



CASE STUDY /

# Ansys + IIT Bombay Racing

“The comprehensive suite of engineering simulation tools provided by Ansys helped us win the Engineering Design event at Formula Student 2020 by transforming our design ideas into reality. With the use of Ansys, our team was able to reduce the weight of the mounting structure by 40%. In a field like motorsport where each gram of the car’s weight matters, Ansys’ Structures package is an indispensable tool.”

**Prasanth Kumar Murari**

Design Engineer / IIT Bombay Racing

## Design of a Lightweight Wing Mounting Structure Through Topology Optimization

IIT Bombay Racing is India's premier Formula Student team and hence the expectations are always high. A team of motivated design engineers work together in a fast-paced environment to deliver the best components for their subsystems, in-line with the team's yearly design goals. Reliable simulation software plays a key role during any engineering product development cycle; hence, we chose Ansys.

### / Challenges

The development of a lightweight mounting structure for a Formula Student car's rear wing comes with its own set of challenges due to the position of the wing relative to the chassis. Despite using composite materials to make these parts, there is always room for reduction in the component weight through structural simulation. An intelligent weight-optimization tool, with an ability to import parts from Solidworks, was needed.

### / Technology Used

- Ansys Mechanical

### / Engineering Solution

- Static structural simulation was done on the first iteration of the design, and stress contours in the structure were visualized. This made us realise that there was a lot of unnecessary weight in our design.
- The topology optimization analysis system was the link to the project. Exclusions and goals (weight) were defined for the optimization.
- The solution was run, the result was exported and refinements were done in the design.

### / Benefits

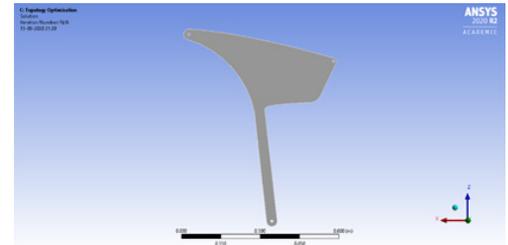
The aim of Formula Student is to create the next generation of engineers by providing a hands-on, engineering product design experience. A cost-effective, yet efficient way of testing the products for practical application is through simulation.

Ansys Mechanical has played a key role in transforming our design ideas into reality, greatly simplifying the analysis and optimization processes. Specifically, our team was able to create a mounting structure that was 40% lighter than the original design.

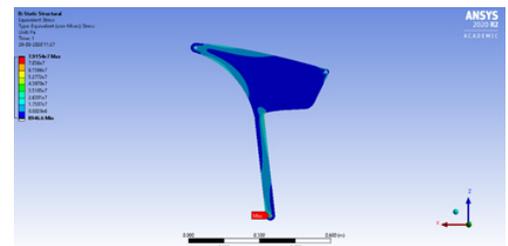
Winning the Engineering Design event at Formula Student 2020 was a herculean task, but not an impossible one when we have tools like Ansys Mechanical at our disposal. We can confidently say that the design and development process with help of Ansys simulation solutions made the team's student engineers ready to work in industry.

### / Company Description

IIT Bombay Racing is a Formula Student team based at the Indian Institute of Technology Bombay. Established in 2007, the team has taken part in several competitions like FSAE Michigan, BAJA SAE and Formula Student UK through the years. The team now designs and manufactures an Electric Vehicle to participate in Formula Student UK, Europe's most established educational engineering competition.



The initial design of the mounting structure was imported into Ansys workbench.



Mesh generation was done and boundary conditions were defined for the problem. The solution was run and stress contours were visualized.



Topology optimization was performed on the design, and the result was exported into SolidWorks to make refinements. A structural simulation was re-run on the refined design to check for safety factor.



The final design, which is 40% lighter than the first design.



The designed structure is integrated into the rear wing assembly; inserts and stepwashers were made to complete the design of the rear wing.

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