Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NFMD515	Agglomeration Technology	3	0	0	3

Course Objective

- To develop an understanding of the fundamentals, mechanisms, equipment and industrial practices of iron ore agglomeration through pelletization, sintering and briquetting. The course emphasizes feed characteristics, bonding mechanisms, thermal and physicochemical reactions, process parameters, product quality, microstructure, energy efficiency and sustainable utilization of iron-bearing fines and secondary resources.

Learning Outcomes

- After completion of the course, students will be able to explain the principles and selection criteria of agglomeration processes; analyze green pellet formation and induration; interpret sintering reactions, bonding phases and process operation; evaluate cold and hot briquetting methods and briquette properties; and compare agglomeration routes using metallurgical performance, resource efficiency, environmental impacts and basic process calculations.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Introduction to agglomeration: need, scope and classification; properties of iron ore fines, concentrates, slimes and secondary iron-bearing materials; particle size, specific surface area, moisture and mineralogy; bonding forces and agglomeration mechanisms; suitability of pellets, sinter and briquettes for BF and DRI applications.	5	Explain the purpose of agglomeration, characterize feed materials and identify appropriate process routes.
2.	Pelletization: nucleation, coalescence, layering and consolidation; capillary forces and moisture; feed preparation, fluxes and organic/inorganic binders; disc and drum pelletizers; green pellet quality; drying, preheating, firing and cooling; straight-grate and grate-kiln processes; oxidation of magnetite, hematite bonding, diffusion, recrystallization and slag bonding; heat and mass transfer; pellet microstructures; CCS, drop number, TI, AI, reducibility, RDI and swelling; BF and DR pellets.	12	Describe pellet growth and induration; assess operating variables, bonding phases, microstructure and metallurgical quality.
3.	Sintering: raw materials, coke breeze, fluxes and return fines; granulation, bed permeability and Dwight–Lloyd strand; ignition, suction, flame front and sinter bed zones; combustion, calcination, melt formation and solidification; calcium ferrites and SFCA formation; thermodynamics, kinetics and heat transfer; effect of basicity, FeO, Al_2O_3, MgO, fuel rate and bed height; sinter mineralogy, porosity and microstructure; TI, AI, reducibility and RDI; emissions and waste heat recovery.	12	Analyze sinter bed operation, key reactions, phase evolution and effects of process variables on sinter quality.
4.	Briquetting: cold, hot and binder less briquetting; particle rearrangement, plastic deformation and bonding; effect of compaction pressure, temperature, particle size and moisture; binders and curing; roller presses, hydraulic presses and mechanical systems; cold-bonded briquettes and hot briquetted iron (HBI); briquetting of DRI fines, mill scale, dust and sludge; compressive strength, density, porosity, drop resistance, reducibility and thermal stability; BF, DRI and EAF applications.	8	Differentiate briquetting technologies; select equipment and binders and evaluate briquette properties and uses.
5.	Comparison of pelletization, sintering and briquetting; feed suitability, process selection, mass and heat balances, energy consumption, productivity and basic techno-	5	Compare process alternatives and evaluate their technical, economic and environmental performance.

	economic evaluation; low-grade ore, tailings and waste recycling; biomass and alternative fuels, low-carbon agglomeration, emission mitigation and circular economy; emerging research opportunities in sustainable iron-making feed preparation.		
	Total	**42**	

Text Books:

1. A. K. Biswas, Principles of Blast Furnace Ironmaking
2. R. H. Tupkary and V. R. Tupkary, An Introduction to Modern Iron Making

Reference Books:

3. T. Rosenqvist, Principles of Extractive Metallurgy
4. A. R. Burkin (Ed.), Production of Iron and Steel.