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Innovative Teaching – Learning Activities

Active & Experimental Learning:

Flipped Classroom

Class : S.Y. B.Tech (E&TC)

Course : Hardware and Software Tools for Electronics Engineer

Objectives:

1. Help students understand how first-order systems respond over time.
2. Make learning more interactive and engaging instead of just lectures.
3. Allow students to learn at their own pace with video before class.
4. Use class time for solving problems and hands-on activities.

Outcome:

1. Students understand first-order system behavior better.
2. They become better at solving related problems.
3. Learning becomes more fun and interactive.
4. Test scores and performance improve

Details of Activity:

The Flipped Classroom method was employed in HST classes.This collaborative approach facilitated problem-solving by encouraging students to analyze real time applications, discuss it's implementation with a partner or in groups and critically examine the MATLAB code to implement it practically. Specific details are:

● **Before the Class (Pre-Class Activity):**

Shared a video explaining the time response of first-order systems. Students watched the video to understand key concepts before coming to class.

- **During the Class (In-Class Activities):**

  a) Quiz:

  Conducted a **quiz** to check if students understood the video , included basic questions about first-order system behavior.

  b) Group Discussion on Real-Life Applications:

  Students **discussed** how first-order systems are used in real life (e.g., temperature control in water heater, electric circuits, LPF, etc.).They shared examples with their groups. Each group **presented their thoughts** on real-world applications. Added on it students were ready with their MATLAB code to implement their examples practically. It encouraged teamwork and critical thinking.

  Students Gained Better understanding of first order systems because of video shared before in google classroom. Their responses showed that they improved problem-solving through quizzes. Also, Teamwork and communication skills from discussions improved. As well as familiar with Practical knowledge about real time examples.

- **Photo for Activity:**
  Firstly pre- recorded video lecture provided to SY BTech students before in class session.
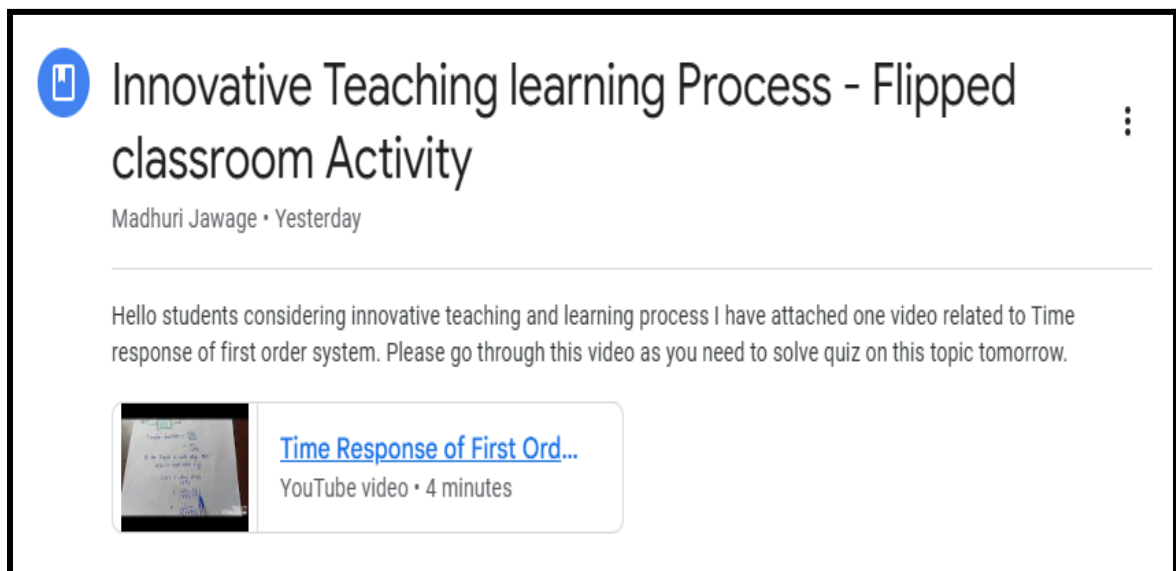
Then in classroom session one quiz was conducted online on the basis of video lecture.

Quiz : Time response of first order system

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Form description

This form is automatically collecting emails from all respondents. Change settings

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1.Given the first-order differential equation τ dy(t) / dt +y(t)=u(t), what is the time constant τ if *
the system response is y(t)=1−e^−t/5?

○ 5

○ 10

○ 0.5

○ 1

2.The response of a first-order system to a step input is always exponential. *

○ True

○ False

3.The time constant (τ) of a first-order system is influenced by which of the following *
factors?

○ A) Only input magnitude

○ B) System parameters like resistance and capacitance

○ C) Feedback control mechanisms

○ D) Initial conditions only

4. In a first-order electrical circuit (RC circuit), if the resistance (R) is doubled while the capacitance (C) remains the same, what happens to the time constant ($\tau = RC$)? *

○ A) It doubles

○ B) It halves

○ C) It remains unchanged

○ D) It becomes zero

5. Which of the following does NOT apply to an open-loop first-order system? *

○ A) It does not use feedback

○ B) It cannot correct errors automatically

○ C) It always has a delay in reaching steady-state

○ D) It adjusts its output based on system error

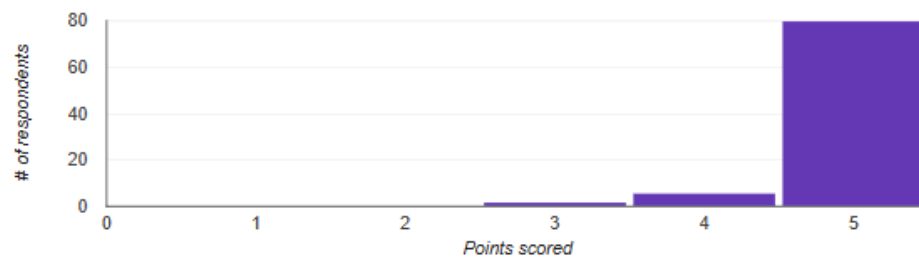Responses showed better understanding of students for first order systems.

📊 Insights

Average	Median	Range
4.89 / 5 points	5 / 5 points	3 - 5 points

Total points distribution

Through this collaborative exercises and discussions, students apply concepts more effectively.
They have been discussed real time application of it amongst themselves and present their views in classroom session group wise.

As well as they are ready to implement their code on MATLAB

Impact of the Activity:

1. **Better Understanding** – Students grasped the concept of first-order system response more effectively. As they have solved quiz and scored good marks in it.
2. **Active Learning** – Instead of just listening to lectures, students actively participated through quizzes, discussions, and presentations.
3. **Improved Problem-Solving** – The quiz helped students test their knowledge and improve their analytical skills.
4. **Real-Life Connection** – Group discussions made students think about how first-order systems are used in real-world applications.
5. **Teamwork & Communication** – Presenting their ideas in groups improved collaboration and speaking skills.
6. **Efficient Class Time** – Since students watched the video before class, more time was spent on solving problems and discussions.