



Innovation in Teaching Learning Process

Case Study on Research Paper on Characterization Techniques

Name of the Innovation	:	Case Study on Research Paper on Characterization Techniques
Course Code and Name	:	1AEPE307 - Material Testing and Characterization
Class and Semester	:	Third Year B.Tech. Aeronautical Engineering, V Semester
Academic Year and Term	:	AY 2023-24, Term - I
Faculty Name and Designation	:	Mr. Y. B. Kumbhar, Assistant Professor

Introduction:

Characterization techniques play a crucial role in materials science and engineering by providing insights into the structure, composition, and properties of materials. Understanding these techniques is essential for material selection, failure analysis, and quality control in aerospace and other engineering applications.

To enhance students' understanding of material characterization, an individual case study activity was conducted where students analyzed and presented research papers related to various characterization techniques such as XRD (X-ray Diffraction), SEM (Scanning Electron Microscopy), TEM (Transmission Electron Microscopy) and DSC (Differential Scanning Calorimetry).

This activity enabled students to explore **real-world applications of material characterization techniques** through research papers, improving their analytical and critical thinking skills.

Motivation/Purpose of Innovative Technique:

The primary motivation behind this activity was to:

- Bridge the gap between theoretical concepts and practical research applications in material characterization.
- **Develop students' ability to analyze, interpret, and present scientific research papers** in the field of material testing.
- **Improve scientific literacy and critical thinking** by encouraging students to explore and summarize key findings from published research.
- Enhance awareness of modern characterization techniques used in aerospace, mechanical, and materials engineering industries.
- Strengthen technical writing and presentation skills, which are essential for future research and industry roles.





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Procedure Followed:

This was an individual assessment, conducted as part of the In-Semester Evaluation (ISE2) with a submission deadline of December 15, 2023.

Assessment Details:

- Class: Third Year B.Tech., Semester V
- Course Code: 1AEPE307
- Task: Case Study Analysis of a Research Paper on Material Characterization Techniques
- Submission Format: Report
- **Due Date:** December 15, 2023

Requirements:

- 1. Selection of a Research Paper
 - Students were required to **select a recent research paper** (published in a reputed journal/conference) related to **any characterization technique** such as:
 - X-ray Diffraction (XRD)
 - Scanning Electron Microscopy (SEM)
 - Transmission Electron Microscopy (TEM)
 - Differential Scanning Calorimetry (DSC)
 - Thermogravimetric Analysis (TGA)
- 2. Analysis and Summary
 - Understanding the **objective and significance** of the research.
 - Explaining the characterization technique used and its working principle.
 - Summarizing the experimental methods, findings, and conclusions.
 - Discussing the **applications and relevance** of the technique in aerospace/material science.
- 3. Report Submission
 - A structured **technical report (3-5 pages)** summarizing the research paper with proper citations.

Outcome:

This activity helped students **gain exposure to real-world research** and understand the practical applications of characterization techniques in material science. Key takeaways include:

- **Improved research and analytical skills** by reviewing and summarizing scientific literature.
- Better understanding of experimental techniques and their role in material analysis.
- Enhanced technical writing and presentation skills, crucial for both academics and industry roles.





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• Increased awareness of cutting-edge materials research and its relevance to aerospace applications.

Many students initially found it challenging to interpret complex scientific data, but with guidance, they successfully analyzed their chosen research papers.