project Milestone 1 description

Milestone objectives: **(submission deadline: 8th Oct. 11:59 pm)**

- Each student is assigned a mechatronic industrial system according to the project assignment list posted on the CMS.
- Understand and describe the functionality and the operation of the assigned project.
- Design a full replica of the 3D mechanical design in SolidWorks similar to the hardware when implemented.
- Revise, learn, and apply mechanical design concepts studied before in a full mechatronics system.
- Document professionally needed documents and files ready for manufacturing.

Milestone Deliverables:

- A technical report (using the uploaded project report template on the CMS), the report MUST include the following: **(follow instructions of this milestone description)**
    - Project description. (5 marks)
    - 3D views of the implemented mechanical design on SolidWorks. (5 marks)
    - Mechanical component list. (10 marks)
    - A Design For Manufacturing (DFM) report + Technical 2D drawings of the mechanical parts with dimensions. (20 marks)
    - A Design For Assembly (DFA) report for the whole mechanical system should be done. (10 marks)
    - Pneumatic position-step diagram. (10 marks)
- 3D mechanical design on SolidWorks following the instructions in this description. Any additions can be added or to be asked by their project supervisor to add. (60 marks)
- Upload the required deliverables through this google form, submit as a ZIP file. The ZIP file includes a PDF report with the above requirements and a ZIP file of the SolidWorks design. Submission link: https://docs.google.com/forms/d/e/1FAIpQLSdhmsUYYDwSu1SGfMGESQxmUSD0Wse6lXmXVmZ5sYtLqZNgxw/viewform?usp=sharing&ouid=110880056856329240657
- You can attend a one to one follow up on 8th of October during 4th and 5th. Detailed timings for each student will be announced soon with office hours scheduled.

Milestone Description:

1. Project description (MUST be first step for brainstorming):
    a. Describe the functionality of the project.
    b. Describe the workpiece that will be transferred and moved inside the assigned system in terms of dimensions and color (if needed).
    c. Describe the operating sequence of the assigned industrial process from the input stage till delivery stage.

    d. The assigned project description only covers the main operation of the mechatronic system. Extra needed components (cylinders, valves, sensors, and etc.) for both input and delivery stages MUST be added for full operation of the system.
    e. Take time in understanding the mechatronics system requirements and DO NOT JUMP INTO THE 3D DESIGN DIRECTLY ☺.

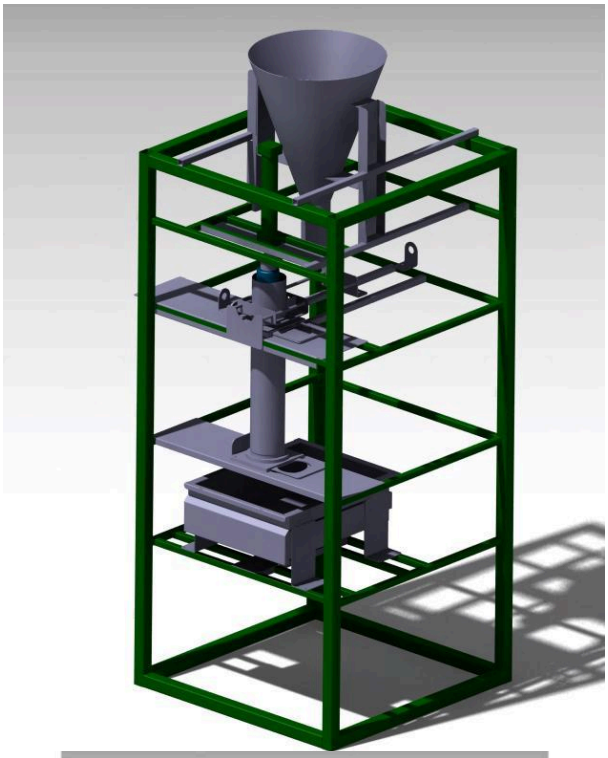
2. SolidWorks 3D mechanical design guidelines:
    a. The 3D mechanical design to be implemented on SolidWorks MUST be similar to the real hardware when implemented.
    b. All components MUST be distinct and obvious, so that it can be differentiated when seen.
    c. You MUST take into consideration:
        i. The frame design MUST be ground seated.
        ii. All components MUST be contained inside the frame.
        iii. The size of the project relies on the size of the frame, therefore the size MUST be reasonable. The size of the frame depends on the size of the cylinders used and the size of the workpiece.
        iv. A control panel for system control will be added to the mechanical design in Milestone 2.
        v. The designed machine MUST include three main stages (input stage - main operation stage - delivery stage). For example, a Can crusher can have an input stage as a magazine for can storage, then an operation stage for moving the can and crushing it, finally, delivery stage moving the can to a crushed can storage box, then starting the process all over again.
        vi. Cylinders and sensors placement and orientation with respect to the travel path of the workpiece.
        vii. The workpiece MUST be always tracked during its flow inside the developed mechatronic system either through the

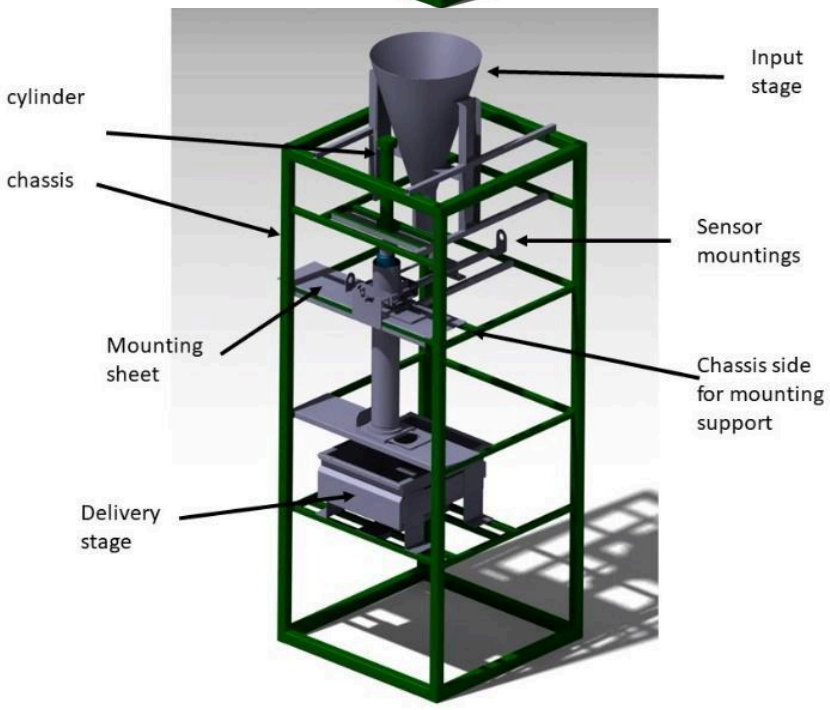
extension/retraction reed switches of the cylinders or additional sensors.

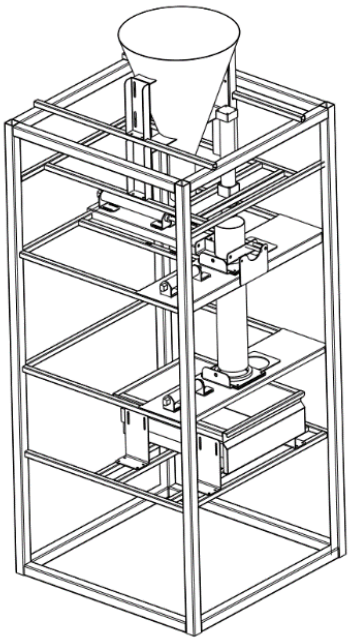
viii. The use of mechanical bearings in case of rotating shafts and rails in case of translational motion of the objects.

ix. Any layer of the machine MUST be supported by the machine chassis, upon which you can mount metal sheets used to mount the mechanical parts of the system on.

3. Images of a real hardware compared to a SolidWorks design:







3. Design For Manufacturing (DFM) report:

Design For Manufacturing concept: Mechanically designed parts for the assigned mechatronics systems MUST take into consideration the manufacturability of the part while designing.whole

DFM report: it MUST include the manufacturing process of each part and how it will be manufactured in addition to its 2D drawings. For example, a mounting sheet that will be used for mounting a cylinder. It MUST be designed with metal sheet features in SolidWorks, where material of the sheet, locations of holes, location of bends, etc. MUST be specified.

4. Design For Assembly (DFA) report:

Design For Assembly concept: This concept focuses on making the mechatronics system easy to be assembled and each part in it is accessible for later operations.

DFA report: it MUST include how the mechanically designed mechatronics system is reliable enough and supports efficient assembly through an exploded views of the subassemblies implemented within the whole system.

5. Mechanical component list:

A list MUST be included to count the number of used components including:

- Cylinders
- Valves
- Pneumatic components (pneumatic tubes, T-connection, etc.)
- All mechanical components including (rods, bearings, brackets, nuts, bolts, etc.)
- All other purchased components.

6. Pneumatic position-step diagram:

A diagram that explains the operation of the whole circuit operation including cylinders and their operation sequence with steps operated by the sensors used.