COLLOIDS AND INTERFACIAL PHENOMENA

Course Type	Course Code	Name of Course	L	T	P	Credits
DC	FMC201	Colloids and interfacial phenomena	3	0	0	9

Course Objective

Fundamentals of colloids and interfacial phenomena and its applications in mineral and metals processing.

Learning Outcomes

- Characterization of colloidal systems and interfaces.
- Fundamentals, characterization, and applications of liquid-gas, liquid-liquid, solid-gas, solid-liquid, and charges interfaces.
- Interactions between colloidal particles and factors resulting in colloidal stability.
- Experimental techniques for characterization of interfaces and colloidal systems.
- Applications of colloids and interfacial phenomena in industrial applications with special emphasis on mineral and metals processing operations.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Colloidal systems:** definition; importance; particle characterization; classification of colloidal systems; structural characteristics; motion of particles in liquid media: viscosity, sedimentation, Brownian motion, diffusion; osmotic pressure.	4	Introduction to colloids and characterization of particles constituting colloidal systems
2	**Liquid-gas and liquid-liquid interfaces:** surface and interfacial tension; Kelvin's equation; measurement of surface and interfacial tensions; adsorption at interface; surfactants; Gibbs adsorption equation; micelle formation; critical micelle concentration; spreading; monomolecular films; emulsions and foams.	7	Concept of surface and interfacial tensions, effect of curvature and temperature on surface tension, measurement of surface tension, adsorption at interfaces, introduction to emulsions and foams.
3	**Solid-gas interface:** Adsorption of gases on solids; physical versus chemical adsorption; classification of physical adsorption; Langmuir, Freundlich, and BET adsorption isotherms; determination of total surface area of porous solids, heat of adsorption; effect of solid structure and composition on adsorption.	7	Modes of adsorption of gases on solids, adsorption isotherms, characterization of porous solids.
4	**Solid-liquid interface:** Contact angle and wetting; Young's equation; spreading, adhesion, and immersion wetting; measurement of contact angle; ore flotation; detergency; adsorption from solution.	6	Introduction, characterization, and mechanisms of wetting phenomenon.
5	**Charged interfaces:** Electric double layer; zeta potential; electrokinetic phenomena: electrophoresis, electroosmosis, streaming potential, sedimentation potential; Smoluchowski and Huckel equation.	6	Fundamentals, characterization and applications of electric double layer.
6	**Colloidal interaction and stability:** van der Waals interaction; DLVO theory; electrostatic and steric interactions; flocculation.	3	Aggregation and stability of colloidal dispersions.
7	**Methods to characterize colloidal systems:** Viscometry, microelectrophoresis, sedimentation, surface tension; static and dynamic light scattering.	3	Experimental techniques for characterizing colloidal systems.
8	Industrial applications of colloids and interfacial phenomena especially in minerals, metals processing.	6	Industrial applications of colloids and interfacial phenomena.
	Total	42	

Text Books:

S. No	Resource/Book Name	Author(s)/Editor(s)	Publisher
1	Introduction to colloid and surface chemistry	Duncan J. Shaw	Butterworth-Heinemann