



Second Semester 2019 - 2020
Course Handout

Date: 06/01/2020

In addition to Part I (General Handout for all courses appended to the Time Table) this portion further specific details regarding the course.

Course No. : CHE F498 (3 0 3)
Course Title : Colloids and Interface Engineering
Instructor-in-charge : JAIDEEP CHATTERJEE, NANDINI BHANDARU

Scope and Objective of the Course:

This course deals with the application aspects of colloids chemistry and engineering aspects of fluid-fluid and fluid-solid interfaces. Being an interdisciplinary course, its main focus to present fundamental knowledge of colloids and interfaces to the students. This course underlines that how this knowledge can be used to enhance the efficiency in any application involving surface active agents. Based on the basic principles of chemistry, physics, thermodynamics, fluid mechanics and mass transfer this course covers some frontiers of chemical engineering.

Course Pre/Co- requisite (if any) & Catalogue / Bulletin Description: None

Text book(s) [TB]

1. P. C. Hiemenz, and R. Rajagopalan, Principle of colloid and surface chemistry, 3rd edition, Mercel Dekher, N.Y. 1997.
2. Drew Myers, Surfaces, Interfaces and Colloids, 3rd Edition, Wiley, 2006.
3. Pallab Ghosh, Colloid and Interface Science, 1st Edition, PHI Learning, 2009.

Reference book(s) [RB]:

1. Tharwat F. Tadros, Applied Surfactants Principles and Applications, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 2005.
2. M. J. Rosen, Surfactants and Interfacial Phenomena, Wiley-Interscience Publication, New York, 2004.

Course Plan / Schedule:

Lec. No.	Learning Objectives	Topics to be Covered	Chapter in the Text Book
1	Introduction	Overview of colloidal systems, interfaces and surface	Chapter1, TB1
1-7	Colloidal Systems	Colloidal stability. Kinetic theory of colloidal systems: sedimentation, centrifugation, diffusion, Intermolecular forces relevant to colloidal systems: Electrostatic and van der Waals forces. DLVO theory and its applications.	Chapter 2,11, 12 TB1



8-12	Surface & Interface tension	Surface and interfacial tension, surface free energy, Surface active agent: Surfactant, Surface Pressure, surface excess and Gibbs equation, Theory of surface tension, contact angle, and wetting. Adsorption at fluid-fluid and fluid-solid interfaces	Chapter 6, 7 TB1
13-18	Interfacial & Capillary Phenomena	Laplace equation, Kelvin equation, Young-Laplace equation, Capillary rise, kinetics of capillary rise, Wicking, Capillarity and porosimetry, liquid displacement from capillaries	Chapter 6, 7 TB1
19-20	Measurement Techniques	Measurement techniques of surface tension, Interface tension, contact angle, zeta potential, particle size.	TBA
21-23	Association Colloids	Structure of micelles; Thermodynamics of micellization; Solubilization; Mixed micellar properties	Chap 8 (T1)
24-26	Emulsion, Micro emulsion and foams	Preparation, mechanistic details of stabilization of emulsions; classification and stability of microemulsions; preparation and stability of foams	Chap 8 (T1), Chap 9 (T3)
27-30	Advanced Interfacial phenomena	Interfacial rheology and transport process; Surface modification processes and Thin liquid films	Chap 7 & 8 (T3)
31-33	Nanomaterials	Classification of nanomaterials; Self-assembly; Nanofluidics; Functional coatings; Lithographic techniques	Chap 11 (T3)
34-37	Seminar	Individual presentations by students on PROJECTS	NA
38-40	Industrial Applications	Emulsions and Foams, Overview of industrial applications of various interfacial phenomena in the industries.	TBA

* The lectures may be slightly diverge from aforesaid plan based on students background & interest in the topic, which may perhaps include special lectures and discussions that would be planned and schedule notified accordingly.

Evaluation scheme:

EC No	Components	Duration	Date & Time	Weightage %	Nature of Component
1	Class Test 1	45 mins		10 %	(OB)
2	Mid-semester Exam	90 mins	4/3 3.30 - 5.00 PM	25 %	(CB)
3	Class Test 2	45 mins		10 %	(OB)
4	Project Seminar	TBA	--	15 %	(OB)*
5	Comprehensive Exam	3 Hours	08/05 AN	40 %	(CB)

*Assignment: The Assignment will be given on either some or all of the above mentioned topics and will be a part of evaluation components. Details will be intimated through a separate notification or announced in the class and the deadlines would be indicated therein. It is necessary that all students stick to time schedule and do not postpone submission of assignments/reports.

Mid-Semester Grading:

Mid-sem grading will be displayed after two evaluation components. (Refer Academic calendar for schedule).

Note: A student will be likely to get “NC”, if he / she doesn’t appear / appear for the sake of appearing for the evaluation components / scoring zero in pre-comprehensive total.



Makeup and Attendance policies:

Make-ups are not given as a routine. It is solely dependent upon the genuineness of the circumstances under which a student fails to appear in a scheduled evaluation component. In such circumstances, prior permission should be obtained from the Instructor-in-Charge (I/C) and the attendance should be more than 70% at that time. The decision of the I/C in the above matter will be final. For Class Tests there will be no make-up.

Attendance: For the students under the purview of Academic Counseling Board (ACB), the Board shall prescribe the minimum attendance requirement on a case-to-case basis. Attendance in the course will be a deciding factor in judging the seriousness of a student which may be directly / indirectly related to grading.

General timings for consultation: Room No: D 213

General instructions:

Notices: Will be on CMS

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.

JAIDEEP CHATTERJEE
Instructor-in-Charge

