From the Academic Year 2017-2018

VASAVI COLLEGE OF ENGINEERING (A)

DEPARTMENT OF CHEMISTRY

SEMESTER-I

ENGINEERING CHEMISTRY

(Common to all branches)

Instruction : 2+1 hours per week		Semester End Exam Marks	: 60	Subject Reference Code	: BS130CH
Credits : 2		Continuous Internal Exam Marks	: 40	Duration of semester End Exam	: 3 Hours

OBJECTIVES	OUTCOMES
The course will enable the students to:	**At the end of the course students should be able to:**
1. Study types of conductance, variation of electrode potential and electromotive force and to acquaint with applications of Galvanic Cell. 2. Describe the requirements of water for domestic and industrial uses. 3. Study the phase behaviour and composition of heterogeneous equilibrium systems. 4. Study various types of nano materials, their preparation methods and applications. 5. Get acquainted with engineering materials like membranes and refractories.	1. Apply concepts of electrode potentials and Nernst equation to calculate electromotive force of a given cell. 2. Explain the principles and applications of conductometric and potentiometric titrations and determination of pH of a solution using Glass and Quinhydrone electrodes. 3. Determine hardness and alkalinity of a given water sample and suggest suitable methods for removal of hardness of the given water sample. 4. Apply Phase rule to explain phase diagrams of one component and two component systems. 5. Explain properties, synthetic methods, and applications of nanomaterials in general and carbon nanotubes in particular 6. Discuss the principle, casting methods, and applications of membranes with special reference to poly phenylene oxide and poly ether sulphone. 7. Apply the knowledge of properties of refractory materials and suggest a suitable refractory material for a given industrial application.

UNIT-I-Electro Chemistry

Introduction, types of conductors-electronic and electrolytic, description of conductivity cell, principle and applications of conductometric titrations- electrolytic and galvanic cells. IUPAC convention of cell notation, cell reaction, concept of electrode potential, electro motive force (emf), electro chemical series – applications, Nernst equation-derivation and Numericals. Types of electrodes- Calomel electrode (CE), Quinhydrone and Glass electrode (GE). Determination of p^H using quinhydrone and glass electrodes. Principle and applications of potentiometric titrations.

UNIT-II- Water Technology

Hardness of water- types and its units, Degree of hardness-Numericals on calculation of hardness of water. Determination of hardness of water by complexometric titration method - Numericals. Alkalinity of water and its determination-Numericals. Effect of hard water in boilers- scales, sludges, causes and their prevention by calgon & blow down processes. Softening of water by de mineralization. Specifications of potable water (WHO & BIS). Water treatment for drinking purpose- Chlorination- Break Point Chlorination and Reverse Osmosis.

UNIT-III-Phase rule

Phase rule- explanation of terms involved, One component system: Water system, Condensed phase rule, Two component systems: Lead- Silver (Pb-Ag) system, Pattinson's process, Copper -Nickel (Cu-Ni) system, Lead – Tin system (Pb-Sn), Eutectics and their applications in safety fuses and solders.

UNIT-IV- Nano Materials

Introduction - concept of Nanomaterials, electrical, optical, magnetic, and mechanical properties.
Types of Nanomaterials: Carbon nano tubes, quantum dots, nanowires, nano crystals.
Synthesis of nano materials: Top down and bottom up approaches- Mechanical grinding by ball milling, Sol gel method and Chemical vapor deposition methods.
Carbon Nanotubes: Single walled carbon nanotubes (SWCNTs), structure of SWCNTs - arm chair, chiral and zig zag. Multi walled carbon nanotubes (MWCNTs), synthesis of CNTs- arc discharge and laser ablation methods, applications.

UNIT-V- Membrane technology and Refractories

Membrane technology
Introduction, classification, working principle of membrane, casting methods: Phase Inversion and Solvent Evaporation methods, Synthesis of poly phenylene oxide, poly ether sulphone and membrane casting. Industrial applications of membranes.

Refractories:
Introduction, requirements of a good refractory, classification, properties: Refractoriness-determination and significance, Refractoriness under load (RUL)-determination and significance, Thermal spalling and Porosity- Applications of refractories.

Books:

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
2. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).
3. S.S. Dara "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).
4. Puri B. R., Sharma L. R. and Pathania M. S., "Principles of Physical Chemistry", Vishal Publishing Company, Delhi, 2010.
5. Palanna O. G., "Engineering Chemistry", Tata Mc.Graw Hill Education Pvt. Ltd., New Delhi, 2009.
6. Mary Jane Shultz, "Engineering Chemistry", Cengage Learning, USA, 2009

Suggested Reading:

1. B.K.Sharma, "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001)
2. Water Treatment : F. I. Bilane, Mir publisher
3. Chemistry of Advanced Materials: CNR Rao, RSC Publication.
4. Materials Science and Engineering an Introduction, William D. Callister, (Jr. Wiley publisher).
5. Introduction to nano materials by T.Pradeep.
6. Derek Pletcher and Frank C. Walsh, "Industrial Electrochemistry", Chapman and Hall, New York, 1993
7. Vijayamohanan K. Pillai and MeeraParthasarathy. "Functional Materials - A Chemist's Perspective" Universities Press, India, 2012.
8. Nanostructures and Nanomaterials: Synthesis, Properties and applications, Cao G, ICP, London,2004

From the Academic Year 2017-2018

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

SEMESTER-I & II

ENGINEERING CHEMISTRY LAB

(Common to all branches of B. E.I year)

Instruction	: 2 hours per week	Semester End Exam Marks	: 50	Subject Reference Code	: BS121CH
Credits	: 1	Continuous Internal Exam Marks	: 30	Duration of semester End Exam	: 3 Hours

OBJECTIVES	OUTCOMES
The course will enable the students to:	**At the end of the course students should be able to:**
1. Describe the quantitative analytical techniques 2. Learn the skills to handle the instruments 3. Apply the theoretical principles in experiments 4.Demonstrate the preparation of polymers 5. Examine the accuracy	1. Analyze the given substance using conventional and instrumental methods of chemical analysis 2. Estimate the amount of a given substance in the given sample by Conductometry, Potentiometry , P^H Metry and Colorimetry 3. Evaluate the data recorded from the practical observations 4. Prepare a polymer 5. Calculate the percentage of error of the results obtained

Any 10 experiments to be performed

1. Introduction to Volumetric / Instrumentation analysis and safety precautions.Standardization of $KMnO_4$ / NaOH
2. Estimation of Ferrous iron in given sample by $KMnO_4$
3. Estimation of hardness of Water by Complexometric method
4. Estimation of Calcium in Milk by Complexometric method
5. Estimation of Carbonate and bicarbonate alkalinity of Water
6. Estimation of Copper in brass / in the given solution by hypo
7. Measurement of Conductivity and determination of concentration of given electrolyte by **Conductometry.**
8. Measurement of Conductivity and determination of concentration of electrolytes in given mixture by **Conductometry.**
9. Construction of a galvanic cell / battery and study of variation of EMF / Cell Voltage with change in concentration of electrolyte by **Potentiometry**
10. Construction of galvanic cell with the given electrodes and estimation of Ferrous iron in the test sample by **Potentiometry.**
11. Estimation of acid in the test sample using **P^H Metry**
12. Estimation of copper in the test sample using **Colorimetry.**

Demo

1. Preparation of a polymer
2. Preparation of Nano material

Learning Resource:

1. B.Vishwanathan, P.S Raghavan*Practical Physical Chemistry*, Viva Books Private Limited.
2. J. Mendham and Thomas,"*Vogel's Text book of quantitative chemical analysis*", Person education Pvt. Ltd, 6th Edition (2002).

D. S. Narayana

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