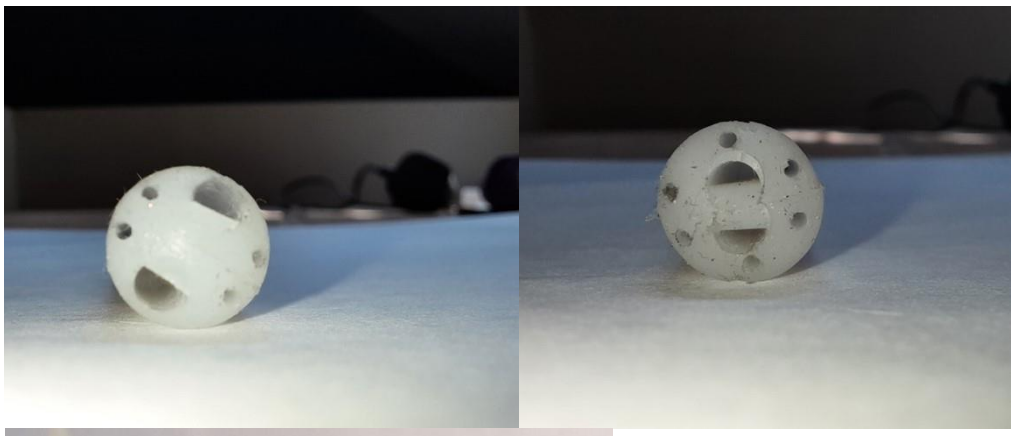
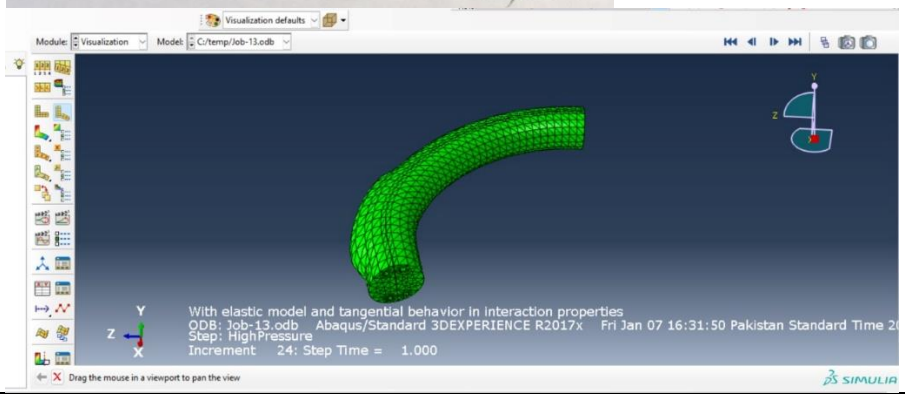
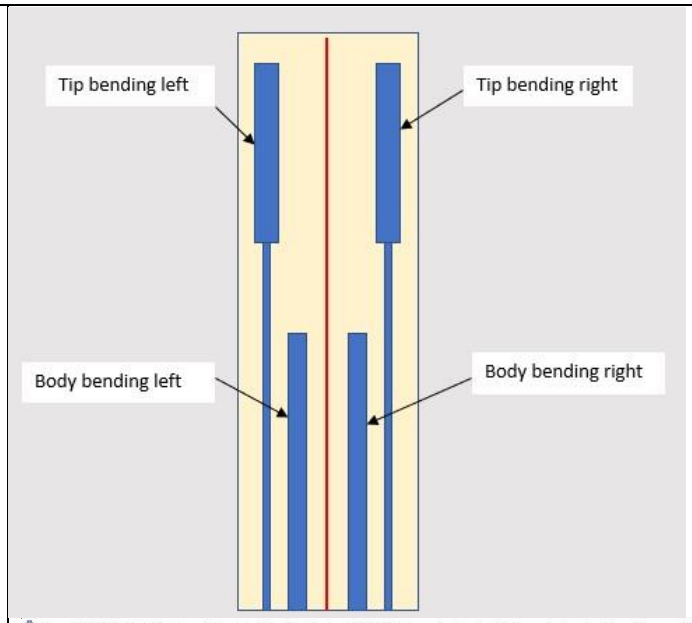
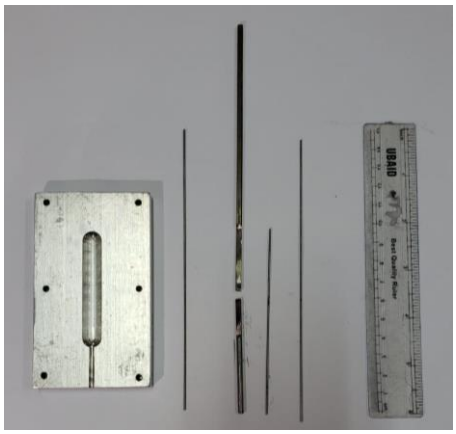
Final Year Project Showcase Batch-2018
Year 2022

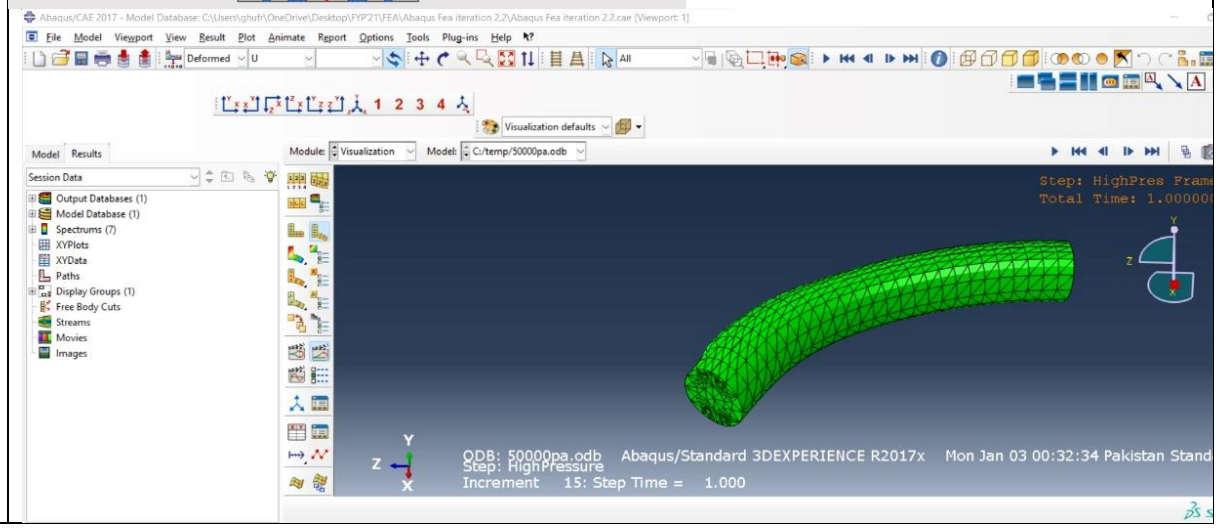
Department: Industrial & Manufacturing Engineering Programme: Industrial & Manufacturing Engineering		
1	**Project Idea**	Fabrication of Narrow Channel Medical Catheter Capable of Exhibiting Snake-Like Motion for the Purpose of Ventriculostomy Procedure
2	**Process**	Fabrication of the catheter consists of four major processes all of them are listed below with an overview of the process 1) Literature Review & Analysis of Design: A literature review is mainly based on the research papers that are published on different actuation principles and their design approaches, analysis was done using ABAQUS software for the analysis of design 2) Fabrication of Mold: The fabrication for the mold is done using a module-based approach consisting of the upper and lower mold with eight other auxiliary parts of the mold it was done using a sophisticated machining process 3) Molding Process: The molding for the silicone-based material i.e Dragon Skin is done using a cold casting process in a vacuum degreaser 4)Actuation: The actuation of the catheter was done by the control pneumatic system consisting of a pump, manifold, solenoid valves, and speed controls through a mobile phone with the integration of IoT
3	**Outcome**	The doctors currently use a catheter for ventriculostomy procedures which does not give the maneuverability due to its rigidity ultimately doctors need to reinsert the catheter again and again which can contaminate the brain tissues and damage it to reach the third ventricle to drain out the excess fluid. Our proposed solution efficiently overcome this problem by giving maneuverability using localize bending and assisting doctors to easily reach the target point in a one go
4	**Evidence (Theoretical Basis)**	The project is related to the fabrication of a soft catheter for the External Vevtriculostomy Drainage (EVD) procedure. The fabrication took place in the Industrial and Manufacturing department, NEDUET. CAD and FEA software were used to analyze and design the catheter. CNC machining was used for the fabrication of mold. There were different actuation principles like hydraulic, pneumatic, magnetic, and electric-based mechanisms and they all contain some limitations as hydraulic-based bursting can occur and the size of valves is also very large for tiny shaped catheters while the magnetic-based actuation required some advancement in technology as they utilize an external magnetic field and for electric-based catheter, the limitation is related to electric induction that decreases the chance of its usage in brain's operation because it contains those metallic and nonmetallic materials that are based on an electrical signal like Shape Memory Alloy, so after the consideration of these actuation principles the one that contains the least limitation is pneumatic based which overcome the issues of bursting and limitations present in the

		electromagnetic one and the size of the catheter can also be reduced due to narrow air channels present in the catheter. After extensive brainstorming and gaining knowledge of the design of catheters through research papers, websites, and YouTube. The local bending Model has been finalized by reviewing. Local bending can be used to reach intricate parts within the brain or any part of the body. Since the brain is the most critical and sensitive part of our brain whether talking about the medulla or cerebellum. The selection of the material must be in a way that they do not adversely affect any part of the brain or be harmful to the living tissue. Dragon Skin kit has been used as silicone material to fabricate the main body of the catheter. The analysis concludes that with the introduction of woven Fiber Glass, the catheter inflates less and bends more at the same pressure due to uneven expansion on either side. The first iteration was based on modules but due to limitations in the 3-d printing facility available could not be possible the second and final iterations give 2 degrees of freedom
5	**Competitive Advantage or Unique Selling Proposition** (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	
a	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region)	**SDG#3:Good Health and Well being,** **SDG#9 Industry Innovation, and Infrastructure**
b	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.)	NA
c	**Cost Reduction of Existing Product**	Since we are doing cold casting single mold can cast up to 20 catheters with precision which will reduce the cost of a single catheter
d	**Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process** (e.g. What is the issue is current process and what improvement you suggests)	The current process for ventriculostomy procedures does not give control of the catheter due to its rigidity ultimately doctors are left with no other option but to reinsert the catheter, again and again, to reach the third ventricle of the brain to drain out the excess fluid this procedure can lead to contaminate the brain tissues and damage it. Our proposed solution efficiently overcome this problem by giving maneuverability using localize bending and assisting doctors to easily reach the target point in one go without reinsertion of the catheter again and again
e	**Expanding of Market share** (e.g. how it expand and what is the problem with the current market	The current market of the medical catheter has not shown any improvement in the existing design of the catheter which leads to creating many problems patients lose their memory or sometimes death occur our solution proposed a better solution with more control of catheter
6	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service	**Medical Instruments** Niche domain under Medical Instruments was biocompatible catheter for EVD Procedure
7	**Team Members** (Names along with email address)	Muhammad Emmad Siddiqui (emmadsiddiqui4@gmail.com) Ghufran Ul Islam (ghufran.islam@gmail.com Muhammad Ahsan Khurshi (ahsankhur@gmail.com)

		Muhammad Suleman Safdar Mughal (muhammadsulemansafdar27@gmail.com)
8	**Supervisor Name** (along with email address)	Maria Iruj /(maria.iruj@gmail.com)
10	**Pictures (If any)**   	


Tip bending left
Tip bending right
Body bending left
Body bending right




File Model Viewport View Result Plot Animate Report Options Tools Plug-ins Help
Model Results
Session Data
Output Databases (1)
Model Database (1)
Spectrums (7)
XYPlots
XYData
Paths
Display Groups (1)
Free Body Cuts
Streams
Movies
Images
Module: Visualization
Model: C:/temp/50000pa.odb
Step: HighPres Frame
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