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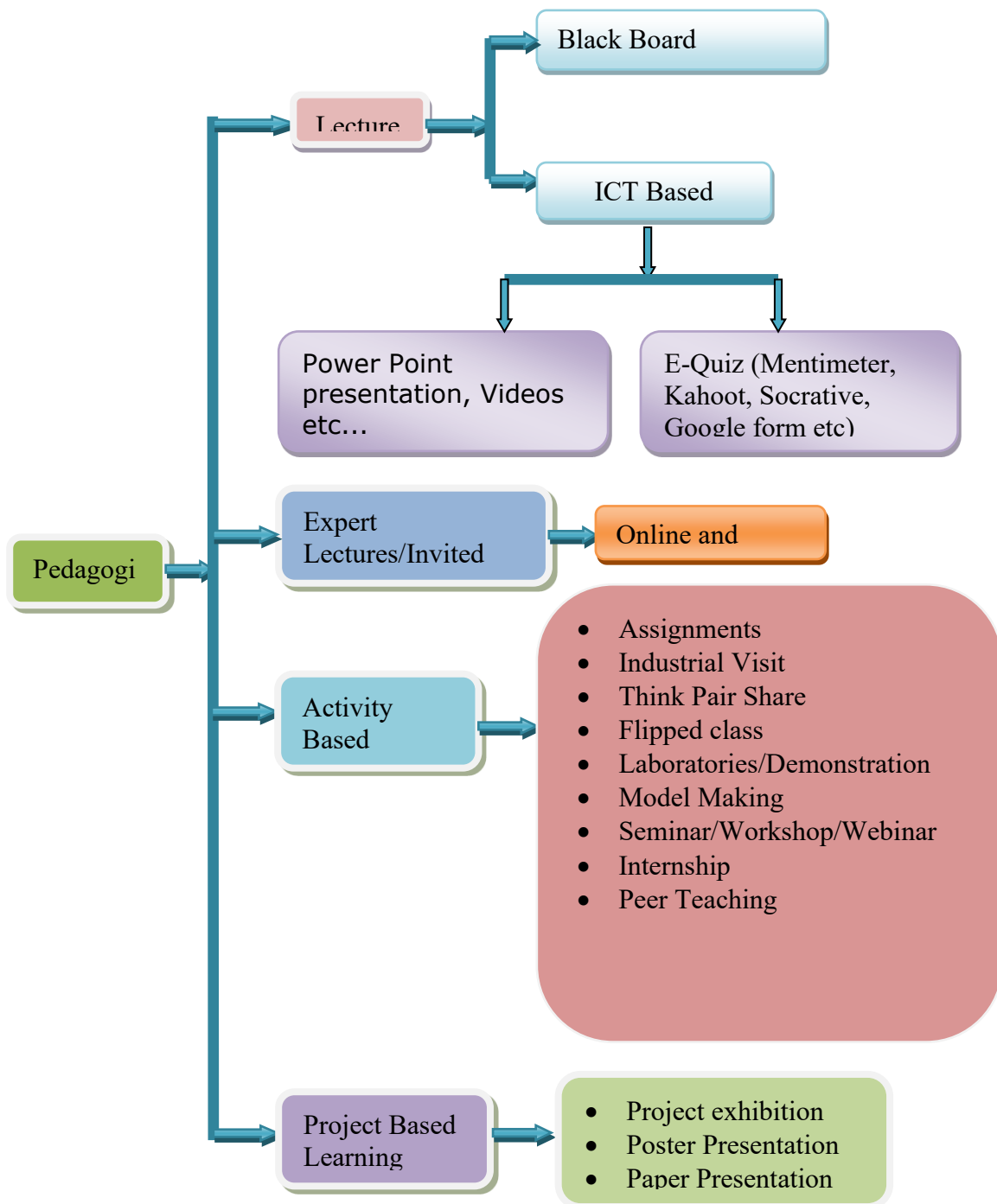
**SJC INSTITUTE OF TECHNOLOGY**

**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.

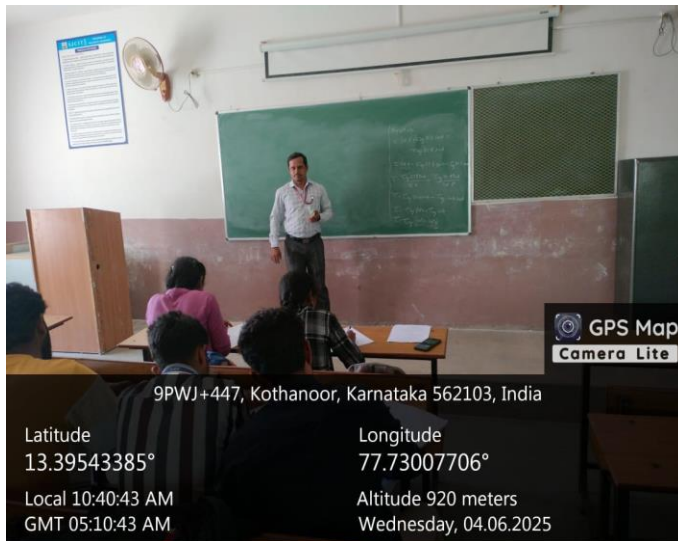
#### **Limitations:**

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)

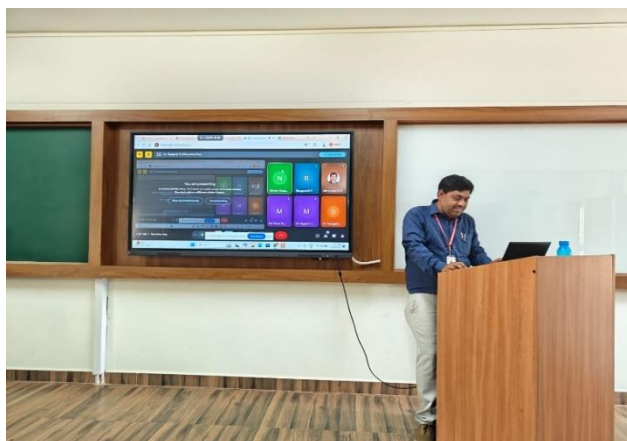


(b)

**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**

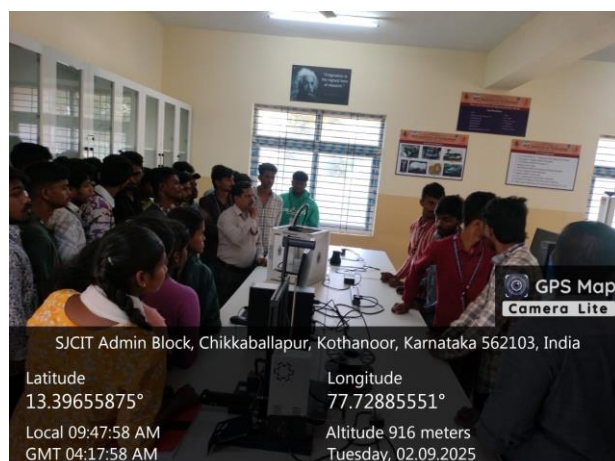
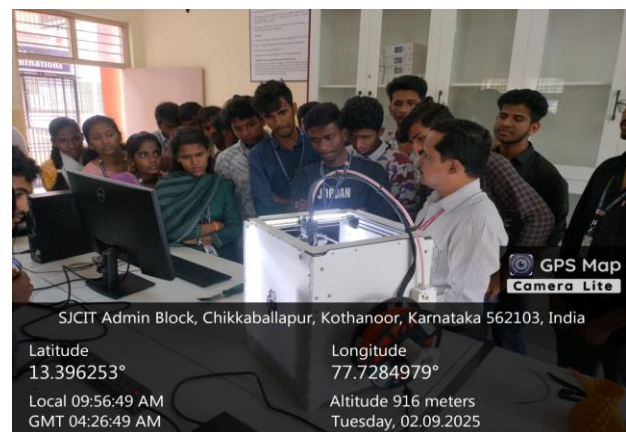
1. Problem Identification: Students select or are given a real-world problem or challenge.
2. Planning: Define objectives, allocate roles, and plan activities or research.
3. Research and Investigation: Gather information, analyze data, and explore possible solutions.
4. Execution: Develop and implement 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**

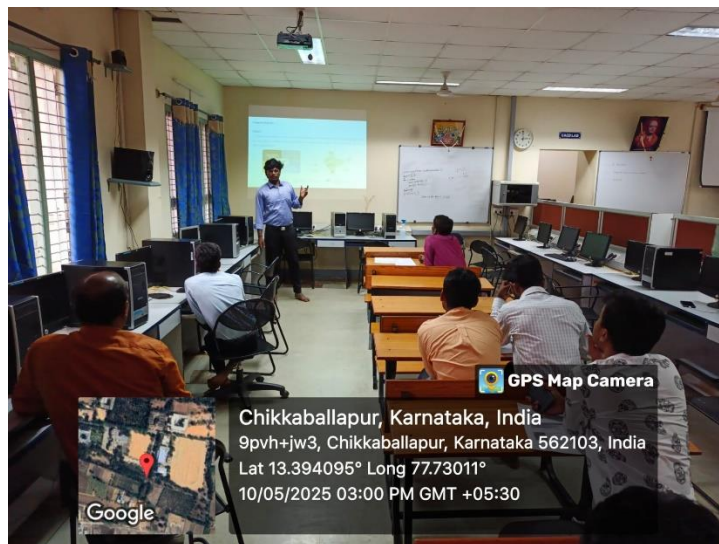
- Students reflect on what they learned and may complete assessments or projects to reinforce understanding.

### **➤ 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**