



SNS COLLEGE OF TECHNOLOGY

Coimbatore – 641 029

An Autonomous Institution



DEPARTMENT OF CIVIL ENGINEERING

19CET303 – 3D PRINTING

III YEAR / V SEMESTER

UNIT 1 :INTRODUCTION TO 3D PRINTING

Topic 1 :INTRODUCTION TO 3D PRINTING



Syllabus



**Introduction To
3D Printing**

**Design Sketching
for 3D Printing**

Fusion 360

3D Scanning

**Applications Of
3D Printing**



UNIT 1 :Introduction to 3D Printing



1. Introduction to 3D Printing
2. Advantages of 3D Printing and limitations of 3D Printing
3. Types of 3D Printing - Fused Deposition Modeling
4. Stereolithography
5. Selective laser sintering
6. Types of 3D Printers.



ADVANTAGES OF 3D PRINTING



1. FLEXIBLE DESIGN

- ✓ 3D printing allows for the design and print of more complex designs than traditional manufacturing processes.
- ✓ More traditional processes have design restrictions which no longer apply with the use of 3D printing.





ADVANTAGES OF 3D PRINTING



2. RAPID PROTOTYPING

- ✓ 3D printing can manufacture parts within hours, which speeds up the [prototyping](#) process.
- ✓ This allows for each stage to complete faster.
- ✓ When compared to machining prototypes, 3D printing is inexpensive and quicker at creating parts as the part can be finished in hours, allowing for each design modification to be completed at a much more efficient rate.



ADVANTAGES OF 3D PRINTING



3. PRINT ON DEMAND

- ✓ Print on demand is another advantage as it doesn't need a lot of space to stock inventory, unlike traditional manufacturing processes.
- ✓ This saves space and costs as there is no need to print in bulk unless required.
- ✓ The 3D design files are all stored in a virtual library as they are printed using a 3D model as either a CAD or STL file, this means they can be located and printed when needed.
- ✓ Edits to designs can be made at very low costs by editing individual files without wastage of out of date inventory and investing in tools.



ADVANTAGES OF 3D PRINTING



4. STRONG AND LIGHTWEIGHT PARTS

- ✓ The main 3D printing material used is plastic, although some metals can also be used for 3D printing.
- ✓ However, plastics offer advantages as they are lighter than their metal equivalents. This is particularly important in industries such as automotive and aerospace where light-weighting is an issue and can deliver greater fuel efficiency.
- ✓ Also, parts can be created from tailored materials to provide specific properties such as heat resistance, higher strength or water repellency.



ADVANTAGES OF 3D PRINTING



5. FAST DESIGN AND PRODUCTION

- ✓ Depending on a part's design and complexity, 3D printing can print objects within hours, which is much faster than moulded or machined parts.
- ✓ It is not only the manufacture of the part that can offer time savings through 3D printing but also the design process can be very quick by creating STL or CAD files ready to be printed.



ADVANTAGES OF 3D PRINTING



6. MINIMISING WASTE

- ✓ The production of parts only requires the materials needed for the part itself, with little or no wastage as compared to alternative methods which are cut from large chunks of non-recyclable materials.
- ✓ Not only does the process save on resources but it also reduces the cost of the materials being used.



ADVANTAGES OF 3D PRINTING



7. COST EFFECTIVE

- ✓ As a single step manufacturing process, 3D printing saves time and therefore costs associated with using different machines for manufacture.
- ✓ 3D printers can also be set up and left to get on with the job, meaning that there is no need for operators to be present the entire time.
- ✓ This manufacturing process can also reduce costs on materials as it only uses the amount of material required for the part itself, with little or no wastage.
- ✓ 3D printing equipment can be expensive to buy, you can even avoid this cost by outsourcing your project to a 3D printing service company.



ADVANTAGES OF 3D PRINTING



8. EASE OF ACCESS

- ✓ 3D printers are becoming more and more accessible with more local service providers offering outsourcing services for manufacturing work.
- ✓ This saves time and doesn't require expensive transport costs compared to more traditional manufacturing processes produced abroad in countries such as China.



ADVANTAGES OF 3D PRINTING



9. ENVIRONMENTALLY FRIENDLY

- ✓ As this technology reduces the amount of material wastage used this process is inherently environmentally friendly.
- ✓ However, the environmental benefits are extended when you consider factors such as improved fuel efficiency from using lightweight 3D printed parts.



ADVANTAGES OF 3D PRINTING



10. ADVANCED HEALTHCARE

- ✓ 3D printing is being used in the medical sector to help save lives by printing organs for the human body such as livers, kidneys and hearts.
- ✓ Further advances and uses are being developed in the healthcare sector providing some of the biggest advances from using the technology.



DISADVANTAGES OF 3D PRINTING



1. Limited Materials

- ✓ While 3D Printing can create items in a selection of plastics and metals the available selection of raw materials is not exhaustive.
- ✓ This is due to the fact that not all metals or plastics can be temperature controlled enough to allow 3D printing.
- ✓ In addition, many of these printable materials cannot be recycled and very few are food safe.



DISADVANTAGES OF 3D PRINTING



2. Restricted build size

- ✓ 3D printers currently have small print chambers which restrict the size of parts that can be printed.
- ✓ Anything bigger will need to be printed in separate parts and joined together after production.
- ✓ This can increase costs and time for larger parts due to the printer needing to print more parts before manual labour is used to join the parts together.



DISADVANTAGES OF 3D PRINTING



3. Post Processing

- ✓ Although large parts require post-processing, as mentioned above, most 3D printed parts need some form of cleaning up to remove support material from the build and to smooth the surface to achieve the required finish.
- ✓ Post processing methods used include waterjetting, sanding, a chemical soak and rinse, air or heat drying, assembly and others.
- ✓ The amount of post processing required depends on factors including the size of the part being produced, the intended application and the type of 3D printing technology used for production.
- ✓ So, while 3D printing allows for the fast production of parts, the speed of manufacture can be slowed by post processing.



DISADVANTAGES OF 3D PRINTING



4. Large Volumes

- ✓ 3D printing is a static cost unlike more conventional techniques like injection moulding, where large volumes may be more cost effective to produce.
- ✓ While the initial investment for 3D printing may be lower than other manufacturing methods, once scaled up to produce large volumes for mass production, the cost per unit does not reduce as it would with injection moulding.



DISADVANTAGES OF 3D PRINTING



5. Part Structure

- ✓ With 3D printing (also known as Additive Manufacturing) parts are produced layer-by-layer.
- ✓ Although these layers adhere together it also means that they can delaminate under certain stresses or orientations.
- ✓ This problem is more significant when producing items using fused deposition modelling (FDM), while polyjet and multijet parts also tend to be more brittle.
- ✓ In certain cases it may be better to use injection moulding as it creates homogenous parts that will not separate and break.



DISADVANTAGES OF 3D PRINTING



6. Reduction in Manufacturing Jobs

- ✓ Another of the disadvantages of 3D technology is the potential reduction in human labour, since most of the production is automated and done by printers.
- ✓ However, many third world countries rely on low skill jobs to keep their economies running, and this technology could put these manufacturing jobs at risk by cutting out the need for production abroad.



DISADVANTAGES OF 3D PRINTING



7. Design Inaccuracies

- ✓ Another potential problem with 3D printing is directly related to the type of machine or process used, with some printers having lower tolerances, meaning that final parts may differ from the original design.
- ✓ This can be fixed in post processing, but it must be considered that this will further increase the time and cost of production.



DISADVANTAGES OF 3D PRINTING



8. Copyright issue

As 3D printing is becoming more popular and accessible there is a greater possibility for people to create fake and counterfeit products and it will almost be impossible to tell the difference.

This has evident issues around copyright as well as for quality control.