Lesson Plan For

Sponge Iron and Ferro Alloys (2023-24)

Department of Metallurgical Engineering

UGIE Rourkela

Discipline: **Metallurgical Engineering**

Subject: **Sponge Iron and Ferro Alloys (TH-4)**

Semester: **4th**

Total Period allotted: **60**

Period per week: **4**

Name of the Teaching Faculty: **Amarjit Mohanta**

Week	Class No.		Lecture Topics
1	1	Review of Sponge Iron Making Processes	Historical Development.
	2		Reasons for Rapid growth of DR Process
	3		Chronological Evolutions of some of the DRI Processes
	4		Conventional versus DRI Steel Making, Direct Reduction of Iron Ore.
2	5	Thermodynamics of Sponge Iron Making	Principles of Direct Reduction Reactions.
	6		Reaction between Coal, Oxygen and Carbon dioxide. (Set-I).
	7		Reaction between Iron ore and CO (Set-II).
	8		Reaction Mechanism in Coal based DRI
3	9		Reaction Mechanism in Gas based DRI.

	10		Reaction Mechanism in Gas based DRI.
	11		Reduction by Carbon monoxide
	12		Reduction by Hydrogen
4	13		Boudourd reaction and Reduction by Carbon
	14		Carbon Deposition
	15		Kinetics in DRI
	16		Factors Influencing the Reducibility of Iron Ore. Rate Controlling Theories.
5	17	Major direct reduction processes	Coal based DR process using rotary kilns.
	18		SL/RN
	19		CODIR, ACCAR
	20		TDR, OSIL Krupp-Rein processes.
6	21		Rotary hearth processes based on Inmetco,fastmet
	22		Tunnel kiln processes Kinglor-meter,hogans,
	23		MIDREX
	24		HYL processes
7	25	Parameters of Sponge Iron Making	Raw materials of Sponge Iron Making
	26		Chemical and Physical Tests on iron ore
	27		Tests on Non Coking Coal
	28		Effect of Iron Ore size on Reduction
8	29		Carbon Enrichment of Sponge Iron
	30		How Carbon Enrichment of

			Sponge Iron is performed
	31		Flow of Solids in the Reactor or Kiln
	32		Process Parameters of Sponge Iron Production
9	33	DRI Plant Operation and Abnormalities	Daily Operating Parameters.
	34		Operational Abnormalities:
	35		Major Problems of DRI Kiln Operation
	36		Shutdown Procedure
10	37		The Start Up process
	38		Accretion Formation
	39		Key notes on process plant operation.
	40		Class Test
11	41	Quality Control in Sponge Iron Plant	Sampling: Sponge Iron and the Raw materials
	42		Chemical Analysis of Sponge Iron, Iron Ore, Lime Stone/Dolomite and Coal
	43		Scheme of Quality Control of input Raw Materials
	44		Determination of Total Iron (FeT), Ferrous Iron and metallic Fe.
12	45		Properties of iron ore
	46		Properties of Coal
	47	Environmental Management in DRI Plants	Air Pollution Mitigation Measures
	48		Fugitive Dust Generation
13	49		Water Pollution Mitigation Measures
	50		Solid Waste Generation and Disposal

	51		Hazardous Wastes and Chemicals
	52		Occupational Health and Safety Environmental Monitoring Environmental Standards
14	53	Production of Ferroalloys	Introduction to Ferro-alloying elements
	54		Different Ferro alloys
	55		General methods of producing Ferro alloys
	56		Refining of Ferro alloys
15	57		Production of individual Ferro alloys
	58		Class Test
	59		Revision
	60		Revision