NANOCHEMISTRY

Semester	Subject Code	Category	Lecture Hours		Theory hours		Practical hours		Credits
			Per week	Per sem.	Per week	Per sem.	Per week	Per sem.	
VI	21CCH6Ca	Elective - III (Option-2)	4	60	4	60	-	-	3

COURSE OBJECTIVES:

The students will be able to

- Know the basics of nanotechnology, classification of nanomaterials and applications of nanotechnology in medicine, defence, agriculture and consumer products.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	Learn about the basics of Nanochemistry andclassification of nanomaterials.	K2
CO2	Learn about the various properties of nanomaterials.	K4
CO3	Learn about different methods for the synthesis of nanoparticles.	K2
CO4	Learn about the nanowires, nanoclusters and their applications.	K3
CO5	Learn about nanotubes and the general applications of nanomaterials.	K3

*CO – Course Outcomes

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	S	M	S
CO2	S	M	S	S	S	S
CO3	S	S	S	S	S	S
CO4	S	M	S	S	S	S
CO5	S	S	S	S	S	S

(S – Strong; M – Medium; L – Low)

UNIT-I: Basics of Nanochemistry **12 Hours**

1.1 Introduction – Basic Terminology− Particle, nano, nanometer, nanoparticle, nanomaterial, nanochemistry and nanotechnology (only definition).

1.2 Classification of Nanomaterials − Zero (0-D), One (1-D), Two (2-D) and Three (3-D) Dimensional (dimensions, criteria and examples) – Molecules, nanoparticles and bulk materials (differences).

UNIT-II: Properties of Nanomaterials **12 Hours**

2.1 Properties of Nanomaterials − Thermal, electrical, mechanical, optical, chemical and magnetic properties.

2.2 Size dependent properties − Property and influence of size reduction on properties of nanoparticles − Structural, mechanical, thermal, thermodynamical, electrical, magnetic, optical and chemical properties.

UNIT-III: Synthesis of Nanoparticles **12 Hours**

3.1 Synthesis of Nanoparticles − Top-Down Approach − Laser ablation, Chemical vapour Deposition – Hot Wire CVD, Plasma Enhanced CVD, Atomic Layer CVD and Metal Organic CVD and Electrode position.

3.2 Bottom-up Approach – Precipitation and thermolysis – Hydrothermal method and solvothermal method.

UNIT-IV: Nanowires and Nanoclusters **12 Hours**

4.1 Nanowires − Definition, characterizations, types of nanowires – Synthesis of nanowires − Solution − Phase Synthesis, template assisted synthesis and VSL Method (Vapour-Liquid –Solid)−Applications of nanowires − Uses of nanowires.

4.2 Nanoclusters − Definition – Characterisation − Magic number −Source of nanoclusters – Seeded supersonic nozzle sources and Gas aggregation cluster sources − Uses.

UNIT-V: Nanotubes and Applications of Nanomaterials **12 Hours**

5.1 Nanotubes − Carbon nanotubes - Types of nanotubes − Single walled carbon nanotubes – zig-zag nanotubes, chiral nanotubes and armchair nanotubes – Multi- walled carbon nanotubes .

5.2 Applications of nanomaterials in energy production, defence, agriculture, electronics manufacturing, drug delivery, therapy techniques, diagnostic techniques, space flight and consumer products.

TEXT BOOKS:

S. No.	Authors	Title	Publishers	Year of publication
1.	S. Shanmugam	Nanotechnology	MJP Publishers, Chennai	2010
2.	S. Balaji	Nanobiotechnology	MJP Publishers, Chennai.	2010
3.	T. Pradeep	Nano: The Essentials	Tata Mc-Graw Hill, New Delhi	2007

REFERENCE BOOKS:

S. No.	Authors	Title	Publishers	Year of publication
1.	Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse and Mick	Nanotechnology: Basic Science and Emerging Technologies	Overseas Press	2005
2.	G. B. Segreev	Nanochemistry	Elsevier, New York	2006
3.	S. Sivanesan and J. Nandagopal	A Textbook of Engineering Chemistry-I	VK Publications	2015
4.	P. Charles P. Poole and Frank J. Owens	Introduction to Nanotechnology	A John Wiley and Sons, Inc.	2003

TEACHING METHODOLOGY:

- Conventional chalk and board teaching
- Power Point Presentations
- Assignments
- Animated videos
- Chalk and Board
- Interactive sessions
- To get recent information through the internet.
- Engaging students in cooperative learning.
- Learning through quiz design

SYLLABUS DESIGNER:

- Dr. S. Sashikala, Assistant Professor of Chemistry