INNOVATIONS IN TEACHING AND LEARNING

Subject: Digital Signal Processing   **Class:** T.Y. BTech E&TC

Topic: Application of DSP

NAME OF THE ACTIVITY: Project Based Learning

I.   **Concept**. Project-Based Learning (PBL) is an instructional approach where students learn by actively engaging in real-world and meaningful projects. In this activity, third-year students were assigned mini-projects related to Digital Signal Processing (DSP) to be simulated using MATLAB software. The projects included applications such as Noise Removal, ECG Signal Processing, and Image Enhancement. Through this approach, students learned to apply theoretical DSP concepts to solve practical problems using simulation and analysis tools

II.   **Objective(Goal):**

- To enable students to apply DSP concepts for solving real-time signal processing problems.
- To enhance analytical and simulation skills using MATLAB.
- To promote independent learning and teamwork among students.
- To strengthen the understanding of filter design, frequency analysis, and signal manipulation.
- To bridge the gap between theoretical knowledge and practical implementation.

III.Appropriateness (Relevance of Selected Method): Project-Based Learning is a highly relevant and effective approach for engineering education. It helps students integrate classroom learning with hands-on experimentation. By simulating DSP applications in MATLAB, students gain a deeper understanding of system behavior, data interpretation, and algorithm implementation. This method enhances creativity, problem-solving ability, and readiness for research or industry-based work.

IV.Effective Presentation (Implementation Details):

A. Students were first introduced to various Digital Signal Processing applications and guided on how to simulate them using MATLAB. Example project themes included:

A. Noise Removal using FIR/IIR Filters
B. ECG Signal Processing and Feature Extraction
C. Image Enhancement using Spatial and Frequency Domain Techniques
D. Speech Signal Processing (optional extension topic)

Each student group selected one topic and prepared the MATLAB simulation plan under faculty guidance.

B. Implementation Process:

- Students were divided into small groups and assigned topics based on their interest.
- Each group carried out literature review, algorithm design, and MATLAB coding for their project.
- Intermediate progress was reviewed to monitor development and guide improvements.
- Students simulated signals, observed outputs such as filtered signals, enhanced images, and ECG feature plots.
- Each group presented their simulation results along with an explanation of their approach, analysis, and observations.
- Faculty members provided feedback on technical accuracy, innovation, and clarity of presentation.

III.   Results (Impact):

A. Students successfully implemented and simulated DSP-based projects in MATLAB.
B. Enhanced problem-solving and analytical skills.
C. Strengthened understanding of digital filters, frequency response, and signal operations.
D. Improved teamwork, communication, and project documentation.

IV.   Reproducibility and Reusability by Other Scholars for Further Development

Sr.No	Innovation Used by	Details of User	Purpose of Reproducibility and Reusability
1.	Dr. PM ghate	Third-Year BTech E&TC	To Enable Students to apply DSP concepts to real time Problem, Enhance analytical and simulation skills using MATLAB.

V.   PEER REVIEW AND CRITIQUE

Category: Internal/External/Interdepartmental

Score: (1:Least   2: Moderate   3:Highly)

Question 1. Is this Innovative Teaching and Learning Methodology useful during content delivery?

Question 2. Did this innovation increase student motivation or participation?

Question 3. Will it show improvement in student learning?

Question 4. Suggestions for improvement in future iterations.

Category	Name of Peer	Organiza tion	Q.1	Q.2	Q.3	Q. 4 Suggestion/Critique	
Internal	Dr PM ghute	E&TC (RSCOE)	2	3	2	This method is highly reproducible & reusable in other engineering discipline involve simulation & Analysis tools.	Qaeg
External	Mrs. Usha Binadar	D.Y.Patil Akurdi	2	3	2	Incorporate Peer review Component where Student group evaluate each others project documentation & Presentations	Usha
Inter-DEPT	Mr. R.S. Ankushe	Electrical RsCoE	2	3	2	Can be organised on regular basis to improve.	Ankushe

Course coordinator
S.P. Pattanaik

Module coordinator
Dr. C.U. Rane

HOD
Dr. S.C. Waga