VIDYA JYOTHI INSTITUTE OF TECHNOLOGY
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Aziznagar Gate, Chilkur Balaji Road, Hyderabad - 500 075.

Department: Electrical & Electronics Engineering

Innovative Teaching Method

Academic Year: 2024-25

Title of Innovative Method/Activity	**:** Flash Cards
Name of the Faculty(Reused)	**:** Mr A Mohan Das
Designation	**:** Asst Professor
Course Name	**:** Power Electronics
Name of the Faculty (Prepared)	**:** Mr. A Mohandas

Aim of the method:

1. To revise and remember the concepts of the module.
2. To inculcate team work and team spirit among the students.
3. To involve students in framing the question so that they learn efficiently.

Implementation/Portrayal of method:

The students are divided into batches. A leader in each batch is identified and different modules are assigned to each batch. Each batch is given a task of preparing flashcards for the whole module using different online platforms and their batch should host the Flashcard quiz to the other batches. The timer is monitored for a stipulated time and the score for the correct answers is recorded, which are maintained by the host team. For Eg: If A1 team hosts for the flash card game, then A2, A3, A4, A5 play the game by answering the questions.

Benefits of the method:

1. Students can revise the module once completed.
2. Students will learn to be work in a team to host an event.
3. Students will learn the topic, since they have to frame questions.

Topic: Power Electronic Converters

Five Quiz questions are prepared by each batch of students on each topic as per their selection from the given topics. Each batch selected one topic as mentioned above and conducted the quiz.

Team A1 questions-Single Phase Converters Team

1. Which rectifiers have better power factor? Why?
2. Why R L load for Single Phase converter results with negative voltage waveform?
3. What are the advantages of Bridge type converter over midpoint (centre tapped) converter.
4. What is the control technique used for output control in rectifiers?
5. Why is an SCR used in single phase converters?

Team A2 questions-AC Voltage Converters Team

1. What is the function of an AC voltage controller?
2. The operation of AC voltage controller happens in how many quadrants?
3. What is the necessity of using two stage or higher stage AC voltage controllers?
4. Name any three applications of ac voltage controllers.
5. When do we get negative voltage in AC voltage controller and why?

Team A3 questions-DC DC Choppers Team

1. What are the control techniques used for output variation in DC choppers.
2. How we can get more voltage in Step Up chopper.
3. Why do we require multi quadrant choppers?
4. What device replicates a multi quadrant chopper operation?
5. What are the applications of DC DC choppers?

Team A4 questions – Dual Converters

1. Why do we use dual converters?
2. What is the condition to be satisfied in order to connect two anti-parallel Converters and operate them at a time?
3. What are the other alternatives for dual converters?
4. Which type of dual converter requires reactors and why?
5. Explain non circulating current type dual converter.

Team A5 questions – Inverters

1. What is the function of an inverter?
2. What is meant by 120 degrees inverter?
3. What are the various PWM Techniques?
4. What is the difference between an inverter and UPS?
5. Which switches are preferred in inverters and why?

Outcome: The students could understand the topic clearly as they have to frame a questionnaire, which can be done only if they are confident about the concepts. The students have searched and learned a lot in the process of questionnaire preparation, this also inculcated interest among the students.

Reflective Critique:

Feedback on practice from students and other stakeholders:

Students understood the concept reflected in their answers to the questions I asked during the discussion session.

Benefits of the practice:

- Students can able to answer the question even if the questions are in indirect form.
- Students can able to explain the concepts in the examination without any confusion.

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Innovative Teaching Method

Academic Year: 2024-25

Title of Innovative Method/Activity	: Gamified Learning Storyline Learning Through Analogies
Name of the Faculty	**:** Mrs**.** K Haritha
Designation	**:** Asst Professor
Course Name	**:**Network Analysis

Topic Covered through activity: Thevenin's Theorem

Aim of the method:

1. To prepare a presentation on a given topic.
2. To speak on a given topic.
3. To adhere to the time limit.
4. To memorize the topic by presenting.

Description of method:

A. Gamified Learning: Circuit Puzzle Challenge

Turn the learning process into a game:

1. **Challenge Levels:**

- **Beginner:** Simplify a simple resistive network using Thevenin’s theorem.
- **Intermediate:** Include voltage and current sources, with varying circuit complexities.
- **Advanced:** Analyze real-world circuits, like a bridge network or amplifier, for load optimization.

2. **Game Features:**

- Time-based challenges to solve for *Vth* and *Rth*.
- Earn "Power Points" for correct answers and efficiency in simplifying circuits.
- Introduce hints, like step-by-step solving guides or visual breakdowns.

B. Concept Introduction with a Storyline

Frame Thevenin's theorem as a **"superpower"** to simplify circuits, inspired by real-world scenarios:

- **Scenario:** "Imagine you're an electrical engineer troubleshooting a complex power grid. Thevenin's theorem helps you focus on a small part of the circuit while still considering its impact on the whole system."

Explain the theorem in simple terms:

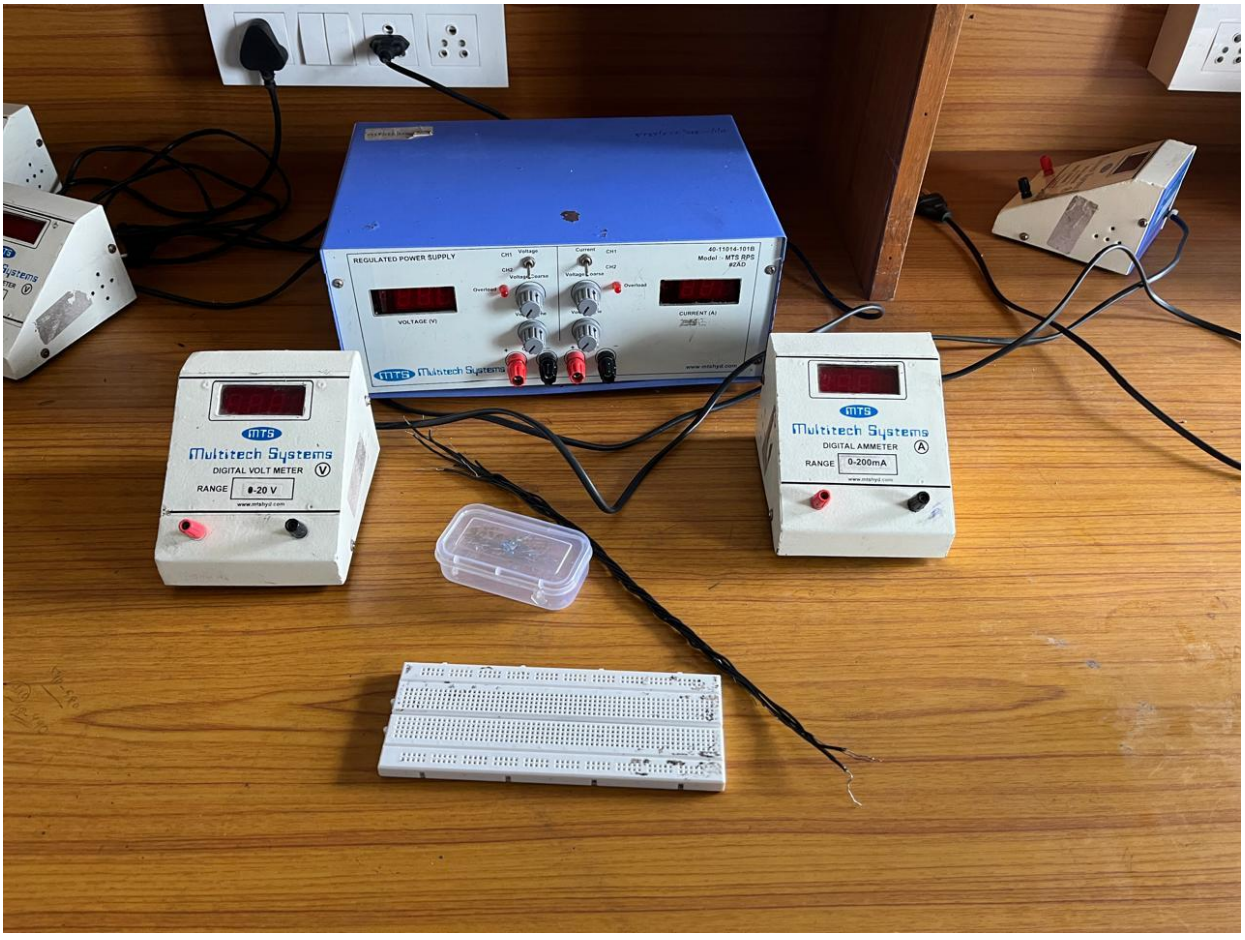
- A circuit with many components can be replaced by an equivalent circuit with just a single voltage source (Thevenin Voltage, *Vth*) and a series resistance (Thevenin Resistance, *Rth*).

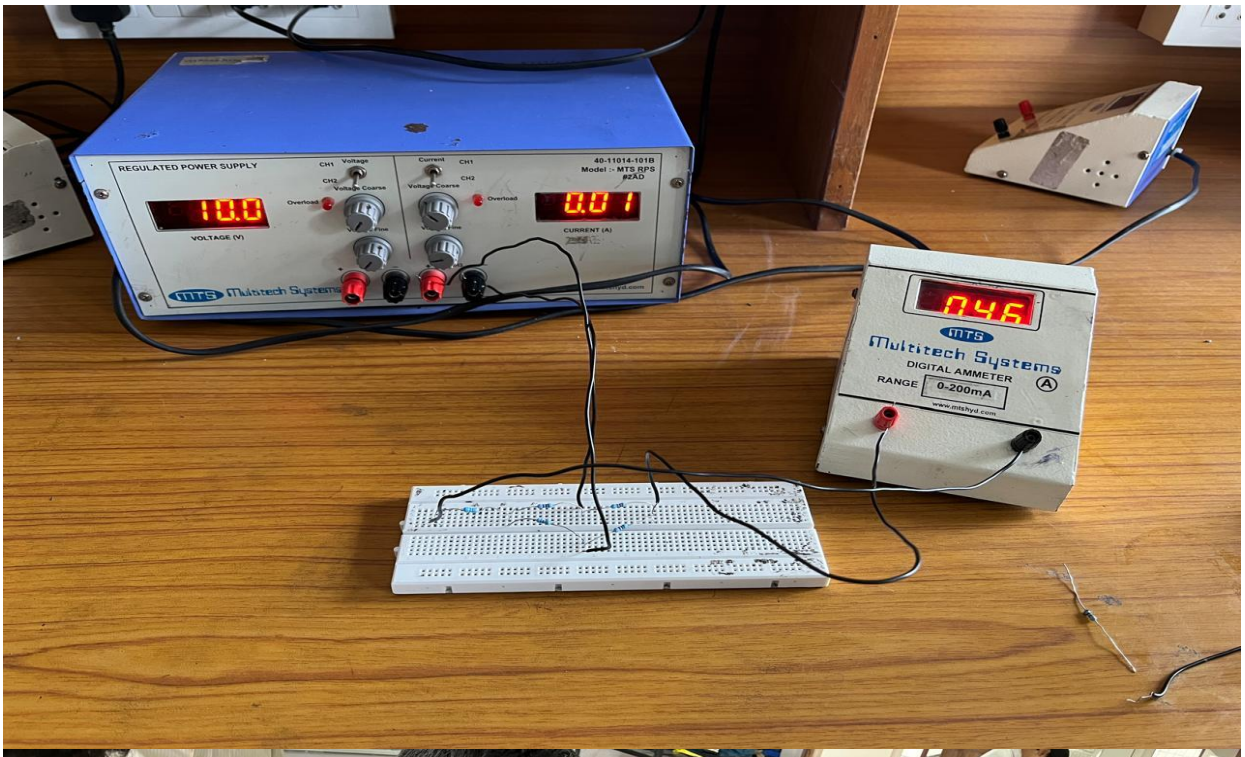
C. Learning Through Analogies

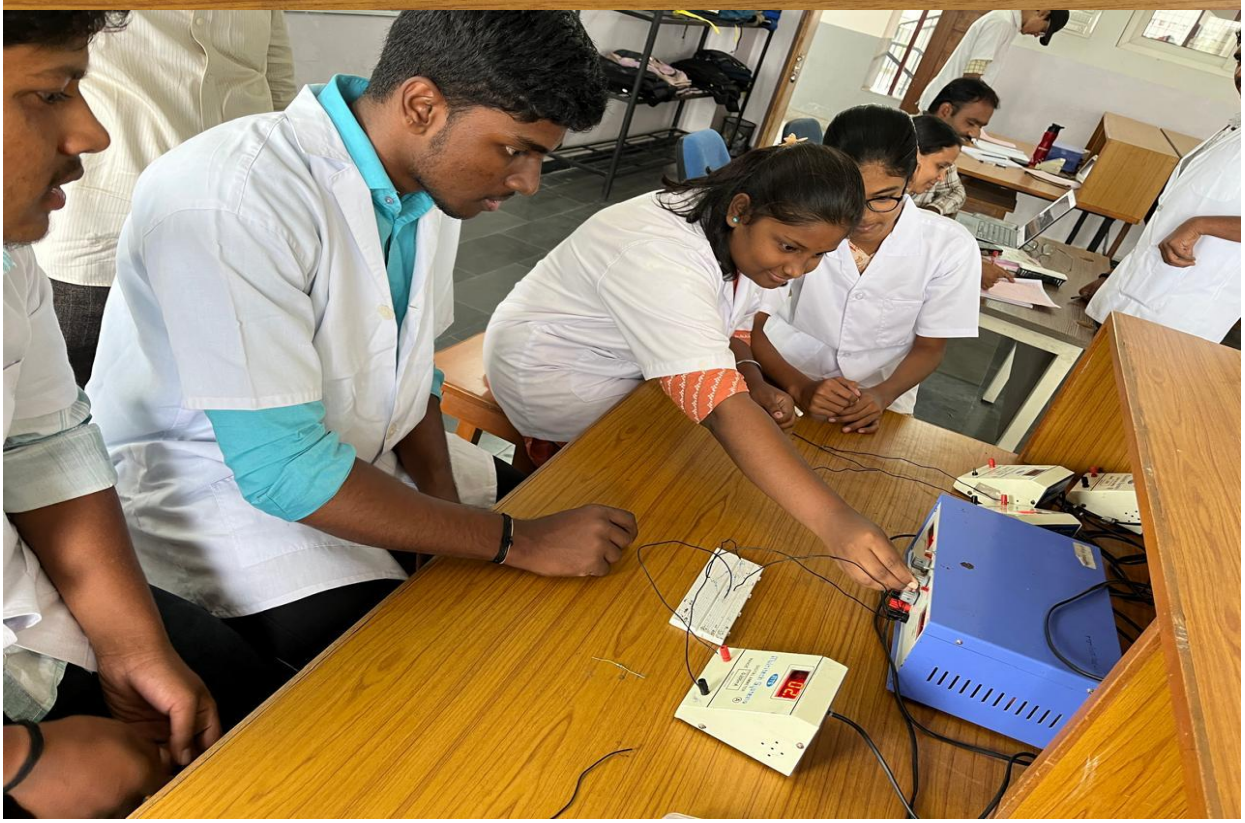
Introduce analogies to make the concept intuitive:

- **Water Pipe Analogy:** Compare current to water flow, voltage to water pressure, and resistance to the pipe's width. Show how simplifying a circuit is like combining all pipes into one equivalent pipe.

Outcome: This helped the students to perform well in end semester examinations. Good presentation skills also help one come up with better ideas, find up-to-date information and develop creative thinking.







Reflective Critique:

- Students can able to attend the question even if the questions are in indirect form.
- Students understood the concept which was reflected from their answers during the next class
- Most of the students able to recollect the concept quickly whenever asked

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Department: Electrical & Electronics Engineering

Innovative Teaching Method

Academic Year: 2024-25

Title of Innovative Method/Activity : Pictionary

Name of the Faculty (Reused) : Mrs. S Chaitanya

Designation : Asst Professor

Course Name : Sustainable Energy(Renewable Energy Sources)

Name of the Faculty (Prepared) : Mr. M Vijay Kumar

Title of Innovative method/activity: **Pictionary**

Pictionary focuses on giving clarity of concepts related with concept and block diagrams in the co-construction of knowledge

Aim of the method: To allow students to convey the meaning of the concept through pictures such that logical skills, creativity, retention and cognition is improved.

Implementation/Portrayal of method:

This teaching method is inspired from dumb charades guessing game. This activity is done by teams where the students try to identify the picture/ block diagram/ circuit or any concept related with pictures enacted by their teammates and have to draw the picture/ block diagram /circuit correctly on the blackboard in the stipulated time.

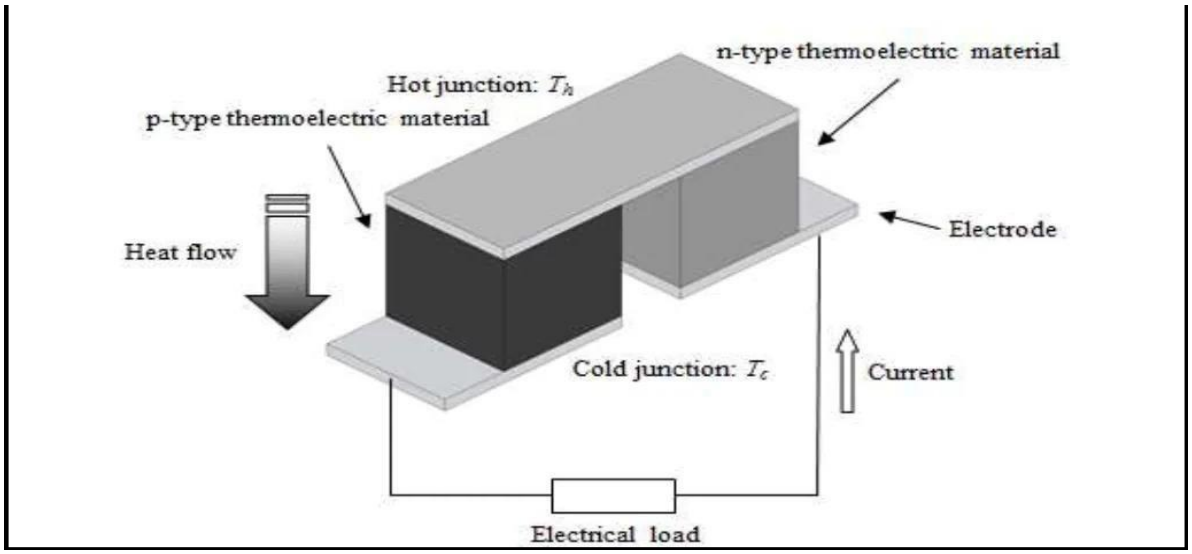
Benefits of method: This activity helps the students to remember the block diagrams, circuits and also the concepts with means of pictures and block diagrams.

Topic: Direct Energy Conversion Systems

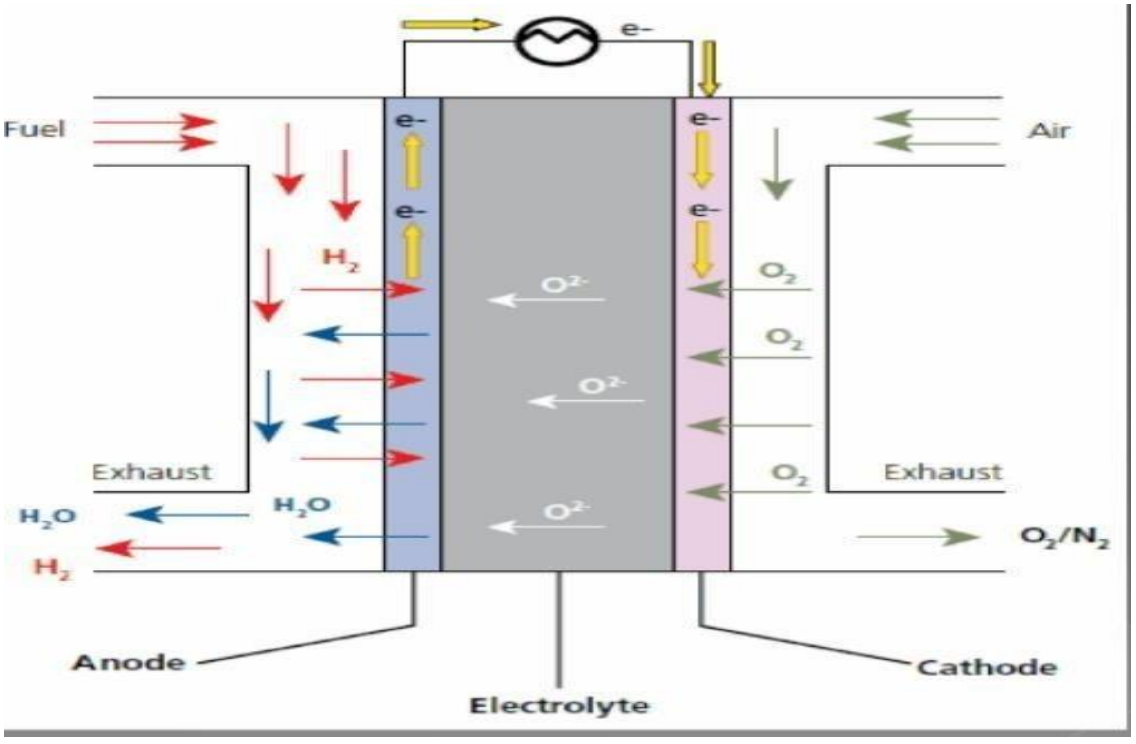
1. Thermo Electric Conversion principle
2. Fuel Cells
3. Photovoltaic Energy Conversion Principle
4. Parabolic through solar collectors
5. Biomass gasification
6. Geothermal energy
7. Small hydroelectric power plant

PICTURES:

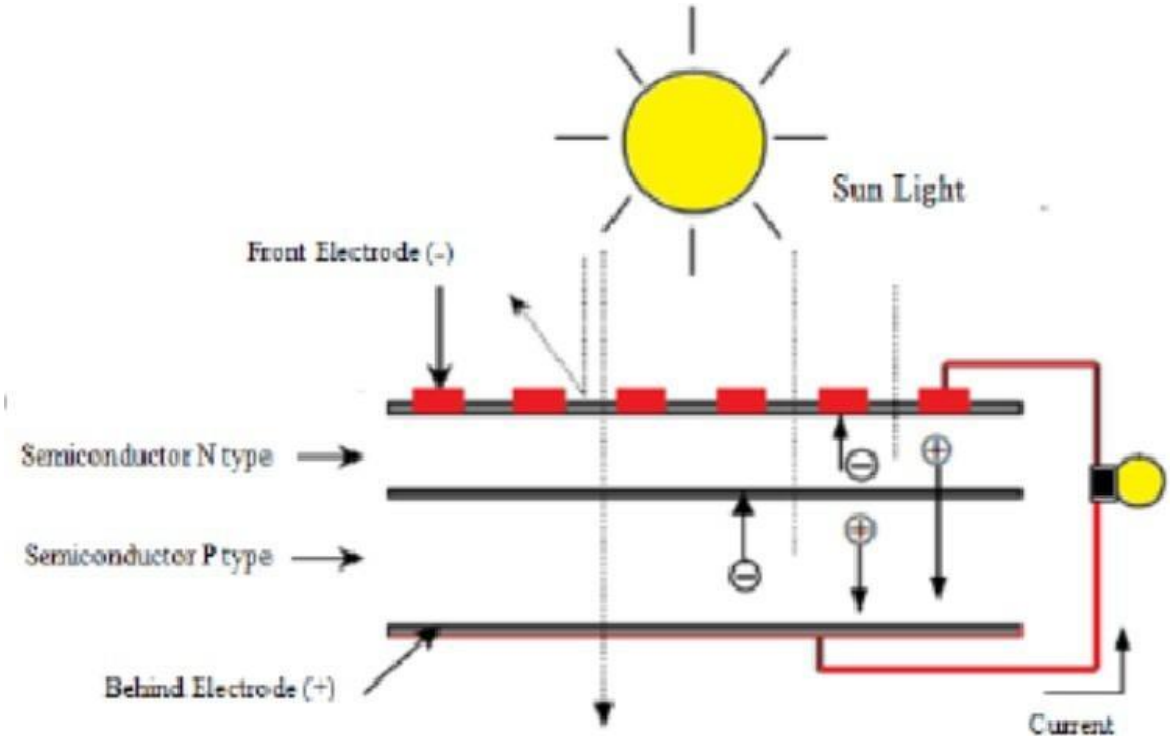
What is the technique used in power generation?



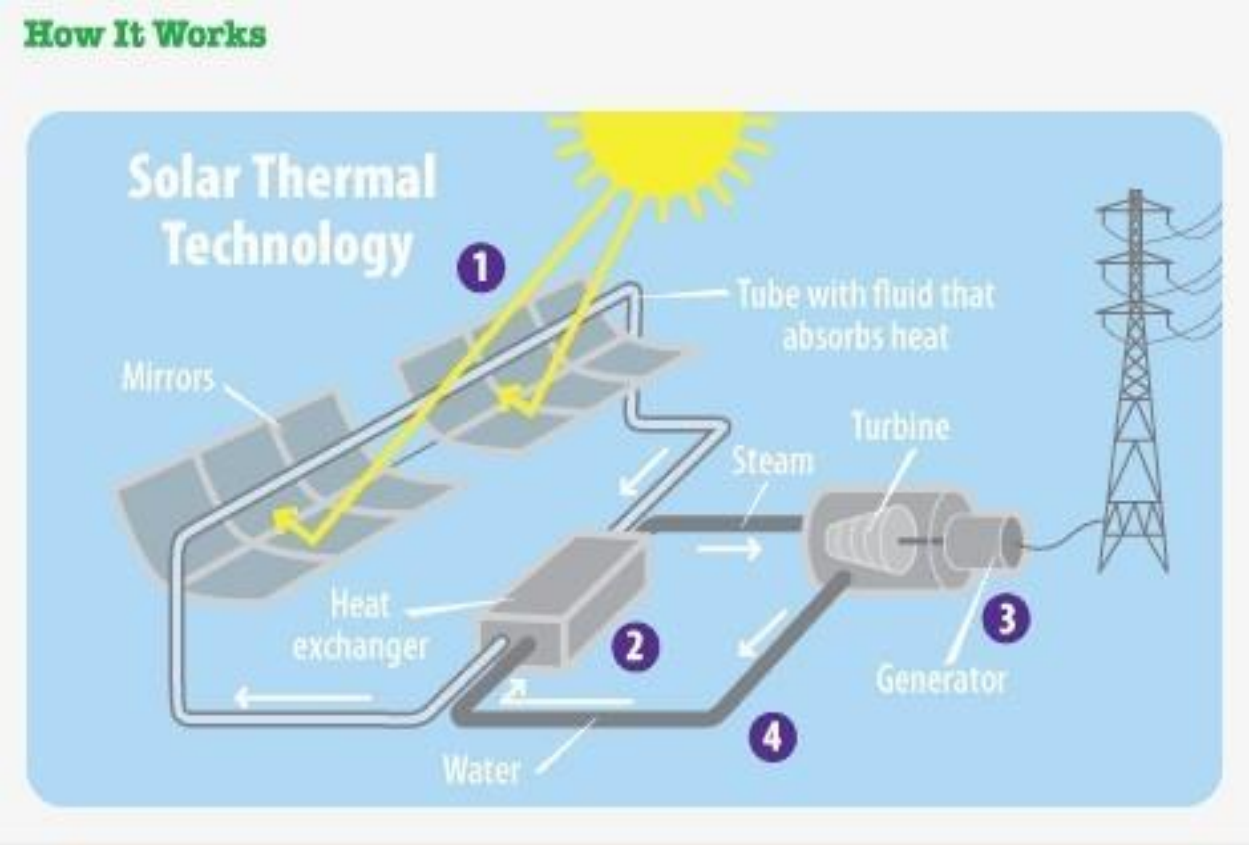
What is the byproduct in the fuel cell?



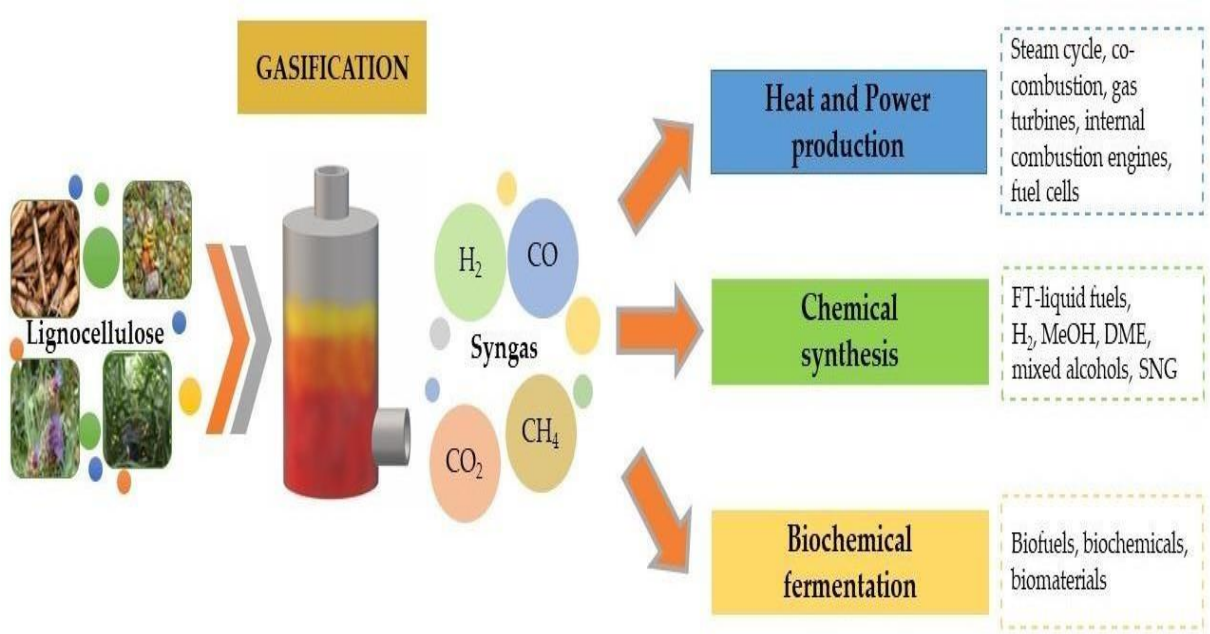
What is the conversion happening in the solar panel?



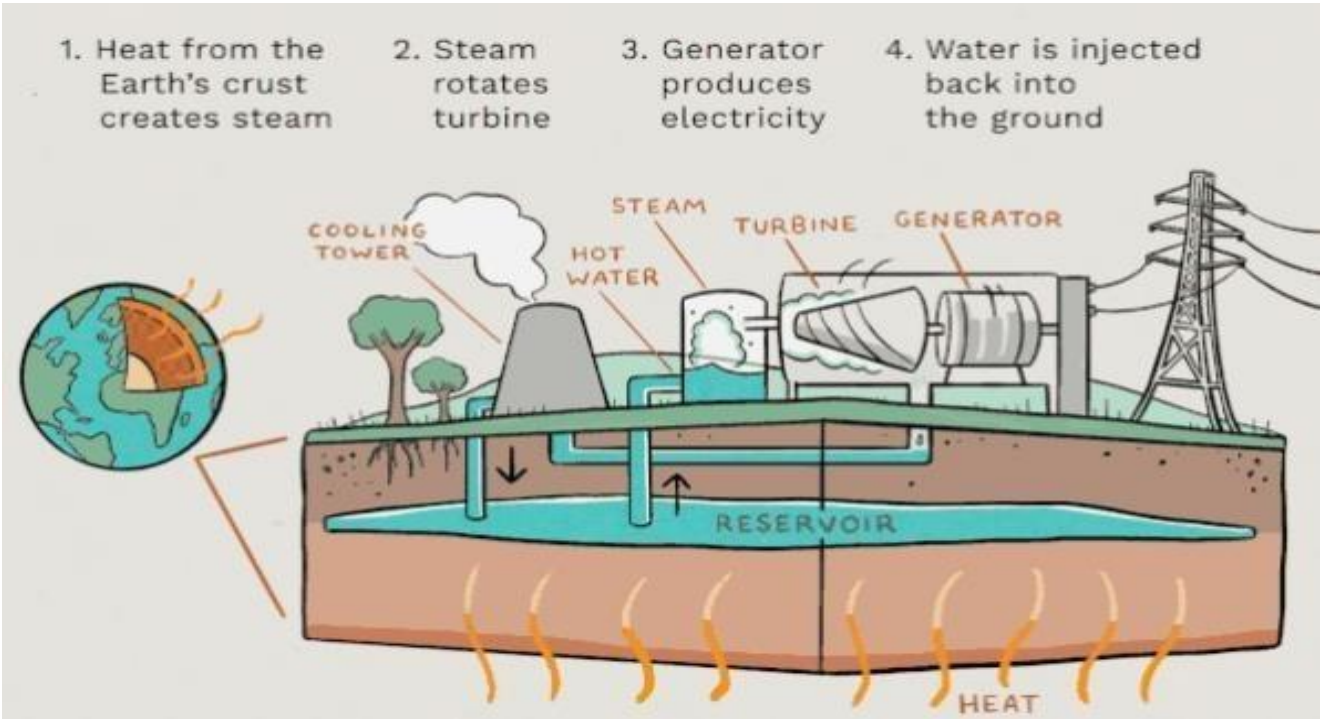
Illustrate Circuits used for the below Converter operations.



List the advantages and disadvantages of biomass gasification



How does geothermal energy work?



What are the benefits of a small hydroelectric power plant?

Outcome: This activity helps the students to remember the block diagrams, circuits, also concepts with means of pictures and block diagrams.

Reflective Critique:

- Most of the students are able to recollect the concept quickly whenever asked
- The Pictionary method for direct energy conversion represents a creative and engagingway to understand and visualize complex scientific principles, particularly those involving energy systems.

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Innovative Teaching Method

Academic Year: 2024-25

Title of Innovative method/activity : Simulation based teaching and Learning

Name of the faculty : M Vijay Kumar

Designation : Asst Professor

Course Name : Smart Grid

Objective of method:

The objective of simulating a microgrid is to analyze, design, and optimize the performance of a microgrid system under various operational conditions. Microgrid simulations aim to provide a virtual environment for testing and validating system behavior, ensuring reliability, efficiency, and sustainability.

Topic: Design of Microgrid

Below are the primary objectives:

1. Performance Analysis

- Evaluate the microgrid's ability to maintain stable operations during normal and abnormal conditions.
- Analyze power flow, voltage, and frequency stability.

2. Renewable Energy Integration

- Assess the impact of integrating renewable energy sources like solar, wind, and biomass on system performance.
- Optimize the utilization of renewable resources to enhance sustainability.

3. Energy Management

- Design and test strategies for efficient energy management and load balancing.
- Develop algorithms for demand-side management and optimal energy storage utilization.

4. Grid Interconnection and Islanding

- Study the seamless transition between grid-connected and islanded modes.
- Ensure stable operation during islanding events or grid outages.

5. Economic Feasibility

- Evaluate cost optimization strategies, including energy trading, generation costs, and storage economics.
- Simulate scenarios for minimizing operational expenses and maximizing return on investment.

6. Fault Analysis and Resilience

- Simulate faults and disturbances to test the microgrid's resilience and protection mechanisms.
- Identify and mitigate potential vulnerabilities in the system.

7. Control System Development

- Develop and validate control algorithms for microgrid operations, including voltage and frequency regulation, load sharing, and synchronization.
- Test advanced control strategies like droop control or hierarchical control methods.

8. Environmental Impact Assessment

- Measure the carbon footprint reduction achieved by deploying renewable energy and efficient energy systems.
- Simulate scenarios for minimizing environmental impact while meeting energy demands.

9. Training and Education

- Provide a platform for learning and experimentation for engineers, researchers, and students.
- Enable hands-on experience in designing and operating microgrid systems in a risk-free environment.

10. Scalability and Flexibility

- Test the microgrid's ability to adapt to changes, such as load growth, integration of new resources, or technological upgrades.
- Evaluate the scalability of system designs for future expansions.

Microgrid simulation tools like MATLAB/Simulink, HOMER, Open DSS, or PSCAD allow researchers and engineers to model these objectives comprehensively and validate solutions before implementing them in real-world systems.

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Figure 1: Micro Grid Simulation Demonstration

Outcome:

Simulation of microgrid systems is an indispensable approach for researchers, engineers, and policymakers. It offers a risk-free, cost-effective platform to explore and address the challenges of integrating diverse energy resources into a cohesive system. While there are challenges such as model complexity and hardware demands, the benefits—such as enhanced understanding, better design, and optimized performance—make simulation a cornerstone in developing future-ready microgrids.

Reflective Critique:

- Students understood the concept reflected in their answers during the next class.
- Students can able to write the concepts in the examination without any confusion.

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Innovative Teaching Method

Academic Year: 2024-25

Title of Innovative Method/Activity : Think-Pair-Share

Name of the Faculty : T Parameshwar

Designation : Assoc Professor

Course Name : Electrical Measurements and Instrumentation

Topic : Dynamometer's

Objective of method:

Think-Pair-Share Method for Learning about Dynamometer Wattmeter's

The Think-Pair-Share (TPS) method is an interactive teaching approach that promotes engagement and deeper understanding through individual reflection, collaborative discussion, and group sharing

Step 1: Think (Individual Reflection)
Objective: Encourage individual understanding of the basic concepts.

1. **Prompt:**

Provide students with a question or scenario to consider individually. For example:

- "What is the working principle of a dynamometer wattmeter?"
- "Why is the dynamometer wattmeter suitable for both AC and DC measurements?"
- "What are some practical challenges or errors associated with using dynamometer wattmeters?"

2. **Materials:**

- Brief explanation of the dynamometer wattmeter, including its construction (moving coil and fixed coil) and working principle.
- Diagram of the device, showing its key components and their functions.

3. **Task:**

Allow 5–10 minutes for individuals to jot down their thoughts, questions, or understanding of the topic.

Step 2: Pair (Collaborative Discussion)

Objective: Build on individual ideas through peer interaction.

1. **Instructions:**

- Pair up students and ask them to share their thoughts from the "Think" phase.
- Encourage them to discuss their understanding and clarify any differences.
- Prompt them with collaborative tasks, such as:

- Sketching the circuit connections for a dynamometer wattmeter in a simple AC circuit.
- Identifying situations where dynamometer wattmeters may not provide accurate readings.

2. **Time:**
   Allow 10–15 minutes for pairs to discuss and create a shared understanding.

Step 3: Share (Group Interaction)

Objective: Broaden perspectives and consolidate learning.

1. **Whole-Class Sharing:**
   - Each pair summarizes key takeaways from their discussion.
   - Groups may present diagrams, use examples, or highlight questions that remain unanswered.

2. **Instructor Input:**
   - Address common misconceptions or elaborate on challenging aspects of the topic.
   - Demonstrate or simulate the dynamometer wattmeter's operation using a physical model or software simulation.

Outcome: students can understand the concept clearly and remember it for long time.

Reflective Critique:

Feedback on practice from students and other stakeholders:

Students understood the concept reflected in their answers to the questions I asked during the discussion session.

Benefits of the practice:

- Students can able to answer the question even if the questions are in indirect form.
- Students can able to explain the concepts in the examination without any confusion.

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