SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Applied Science

SYLLABUS FOR CE, ME and AE Programs

Subject Category	BSC	Subject Code:	CHB102	Subject Name:	Chemistry

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz/Assignment	End Sem	Lab-Work		L	T	P	
60	20	20	30	20	150	3	-	2	4

Prerequisites:

Students who have completed 12th with Science stream or Chemistry of 12th standard or equivalent

Course Objective:

The main aim of Engineering Chemistry is to make Students familiar with basic concepts of Chemistry, the students face in industry and engineering field. With this background the Students will be able to explain Scientifically the various chemistry related problems in industry/engineering field.

Course Outcomes:

Student after successful completion of course shall possess skills to think critically and analyse chemistry problems in engineering field. Students are expected to solve the chemistry problems with an engineering purview. Laboratory work is intended for students to learn conducting experiments and analyse experimental data.

CO's Number	CO's Description
CO1	Differentiate hard & soft water, solve the related numerical on water treatment and have knowledge regarding its Significance in industry and daily life.
CO2	Apply their knowledge regarding various types of fuels including petroleum fuels, Fuels Cells, Electrical Vehicle Batteries
CO3	Acquire basic knowledge of various types of polymers, with mechanism and applications.
CO4	To know basic concept of lubrication and its properties.To have knowledge about cement and refractories to appreciate its applications in various industries.
CO5	Analyze the need of instruments. Identify and estimate about the unknown/new compounds with the help of spectroscopy/ chromatography.

UNITs	Descriptions	Hrs.	CO's	Remarks
I	**WATER TECHNOLOGY:** Sources, Availability, impurities in Water, Types of hardness, Units of hardness. Concentration expression: Normality, Molarity, Molality. Water analysis techniques – Hardness determination by EDTA method, Alkalinity determination. Defects in boiler due to Hard water. External Treatment (Lime-soda, Zeolite & Ion exchange resin method) & Internal Treatment of Boiler feed water. Numerical Problems.	8	1	
II	**FUELS & ENERGY STORAGE SYSTEMS:**	8	2	

	Characteristics of fuels. Classification of fuels, Calorific Value, HCV, NCV. Proximate and ultimate analysis of coal. Petroleum & its refining. Knocking, Octane Number & Cetane Number, Numerical problems. Electrochemistry: Introduction, EMF of cell, Single electrode potential. Classification of batteries (primary, secondary and reserved batteries), Introduction to Fuel Cell, Electrical Vehicle Batteries their components and materials used.			
III	**POLYMERS AND NANOMATERIALS:** Polymers: Nomenclature & classification of polymers. Thermoplastics and Thermosetting polymers. Preparation, properties and applications of PE, PVC, PS, Teflon, Nylon 6:6, PU, SBR, NBR, Bakelite, Silicone resin. Rubber and its types. Vulcanization of Rubber, Applications of rubber. Photoactive polymers, Photovoltaic materials: solar cells and dye sensitized solar cells- principle and applications. Nanomaterials: Introduction, Synthesis and applications of nano materials. Introduction to smart materials and its application.	8	3	
IV	**LUBRICANTS AND CEMENTING MATERIAL:** Introduction, Classification &functions, Mechanism of lubrication, Lubricating oils, grease, semisolid lubricant and solid lubricants. Properties of lubricating oils with significance:Viscosity Index, Flash point, Fire point, Aniline point, Cloud & pour point, Steam EmulsionNumber (S.E.N), Numerical problems. Composition of Cement, Manufacture of Portland cement. Chemistry of Setting and hardening of cement.	8	4	
V	**INSTRUMENTAL METHODS OF ANALYSIS:** Importance of Instrumental techniques. Classification of Instrumental techniques. Introduction to Electroanalytical and Spectroscopic Methods.Principle, Instrumentation, Working and applications of following techniques: Colorimetry, IR Spectroscopy, Conductometry, pH metry, Chromatography and Gas Chromatography.	8	5	
Guest Lectures (if any)				
Total Hours		40		

Suggestive list of experiments:

LABORATORY EXPERIMENTS:(Any 10 experiments to be performed)

1. To determine strength of unknown Ferrous Ammonium Sulphate $FeSO_4.(NH_4)_2SO_4.6H_2O$ (Mohr's Salt) solution by titrating it against intermediate Potassium Dichromate ($K_2Cr_2O_7$) solution using Di Phenyl Amine(DPA) as internal indicator.[Redox Titration]
2. To determine Temporary, Permanent and Total Hardness in given sample of water by E.D.T.A. method.[Complexometric Titration]
3. To determine strength of Sodium Carbonate and Sodium Bicarbonate in given alkaline solution by titrating with standard HCl using phenolphthalein and Methyl Orange indicators.
   Or
   To determine alkalinity in given water sample using Phenolphthalein and Methyl Orange indicators.[Acid Base Titration]
4. To determine strength of unknown $CuSO_4$ solution by titrating it against intermediate sodium thiosulphate (Hypo) solution using starch as final indicator.[Iodometric Titration]
5. To determine the chloride content of the given sample of water using silver nitrate solution with potassium chromate solution as an indicator.[Precipitation Titration]
6. To determine Moisture content in given sample of coal.[Proximate Analysis]

7. To determine Ash content in given sample of coal.[Proximate Analysis]
8. To determine the Viscosity Index of give lubricating oil by Redwood Viscometer No.1 and Redwood Viscometer 2.[Lubricating Oil Analysis]
9. To determine the Flash Point and Fire Point of lubricating oil by Abel's Apparatus.[Lubricating Oil Analysis]
10. To determine the Flash Point and Fire Point of lubricating oil by Pensky Martin's Apparatus.[Lubricating Oil Analysis]
11. To determine S.E.N. of given lubricating oil[Lubricating Oil Analysis].
12. To separate mixture of pigments by Thin Layer Chromatography [Instrumental Methods].
13. To separate mixture of pigments by Paper Chromatography [Instrumental Methods].
14. To verify Beer Lambert's law of colorimetry [Instrumental Methods].
15. To determine amount of Iron by colorimetry [Instrumental Methods].
16. To estimate amount of Iron by UV spectrophotometer. [Instrumental Methods]
17. To determine pH of given solution using pH meter. [Instrumental Methods]
18. To determine strength of acid/base by conductometric titrations. [Instrumental Methods]

TEXT BOOKS:

- Engineering Chemistry – Jain & Jain – Dhanpat Rai &Company Pvt. Ltd, New Delhi.
- A Text Book of Engineering Chemistry – S.S. Dara – S. Chand Publication, Delhi.
- Engineering Chemistry- Shashi Chawla, Dhanpat Rai &Company Pvt. Ltd, Delhi.
- Engineering Chemistry – Uppal – Khanna Publishers.
- A Text book of Engg. Chemistry- Agarwal, C.V, Murthy C.P, Naidu, BS Publication, Hyderabad.
- B. Sivasankar, Engineering Chemistry 1 st Edition, Mc Graw Hill Education (India), 2008
- O.G. Palanna, McGraw Hill Education (India) Private Limited, 9 th Reprint, 2015

REFERENCE BOOKS:

- Chemistry in Engineering and Technology, Kuriacose J.C. and Rajaram J.,Tata McGraw Hill.
- Applied Chemistry- Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt. Ltd. Publishers, New Delhi.
- Chemistry of Engineering Material-C.V. Agarwal, Andranaidu C. Parameswara Moorthy –B.S. Publications.
- William Kemp, Organic Spectroscopy, 3 rd edition, Palgrave, New York, 2005.

Modes of Evaluation and Rubric

Evaluation will be continuous as an integral part of the class as well through external assessment. Laboratory assessment will be based on assignments, presentations, and viva of each candidate.

List/Links of e-learning resource

- Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan
- https://nptel.ac.in/course.html
- https://iln.ieee.org/resources/e-learning
- https://www.researchgate.net/publication/221928462_ELearning_Usage_During_Chemical_Engineering_Courses
- https://learncheme.com/
- https://www.anits.edu.in/elearn_c.php

Recommendation by Board of studies on	14.6.2022 (Tuesday)
Approval by Academic council on	16.6.2022 (Thursday)
Subject handled by department	Applied Science (Chemistry)