

Ironmaking and Steelmaking

Swayam Prabha Course Code - M71

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INSTITUTE	Indian Institute Of Technology Kharagpur
COURSE OUTLINE	The emphasis on extractive metallurgy including ironmaking and steelmaking has been diluted significantly to accommodate newer courses on structure, properties and processing of different kinds of advanced materials. This is in contrary to the fact that India is going to be the second largest producer of crude steel in the world. Besides, after globalization of market, we stand in cut-through competition for day to day innovation in steel processing. Based on changing scenario a conceptual, fundamental and more quantitative course is desirable. Keeping in view of the above consideration, the course has been designed.

COURSE DETAILS

S. No	Module ID/ Lecture ID	Lecture Title/Topic
1.	L1	Introduction
2.	L2	Various Routes of Steelmaking
3.	L3	The Iron Blast Furnace
4.	L4	Thermodynamics of BF Ironmaking
5.	L5	Thermodynamics of BF Ironmaking (Continued)
6.	L6	Overall Heat & Material Balance in Blast Furnace
7.	L7	RIST Diagram Based on Overall Heat and Material Balance
8.	L8	RIST Diagram Based on Heat and Material Balance in the Wustite Reserve Zone
9.	L9	Kinetics of Gas Solid Reaction: Iron Oxide Reduction - I

10.	L10	Kinetics of Gas Solid Reaction: Iron Oxide Reduction - II
11.	L11	Aerodynamics in Blast Furnace - I
12.	L12	Aerodynamics in Blast Furnace – II : Channeling
13.	L13	Aerodynamics in Blast Furnace – III : Flooding
14.	L14	Coke Rate and Fuel Efficiency in Blast Furnace
15.	L15	Oxygen Enrichment of Blast
16.	L16	Blast Furnace and It's Raw Material
17.	L17	Sintering of Iron Ore
18.	L18	Pelletization of Iron Ore
19.	L19	Coking Process
20.	L20	Testing of Burden Material
21.	L21	Burden Distribution
22.	L22	Blast Furnace Products and their Utilization
23.	L23	Blast Furnace Productivity
24.	L24	Modeling of Blast Furnace
25.	L25	New Potential Technologies for Blast Furnace
26.	L26	History of Steelmaking
27.	L27	Properties of Slag
28.	L28	The Reaction Equilibria in Steelmaking
29.	L29	Dephosphorization of Liquid Steel
30.	L30	Kinetics of Slag Metal Reaction
31.	L31	LD Steel Making: Oxygen Lance and Jet Action & Decarburization
32.	L32	LD Steelmaking: Basics, Process Steps, Emulsion Formation and Stabilization
33.	L33	Evolution of Impurities In Steel and Slag Constituents During LD Processing
34.	L34	Hybrid Processes
35.	L35	Electric Steel Making
36.	L36	Secondary Steel Making: Introduction and De-Oxidation

37.	L37	Secondary Steel Making: Introduction and De-Oxidation (Continued)
38.	L38	Secondary Steel Making: Vacuum Techniques for Refining Steel
39.	L39	Homogenization and Gas Stirred Ladle
40.	L40	Ladle De-Sulphurization, Alloying, Stainless Steel Making
41.	L41	Inclusion and its Control
42.	L42	Injection Metallurgy: Submerged Injection of Calcium Powder
43.	L43	Cored Wire Injection-Modeling, Melting Sequence, Effect Of Operating Parameters
44.	L44	IM: Cored Wire Injection: Industrial Implications
45.	L45	IM: Tundish Metallurgy & Design
46.	L46	Casting Fundamentals- Heat Transfer
47.	L47	Casting Fundamentals- Segregation
48.	L48	Morphology of Solidification Structure & Ingot Casting
49.	L49	Continuous Casting
50.	L50	Downstream Processing and Near Net Shape Casting
51.	L51	Alternative Routes of Iron Making: Introduction to Direct Reduction(DR) and Smelting Reduction(SR) Processes
52.	L52	Alternative Routes of Iron Making: Introduction to Direct Reduction(DR) and Smelting Reduction (SR) Processes (Continued)
53.	L53	Coal Based Dr Processes
54.	L54	Coal Based DR Processes (Continued)
55.	L55	Gas Based DR Processes
56.	L56	Gas Based DR Processes (Continued)
57.	L57	Smelting Reduction (Sr) Processes
58.	L58	Smelting Reduction (SR) Processes (Continued)
59.	L59	Ironmaking & Steelmaking in India
60.	L60	Ironmaking & Steelmaking in India (Continued)

List of reference material/ books:

Name and contact details of two referees for the course: