



## Final Year Project Showcase Batch-2021 Year 2025

<b>Department: Biomedical Engineering</b> <b>Programme: Biomedical Engineering.</b>	
1	<b>Project Title</b> Unified Speech Disorder Therapy System
2	<b>Project Idea</b> A unified system that combines pressure sensors, airflow sensors, and real-time voice analysis into one integrated speech therapy platform providing quantitative measurements of tongue pressure and movements, exhaled air and different parameters related to speech. It allows therapists and patients to assess and track speech disorders more accurately and affordably.
3	<b>Process</b> The system was developed in following phases: <ul style="list-style-type: none"> <li>• <b>Design &amp; Hardware:</b> sensors integrated with a specifically designed with a custom circuit and data acquisition system.</li> <li>• <b>Software:</b> Python-based signal processing modules analyze voice for jitter, shimmer, intensity, energy and fundamental frequency.</li> <li>• <b>GUI:</b> A user-friendly interface allows therapists to record or upload sessions, view metrics, and track patient progress.</li> </ul> <b>Testing &amp; Calibration:</b> Prototype was tested with controlled weights and airflow; output validated using healthy and disordered voice samples.
4	<b>Outcome</b> A functional prototype capable of: <ul style="list-style-type: none"> <li>• Real time Detection of tongue pressure, movement and airflow during speech.</li> <li>• Analyzing vocal properties in real time.</li> </ul> Offering a low-cost, comprehensive solution for utilization in clinical setup.
5	<b>Evidence (Theoretical Basis)</b> The Unified Speech Disorder Therapy System is built upon established concepts in speech language pathology, biomedical instrumentation, and digital signal processing. Tongue pressure measurement using Force sensors is a clinically recognized method to assess lingual strength, crucial in diagnosing motor speech disorders such as dysarthria and apraxia. Airflow sensors provide data on breath support and control, which are essential in evaluating phonation difficulties in conditions like stuttering, cleft palate, and vocal fold impairments. Additionally, acoustic voice analysis specifically measuring jitter, shimmer, and fundamental frequency offers quantitative insights into vocal stability and is widely used in clinical settings. By integrating these three dimensions biomechanical, respiratory, and acoustic into a single platform, the system leverages theoretical and empirical evidence to offer objective, repeatable, and comprehensive speech disorder assessments. This integration enhances diagnostic accuracy by providing quantitative.
6	<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
a	<b>Attainment of any SDG</b> The system contributes to SDG-3 by improving access to speech therapy and promoting better health outcomes through early diagnosis and monitoring. It supports SDG-9 by introducing an innovative, low-cost biomedical device that strengthens healthcare

	infrastructure. Additionally, it aligns with SDG-11 by enabling inclusive, home-based therapy for sustainable and resilient urban healthcare.	
<b>b</b>	<b>Cost Reduction of Existing Product</b> Combines multiple diagnostic tools (which are not digitalized and usually sold separately) into one device, significantly reducing therapy costs.	
<b>c</b>	<b>Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process</b> Traditional therapy lacks objective tracking tools. Our system introduces quantifiable, repeatable data point to enhance diagnostics and therapy monitoring.	
<b>d</b>	<b>Capture New Market</b> Targets home-based users, clinics, and special education institutions an underserved segment overlooked by existing expensive solutions.	
<b>7</b>	<b>Target Market</b> <ul style="list-style-type: none"> <li>• <b>Speech Therapists:</b> For objective progress tracking.</li> <li>• <b>Hospitals &amp; Rehab Clinics:</b> As a diagnostic and therapy aid.</li> <li>• <b>Special Schools:</b> For children with developmental speech disorders.</li> <li>• <b>Families:</b> For affordable home-based therapy for stroke or trauma survivors.</li> <li>• <b>Research Institutes:</b> For data collection on speech biomechanics.</li> </ul>	
<b>8</b>	<b>Team Members</b> (Names along with email address)	1. Abdul Wasay Shahid wasay0948@gmail.com 2. Zuhaib Khan khanzobi684@gmail.com 3. M. Hood A. Sattar m.hoodkhatri7@gmail.com 4. Abdur Rehman abdurrehman.24867@gmail.com
<b>9</b>	<b>Supervisor Name</b> (along with email address)	Dr. Muhammad Danish Mujib
<b>10</b>	<b>Video (If any)</b>	<a href="https://drive.google.com/drive/folders/1o1-YSGe7BdYCPaTNv0VcCpalgVp7XJrH?usp=drive_link">https://drive.google.com/drive/folders/1o1-YSGe7BdYCPaTNv0VcCpalgVp7XJrH?usp=drive_link</a>



