

## Lesson Plan


Subject : MATERIAL CHARACTERIZATION (TH-4(A)) Name of faculty: SAGARIKA PALEI

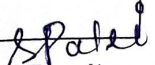
Semester: 4<sup>th</sup>

Class allotted: 3p/week

Branch: Metallurgical Engg. Session: 2026(S)

Discipline	Semester	From date: 22/12/2025 To date: 18/04/2026	Teaching Aid
Subject:	No. of days/ per week	Theory/ Practical –Topics/Lesson	
Week	Date/Period		
1	22/12/2025 TO 27/12/2025	<b>Module 1: Introduction to Material Characterization :</b> Fundamentals of Material Characterization: Importance of material characterization in metallurgy, Classification of characterization techniques: Structural, chemical, mechanical, and thermal analysis,)	White Board Marker Smart board
2	29/12/2025 TO 03/01/2026	Selection criteria for characterization methods Specimen Preparation Techniques: Cutting, grinding, polishing, and etching, Sample preparation for different characterization methods (metals, ceramics, polymers	White Board Marker Smart board
3	05/01/2026 TO 10/01/2026	<b>Module 2: Microstructural Characterization Techniques</b> Optical Microscopy (OM): Principles of optical microscopy, Bright-field and dark-field imaging,	White Board Marker Smart board
4	12/01/2026 TO 17/01/2026	Grain size analysis using ASTM standards Scanning Electron Microscopy (SEM) & Energy Dispersive Spectroscopy (EDS): Working principle and components of SEM.	White Board Marker Smart board
5	19/01/2026 TO 24/01/2026	, Image contrast mechanisms and resolution, EDS for elemental composition analysis Transmission Electron Microscopy (TEM): Principles and applications of TEM,	White Board Marker Smart board

  
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6	27/01/2026 TO 31/01/2026	Diffraction contrast and phase identification Atomic Force Microscopy (AFM): Principles of AFM	White Board Marker Smart board
7	02/02/2026 TO 07/02/2026	, different modes of operation (contact, tapping, non- contact). Surface topography, roughness measurement	White Board Marker Smart board
8	09/02/2026 TO 14/02/2026	<b>Module 3: X-ray and Spectroscopic Characterization:</b>  X-ray Diffraction (XRD): Bragg's law and diffraction principles	White Board Marker Smart board
9	16/02/2026 TO 21/02/2026	, Phase identification and crystallite size determination	White Board Marker Smart board
10	23/02/2026 TO 28/02/2026	, Applications in metallurgy and materials science Spectroscopy Techniques:	Marker White Board Smart board
11	02/03/2026 TO 07/03/2026	UV-Visible Spectroscopy: Absorption and bandgap analysis, ials	White Board Marker Smart board
12	09/03/2026 TO 14/03/2026	Infrared (IR) Spectroscopy: Functional group identification,	Marker White Board Smart board
13	16/03/2026 TO 18/03/2026	. Raman Spectroscopy: Vibrational analysis of mater	White Board Marker Smart board
14	23/03/2026 TO 28/03/2026	<b>Module 4: Thermal &amp; Mechanical Characterization Techniques:</b>  Thermal Analysis Methods: Differential Scanning Calorimetry (DSC):	White Board Marker Smart board

  
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15	30/03/2026 TO 04/03/2026	Phase transformation studies, Thermogravimetric Analysis (TGA).	White Board Marker Smart board
16	06/04/2026 TO 11/04/2026	Thermal stability and decomposition analysis, Dilatometry: Thermal expansion studies	White Board Marker Smart board
17	13/04/2026 TO 18/04/2026	Revision....	White Board Marker Smart board

  
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