

**GOVERNMENT POLYTECHNIC JAJPUR**

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**DEPARTMENT OF METALLURGY**

<b>Discipline: Metallurgy</b>	<b>Semester: 6TH</b>	<b>Name of the Teaching faculty: P ARADHANA</b>
<b>Subject: SI&amp;FA</b>	<b>No of Days/Week class allotted: 4</b>	<b>Semester from Date:                      To Date: No of weeks: 16</b>
<b>Week</b>	<b>Class Day</b>	<b>Topics</b>
1st	1 <sup>st</sup>	<b>Chapter-1:</b> Introduction to sponge iron making
	2 <sup>nd</sup>	Reasons for Rapid growth of DR Process
	3 <sup>rd</sup>	DRI Steel Making
	4 <sup>th</sup>	Direct Reduction of Iron Ore
2nd	1 <sup>st</sup>	Chapter-2: Principles of Direct Reduction Re
	2 <sup>nd</sup>	Reaction between Coal, Oxygen and Carbon dioxide. (Set-I)
	3 <sup>rd</sup>	Reaction between Coal, Oxygen and Carbon dioxide. (Set-I)
	4 <sup>th</sup>	Reaction between Iron ore and CO (Set-II)
	1 <sup>st</sup>	Reaction between Iron ore and CO (Set-II)
	2 <sup>nd</sup>	Reaction Mechanism in Coal based DRI
	3 <sup>rd</sup>	Reaction Mechanism in Gas based DR
	4 <sup>th</sup>	Reduction by Carbon monoxide
3rd	1 <sup>st</sup>	Reduction by Hydrogen
	2 <sup>nd</sup>	Boudourd reaction and Reduction by Carbon
	3 <sup>rd</sup>	Boudourd reaction and Reduction by Carbon deposition
	4 <sup>th</sup>	Kinetics in DRI
4th	1 <sup>st</sup>	Kinetics in DRI
	2 <sup>nd</sup>	Factors Influencing the Reducibility of Iron Ore
	3 <sup>rd</sup>	<b>Chapter-3: Major direct reduction processes</b>
	4 <sup>th</sup>	Coal based DR process using rotary kilns.
5th	1 <sup>st</sup>	SL/RN process
	2 <sup>nd</sup>	CODIRprocess
	3 <sup>rd</sup>	ACCARprocess
	4 <sup>th</sup>	TDR process
6th	1 <sup>st</sup>	OSIL process
	2 <sup>nd</sup>	Krupp process
	3 <sup>rd</sup>	Coal based processes using reactors other than rotary kilns
	4 <sup>th</sup>	Rotary hearth processes
7th	1 <sup>st</sup>	Tunnel kiln processes
	2 <sup>nd</sup>	fastmet
	3 <sup>rd</sup>	Inmetco
	4 <sup>th</sup>	Gas based direct reduction
8th	1 <sup>st</sup>	HYL processes
	2 <sup>nd</sup>	midrex
	3 <sup>rd</sup>	Fluidwise bed processes-FIOR-HIB

	4 <sup>th</sup>	Uses of DRI in iron making
9th	1 <sup>st</sup>	Uses of DRI in steel making
	2 <sup>nd</sup>	<b>Chapter-4: Parameters of Sponge Iron Making:</b> Raw materials
	3 <sup>rd</sup>	Chemical and Physical Tests on iron ore
	4 <sup>th</sup>	Chemical and Physical Tests on iron ore
10th	1 <sup>st</sup>	Reducibility, Strength, Tumbling, Abrasion and Shatter Index
	2 <sup>nd</sup>	Porosity, Bulk Density, Thermal Degradation Index (TDI).
	3 <sup>rd</sup>	Proximate and Ultimate Analysis
	4 <sup>th</sup>	Reactivity, Calorific Value, Coking Index, Swelling Index, Ash Fusion Temperature, Bulk Density
11th	1 <sup>st</sup>	Carbon Enrichment of Sponge Iron
	2 <sup>nd</sup>	Coal Feed Rate, C/Fe Ratio
	3 <sup>rd</sup>	Chapter-5: DRI Plant Operation and Abnormalities
	4 <sup>th</sup>	Operational Abnormalities: Process Pressure Fluctuations, Temperature Deviations
12th	1 <sup>st</sup>	Back Spill, Loss of Process Fan(s), High Temperature of Cooler Discharge, Loss of Product Quality
	2 <sup>nd</sup>	Coal Jam, Feed Pipe Jam
	3 <sup>rd</sup>	Main Drive Problem, Refractory Failure their causes and remedies
	4 <sup>th</sup>	Shutdown Procedure
13th	1 <sup>st</sup>	Accretion Formation
	2 <sup>nd</sup>	<b>Chapter-6: Quality Control in Sponge Iron Plant</b>
	3 <sup>rd</sup>	Chemical Analysis of Sponge Iron
	4 <sup>th</sup>	Chemical Analysis of Iron ore
14th	1 <sup>st</sup>	Chemical Analysis of limestone
	2 <sup>nd</sup>	Feed Coal, Back –Spill Coal, Slinger Coal
	3 <sup>rd</sup>	Determination of Total Iron (FeT), Ferrous Iron and metallic Fe
	4 <sup>th</sup>	Chapter-7: Environmental Management in DRI Plants: Air Pollution Mitigation Measures
15th	1 <sup>st</sup>	Solid Waste Generation and Disposal
	2 <sup>nd</sup>	Hazardous Wastes and Chemicals
	3 <sup>rd</sup>	<b>Chapter - 8: Production of Ferro-alloys:</b> Introduction to Ferro-alloying elements
	4 <sup>th</sup>	Ferro manganese
16th	1 <sup>st</sup>	<b>Ferro chrome</b>
	2 <sup>nd</sup>	ferrosilicon
	3 <sup>rd</sup>	Fe-Ti
	4 <sup>th</sup>	Fe-Mo

