

## LESSON PLAN FOR ACADEMIC SESSION: 2025-2026(SUMMER)

<b>Discipline: Metallurgical Engineering</b>	<b>Semester : 4th</b>	<b>Name of teaching faculty: Rueigved mahanand</b>
subject: Physical metallurgy	No. Of days/week class allotted	Semseter From: 22/12/2025 to 18/04/2026 No.of week per semester : 15
<b>week</b>	<b>Class Day</b>	<b>Theory topics</b>
1 <sup>st</sup>	1 <sup>st</sup>	Classification of materials: Metals, alloys, ceramics, polymers, composites
	2 <sup>nd</sup>	Structure of metals: Atomic bonding, metallic bonding
	3 <sup>rd</sup>	Imperfections in Solids: Point defects: Vacancies, interstitials, substitutional defects
2 <sup>nd</sup>	1 <sup>st</sup>	Line defects: Edge and screw dislocations
	2 <sup>nd</sup>	Surface defects: Grain boundaries, twin boundaries and volume defects
	3 <sup>rd</sup>	Surface defects: Grain boundaries, twin boundaries and volume defects
3 <sup>rd</sup>	1 <sup>st</sup>	Solid solutions (substitutional, interstitial)
	2 <sup>nd</sup>	Hume-Rothery rules
	3 <sup>rd</sup>	intermediate phases
4 <sup>th</sup>	1 <sup>st</sup>	Alloys and solid solution, solidification and crystallization,
	2 <sup>nd</sup>	role of free energy thermodynamic potential in conversion of liquid to solid,
	3 <sup>rd</sup>	super cooling, under cooling, degree of super cooling,
5 <sup>th</sup>	1 <sup>st</sup>	mechanism of solidification/ crystallization, nucleation, critical size nucleus, spontaneous nucleation
	2 <sup>nd</sup>	mechanism of solidification/ crystallization, nucleation, critical size nucleus, spontaneous nucleation
	3 <sup>rd</sup>	relation between nucleation and grain growth
6th	1 <sup>st</sup>	relation between nucleation and grain growth
	2 <sup>nd</sup>	shape of crystals and solidification of ingot
	3 <sup>rd</sup>	shape of crystals and solidification of ingot
7th	1 <sup>st</sup>	Definitions of phase, component, degree of freedom,
	2 <sup>nd</sup>	The phase rule and its applications.
	3 <sup>rd</sup>	Unary Phase Diagrams: Pressure-temperature diagrams for pure substances.
8th	1 <sup>st</sup>	Unary Phase Diagrams: Pressure-temperature diagrams for pure substances.
	2 <sup>nd</sup>	Binary Phase Diagrams: Interpretation of binary phase diagrams (eutectic, peritectic, eutectoid, peritectoid)
	3 <sup>rd</sup>	Binary Phase Diagrams: Interpretation of binary phase diagrams (eutectic, peritectic, eutectoid, peritectoid)
9th	1 <sup>st</sup>	lever rule,

	2 <sup>nd</sup>	equilibrium and non-equilibrium cooling
	3 <sup>rd</sup>	Iron carbon diagram
10 <sup>th</sup>	1 <sup>st</sup>	Iron carbon diagram
	2 <sup>nd</sup>	Plain Carbon Steels: Classification based on carbon content, their properties and applications
	3 <sup>rd</sup>	Plain Carbon Steels: Classification based on carbon content, their properties and applications
		Alloy Steels: Effects of alloying elements (Ni, Cr, Mo, V, W, Mn, Si) on properties, classification of alloy steels, applications, stainless and special steels
11 <sup>th</sup>	1 <sup>st</sup>	Alloy Steels: Effects of alloying elements (Ni, Cr, Mo, V, W, Mn, Si) on properties, classification of alloy steels, applications, stainless and special steels
	2 <sup>nd</sup>	Cast Irons: Types of cast irons (grey, white, ductile, malleable), their microstructure, properties, and applications.
	3 <sup>rd</sup>	Cast Irons: Types of cast irons (grey, white, ductile, malleable), their microstructure, properties, and applications.
12 <sup>th</sup>	1 <sup>st</sup>	Aluminum Alloys: Common aluminum alloys, their properties, and applications.
	2 <sup>nd</sup>	Aluminum Alloys: Common aluminum alloys, their properties, and applications.
	3 <sup>rd</sup>	Copper Alloys: Brass, bronze, cupronickel, their properties, and applications.
14 <sup>th</sup>	1 <sup>st</sup>	Other Non-Ferrous Alloys: Brief overview of titanium alloys, nickel alloys, etc.
	2 <sup>nd</sup>	Revision
	3 <sup>rd</sup>	Revision
15 <sup>th</sup>	1 <sup>st</sup>	Revision
	2 <sup>nd</sup>	Revision
	3 <sup>rd</sup>	Revision

  
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