BAPATLA ENGINEERING COLLEGE
1st B. Tech Syllabus (EIE), SEMESTER-II
With effect from 2020-21
NANOCHEMISTRY & INSTRUMENTATION

Lecture :	4 hours/week	**Continuous Assessment:**	30 M
Credits :	3	**Semester Exam :**	70M
Code :	20CY02	**Time of SEE :**	3 hrs

PREREQUISITES:

COURSE OBJECTIVES:

The student should be conversant:

- To make students understand the role of chemistry in various Nano particles.
- To enhance knowledge about the various Nano synthetic techniques and their applications.
- To introduce the students to basic principles, constructions and applications of different batteries.
- To make students understand different analytical techniques and their importance.

COURSE OUTCOME:

After studying this course, students will be able to:

CO-1: To know the importance of advanced nanoparticles and analytical techniques.
CO-2: Understand chemistry and synthesis of various types of nanomaterials.
CO-3: Know different types of batteries and their working principles and applications.
CO-4: Learn the principles, instrumentation and applications of spectroscopic techniques for chemical analysis.

UNIT-I: Nano Chemistry **10hrs**

Introduction to Nano chemistry- Nanoparticles-properties, Introduction to Nanostructures: Carbon Nanotubes (CNT), Graphenes, Fullerenes, Nano Peapods, Quantum Dots and Semiconductor Nanoparticles Metal-based Nanostructures (Iron Oxide Nanoparticles) Nanowires Polymer-based Nanostructures including dendrimers.

UNIT-II: Synthesis of Nanoparticles **12hrs**

Chemical Vapour Deposition (CVD) Chemical precipitation and coprecipitation;Metal nanocrystals by reduction, Sol-gel synthesis-Microemulsions or reverse micelles, micelle formation – Chemical Reduction-Emulsions, and Dendrimers-Microwave heating synthesis-Sonochemical synthesis – Electrochemical synthesis-Photochemical synthesis.

Engineering applications- Drug delivery, Fabric, Reactivity of materials, Micro/ Nano Electro mechanical systems.

UNIT-III: Batteries **10 hrs**

Different types of batteries- primary, secondary and flow cells. Working principle and uses- Laclanche cell, alkaline battery, Ni-Cd battery and Lithium, Lithium ion batteries.

Lead acid storage cell, charging and discharging principles- operation and uses, Solar battery-its working principle and applications, electrochemical sensors.

UNIT-IV: ANALYTICAL TECHNIQUES **16hrs**

Interaction of electromagnetic radiation with matter. Beer-Lambert's law (problem) – UV-visible and IR spectroscopy– principles, instrumentation (block diagram only) and Applications. Estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TEXT BOOKS:

1. P.C. Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi (2002).
2. Rao C. N., A. Muller, A. K. Cheetham, "Nanomaterials Chemistry", Wiley- VCH, 2007.
3. C. N. Banwell, Fundamentals of Molecular spectroscopy.

REFERENCES:

1. B.K. Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. Engineering Chemistry J.C Kuriacase&J.Rajaram, Tata McGraw Hills co., New Delhi 1. (2004).
3. Text Book of Engineering Chemistry - ShasiChawla, DhanpatRai publishing company, New Delhi (2008).
4. Kenneth J. Klabunde, "Nanoscale materials in chemistry", Wiley Interscience Publications, 2001.
5. Sergeev G.B., "Nanochemistry", Elseiver publication,2006.
6. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.
7. T. Pradeep, A Textbook of Nanoscience and Nanotechnology, Hardcover – 2012