|| Jai Sri Gurudev ||

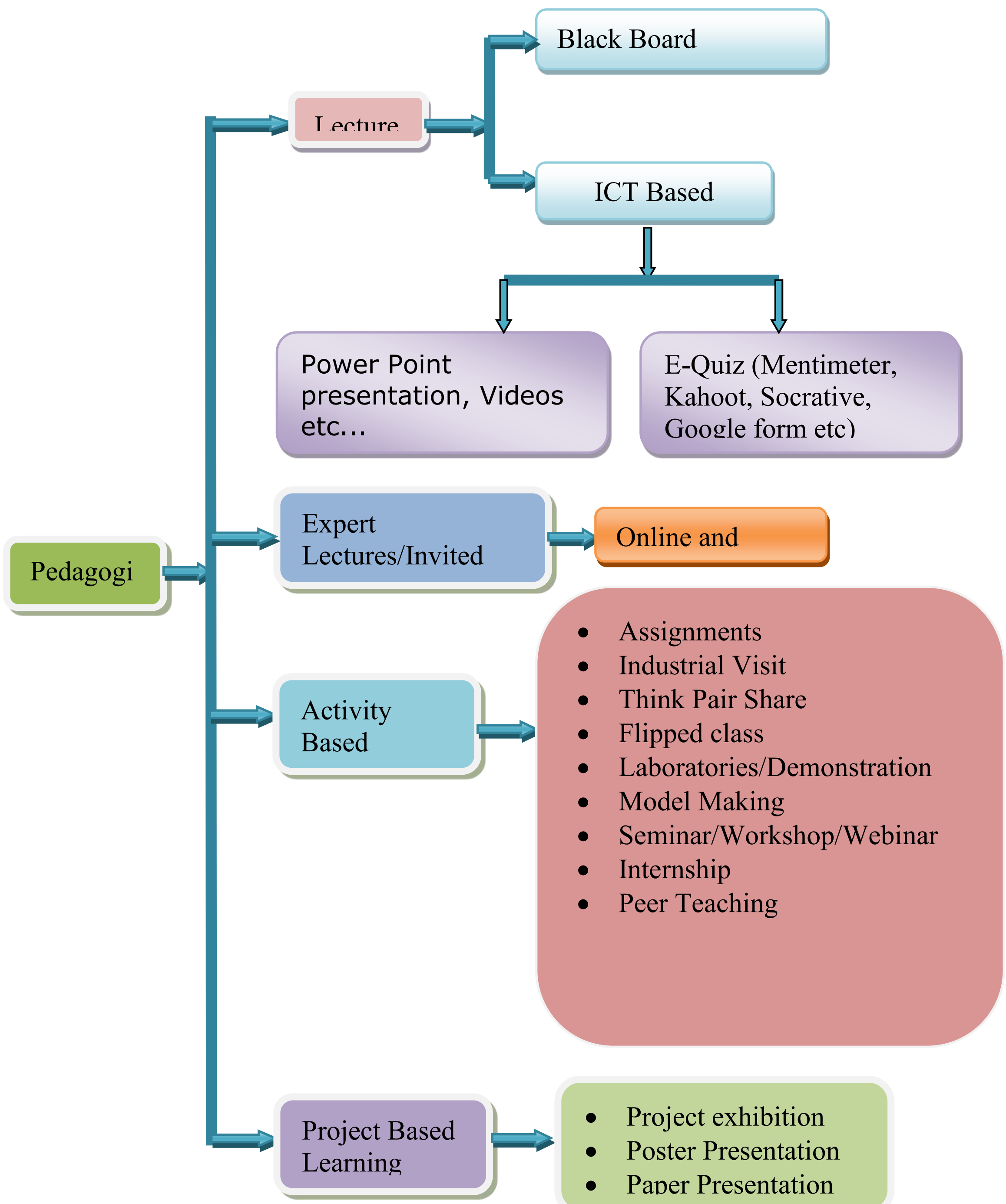
Sri Adichunchanagiri Shikshana Trust (R.)

SJC INSTITUTE OF TECHNOLOGY

Department of Mechanical Engineering

USE OF VARIOUS INSTRUCTIONAL METHODS AND PEDAGOGICAL INITIATIVES

Department follows Outcome Based Education (OBE) approach. Faculty use innovative teaching methods to cater the needs of OBE.



Classroom Teaching:

The lecture delivery by the faculty is through a set of educational technology/tools such as

1. **Chalk and Talk - Lecturing is done using green/black board**

The *Chalk and Talk* method is a traditional teaching approach where the teacher explains concepts by writing and illustrating key points on the blackboard (using chalk) while simultaneously delivering a lecture (talking). It emphasizes direct instruction and teacher-centered learning.

Key Features:

- The **teacher is the main source of information**.
- **Blackboard and chalk** are the primary teaching tools.
- Focuses on **oral explanation and visual demonstration**.
- Encourages **real-time interaction** between teacher and students.
- Suitable for **concept-based and theoretical subjects**.

Advantages:

1. **Simple and cost-effective** – Requires minimal resources.
2. **Direct teacher-student communication** – Helps in immediate clarification of doubts.
3. **Effective for large classes** – Easy to implement without technology.
4. **Improves note-taking skills** of students.
5. **Flexible** – Can be adapted to different subjects and levels.

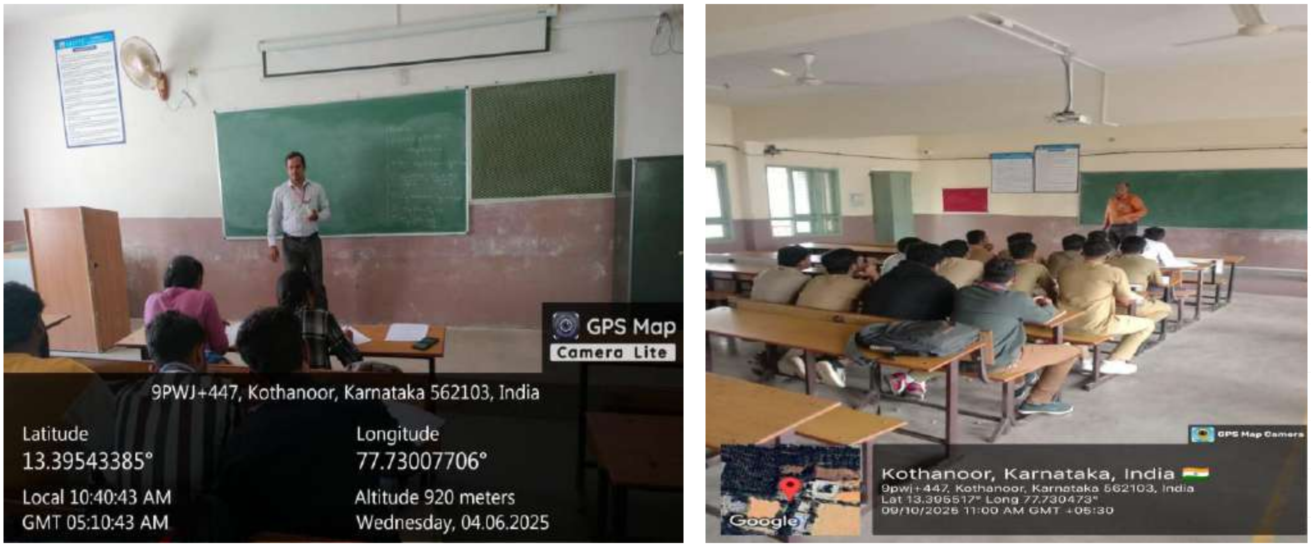
Limitations:

1. **Teacher-centered** – Students have limited participation.
2. **Less engaging** – May not hold attention for long periods.
3. **No visual aids or multimedia** – Difficult for abstract or practical topics.
4. **Pace may not suit all learners**.
5. **Limited assessment or feedback** during class.

Applications:

- Commonly used in **schools, colleges, and universities**.
- Effective for subjects like **mathematics, physics, and engineering fundamentals**.

- Often combined with modern methods (like PowerPoint, videos, or group discussions) for better outcomes.



(a) (b)

Fig. 1: Sample photo of Chalk and Board Method (a) Concept of mechanics of materials (b) Carpentry Skills

2. Power Point Presentation (PPT)

The **PPT Method of Teaching** is not a specific pedagogical model, but rather a common **delivery tool** that refers to using **PowerPoint (or similar presentation software like Google Slides/Keynote)** as the main visual aid for delivering a lecture or lesson. In essence, the "PPT Method" is the modern evolution of the traditional lecture method, enhanced by visual and multimedia aids.

(a) (b)

(c)

Fig. 2: Sample photo of Power Point Presentation Method (a) About NEP (b) AI powered Robots (c) FEM methods

3. Demonstration in Lab

The **Demonstration in Lab Method of Teaching** is a specific instructional strategy where the instructor (or a qualified student) performs an experiment, procedure, or technical operation **live** in the laboratory while the students **observe** the process.

This method is crucial in science, technology, engineering, and vocational fields because it effectively bridges the gap between **theory (concepts)** and **practice (skills)**. It is typically followed by a hands-on activity where students replicate the demonstrated procedure themselves (the **Laboratory Method**).

A successful lab demonstration requires meticulous planning and execution to ensure maximum visibility, comprehension, and safety.

1. Planning and Preparation Phase

- **Define Objectives:** Clearly state the **purpose** of the demonstration (what skill or principle will be taught) and ensure it aligns with the day's lesson.
- **Rehearsal:** The instructor must **practice** the demonstration beforehand to ensure familiarity with the procedure, correct timing, and to anticipate any potential errors or safety hazards.
- **Set-up: Pre-assemble all equipment** and place materials in the order they will be used. Ensure all apparatus is clean and functional.

- **Visibility Check:** Arrange the demonstration area so that **every student can clearly see** the procedure. Use a raised platform, a projected video feed (e.g., using a document camera on a small reaction), or models/charts for small-scale processes.

2. Introduction Phase

- **Hook Attention:** Start by relating the demonstration to a real-world problem or a theoretical concept they just learned to **create interest**.
- **State Objectives:** Clearly tell the students what they are about to see and **what they should be looking for** (e.g., "Observe the color change and the temperature variation").
- **Review Safety:** Stress the **specific safety precautions** relevant to the demonstration before starting.

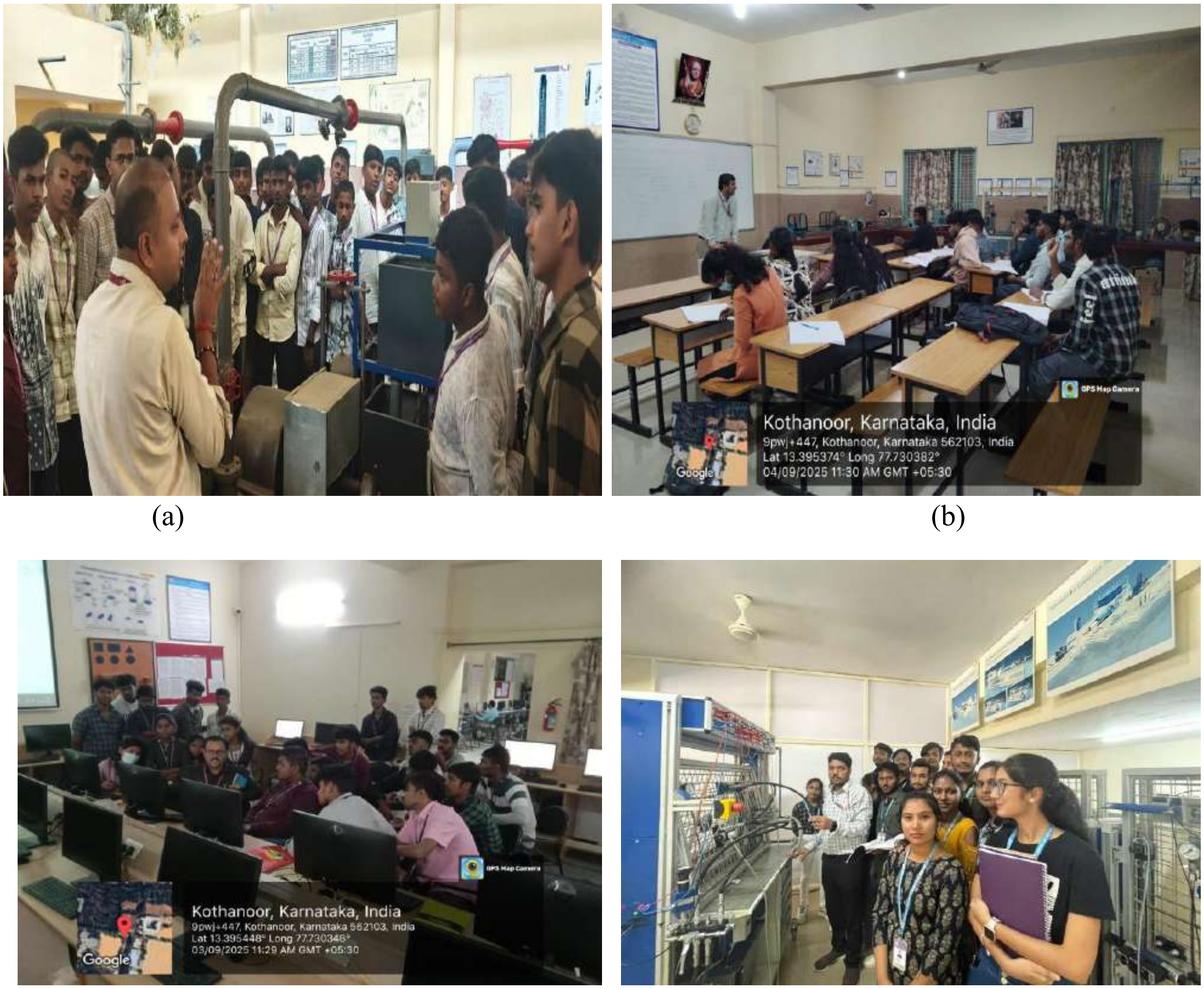
3. Performance Phase (The Demonstration)

- **Do and Explain:** Perform the task **step-by-step**. As you perform a step, **verbally explain** the scientific principle or reason *why* that step is being done. This links the action to the cognition.
- **Pace Control:** Maintain a **slow, deliberate pace**. Pause after key steps to check for student understanding and allow students time to note their observations.
- **Use Questions:** Interject guiding questions to the students throughout the process ("What gas do you predict will be released here?"). This keeps students actively involved as observers.
- **Point Out Key Elements:** Use pointers, color contrast, or simple background changes (e.g., a white sheet) to draw attention to critical parts of the process or equipment.

4. Conclusion and Follow-up Phase

- **Summarize:** Briefly **recap the entire procedure** and the main concepts/principles that were proven.
- **Discussion:** Open the floor for a **Q&A session** to clarify misunderstandings and encourage critical discussion about the results.
- **Hands-on Practice:** The most critical follow-up is to transition the students to **perform the procedure themselves** (the Lab Method) or a related activity, either individually or in small groups.

- **Evaluation:** Assess the students' understanding, often through a lab report or a practical performance assessment (return demonstration).



(a) (b)

(c) (d)

Fig. 3: Sample photo of Demonstration of Lab (a) Working of Pelton Wheel (b) Types of Gauges (c) Assembly drawing of Screw Jack (d) Bosch Lab

4. Workshops and Expert Talks

Workshops and Technical Talks play a vital role in enhancing students' practical knowledge and industry readiness. These sessions are typically organized by departments or institutions to complement the academic curriculum. Workshops focus on **hands-on learning** and allow participants to gain practical exposure to tools, software, or experimental techniques. They foster creativity, problem-solving, and teamwork while bridging the gap between classroom concepts and real-world applications. Technical Talks, on the other hand, are **expert-led sessions** where professionals, researchers, or alumni share insights on recent advancements, industrial practices, and future technologies. These talks encourage intellectual discussions, motivate innovation, and help students understand the **real-world relevance** of their academic subjects. Overall, workshops and technical talks cultivate professional competence, broaden technical perspectives, and inspire students to pursue research and innovation in their respective fields.

(a) (b)

Fig. 4: Sample photos of Workshops/Technical Talks (a) Workshop on CATIA V5 (b) Workshop on AI powered smart manufacturing

5. Experiential Learning

➢ **Key Features of Experiential Learning**

- Focuses on active participation rather than passive listening.
- Encourages reflection to derive meaning from experiences.
- Promotes critical thinking and problem-solving skills.
- Provides real-world exposure through projects, case studies, and fieldwork.

- Enables learners to apply theoretical knowledge in practical contexts.

➢ **Examples of Experiential Learning**

- Performing lab experiments, industrial visits, or prototype development.

Fig. 5: Sample photos of Industrial Visit to Cavery Hydro Power Plant to understand about the Turbines

Fig. 5: Sample photos of Robot Development

Fig. 5: Sample photos of Procedure of Casting

- **Benefits of Experiential Learning**
  - Builds confidence and decision-making abilities.
  - Improves retention and understanding of concepts.
  - Encourages teamwork, communication, and leadership.
  - Makes learning engaging, relevant, and meaningful.
  - Prepares students for industry expectations and professional challenges.

6. Project Based Learning

Project-Based Learning involves solving authentic, meaningful problems that require application of theoretical knowledge. Students plan, design, research, and implement projects that simulate real-life professional or social challenges. This approach bridges the gap between classroom learning and real-world applications.

- **Phases of Project-Based Learning**

1. Problem Identification: Students select or are given a real-world problem or challenge.
2. Planning: Define objectives, allocate roles, and plan activities or research.
3. Research and Investigation: Gather information, analyze data, and explore possible solutions.
4. Execution: Develop and implement the project (prototype, model, report, etc.).
5. Presentation: Share results or outcomes with peers, faculty, or industry experts.
6. Reflection and Evaluation: Review what was learned and how the process can be improved.

➢ **Features of Project-Based Learning**

- Interdisciplinary approach: Integrates knowledge from multiple subjects.
- Teamwork and collaboration: Students often work in groups, simulating workplace dynamics.
- Inquiry-driven: Encourages students to ask questions, research, and experiment.
- Outcome-focused: Learning is demonstrated through tangible results (models, reports, or presentations).
- Teacher as facilitator: Teachers guide and support rather than directly instruct.

➢ **Benefits of Project-Based Learning**

- Enhances critical thinking and problem-solving abilities.
- Promotes collaboration, leadership, and communication skills.
- Improves retention through hands-on practice.
- Encourages innovation and self-directed learning.
- Builds confidence and prepares students for real-world challenges.

Fig. 5: Sample photos of Project Based Learning like 3D Printing, Hydraulics and Pneumatics

7. Flipped Classroom

In a traditional classroom, teachers lecture during class, and students complete homework afterward. The flipped model **inverts** this by moving direct instruction outside the classroom and turning class time into an **interactive learning session**. This approach allows teachers to **focus on guidance, feedback, and deeper learning** during class hours.

➢ **Phases of Flipped Classroom**

1. Pre-Class Learning
   - Students watch video lectures, read notes, or review study materials at home.
   - They learn fundamental concepts independently.
2. In-Class Application
   - Class time is used for activities such as discussions, case studies, projects, or problem-solving exercises.
   - Teachers facilitate, clarify doubts, and guide application-based learning.
3. Post-Class Reflection
   - Students reflect on what they learned and may complete assessments or projects to reinforce understanding.

➢ **Features of Flipped Classroom**

- Shifts from teacher-centered to student-centered learning.
- Promotes active learning and engagement.
- Encourages self-paced study and accountability.

- Uses technology effectively (videos, online quizzes, discussion forums).
- Allows personalized support from teachers during class.

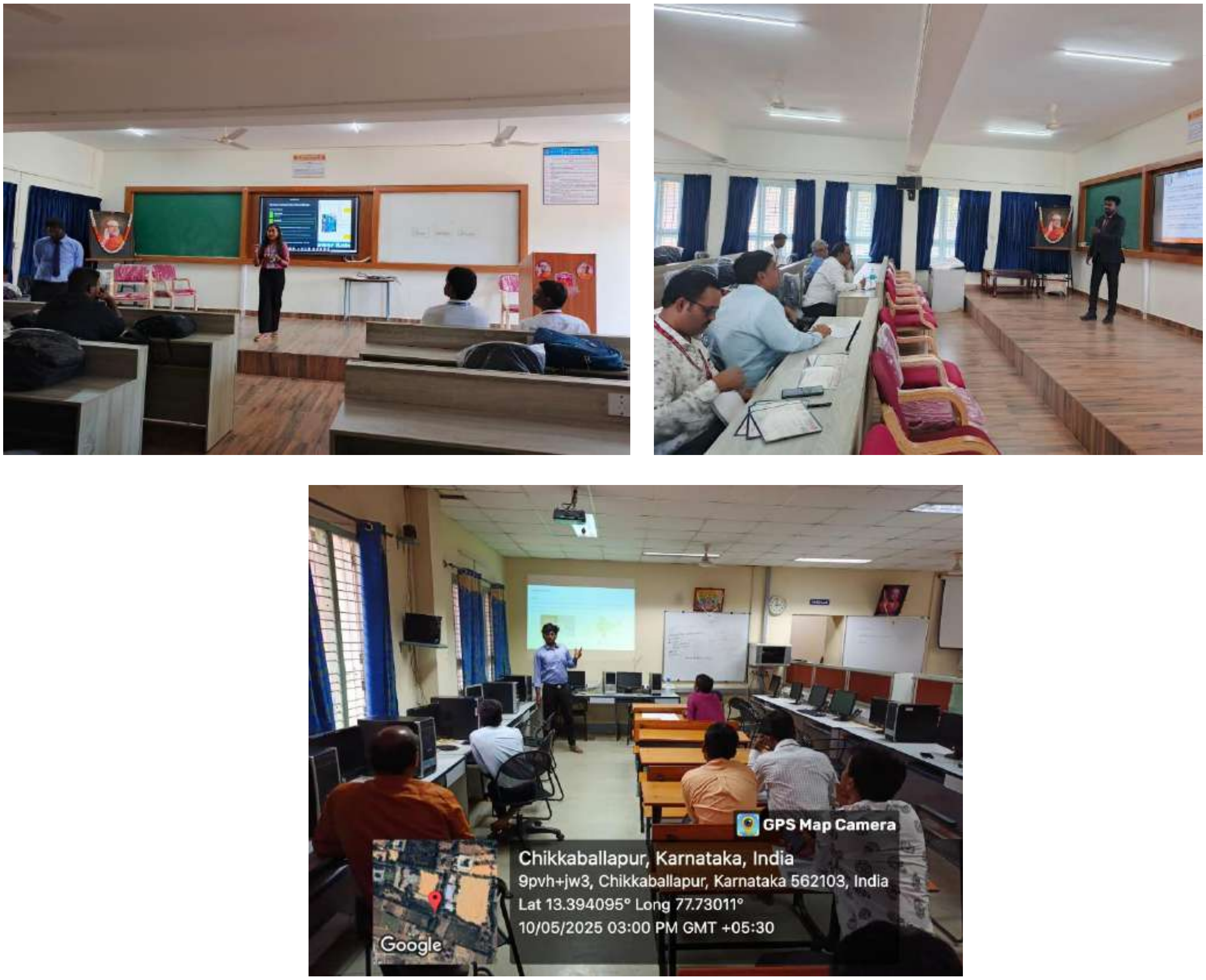


Fig. 5: Sample photos of students delivery lectures