

Personal Protective Equipment to Doctors,
Health care workers, Police and sanitation workers for
Corona virus (COVID-19) Pandemic protection



(DEEMED TO BE **UNIVERSITY**)



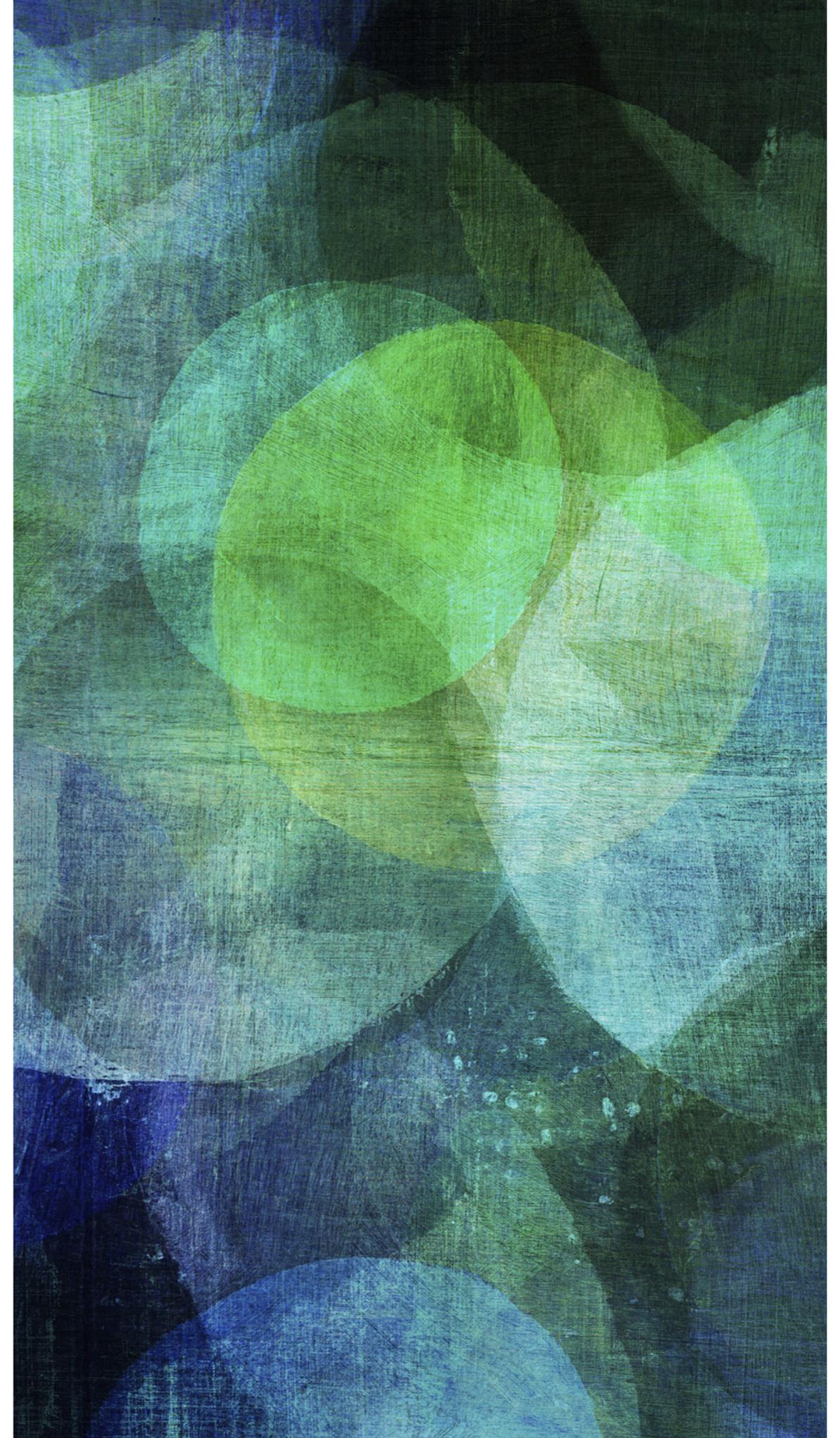
KL Deemed to be University, started as a private engineering college in 1980, declared autonomous in 2006, Deemed university in 2009 and has a rich 40 years of experience in research, academics and innovations. University faculty, students have filed 210 patents and have 7500 + publications in SCOPUS and SCI indexed journals and faculty members are undertaking sponsored research projects from various ministries of Govt of India, worth over INR 21 crores. The university 1150 + faculty of them 500+ are faculty with a Ph.D degree. University houses various research based and special labs and centers of excellence fully in house funded and established with technology support and collaboration of relevant industries, and has a self funded central Fabrication lab integrating Design, Manufacturing through 3D Printing and CNC machines and also integrating IoT and AI into the, thus designed products.

About PPE's:

At KL Deemed to be University, using the state of art infrastructure of laboratories and centers of excellence in different Engineering departments like Mechanical Engineering, Electronics and Communication Engineering, Computer Science Engineering, Bio Technology. Using all these resources department of Mechanical Engineering has developed Personal Protective Equipment (PPE's) for Doctors, health care workers, Police and sanitation workers.

As part part of this initiative, the department has developed 3D printed prototypes of :

- Face shields
- N-95 masks integrated with face shield
- Portable / Mobile Ventilator or Emergency ventilators

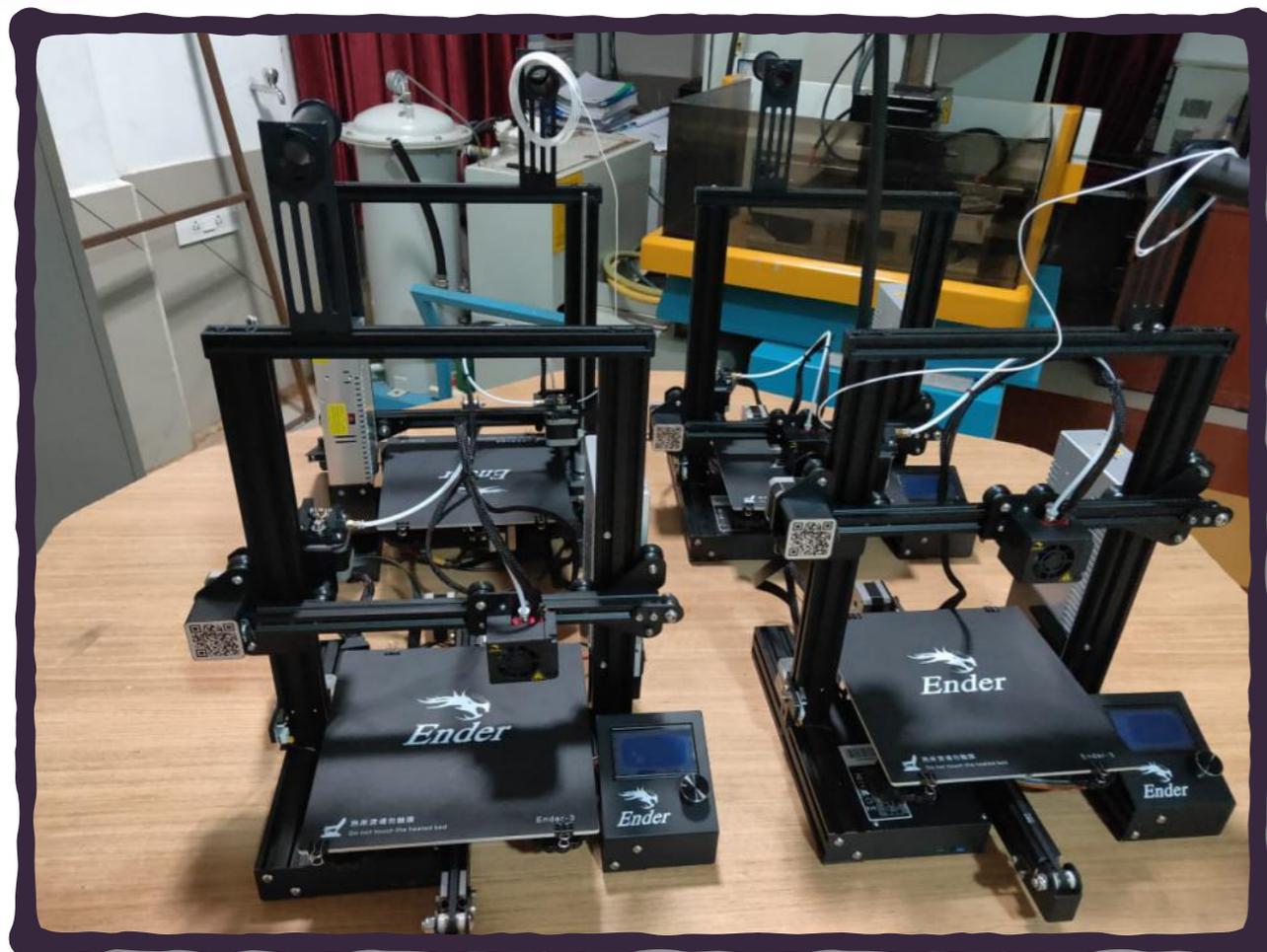


3D – Printing Laboratory:

3D printing is one of special laboratory which comes under innovation and skill development centre. Where freshman Engineering Department and Mechanical Engineering Department jointly design, analyse, build and 3D print the prototype models of various engineering domain and medical domain areas

Facilities available:

- 14No's of 3D Printing equipment
- Design Software tools: AUTODESK, FUSION 360, CATIA and Solidworks
- Software analysis Tools: ANSYS, CFD FLUENT, NI-Lab View, MSC-NASTRAN/ PATRAN
- Simulation Tools: MAT LAB, MSC-ADAMS
- 4 No's of CNC Machines- Milling, Turning and Lathes.



FDM 3D printer



High precision Stratasys 3D printer



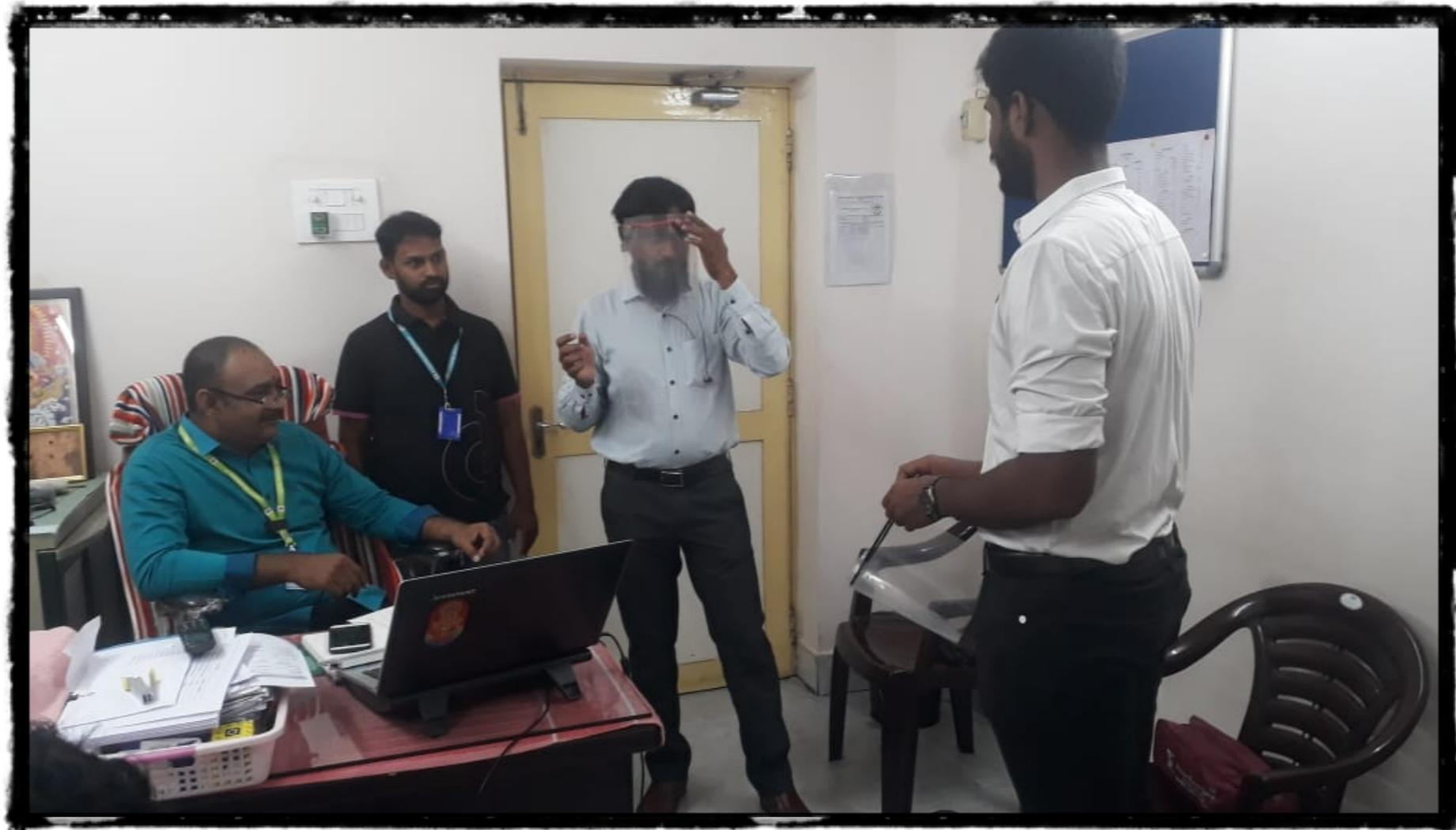
Face shields:

Face shields are personal protective devices that are used for protection of the facial area & also the areas that are associated with mucous membranes (eyes, nose, mouth) from splashes, sprays, and spatter of body fluids of infected patients.

Advantages of these face shields are:

- Low cost as compared to present market prices where one piece is around Rs. 300.
- These face shields are reusable as one can clean these face shields using sanitizers and reuse them.
- These face shields are of low self-weight which will eliminate localized stress on the users forehead area unlike existing face shields.

Department of Mechanical Engineering faculty, student have designed: simple model of face shield which just costs around Rs. 35/- per piece. Using the 3D printing facilities at the university, we have the capability to print and supply upto 250 pieces of face shields per day.



Andhra Hospitals-Vijayawada- Authorities validating the face shield prototypes

Local hospital authorities tested these face shields and gave positive feedback. These authorities also mentioned that these face shields can be reused for several times as there is no sponge materials used, and moreover these are washable.



Integrated N 95 Mask + Face shield

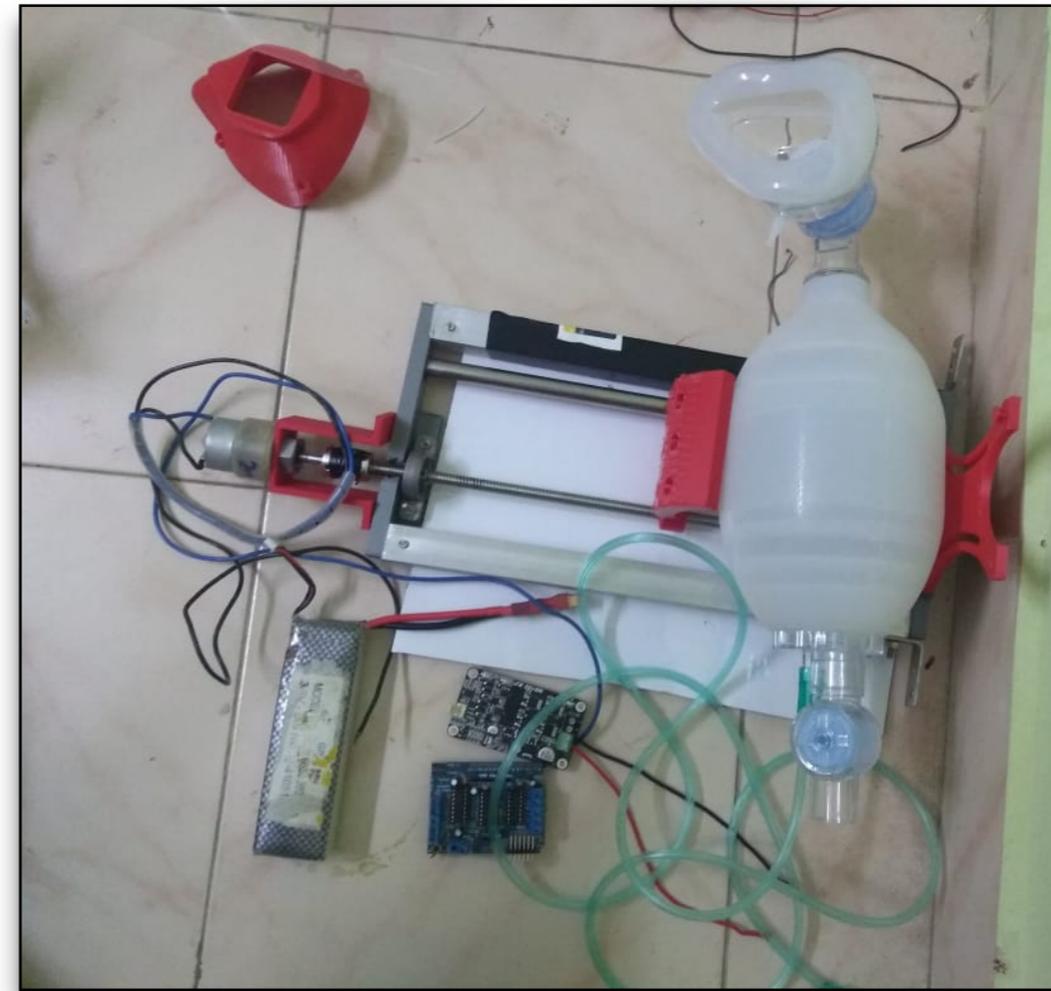
Integrated N95 mask + Face shield:

This product has been designed and prototyped by Mechanical Engineering Department. This product is unique and novel design which serves dual purposes of acting as a face shield and also act as a nose and mouth mask in a single integrated model.

This product comes with basic N95 mask which is attached to the face shield. A person can wear this equipment directly to his/her nose as a normal mask and a face shield is attached to the mask filter area with protects one's face from external micro organisms as shown.

The integrated N95 Mask+face shield costs Rs. 90/- per piece, which is very low cost when compared to normal face shields and nose masks combined cost, available in present market. This type of integrated N95 + face shields, can be printed upto 150 pieces per day.

These are novel designs of KL Deemed to be University and have Design Procedures filed and submitted for patent rights through IPR-India.



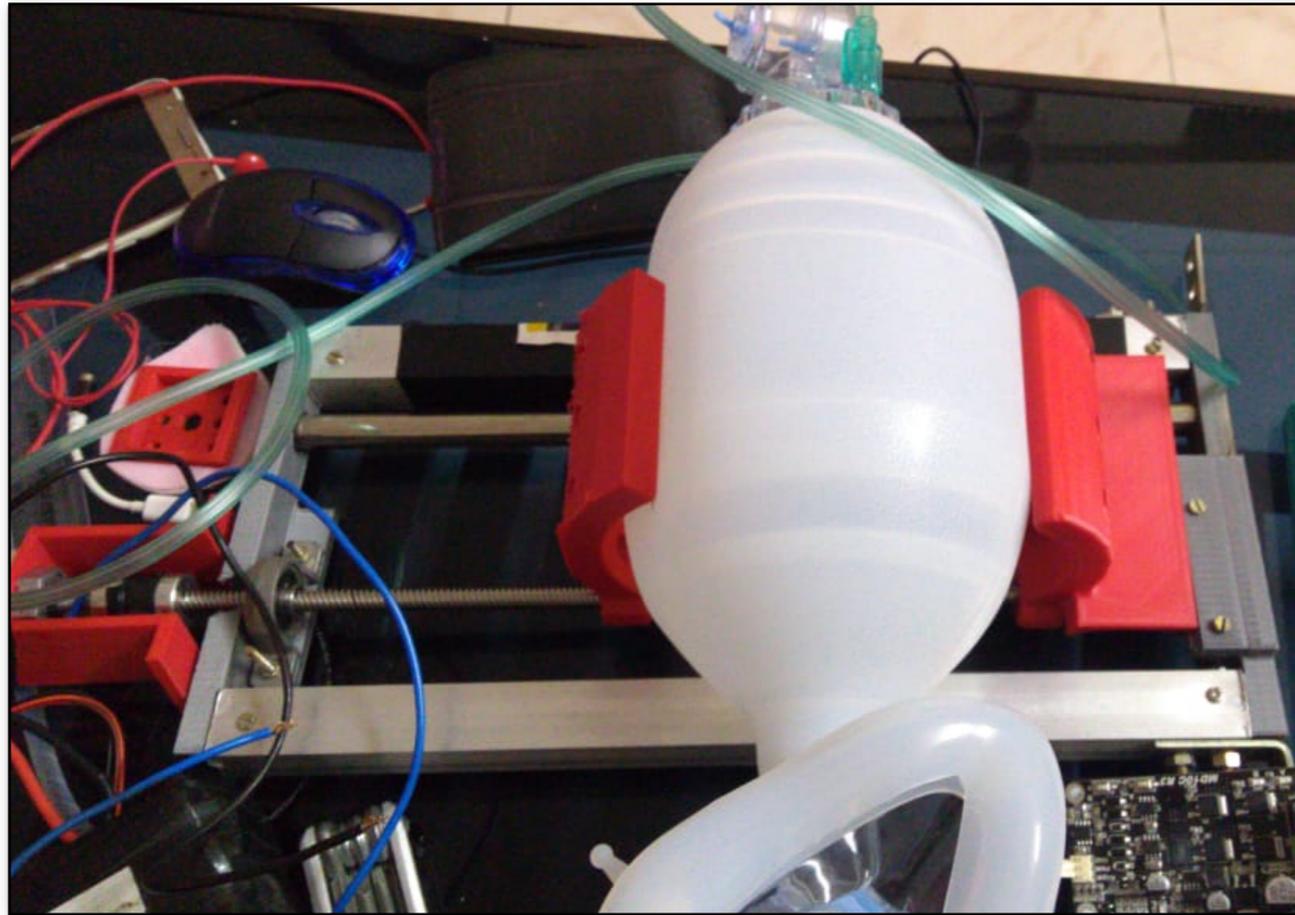
Silicon Ambu bag uses to pump air mechanically to patients

Mobile Ventilators / Emergency Ventilators:

Ventilators are the most important equipment in current COVID-19 pandemic situation.

When patient reaches to critical condition due to severe respiratory problems due to COVID-19 infection, they are required to shift to Intensive care units and need ventilators to supply forced oxygen to them. In the pandemic situation several countries are suffering due to lack of ventilators as all most all ICUs are most likely to be filled with COVID-19 infected patients.

In these critical conditions, when a patient need oxygen they use “Silicon Ambu Bags” to pump oxygen into patients body.



At these critical conditions where medical ICU ventilators are not available, generally a nurse or a doctor uses this silicon bags to pump air in to the patient. In these pandemic situations assigning nurses for every single patient is merely impossible because of increasing number of corona infected patients day by day all over the world. To resolve this condition, a prototype of mobile ventilator or emergency ventilator was designed, 3D printed parts and assembled.

This prototype can pump upto a pressure of 25CMH₂O to patients. This prototype has an input for oxygen supply along with natural oxygen valves. One of the major advantage of this ventilator is of low cost and works with minimum power consumption and equipped with external power source also.