GOVT. POLYTECHNIC MAYURBHANJ

LESSON PLAN OF SPONGE IRON AND FERROUS ALLOYS (SUMMER 2023-2024)

Program: Metallurgy engineering.	Semester: 4th	Name of the Teaching Faculty: SUSHREE SUBHASHREE DAS
Course: Sponge iron &Ferrous Alloys (SIFA) Course code:TH4	No. of Days / per week class allotted: 04	Semester From date: 16.01.2024 To Date: 26.04.2024

MONTH	Week	Day	Unit	Topics
JANUARY	3RD	2ND	UNIT-1	Historical Development. Reasons for Rapid growth of DR Process
		3RD		Chronological Evolutions of some of the DRI Processes
	4th	2nd		Conventional versus DRI Steel Making
		3rd		Direct Reduction of Iron Ore.
		4th		Advantages and Disadvantages of sponge iron making
	3rd	2nd	UNIT-2	Thermodynamics of sponge iron making
		3rd		Principles of Direct Reduction Reactions.
		4th		Principles of Direct Reduction Reactions.
	5th	2nd		Reaction between Iron ore and CO (Set-II).
		3rd		Reaction Mechanism in Coal based DRI
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	1st	2nd		Reaction Mechanism in Gas based DRI.
		3rd		Reduction by Carbon Monoxide

		4th		Reduction by Carbon Monoxide
	2nd	2nd		Reduction by Hydrogen
		3rd		Boudourd reaction and Reduction by Carbon
		4th		Carbon Deposition, Kinetics in DRI
	3rd	2nd		Factors Influencing the Reducibility of Iron Ore., Rate Controlling Theories.
		3rd	**UNIT-3**	Coal based DR process using rotary kilns. SL/RN, CODIR, ACCAR, TDR, OSIL, Krupp-Rein processes.
		4th		Coal based processes using reactors other than rotary kilns. Rotary hearth processes based on Inmetco, fastmet, It mk-3, Tunnel kiln processes kinglor-meter, hogans,

FEBRUARY	4th	1st		Gas based direct reduction HYL processes, MIDREX Fluid wise bed processes-FIOR-HIB
		2nd		Uses of DRI in iron making and steel making
		3rd	UNIT-4	CLASS TEST-I
	4th	4th		CLASS TEST-I
MARCH	2nd	2nd		Index, Porosity, Bulk Density, Thermal Degradation Index (TDI).
		3rd		Tests on Non-Coking Coal: Proximate and Ultimate Analysis, Reactivity, Calorific Value, Coking Index, Swelling Index, Ash Fusion Temperature, Bulk Density
		4th		Effect of Iron Ore size on Reduction
	2nd	2nd		Effect of Iron Ore size on Reduction
		3rd	UNIT-8	Carbon Enrichment of Sponge Iron
		4th		Differentiate between killed steel semi killed steel and rimming steel
	3rd	2nd		How Carbon Enrichment of Sponge Iron is performed Flow of Solids in the Reactor or Kiln
		3rd		Process Parameters of Sponge Iron Production: Raw materials, Iron Ore Feed Rate, Coal Feed Rate, C/Fe Ratio, Dolomite Feed, Rate, Reduction Coal to Blow Coal Ratio, Ratio of coarse and Fines in Blow Coal, Blow Coal Pressure, Temperature Profile, Kiln Speed, Ore Retention Time and Cooler Discharge end Pressure. Nonmagnetic Percentage in the Kiln Discharge
		4th	UNIT-5	Daily Operating Parameters
	4th	2nd		Operational Abnormalities: Process Pressure Fluctuations, Temperature Deviations, Back Spill, Loss of Process Fan(s), High Temperature of Cooler Discharge, Loss of Product Quality
		3rd		Major Problems of DRI Kiln Operation: Injection Coal Jam, Feed Pipe Jam, Transfer Chute Jam, Main Drive Problem, Refractory Failure their causes and remedies

		4th		INTERNAL ASSESSMENT
	5th	2nd		HOLI
		3rd		Accretion Formation
		4th		Key notes on process plant operation.
APRIL	1st	3rd	**UNIT-6**	Sampling: Sponge Iron and the Raw materials
		4th		Chemical Analysis of Sponge Iron, Iron Ore, Lime Stone/Dolomite and Coal
	2nd	2nd		Determination of Total Iron (FeT), Ferrous Iron and metallic Fe, Production of individual Ferro alloys: Ferro manganese, Ferro chrome, charge chrome,ferrosilicon
		3rd		Scheme of Quality Control of input Raw Materials: Reactor Feed Iron Ore, Reactor Feed Coal, Back –Spill Coal, Slinger Coal.
		4th		Id-Ul-Fitre
	3rd	2nd	**UNIT-7**	Air Pollution Mitigation Measures, Hazardous Wastes and Chemicals, Occupational Health and Safety, General methods of producing Ferro alloys: carbothermic and aluminothermy reductions,
		3rd		RAM NAVAMI
		4th		Previous year's question answers

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