

**REPORT ON**  
**PROJECT BASED LEARNING**

**Academic Year: 2020-2021**

**Class: Third Year (Mech/Auto)**

**Semester: VI CBCGS**

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The department of Mechanical & Automobile engineering has floated the problem on developing virtual experiments of their choice using software with which they are acquainted for the PBL.

**DESIGN, MODELING AND ANALYSIS OF THE  
MAIN BODY FRAME FOR A TYPICAL APPLICATION**

Students are required to perform structural analysis (design calculations, 3D modeling, and finite element analysis), followed by optimization of shape/material/dimensions as related to ergonomics &/or aerodynamics, of the main body frame for any one of the following applications:

1. Bicycle
2. Tricycle (seated) for a baby
3. Gymnasium Exercise Equipment (viz., Workout Weight Stand, Dumbbell Stand, Barbell Stand etc.)

Mechanical Engineering student groups are free to select any one of the above three applications listed, while Automobile Engineering student groups are advised to select any one of the Bicycle or Tricycle applications only.

**Detailed study with respect to the following parameters is to be carried out.**

1. Loads (dead and live, static and dynamic/shock/impact) acting on the main frame
2. Standard materials used for the frame
3. Aerodynamics
4. Ergonomics

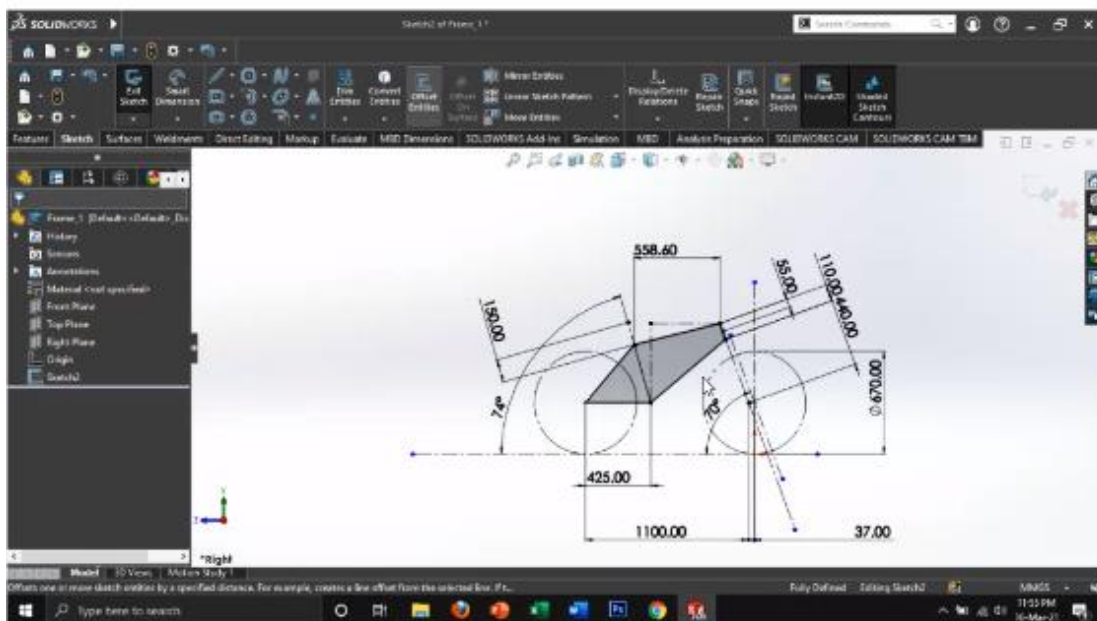
5. Calculations (manual) of strengths of frame
6. Manufacturing methods used
7. Optimization studies of shape/dimensions/material

(to be conducted after complete structural analysis of the existing frame). Student groups are advised to conduct simulation studies (at least one or two iterations) on optimization parameters, and come up with an improvement in the savings of material, manufacturing, or improved aerodynamics defined by simulated drag coefficients etc.

### **Video Link of one of the solution**

[https://drive.google.com/file/d/1MYHB\\_H9dyt8XwAhbO5rjkiqP3viEWMP/view?usp=sharing](https://drive.google.com/file/d/1MYHB_H9dyt8XwAhbO5rjkiqP3viEWMP/view?usp=sharing)

### **Snapshots of the PBL Evaluation**



# ANSYS FEA ANALYSIS

