From the Academic Year 2017-2018

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

SEMESTER-II

APPLIED CHEMISTRY

(All branches)

Instruction:(2+1)periods per week	Semester End Exam Marks : 60	Subject Reference Code : BS230CH
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. Acquaint with types of batteries and their applications. 2. Discuss different types of polymers and their applications. 3. Emphasize upon the quantity and quality of fossil fuels and need for bio- diesel. 4. To appraise rocket propellants and high energy materials. 5. Get acquainted with the principles of chemical analysis.	1. Discuss the construction, electrochemistry and applications of selected primary batteries and secondary lead-acid battery. 2. Explain effect of functionality on structure of polymers, different types of classification of polymers, types of polymerization, polymer processing techniques, preparation, properties and applications of few plastics and elastomers. 3. Apply the chemical principles of combustion to calculate the quantity of air required for combustion of a given fuel. 4. Calculate proximate and ultimate analysis of coal. 5. Discuss the properties and applications of selected solid, liquid and gaseous fuels. 6. Explain the principle of rocket propulsion, classification and characteristics of good propellants. 7.Explain the methods of preparation and applications of high energy materials namely lead azide, TNT, Nitro glycerine and RDX 8. Discuss the principle, working and applications of selected instrumental methods in chemical analysis of materials.

UNIT-I: Batteries

Introduction, basic concepts of battery (power density and energy density), primary and secondary cells.
Primary batteries: construction and electrochemistry of Zn-Carbon battery, Zn-alkaline battery- HgO-Zn battery and Ag_2O-Zn battery.
Secondary batteries: construction and electrochemistry of lead-acid battery- advantages and limitations.

UNIT-II: Polymers

Introduction, Degree of polymerization, Functionality of monomers & its effect on the structure of polymers, Classification of polymers-a) Homo and Co-polymers, b) Homo chain and Hetero chain polymers. c) Plastics, Elastomers, Fibers & Resins d) Thermoplastics & Thermosets. Molecular weight: Number average and Weight average methods, numerical. Glass transition temperature (Tg), factors affecting Tg.
Types of Polymerization: Addition and Condensation polymerization.
Plastics: Preparation, properties and applications of Aramid (Kevlar), Polymethylmethacrylate (PMMA) , Polycarbonate and Phenol-formaldehyde (Bakelite).
Elastomers: Natural rubber- Structure – Vulcanization and advantages.
Artificial Rubbers: Preparation, properties and applications of Buna-S, Butyl and Silicone rubbers.

UNIT-III: Fuels

Introduction, classification, requisites of a good fuel. Calorific value (CV)-HCV, LCV (Definition and relationship), Calculation of CV using Dulong's formula, Numericals. Chemistry of combustion-Numericals on volume- weight and weight-weight methods.

Solid Fuels: Coal: Proximate & Ultimate analysis of coal and their significance -Numericals.

Liquid Fuels: Fractions of crude oil, Composition and CV of Gasoline, Cracking: Fixed bed catalytic cracking method, Knocking and its significance, Octane number, Enhancement of quality of gasoline by reforming and anti- knock agents. Leaded & unleaded petrol, Power alcohol. Catalytic converters and their role in reducing the toxicity of automobile exhaust emissions. Composition and CV of diesel oil, Cetane number.

Gaseous Fuels: Composition and applications of CNG, LPG.

Bio-diesel: Source, chemistry of transesterification, merits of bio diesel.

UNIT-IV: Rocket Propellants & High energy materials

Rocket Propellants- Principle of rocket propulsion, classification, characteristics of good propellants.

High energy materials- Introduction, classification, precautions during storage, characteristics of explosives (oxygen balance-numericals) preparation of lead azide, TNT, Nitro glycerine and RDX

UNIT-V: Instrumentation techniques in chemical analysis

a) **Visible Spectroscopy:** Beer- Lamberts law- estimation of copper (II) in the given sample.
b) **Atomic Absorption Spectroscopy:** Principle-working and applications.
c) **Flame Photometer:** Principle-working and applications
d) **Thermal Analysis Techniques:** Introduction, Thermogravimetry (TGA) and Differential Scanning Calorimetry (DSC): principle and applications.

Books:

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
2. Applied Chemistry "A text for Engineering & Technology" Springer (2005).
3. S. Dara "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).
4. Gowarikar V. R., Viswanathan N. V. and JayadevSreedhar, "Polymer Science", New Age International (P) Ltd., New Delhi, 2011.
5. Palanna O. G., "Engineering Chemistry", Tata Mc.Graw Hill Education Pvt. Ltd., New Delhi, 2009.
6. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).

Suggested Reading:

1. A textbook of Polymer Science: Fred, Billmeyer Jr., Wiley India Third edition.
2. Samir S., "Fuels and Combustion", India Universities Press, Hyderabad, 2009.
3. Dell R. M. and Rand D. A. J., "Understanding Batteries", Royal Society of Chemistry, UK, 2001.
4. Billmeyar F. W., "Text book of Polymer Science", Wiley-Inter Science, New York, 2002.
5. Joel R. Fried, "Polymer Science and Technology", Prentice Hall of India Pvt. Ltd., India, 2003.
6. Arora M. G., Singh M and Yadav M.S, "Polymer Chemistry", Anmol Publications, New Delhi, 2003.
7. Bahadur P. and Sastry N.V., "Principles of Polymer Science", Narosa Publishing House, New Delhi, 2002.

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

5/6