Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2023-2024

Course Handout Part II

Date: 09-01-2024

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CHEM F223
Course Title : Colloid and Surface Chemistry
Instructor-in-Charge : Dr. Ramakrishnan Ganesan

1. Scope and Objective of the Course: This course gives a comprehensive understanding about the intermolecular forces, dynamics, stability and characterization of colloids such as membranes, microemulsions and vesicles. The course will brief about the formulation, characterization and applications of such colloidal systems. The course will give an insight on the electrostatic forces prevailing on surfaces that give rise to stability and surface properties. In addition, this course will provide a brief overview on surface modification, its characterization and applications.

2. Textbooks:

T1: **Pallab Ghosh**, 'Colloid and Interface Science', 2009.
T2: **Drew Myers**, 'Surfaces, Interfaces, and Colloids: Principles and Applications', Wiley, Second Edition, 1999.
T3: **I. N. Levine,** "Physical Chemistry", 5th Edition, Tata McGraw-Hill, 2011.

3. Reference books

R1: **Paul C. Hiemenz and Raj Rajagopalan,** Principles of Colloids and Surface Chemistry, 3rd Edition, Marcel Dekker Inc, USA, 1997.

- ***The syllabus also includes lecture notes***

4. Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-2	Basics; surface free energy	Surfaces, Colloids and Interfaces	T1: Chapter 1; T2: Chapter 1 and 2
3-6	Sedimentation, Brownian motion, Osmotic pressure, Gold number	Properties of Colloid Dispersions	T1: Chapter 2
7-10	Structural requirements of surface activity, classifications and building blocks of surfactants	Surface activity and surfactant structures	T1: Chapter 3; T2: Chapter 3
11-13	Surface mobility in solids, surface tension, interfacial tension, contact angle and their measurements	Surface and interfacial tension	T1: Chapter 4; T2: Chapter 7 and 8; R1: Chapter 6
14-17	van der Waals Forces, (Kessom, Debye, and London Interactions)	Intermolecular forces	T1: Chapter 5; T2: Chapter 4; T3: 14.15, 22.10

18-22	Charged colloids, Sources of Interfacial Charge, Electrostatic Theory: Coulomb's Law, Electrokinetic Phenomena	Electrostatic Forces and the Electrical Double Layer	T1: Chapter 5; R1: Chapter 11 and 12
23-28	Mechanism for colloid formation, rules and sources of colloidal stability and coagulation, Association colloids (Micelles, vesicles and membranes & catalysis by micelles)	Colloids and colloidal stability	T2: Chapter 10
29-33	Formation, mechanistic details of stabilization and relationship between HLB and solubility parameter	Emulsions, microemulsions and foams	T1: Chapter 11 and 12; T2: Chapter 9
34-37	Properties of monolayers, Langmuir-Blodgett films, Surface diffusion	Monolayers and thin liquid films	T1: Chapter 8
38	Synthesis, surface modification and their applications	Nanomaterials	T1: Chapter 11
39-40	Lab components based on some topics discussed in the lectures.	Experiments on (1) contact angle measurements, (2) particle size analysis, and (3) nanoparticle synthesis	Procedures of the experiments will be provided

5. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-sem Test	90 min	30	14/03 - 2.00 - 3.30PM	Closed Book
Quiz*	-	10	Continuous	Closed Book
Assignments/seminar presentations/practical components†	-	20	Will be announced by I/C	Open Book
Comprehensive examination	3 hrs.	40	15/05 FN	Closed Book

* All the four quizzes are mandatory.
† Lab component includes experiments like contact angle measurements, particle size analysis, and nanoparticle synthesis.

6. Chamber Consultation Hour: To be announced.

7. Notices: All notices concerning the course will be displayed **only** on the **CMS**.

8.Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

9. Make-up Policy: Make up would be considered only for very genuine reasons.

INSTRUCTOR-IN-CHARGE
CHEM F223