GUJARAT TECHNOLOGICAL UNIVERSITY

Chemical Engineering

M.E. Semester: II

Subject Name: **Nanotechnology (Major Elective -III)**

Sr. No.	Course Content
1.	Introduction to nanotechnology.
2.	**Synthesis methods of Nano-materials:** Top-down approach, Bottom-up approach.
3.	**Chemical Process in Macro-machining & Microelectronic Devices Fabrication**: Process of obtaining silicon (MGS), Process of obtaining EGS, Process of Wafer making & polishing.
4.	**Vapor Processing of Nano-structured materials:** Physical Vapor Deposition, Chemical Vapor Deposition, Aerosol based processing routes, Flame Assisted Deposition. Application of Vapor Deposition in Epitaxial film, Oxidation, Doping, etc, Reactors for CVD & PVD, Kinetics & Mechanisms of reactions.
5.	Nano-synthesis by Sol- Gel technique.
6.	**Nanocatalysis**: Characteristics of Nano-catalysts, Synthesis of Nano-catalyst. Industrial applications of nanocatalysts.
7.	**Carbon Nano tubes** – Fabrication, Structure, Electrical properties, Vibrational properties, Mechanical properties. Application of carbon nano tubes in field emission and shielding, Computers, fuel cells, chemical sensors, and catalysis.
8.	**Nano- biotechnology**- Bionanomachines in action, biomolecular design and biotechnology, functional principles of bionanotechnology.
9.	**Nano-biomaterials**- Biomaterials, historical overview and current directions, Tissue engineering and artificial cells, Artificial organs and stem cell biology, Introduction to microbial biofilms Microsystems for single molecule handling and modification, Manipulation of single DNA molecules, Biological and biomimatic applications of nanoparticles, Lectrodeposited nanocrystalline materials, Natural nanobiocomposites, biomimatic

	nanocomposites and biologically inspired nanocomposites.
10.	**Nanotechnology for energy**- Introduction, carbon solar cell, hydrogen fuel cell, hydrogen storage, super capacitors, Batteries.
11.	Advance topics in nanoscience.

Reference Books:

1. Introduction to nanotechnology by Charles P. Poole Jr. & Frank J. Owens
2. VLSI Technology, 2nd Edition, by S.M. Sze
3. Handbook of Nanostructured materials & Nanotechnology by Hari Singh Nalwa.