Course Title: Advanced Colloidal and Surface Chemistry

Course Code: CH-826

Credit Hours: 3-0

Prerequisite: Nil

Course Objectives

Students will learn about the fundamentals of thermodynamically and kinetically stable nanoparticles and colloidal solutions, as well as the critical physical and chemical characteristics of nano and colloidal systems. They'll also learn about surfactant chemistry, characterization techniques, and nanoparticle and colloidal solution applications.

Course Contents

Colloid and Surface Chemistry: Colloidal solutions, catalyst preparation methods, industrial catalysts, emulsion, surfactant, nanoscale chemistry, nanomaterials and their applications, dimensional control in nanostructures, macromolecular surface films, charged films and Langmuir-Blodgett layers, characterization methods and applications. Adsorption isotherms, single system, double system, study of gas reactions on solid surfaces, retardation, the Eley-Rideal mechanism and the Langmuir-Hinshelwood mechanism to study some organic and inorganic reactions, Catalysis, Autocatalysis, enzyme catalysis and enzyme inhibition. Solid surfaces, surface structures, clean surface structures, gas solid interface, thermodynamics of adsorption, heterogeneous catalysis, kinetic and mechanisms of catalyzed reactions, adsorption at liquid surfaces, chemisorption, physiosorption and dynamics, enzymatic catalysis, organized molecular assemblies, experimental probes for surface and adsorbent structures, scanning probe techniques, low energy electron diffraction (LEED), electron spectroscopy, and other surface analysis techniques.

Gels and Emulsions: Introductions, Methods of Preparation of Emulsions. Emulsifiers, Breaking of emulsions. Orientation Theory. Emulsification and wetting, Significance.

Course Outcomes

After having completed the course, the candidates will be able to conclude about the colloidal systems, gel surface chemistry, catalysis and adsorption isotherms.

Recommended Books

1. Poole, C. P. and Owens, F. J., Introduction to Nanotechnology, 1st ed., WileyInterscience, (2003).
2. Kolunsiki, K. W., Surface Science: Foundations of Catalysis and Nanoscience, 3rd ed., John-Wiley & Sons, Ltd., (2012).
3. Atkins, P. and Paula, J. D., Atkin's Physical Chemistry, 8th ed., Oxford University Press, (2006).
4. Adamson, A. W. and Gast, A. P., Physical chemistry of Surfaces, 6th ed., WileyInterscience, (1997).
5. Physical Chemistry by Engel, T. and Ried, P., 1st Ed,. Pearson education, Inc. 2006
6. Chemical Process Industries by Shreve and Dum. McGraw Hill.
7. Physical Chemistry, Moore, 1972, Rentice Hall, Englewood cliffs, Jersey.
8. Physical Chemistry, Samuel Glasstone, 1995. Macmillan and Co. Ltd. St. marlins Street, London.