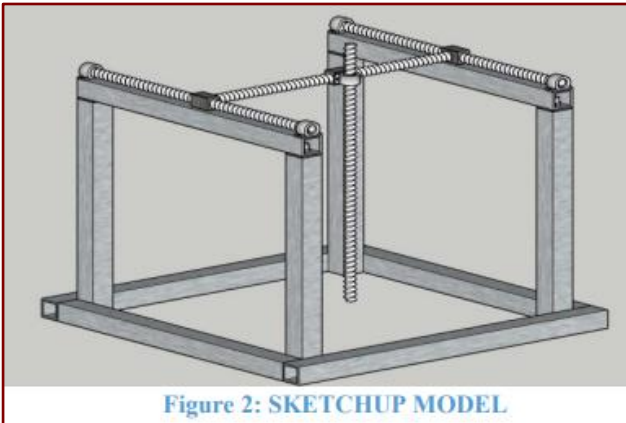
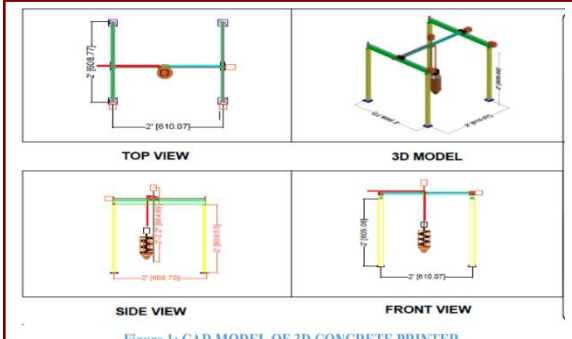



## Final Year Project Showcase Batch-2017 Year 2021

<b>Department: Civil Engineering</b> <b>Programme: Civil Engineering</b>		
1	<b>Project Idea</b>	Design and Construction of 3D Concrete Printer
2	<b>Process</b>	<p>The process of construction has not been completely mechanized in Pakistan. Construction industry is some-what reluctant to incorporate “Fourth Industrial Revolution” i.e., adopting innovative technologies into its practices. The specific objectives of this project were Determination of mix design for construction of 3D printed concrete wall and Development of prototype 3D concrete Printer and Printing of concrete wall. The methodology used in this project was Contour Crafting based on a gantry system and fixed to only 3 axes. The concrete mix ratios of 1:1 and 1:1.5 were tested and several tests were performed to check the properties of fresh and hardened concrete. 1:1.5 results in higher compressive strength than the 1:1. Tensile strength of 1:1 is higher than the 1:1.5. Printed concrete cylinders failed mostly in Type 3 and Type 5 failures. Accelerators must be used along with the Plasticizer with 0.75-1%. The water cement ratio should range between 0.4 to 0.5. Final printing was based on 1:1.5 ink mix design. Manual pouring of concrete through nozzle was adopted. Flowability was achieved while buildability achievement requires further experimentation in future with availability of proper accelerator and slight modifications of the nozzle. The scaled down model can be extended to full scale printer by lifting frame lifting, trowels and modified nozzle design.</p>
3	<b>Outcome</b>	<ol style="list-style-type: none"> <li>1. Design of a prototype 3D printer.</li> <li>2. Prototype 3D Printer.</li> <li>3. 3D Printing concrete mix design.</li> </ol>
4	<p><b>Evidence (Theoretical Basis)</b></p> <p>Figure 1 provide the CAD snapshots of the printer design, Figure 2 illustrates 3D model, Figure 3 gives an insight to printer fabrication and development process.</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Figure 2: SKETCHUP MODEL</p> </div> <div style="text-align: center;">  <p>Figure 1: CAD MODEL OF 3D CONCRETE PRINTER</p> </div> </div> <div style="text-align: center; margin-top: 10px;">  <p>Figure 3: FABRICATION SNAPS</p> </div>

<b>5</b>	<b>Competitive Advantage or Unique Selling Proposition</b> (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over a competitor. In summary, any striking aspect of the project that compels the industry to invest in FYP or purchase it. Some detailed description is required in terms of how, why when what. You can select one or more from the following dropdown and delete the rest of them). Please keep relevant options, delete the rest of them, and correct the sequence
<b>a</b>	<b>Cost Reduction of Existing Product</b> Full scale printer is estimated to be 50% less than imported printer cost. If utilized for house construction, labour and material cost (i.e for form work) would be reduced by atleast 30%
<b>b</b>	<b>Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process</b> (e.g. What is the issue is current process and what improvement you suggests) The process of construction has not been completely mechanized in Pakistan. Construction industry is some-what reluctant to incorporate “Fourth Industrial Revolution” i.e. adopting innovative technologies into its practices. Manufacturing industries have taken advantage of forth industrial revolution (4IR) to ensure quality of design and manufacturing of product. This project resulted in development of a 3D concrete construction printer prototype.
<b>c</b>	<b>Attainment of any SDG</b> (e.g. How it is achieved and why it is necessary for the region) <b>SDG#09, Industry Innovation and Infrastructure</b> The broader aim of the project is to make the construction process efficient and environmentally sustainable in accordance with the United Nations sustainability goals. Specifically, it address SDG 9 i.e. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. <b>SDG#12, Responsible Consumption and Production</b> 3D Concrete printing can reduce carbon foot print through additive construction process, hence avoiding use of wood for formwork and wasage of concrete due to precision of printing process. Lesser use of wood would have significant impact on saving carbon footprint not only through reduction of wood usage, its transportation, but also a reduction in terms of avoding concrete wastage and hence cement wastage.
<b>d</b>	<b>Expanding of Market share</b> (e.g. how it expand and what is the problem with the current market Construction time and quality specifically of low rise structures such as small families houses can be significantly improved through this technology.
<b>e</b>	<b>Capture New Market</b> Housing Construction Sector
<b>g</b>	<b>Any Other Aspect</b> This is the first and only indeginuously build 3D Concrete Printer (Prototype) in Pakistan.
<b>6</b>	<b>Target Market</b> (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service <ul style="list-style-type: none"> <li>• Construction Industry (as technology adoption for construction processes)</li> <li>• Housing Construction Sector (for rapid construction of houses)</li> <li>• Academia and research institutes ( prototype printer design can be readily used as a lab equipment for mix deign, flowability, buildability and constructability experimentation).</li> </ul>
<b>7</b>	<b>Team Members</b> (Names & Roll No.) <ol style="list-style-type: none"> <li>1. Muhammad Moiz Khan CE-17014</li> <li>2. Farooq Ahmed CE-17021</li> <li>3. Syed Sohaib Ahmed CE-17032</li> <li>4. Sharjeel Alam Khan CE-17036</li> <li>5. Muhammad Usama CE-17039</li> <li>6. Talha Hassan Khan CE-17041</li> <li>7. Ammar Hashmi CE-17049</li> </ol>
<b>8</b>	<b>Supervisor Name</b> Dr. Farrukh Arif
<b>9</b>	<b>Supervisor Email Address</b> <a href="mailto:farrukh@cloud.neduet.edu.pk">farrukh@cloud.neduet.edu.pk</a>

<p>10</p>	<p>Pictures (If any)</p>	
<p>11</p>	<p>Video (If any)</p>	<p><a href="https://drive.google.com/file/d/1yrncYb6MDFm5rVT403MtFNva0T_mPV_-/view?usp=sharing">https://drive.google.com/file/d/1yrncYb6MDFm5rVT403MtFNva0T_mPV_-/view?usp=sharing</a></p>