GUJARAT TECHNOLOGICAL UNIVERSITY

NANO TECHNOLOGY (39)
CHEMICAL PRINCIPLES OF SELF ASSEMBLY SYSTEMS
SUBJECT CODE: 2183907
B.E.8th SEMESTER

Type of course: Chemical Principle of Self Assemblies Systems

Prerequisite: Require basic knowledge of chemistry, polymer chemistry, characterization of nanomaterials, properties of nanomaterials and basics of lithography so that students can understand principles of self-assemblies in a better way.

Rationale: The objective of this course is to make students familiar with self-assembly techniques which are useful identifying physical, chemical, optical and biological properties of nanomaterials.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	2	0	5	70	20	10	30	0	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to self-assembly General Introduction to Self-Assembly, Monolayers, Block Copolymers, Nano crystals. Structural Characterization of Nano architectures	6	15
2	Self-assembled monolayers Introduction, Monolayers on Gold, Growth Process, Phase Transitions, Patterning Monolayers, Mixed monolayers, SAMS and applications	10	20
3	Synthetic self-assembled materials: Principles and practice Transition from Dispersed to Condensed State, Packing Geometry, Self-Assembled Block Copolymer, Co-Assembly of Liquid Crystalline Structures and Inorganic Materials, Intelligent Nanoscale Materials	10	20
4	Nano crystals Self Assembly Nano crystals, Surface Passivation, Interparticle Bonds, Solution-Phase Self-Assembly of Particles, Properties of Nanocrystals Self-Assembly, Technical Aspects of Self-Assembling, Template Assisted Self-Assembly	10	20
5	Self-Assemblies of Organic and Inorganic Materials Introduction, Structure of Colloidal Self-Assemblies Made of Surfactants and Used as Templates, Production of Nanocrystals by Using Colloidal Solutions as Templates and Their Limitations, Self-Organization of Nanocrystals, Colloidal Nanolithography by Using Nanocrystals Organized in a Given Structure as Masks	12	25

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	**25**	**10**	**10**	**-**	**-**

Legends: R: Remembrance; U = Understanding; A = Application and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

Reference Books:

1. Clusters and Nano Assemblies, physical and biological systems, P. Jena, S.N. Khanna, B.K. Rao, publishing year 2003.
2. Self Assembled Nanostructures, Jin Z Zhang, Zhong-Lin-Wang, Jun Liu, Shaowei Chen, Gang-Yu-Liu 2004.
3. Springer series in Material Science, Self-Organized Morphology in Nanostructure Materials.

Course Outcome: After learning the course the students should be able:

1) Understand the physics of self-assemble materials in a better way.
2) Apply the concept of self-assembly in fabrication of nano devices.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.