JSPM's

Rajarshi Shahu College of Engineering, Pune

Department of Electronics & Telecommunication Engineering

INNOVATIONS IN TEACHING AND LEARNING

Subject: Electronic Devices & Circuits **Class:** S.Y. BTech E&TC Div A

Topic: Temperature monitoring and control applications using instrumentation amplifiers

NAME OF THE ACTIVITY: Research paper study

I. **Concept:** The research paper focuses on the design and simulation of an automatic room heater control system that maintains room temperature within a desired range using electronic sensing and feedback control principles. The system employs an Instrumentation Amplifier to amplify the small voltage variations from a temperature sensor, ensuring accurate signal processing for automatic heater control. This study introduces students to the practical application of instrumentation amplifiers in precision measurement and control systems, bridging theoretical circuit concepts with real-world automation systems.

II. **Objective(Goal):**

- To help students understand the role of instrumentation amplifiers in real-time temperature monitoring and control applications.
- To analyze the design aspects of an automatic control system integrating sensors, amplifiers, comparators, and actuators.
- To demonstrate how simulation tools are used to validate electronic system performance before hardware implementation.
- To encourage analytical thinking and design problem-solving skills through literature-based learning.

III. **Appropriateness (Relevance of Selected Method):**

Assigning a research paper study is an appropriate method for deepening conceptual understanding. The selected paper is directly relevant to Electronic Devices & Circuits and illustrates the application of an instrumentation amplifier in system design context. It exposes students to practical circuit design, MATLAB/Proteus simulation, and signal conditioning techniques, which are integral to their course outcomes. The paper effectively integrates both hardware design and simulation methodology, aligning with modern engineering education practices.

IV. Effective Presentation (Implementation Details):

The research paper was shared with all students in digital form prior to the session.
A guided reading session was conducted, highlighting key sections such as circuit design, simulation methodology, and amplifier configuration.
The faculty explained the role of the LM35 sensor, operational amplifiers, and instrumentation amplifier stages using whiteboard illustrations.
Students were divided into small groups to discuss design challenges and propose potential improvements.
A concluding presentation summarized the findings and connected the paper's concepts to design problems on instrumentation amplifiers.

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Design and simulation of an automatic room heater control system

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Abstract

This paper presents the design and simulation of an Automatic Room Heater Control system. This system allows the user to set a desired temperature which is then compared to the room temperature measured by a temperature sensor.

V. Results (Impact):

A. Students developed a stronger conceptual understanding of how instrumentation amplifiers are used in temperature control applications.
B. The activity enhanced student's ability to interpret and analyze research-based circuit designs.
C. Increased engagement and technical discussions were observed during and after the session.

D. The paper inspired several students to attempt their own Proteus simulations of temperature control circuits using instrumentation amplifiers.
E. The exercise improved students' research orientation and problem solving confidence.

VI. Reproducibility and Reusability by Other Scholars for Further Development

Sr.No	Innovation Used by	Details of User	Purpose of Reproducibility and Reusability
1.	Dr. B.D. Jadhav	Other Instructor.	Used in other class SY DivB to demonstrate the Appln of Instrumentation amp.

VII. 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	Organization	Q.1	Q.2	Q.3	Q. 4 Suggestion/Critique
Internal	Dr. B. D. Jadhav	RSCOE E&TC	3	2	3	The selected paper is well-aligned with course objectives.
external	Mrs. trupti wagh	PVPCOE	3	3	2	The use of Elsevier research paper ~~of~~ for undergraduate exposure is commendable.
Interde-Partmental	Mr. Lodha	RSCOE	3	3	2	interdisciplinary relevance is appreciable

Course Co-ordinator
Dr.Rane Charushila Vijay

Module Co-ordinator

HOD E&TC
Dr.S.C.Wagaj