


**GOVT. POLYTECHNIC MAYURBHANJ**

**LESSON PLAN OF MATERIAL CHARACTERIZATION FOR ACADEMIC YEAR (2025-26) SUMMER**

Discipline: <b>Metallurgy Engineering</b>		Semester: <b>4<sup>th</sup> semester</b>	Name of the Teaching Faculty: <b>SUSHREE SUBHASHREE DAS &amp; BHAGYASHREE BAL</b>		
Subject: <b>MATERIAL CHARACTERIZATION</b> Sub code: <b>MTPC212</b>		No of days /week class allotted: <b>03</b>	Semester from Date: <b>22/12/2025 to 18/04/2026</b>		
Month	Week	Day	Unit	Topics	
December	4 <sup>th</sup>	2 <sup>nd</sup>	UNIT-1	Introduction: Fundamentals of Material Characterization: Importance of material characterization in metallurgy	
		5 <sup>th</sup>		<b>X-MASS DAY</b>	
		6 <sup>th</sup>		<b>4<sup>th</sup> SATURDAY HOLIDAY</b>	
	5 <sup>th</sup>	2 <sup>nd</sup>		Classification of characterization techniques: Structural, chemical, mechanical, and thermal analysis,	
	January	1 <sup>st</sup>	5 <sup>th</sup>	UNIT-1	Selection criteria for characterization methods
			6 <sup>th</sup>		Specimen Preparation Techniques: Cutting, grinding,
2 <sup>nd</sup>		2 <sup>nd</sup>	UNIT-2	Specimen Preparation Techniques: polishing, etching,	
		5 <sup>th</sup>		<b>REVISION</b>	
		6 <sup>th</sup>		<b>2<sup>nd</sup> SATURDAY HOLIDAY</b>	
		3 <sup>rd</sup>		2 <sup>nd</sup>	Sample preparation for different characterization methods (metals, ceramics, polymers)
4 <sup>th</sup>		5 <sup>th</sup>	UNIT-2	Microstructural Characterization Techniques	
		6 <sup>th</sup>		Optical Microscopy (OM): Principles of optical microscopy,	
		7 <sup>th</sup>		Bright-field and dark-field imaging,	
		2 <sup>nd</sup>		Grain size analysis using ASTM standards	
		5 <sup>th</sup>		Scanning Electron Microscopy (SEM) & Energy	
		7 <sup>th</sup>		<b>4<sup>th</sup> SATURDAY HOLIDAY</b>	
	5 <sup>th</sup>	2 <sup>nd</sup>		UNIT-2	Working principle and components of
		5 <sup>th</sup>			<b>1<sup>st</sup> Monthly Test</b>
6 <sup>th</sup>		SEM, Image contrast mechanisms and resolution, EDS for elemental composition analysis			
1 <sup>st</sup>		2 <sup>nd</sup>	UNIT-3		Transmission Electron Microscopy (TEM): Principles and applications of TEM
February	1 <sup>st</sup>	5 <sup>th</sup>		Diffraction contrast and phase identification	
		6 <sup>th</sup>		Atomic Force Microscopy (AFM): Principles of AFM, different modes of operation (contact, tapping, non- contact).	
		2 <sup>nd</sup>	Surface topography, roughness measurement.		
	2 <sup>nd</sup>	5 <sup>th</sup>	<b>REVISION</b>		
		6 <sup>th</sup>	<b>2ND SATURDAY HOLIDAY</b>		
3 <sup>rd</sup>	2 <sup>nd</sup>	UNIT-3	X-ray and Spectroscopic Characterization		

	4 <sup>th</sup>	5 <sup>th</sup>	UNIT-4	1 <sup>st</sup> Internal Assessment
		6 <sup>th</sup>		X-ray Diffraction (XRD): Bragg's law and diffraction principles,
		2 <sup>nd</sup>		Phase identification and crystallite size determination,
		5 <sup>th</sup>		Applications in metallurgy and materials science
		6 <sup>th</sup>		4TH SATURDAY HOLIDAY
March	1 <sup>st</sup>	2 <sup>nd</sup>	UNIT-4	DOLA PURNIMA
		5 <sup>th</sup>		Spectroscopy Techniques: UV-Visible Spectroscopy: Absorption and bandgap analysis,
		6 <sup>th</sup>		Spectroscopy: Functional group identification, Raman
	2 <sup>nd</sup>	2 <sup>nd</sup>		Spectroscopy: Vibrational analysis of materials
		5 <sup>th</sup>		Doubt clearing Class
		6 <sup>th</sup>		2ND SATURDAY HOLIDAY
	3 <sup>rd</sup>	2 <sup>nd</sup>		REVISION
		5 <sup>th</sup>		Thermal Analysis Methods: Differential Scanning
		6 <sup>th</sup>		ID-UL-FITRE
	4 <sup>th</sup>	2 <sup>nd</sup>		Calorimetry (DSC): Phase transformation studies,
		5 <sup>th</sup>		2 <sup>nd</sup> Internal Assessment
		6 <sup>th</sup>		4TH SATURDAY HOLIDAY
	5 <sup>th</sup>	2 <sup>nd</sup>		Thermogravimetric Analysis (TGA): Thermal stability and decomposition analysis,
April	1 <sup>st</sup>	5 <sup>th</sup>	Dilatometry: Thermal expansion studies	
		6 <sup>th</sup>	GOOD FRIDAY	
	2 <sup>nd</sup>	2 <sup>nd</sup>	Doubt clearing Class	
		5 <sup>th</sup>	REVISION	
		6 <sup>th</sup>	2 <sup>ND</sup> SATURDAY HOLIDAY	
	3 <sup>rd</sup>	2 <sup>nd</sup>	MAHABISHUBA SANKRANTI	
		5 <sup>th</sup>	2 <sup>nd</sup> Monthly Test	
		6 <sup>th</sup>	MOCK TEST	

  
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