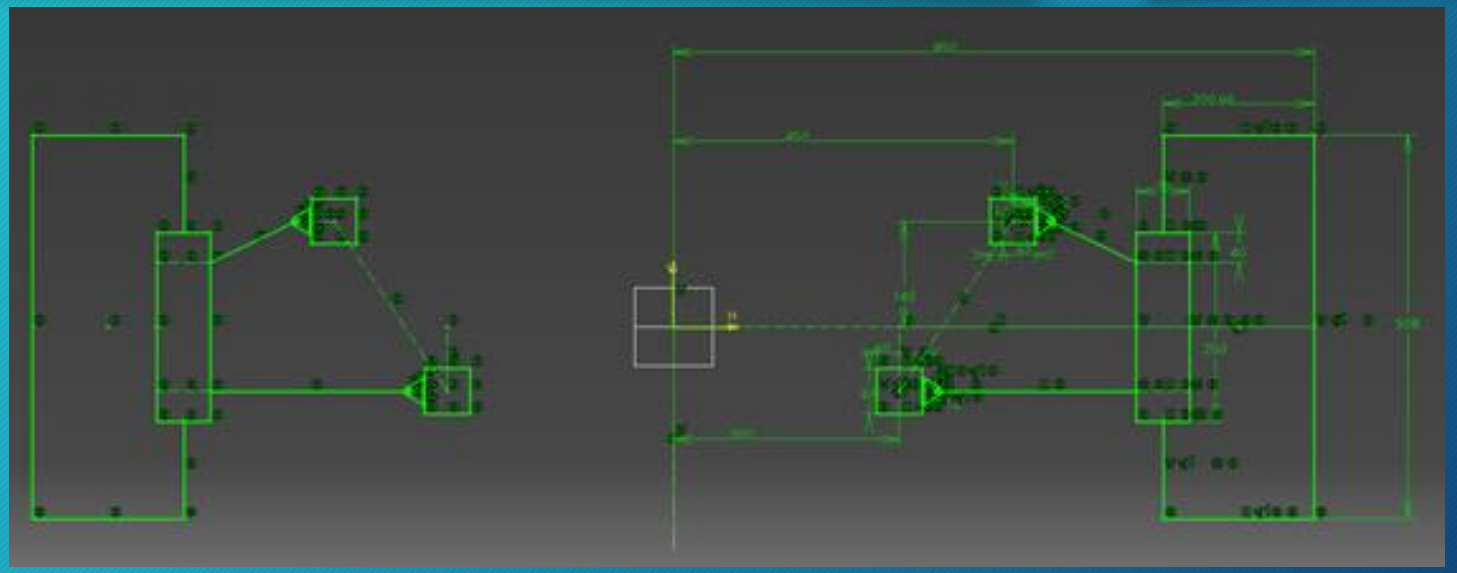
A Few Assembly Components



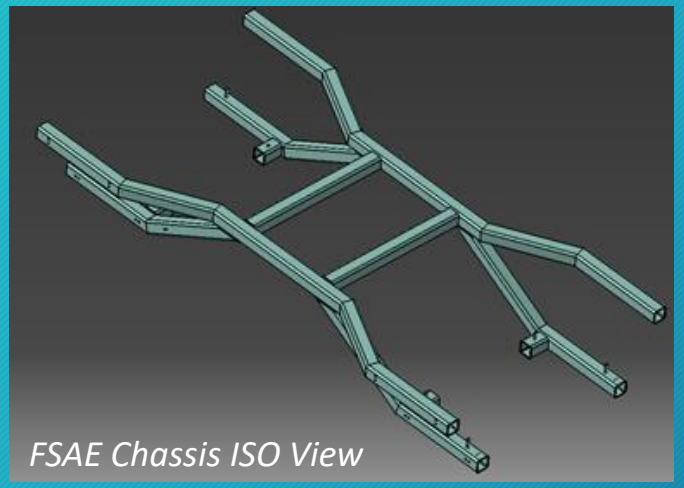
Suspension View



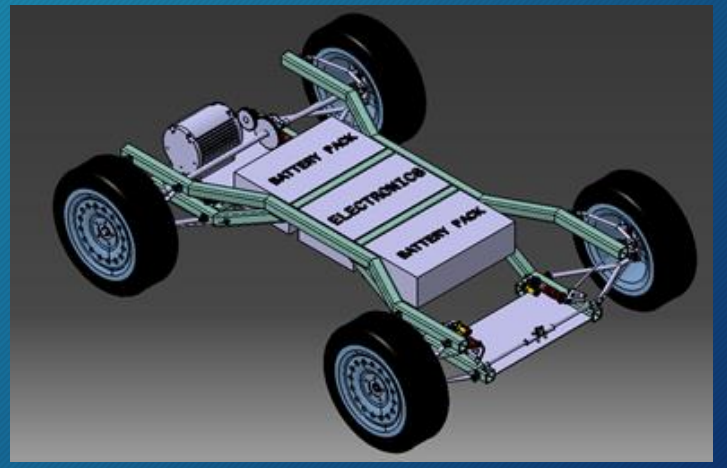
Suspension Bracket Assembly



2D Suspension CATIA Sketch



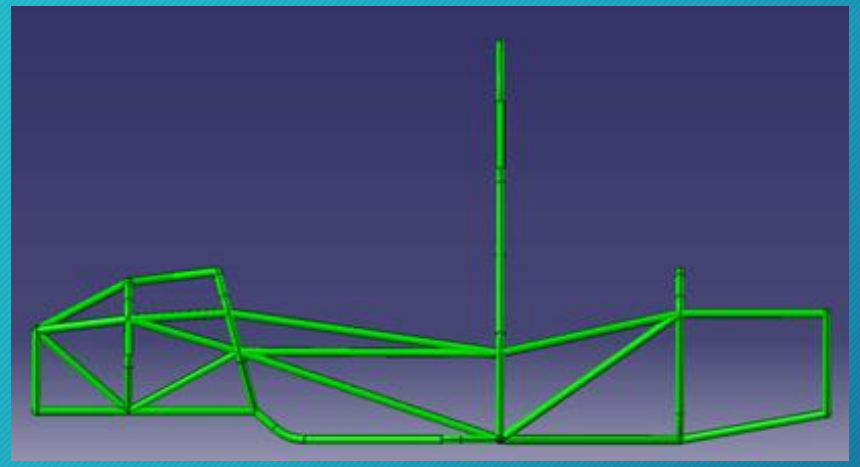
FSAE Chassis ISO View



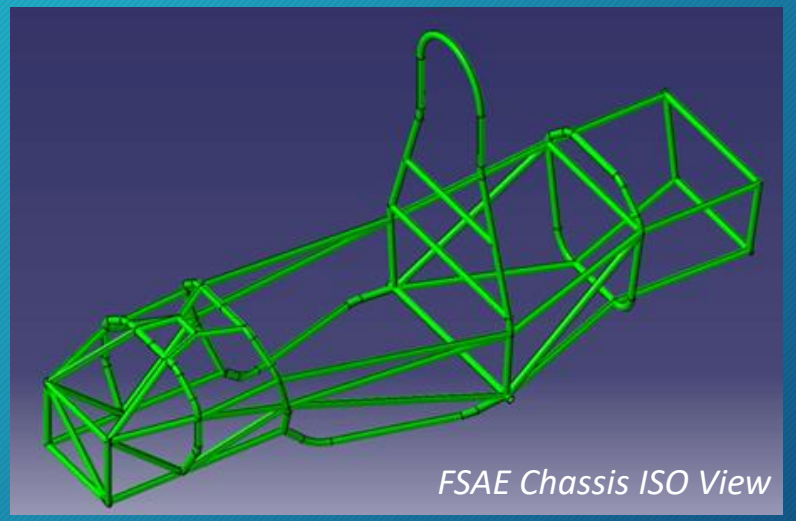
University Project Complete Assembly

Project: FSAE Chassis

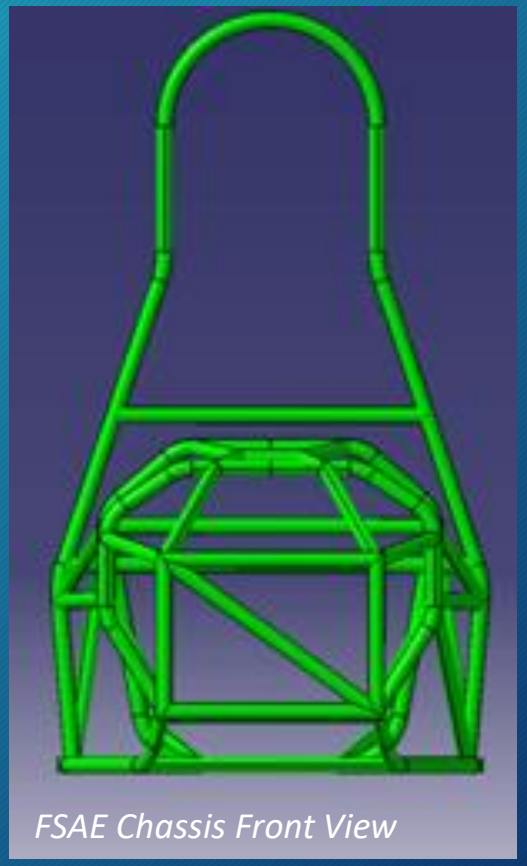
- **Software:** CATIA
- **Aim:** To model a FSAE Chassis with all its components and with an assembled final product. The FSAE Chassis was modelled based of my own research off the internet.
- **Challenges:** The main challenge that I faced was learning how to model a chassis using GSD Sweeps, Trim and to thicken the 2D surfaces.
- **Solution:** I followed a useful online tutorial on creating a 3D sketch using lines and points. With this, I sketched the chassis layout and applied the sweep to all the line segments. The trimming of the surfaces was new to me and I learnt that the trimming order is vital for a well-designed model.



FSAE Chassis Side View



FSAE Chassis ISO View

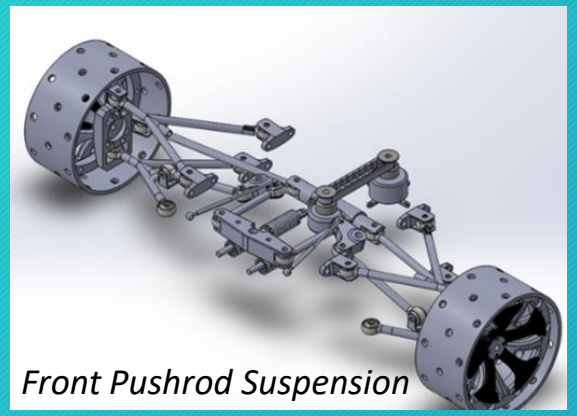


FSAE Chassis Front View

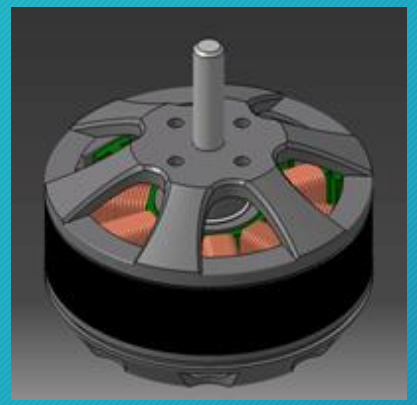
Project: FSAE Chassis

A Few Assembly Components

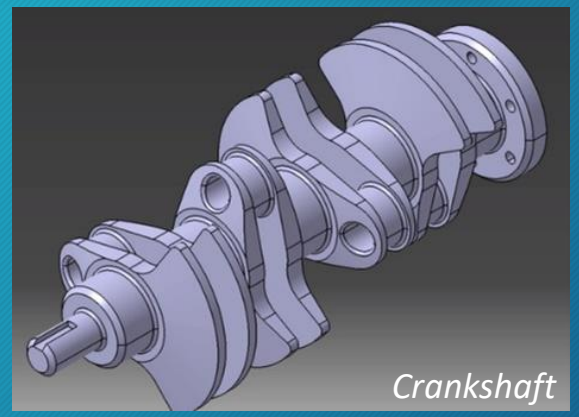
Clutch and Flywheel



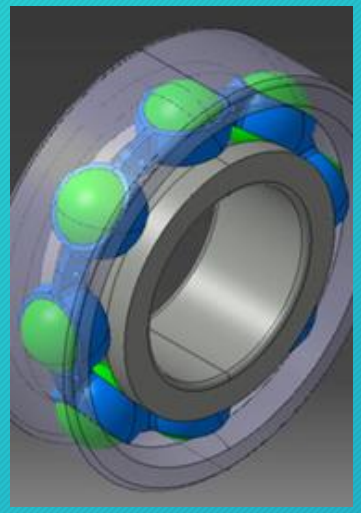
Front Pushrod Suspension



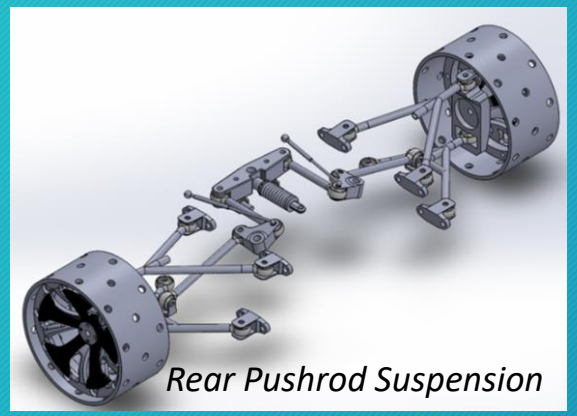
Brushless DC Motor



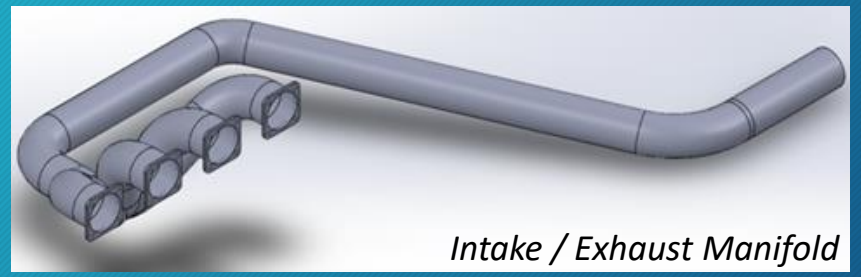
Crankshaft



Rolling Element Bearing



Rear Pushrod Suspension



Intake / Exhaust Manifold

CFL Lightbulb